Proceedings of the 2nd International Conference of Urban Biodiversity and Design (URBIO2010)

Nagoya, Japan, May 18−22, 2010

Organizer

URBIO2010 Organizing Committee

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Japan Association for Landscape Ecology
Japanese Institute of Landscape Architecture
The Japanese Society of Revegetation Technology
Organization for Landscape and Urban Greenery Technology Development
The Institution of Professional Engineers, Japan
Natural Environment Coexistence Technology Association

Supporting Societies & Associations

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Welcome Address

Distinguished guests,
Dear colleagues,

We would like to extend our hearty welcome to all of the participants to the URBIO 2010.

"We must come together and share our experience and wisdom, in order to create a new direction for humanity which (is) harmonious with nature". This is a message from the World EXPO 2005, which was held in Aichi and Nagoya. The theme of this EXPO was "Nature's Wisdom". Incidentally, EXPO2005 was called Ai-chikyuu-haku, or "Love the Earth EXPO". It is a great honour to hold the conference URBIO 2010 that takes over the spirit of "Nature's Wisdom", here in Nagoya.

We are very happy to announce that more than 430 scientists, planners and other practitioners from 35 countries (as of March 18) will gather together for the second time in a global context and discuss the current scientific and practical approaches to implement the Convention on Biological Diversity in towns and cities.

At the Second Curitiba Meeting on Cities and Biodiversity, which was held at the beginning of the International Year of Biodiversity 2010, the adopted declaration recalled "the Bonn call for Actions" and "the Erfurt Declaration", and reaffirmed the Mayor's commitment to contribute actively to implement the three objectives of the Convention on Biological Diversity, using mechanisms such as "Local Biodiversity Strategies and Action Plans (LBSAPs)". We, co-chairs of the URBIO 2010 planning committee, attended the Curitiba meeting, and fully understood the role of the URBIO conference is to contribute to the "City Biodiversity Summit 2010" and to the 10th meetings of the Conference of the Parties (COP10) of the Convention on Biological Diversity, both of which will take place this October.

In Asian countries, people traditionally have an idea that cities are not the opposite to nature, and people live together with the nature. These ideas would be valuable for the discussion toward sustainable cities in the world. The conference is expected to provide a significant opportunity for the discussion from various fields including science, technology, policy, landscape planning and design of urban areas for the purpose to realize the goal of the CBD. Additionally, we are very happy if we could draw all of the participants' attention to Asia, where cities have been developed under unique culture with nature. The spirit would hopefully be reflected to the Nagoya declaration - URBIO 2010.

It is our sincere hope that the convening of URBIO 2010 will be fruitful to all disciplines involved in research, planning, design and management of the urban green environment including biologists, ecologists, landscape architects and planners, horticulturists, urban designers and local government administrators.

We look forward that all the participants will also enjoy their own accompanying events in the friendly atmosphere of Nagoya, as well as sharing thoughts and working together to make all our cities green and prosperous places.

On behalf of the Organizing Committee of URBIO 2010, we would like to express sincere thanks to the URBIO 2010 Executive Advisor, Dr. Ahmed Djoghlaf, the Executive Secretary of the Convention on Biological Diversity, and Dr. Kunio Iwatsuki, Director of Museum of Nature and Human Activities, Hyogo, Japan.

The conference would not come true without the sincere advices from the president of URBIO, Dr. Norbert Müller and URBIO Network members. We appreciate our distinguished keynote speakers, for willingly agree to participate in URBIO 2010.

We must mention that this conference could not be prepared without the financial supports from many biodiversity conscious organizations and companies. Thank you to all the societies and associations for supporting URBIO 2010.

We would like to end our words of welcome with an earnest prayer for a great success of this conference throughout the coming four days.

Thank you very much.

Tadayoshi Inoue
Co-Chair of the Organizing Committee of URBIO2010
Soken Incorporated, (Registered Landscape Architect and Professional Engineer)

Yukihiro Morimoto
Co-Chair of the Organizing Committee of URBIO2010
Professor of Graduate School of Global Environmental Studies, Kyoto University

Welcome Address

I am truly glad that URBIO2010 is being held in Nagoya this year, which is an internationally important year for biological diversity.

I am looking forward to all of the wisdom that will be assembled here regarding the conservation and revitalization of urban biodiversity through everyone's presentations over a wide range of research and activities here at URBIO2010.

The importance of cities and local authorities in achieving the goals of the Convention on Biological Diversity was acknowledged in a decision adopted at COP 9 held in Germany in 2008.

As you have already been informed, at COP 10 which is scheduled to take place in October this year, the City of Nagoya will jointly host the City Biodiversity Summit 2010 with the Aichi Prefectural Government. Our expectation is to have 500 participants from 200 organizations including local governments and international organizations from around the world.

The results of URBIO2008 which I attended in Erfurt, the forerunner of URBIO2010, were proposed at the Mayors Conference held by cities including Bonn, which took place during the same period as COP 9.

At the City Biodiversity Summit, I would like to inform the world's cities and local authorities of the results of the URBIO2010 academic study in order to promote more effective local action concerning biodiversity.

The City of Nagoya formulated the 2050 Nagoya Strategy for Biodiversity in March this year. Our productive lives are supported by a large variety of organic life and ecosystems, and the goal of this strategy is to realize Nagoya as a city where these lives are maintained. We hope to make use of the academic results of URBIO2010 in our strategy.

I would like to express my sincerest appreciation for the tireless efforts of everyone who worked toward hosting URBIO2010 and expanding and developing it beyond the scope of its predecessor URBIO2008, and I offer my best wishes for the continued development of URBIO.

Masao Yamada (Deputy Mayor)
City of Nagoya, Japan

Welcome Address

It is my pleasure to present a welcome address in the opening ceremony and to send hearty welcome to all the participants of well-organized URBIO 2010 Nagoya.

Historically, Japanese people lived on the Japanese Archipelago performing a harmonious co-existence between nature and humankind in an ideal way. Biodiversity around residential areas was carefully watched and maintained by our ancestors, although they did not have such a concept as conservation of nature. It is said that Yedo city, with a million of population already 300 years ago, was very clean comparing with Paris and London, nearly the same size at that time. It was the principle concept of Japanese that everything on the earth was the blessing from heaven, and the citizens of Yedo at that time reused even the excrements as a valuable fertilizer. Japanese Archipelago was developed under such a general concept, and backyard of residential areas was managed perfectly as we name them *satoyama*. Based on a recent change of life-style of the people, *satoyama* forest zone was abandoned and seriously devastated. In urban areas, so-called secondary nature of such a zone is fairy well managed by the voluntary activities of the citizens with some aids from the local governments. We can see the basic attitude of Japanese people to face the nature and biodiversity by such an activity.

Recently, everything is evaluated under the standard on material-energy basis, and its value is compared by monetary standard. They have a tendency to look down of those with less monetary value. The elements of biodiversity with higher monetary price are respectfully treated but those without any monetary value is carelessly given up. Crisis to biodiversity is observed everywhere on the earth, and this is particularly distinct in densely populated areas. It is important and urgently necessary to observe urban biodiversity in such a condition of our earth. In this sense, this Conference is organized in very good timing.

Biological diversity of urban area is to be discussed in this URBIO 2010 Nagoya, and it is expected that the principle concept of the Convention of Biological Diversity will be remembered during the discussion to promote the sustainable use of urban biodiversity. I hope this meeting will yield successful investigation and discussion in this Conference, in addition for the visitors to enjoy the brief stay in this beautiful City of Nagoya.

Kunio Iwatsuki (Prof. Dr.)
Executive Advisor for URBIO2010 Advisory Board
Museum of Nature and Human Activities, Hyogo

Welcome Address

Policies and strategies to save biodiversity need to be based on sound science. Too often, decision makers, both at national and local levels, do not have access to solid data. That is why, since the inception of the Convention on Biological Diversity (CBD)'s cities initiative, we have supported URBIO and similar scientific initiatives to backup the plan of action to be proposed for adoption this October at the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 10) in Nagoya, Japan.

URBIO is a privileged platform for academia and specialists to discuss concrete recommendations to policy makers with economists, urban planners, developers, infrastructure specialists. Designing the city of the future will make the most significant difference in the battle for life on Earth. This design cannot be restricted to urban structures and systems: it must encompass the production systems that supply cities, often tens of thousands of miles away from consumption centres. Ultimately, it must change the consumption habits of *homo urbanus*.

URBIO is a key milestone in the roadmap towards COP 10 and the Nagoya City Summit, as it consolidates years of global research on urban biodiversity and its implications for design, planning and development.

We look forward to the input from URBIO during the Nagoya City Biodiversity Summit 2010, where this input will be used to help define the CBD's post-2010 strategic plan.

Ahmed Djoghlaf (Dr.)
Executive Advisor for URBIO2010 Advisory Board
Executive Secretary of the Convention on Biological Diversity

Welcome Address from the President of URBIO - International Network for Education and Research

Honorable Guests,
Dear Delegates,

During the first "URban and BIOdiversity and Design" Conference which was held in Erfurt (Germany) in May 2008, 400 scientists, planners and other practitioners from around 50 countries summarized for the first time in a global context the current scientific and practical approaches of "*Implementing the Convention on Biological Diversity in towns and cities*". The participants of this URBIO Conference expressed promise to support further CBD initiatives on "Cities and Biodiversity" through:

- sharing their knowledge and commitment through this conference and in the future,
- establishing a global "URBIO" network for education and research into urban biodiversity,
- promoting urban biodiversity through continuing dialogue with the CBD, especially linking future URBIO conferences with future COP meetings.

I am honoured and it is with the greatest pleasure that I welcome all of you to the second URBIO Conference, *"Urban Biodiversity in the Ecological Network"* in this wonderful city Nagoya, which is also hosting the tenth Conference of the Parties (COP 10) in October, this year. It is fitting, from several points of view, that the URBIO conference and the Conference of the Parties are being held in Aichi/Nagoya:

1. Japan is one of the countries on earth with the most densely populated areas and the fastest growing cities.
2. The concept of "Satoyama" has provided the Japanese people with a long tradition of sustainable land use and living in harmony with nature. During the conference we will learn more about this early concept of sustainability and how to apply it in urban areas.
3. The traditional "Japanese garden" is famous throughout the world as a model of how design can connect the development of human cultures to nature. The nearby UNESCO World Heritage Site of Kyoto is an impressive demonstration of how biodiversity and cities can co-exist.
4. First entire research activities in urban ecology have their origin in Japan and Germany in the same period. Since the early 1970s Makoto Numata started the "Interdisciplinary Studies of Urban Ecosystems in the Metropolis of Tokyo" - while Herbert Sukopp conducted "The City as a subject for ecological research" in the Metropolis of Berlin. Both scientists worked in close collaboration and since 1971 they played an important part in the inauguration and development of the first Urban UNESCO "Man and Biosphere" Programs (11 and 13) and the institutionalization of urban ecology as an own branch within ecology and an important science for sustainable city planning.
5. The first National Biodiversity Strategy of Japan, which was published already in 1997, was one of the first of the contracting CBD parties to focus on the importance of urban biodiversity to hold the global loss of biodiversity. Japan has one of the most comprehensive and detailed environmental laws and policies for urban areas for example the "Urban Green Space Conservation Act" and the "City Parks Law". In addition the third National Biodiversity Strategy of Japan (2007) is highlighting the

importance of ecological networks for biodiversity - the main theme of this URBIO conference.

I want to congratulate the URBIO 2010 Organizing Board for the wonderful and exciting program and the very interesting excursions it has devised. I would like to express my deep appreciation to all those who have worked very hard in preparing the conference. My special thanks go to all the Societies, Associations and Sponsors which supported this conference. Without their generous promotion and engagement this URBIO conference would not have been possible.

I am sure that the results of this conference will make a very important scientific contribution and support to the “Plan of Action on Cities, Local Authorities and Biodiversity”, which will be discussed during COP 10 here, in less than six months.

Norbert Müller (Prof. Dr.)
Advisor for URBIO2010 Advisory Board
University of Applied Sciences Erfurt and Head Office URBIO, Erfurt (GERMANY)

Network URBIO
Urban Biodiversity & Design

Programs

May 18 Tuesday [*Meijo University Mei-Eki Satellite Office*]

13:00 − 17:00 Registration
17:00 − 19:00 Informal Reception

May 19 Wednesday [*WINC AICHI*]

9:00 − 16:50 Registration [*Small Hall 2*]
11:00 − 16:50 Posters [*9th Floor*]
9:20 − 10:20 Welcome Notes [*Small Hall 2*]
Mr. Tadayoshi Inoue (URBIO2010 Co-Chair, Japan)
Mr. Masao Yamada (Deputy Mayor, City of Nagoya, Japan)
Dr. Kunio Iwatsuki (Director of Museum of Nature and Human Activities, Japan)
Dr. Ahmed Djoghlaf (Executive Secretary of the Convention on Biological Diversity, Canada, Video Message)
Dr. Norbert Müller (URBIO Network, University of Applied Sciences Erfurt, Germany)
10:30 − 11:00 Introduction Keynote (Dr. Yukihiro Morimoto, Japan) [*Small Hall 2*]
11:10 − 11:40 Keynote Topic 1 (Dr. Maria Ignatieva, New Zealand) [*Small Hall 2*]
13:00 − 15:00 Parallel Sessions (Oral) [*11th and 12th Floors*]
15:10 − 16:00 Poster Session 1 (Core Time) [*9th Floor*]
16:00 − 16:50 Poster Session 2 (Core Time) [*9th Floor*]

May 20 Thursday [*WINC AICHI*]

9:00 − 11:50 Posters [*9th Floor*]
9:00 − 9:30 Keynote Topic 2 (Dr. Charles H. Nilon, U.S.A.) [*Small Hall 2*]
9:40 − 10:10 Keynote Topic 3 (Dr. Kwi-Gon Kim, Korea) [*Small Hall 2*]
10:20 − 11:50 Parallel Sessions (Oral) [*11th and 12th Floors*, *Small Hall 2*]
13:00 − Mid-Conference Excursion

May 21 Friday [*WINC AICHI*]

9:00 − 14:20 Posters [*9th Floor*]
9:00 − 9:30 Keynote Topic 4 (Mr. Peter Werner, Germany) [*WINC Hall*]
9:40 − 10:10 Keynote Topic 5 (Dr. Hadi Susilo Arifin, Indonesia) [*WINC Hall*]
10:20 − 11:50 Parallel Sessions (Oral) [*11th and 12th Floors*, *WINC Hall*]
11:50 − 13:00 Lunch (Meeting for URBIO2010 Declaration)
13:00 − 13:30 Keynote Topic 6 (Dr. Thomas Elmqvist, Sweden) [*WINC Hall*]
13:40 − 14:20 Special Poster Session (Core Time) [*9th Floor*]
* Mainly discussed in Japanese and partly in English
14:20 − 15:50 Workshop [WINC Hall], Parallel Sessions (Oral) [*11th and 12th Floors*]
16:00 − 16:40 General Meeting / Concluding Remarks [*WINC Hall*]
18:00 − 20:00 Conference Dinner [*Meitetsu Grand Hotel*]

May 22 Saturday [*Meijo University Tenpaku Campus*]

14:00 − 16:30 Joint Symposium with the Japanese Institute of Landscape Architecture

May 23 − 24 Sunday − Monday Post-Conference Excursion

Venues

May 18	Meijo Univ Mei-Eki Satellite
May 19 - 21	WINC AICHI
May 22	Meijo Univ Tenpaku Campus

May 18 (Tue)

13:00–17:00	Registration
17:00–19:00	Reception

May 19 (Wed)

9:00–16:50	Registration [Small Hall 2]
9:20–10:20	Welcome Notes [Small Hall 2]
10:20–10:30	Break
10:30–11:00	Introduction Keynote (Dr. Yukihiro Morimoto) [Small Hall 2]
11:00–11:10	Break
11:10–11:40	Keynote Topic 1 (Dr. Maria Ignatieva) [Small Hall 2]
11:40–13:00	Lunch
13:00–15:00	Parallel Sessions (Oral) [11th and 12th Floors]
15:00–15:10	Break
15:10–16:00	Poster Session 1 (Core Time) [9th Floor]
16:00–16:50	Poster Session 2 (Core Time) [9th Floor]
11:00–16:50	Posters [9th Floor]

May 20 (Thu)

9:00–9:30	Keynote Topic 2 (Dr. Charles H. Nilon) [Small Hall 2]
9:30–9:40	Break
9:40–10:10	Keynote Topic 3 (Dr. Kwi-Gon Kim) [Small Hall 2]
10:10–10:20	Break
10:20–11:50	Parallel Sessions (Oral) [11th and 12th Floors, Small Hall 2]
11:50–13:00	Lunch
13:00–	Mid-Conference Excursion
9:00–11:50	Posters [9th Floor]

May 21 (Fri)

9:00–9:30	Keynote Topic 4 (Mr. Peter Werner) [WINC Hall]
9:30–9:40	Break
9:40–10:10	Keynote Topic 5 (Dr. Hadi Susilo Arifin) [WINC Hall]
10:10–10:20	Break
10:20–11:50	Parallel Sessions (Oral) [11th and 12th Floors, WINC Hall]
11:50–13:00	Lunch (Meeting for URBIO2010 Declaration)
13:00–13:30	Keynote Topic 6 (Dr. Thomas Elmqvist) [WINC Hall]
13:30–13:40	Break
13:40–14:20	Special Poster Session (Core Time) mainly discussed in Japanese and partly in English [9th Floor]
14:20–15:50	Parallel Sessions (Oral) [11th and 12th Floors] Workshop [WINC Hall]
15:50–16:00	Break
16:00–16:40	General Meeting / Concluding Remarks [WINC Hall]
18:00–20:00	Conference Dinner [Meitetsu Grand Hotel]
9:00–14:20	Posters [9th Floor]

May 22 (Sat)

Joint Symposium with the Japanese Institute of Landscape Architecture

May 23 (Sun)

Departure for Post-Conference Excursion

会場

5月18日	名城大学名駅サテライトオフィス
5月19日～21日	ウインクあいち
5月22日	名城大学天白キャンパス

5月18日（火）

13:00～17:00	受付
17:00～19:00	歓迎会

5月19日（水）

9:00～16:50	受付［小ホール2］
9:20～10:20	開会挨拶［小ホール2］
10:20～10:30	休憩
10:30～11:00	開会基調講演（森本幸裕）［小ホール2］
11:00～11:10	休憩
11:10～11:40	基調講演 1（Maria Ignatieva）［小ホール2］
11:40～13:00	昼食
13:00～15:00	口頭発表セッション［11階、12階］
15:00～15:10	休憩
15:10～16:00	ポスター発表 1（コアタイム）［9階］
16:00～16:50	ポスター発表 2（コアタイム）［9階］
11:00～16:50	ポスター展示［9階］

5月20日（木）

9:00～9:30	基調講演 2（Charles H. Nilon）［小ホール2］
9:30～9:40	休憩
9:40～10:10	基調講演 3（Kwi-Gon Kim）［小ホール2］
10:10～10:20	休憩
10:20～11:50	口頭発表セッション［11階、12階、小ホール2］
11:50～13:00	昼食
13:00～16:50	ミッドコンファレンス・エクスカーション
9:00～11:50	ポスター展示［9階］

5月21日（金）

9:00～9:30	基調講演 4（Peter Werner）［大ホール］
9:30～9:40	休憩
9:40～10:10	基調講演 5（Hadi Susilo Arifin）［大ホール］
10:10～10:20	休憩
10:20～11:50	口頭発表セッション［11階、12階、大ホール］
11:50～13:00	昼食（URBIO2010宣言公式ミーティング）
13:00～13:30	基調講演 6（Thomas Elmqvist）［大ホール］
13:30～13:40	休憩
13:40～14:20	ポスター発表（日本語*）（コアタイム）［9階］
14:20～15:50	口頭発表セッション［11階、12階］ワークショップ［大ホール］
15:50～16:00	休憩
16:00～16:40	総会 / 閉会挨拶［大ホール］
18:00～20:00	懇親会［名鉄グランドホテル］
9:00～14:20	ポスター展示［9階］

5月22日（土）

日本造園学会との合同国際シンポジウム

5月23日（日）

ポストコンファレンス・エクスカーション出発

＊ポスター発表（日本語）は、主に日本語により発表を行いたい方々のための発表コアタイムです。英語では、「主に日本語、一部は英語でディスカッションする特別ポスターセッション（コアタイム）」として案内しています。

14:20 – 15:50, May 21, WINC Hall

Workshop on Cities' Biodiversity Index

Coordinator: Kato, Masashi

Affiliation of Coordinator: City of Nagoya / Aichi-Nagoya COP10 CBD Promotion Committee
E-mail: masashi758@syd.odn.ne.jp (Masashi Kato) TEL: 81-52-972-0081 FAX: 81-52-972-0086

It is expected that at the workshop, participants will deepen the discussion on ideal evaluation index to effectively exploit cities' biodiversity potential and problem-solving ability, taking cities' diversity into consideration.

It is often said that cities' biodiversity is in crisis. But cities have sufficient biodiversity potential for cities and our planet. Recently, a lot of efforts have been started to exploit the cities' biodiversity potential. As an example of effort, a city biodiversity index to measure preservation progress on cities' biodiversity through self-evaluation is being developed by the Secretariat of the CBD and the National Parks Board of Singapore. Several cities supported by ICLEI, Local Governments for Sustainability, and the Secretariat of the CBD are currently testing the application of the index towards its presentation at the CBD-COP10.

Firstly at the Workshop, the outline of the Singapore Index will be explained and some cities will present their interim report on the test-bedding of the Singapore Index. And also the economic evaluation case study utilizing TEEB, the Economics of Ecosystems and Biodiversity, will be presented. Secondly, some presenters will raise issues, including evaluation of Secondary Nature, Urban Green, Urban Ecosystem Services, Environment Load on Ecosystems Outside Cities caused by consumption within cities, and Governance and Management of Biodiversity. From then on, all participants will join in and discuss these issues.

Presenters:

1) Outline of the Singapore Index
   Chan, Lena (National Parks Board, Singapore)
2) Interim Report of Singapore Index's Test-Bedding
   Ito, Tsuyoshi; Asai, Masaaki (City of Nagoya, Japan)
3) Interim Report of Singapore Index's Test-Bedding
   Gryseels, Machteld (Brussels Capital Region, Belgium)
4) TEEB as Concepts and Tools for Assessing & Valuing Ecosystem Service
   Gundimeda, Haripriya (Indian Institute of Technology, India)
5) Evaluation of Secondary Nature Considering Cities' Diversity
   Morimoto, Yukihiro (Kyoto University, Japan), Kato, Masashi (City of Nagoya, Japan)
6) Evaluation of Green and Biodiversity in Cities
   Yamaguchi, Kazuko; Masuyama, Tetsuo; Ishizaki, Akiko; Amejima, Katsunori (Pacific Consultants Co., Ltd., Japan)
7) Evaluation of Urban Ecosystem Services and their Governance and Management
   Kohsaka, Ryo; Hasegawa, Yasuhiro (Nagoya City University, Japan), Ito, Tsuyoshi (City of Nagoya, Japan)
8) Evaluation of Dependence and Environment Load on Ecosystems Outside Cities
   Nishimiya, Hiroshi (Institute for Global Environmental Strategies, Japan)

Symposium (May 22, Tenpaku Campus of Meijo University)

International Symposium on Cities and *Satoyama* Landscapes

This is a joint symposium with the Japanese Institute of Landscape Architecture (JILA). We will provide simultaneous translation in English / Japanese. Please participate in this event as well.

In recent years, *satoyama* landscapes have been ravaged as a result of depopulation and the aging of populations. Meanwhile, in the midst of all this, our awareness about the socio-cultural benefit of *satoyama* landscapes, the contributions they make to biodiversity and the way in which positive natural resource management should function, have been rapidly heightened. If we take a look at the global situation, landscapes like *satoyama* (hereinafter called "socio-ecological production landscapes") that were formed and maintained mainly through agriculture and forestry, exist in most parts of the world. Unfortunately, however, the survival of these landscapes is currently under threat for a number of reasons. Based on this situation, the *Satoyama* Initiative has been introduced. This is an international effort to promote the concept on sustainable management and utilization of natural resources, with a worldwide application. The core vision of the initiative is to realize a society that coexists in harmony with nature. At the 10th meeting of the Conference of the Parties to the Convention on Biodiversity (CBD COP10), which will be held in Nagoya, Aichi Prefecture in October 2010, broader support for the Initiative and establishment of an international framework to accelerate the efforts will be proposed.

Whilst also bearing in mind the outcomes from URBIO, we will discuss the following issues at the symposium:

- socio-ecological production landscapes in countries where populations are expected to decline, such as Japan
- how proper management of the peripheral zones of cities or green spaces within cities should function in the event that cities change as a result of populations decreasing

We thus aim to seek new directions for research at the symposium.

14:00-14:10	Opening Remark Hiroshi Maruyama, Chair, Executive Committee for the Annual Meeting, JILA
14:10-14:30	Keynote Speech 1 "Cities and Socio-ecological Production Landscapes in Europe" Thomas Elmqvist, Stockholm Resilience Centre, Sweden
14:30-14:35	Q & A
14:35-14:55	Keynote Speech 2 "Landscape between *Satoyama-Satochi* and Urbanized Area in Japan" Kazuhiko Takeuchi, President, JILA / Vice Rector, United Nations University
14:55-15:00	Q & A
15:00-15:10	Coffee Break
15:10-16:20	Panel Discussion *Facilitator: Masayuki Wakui, Chair, Committee on Support for CBD COP10, JILA Tadayoshi Inoue, Co-chair, URBIO2010 / Chair, Chapter of Central Region, JILA Isao Nakase, University of Hyogo / Museum of Human and Nature Activities, Hyogo Katsue Fukamachi, Kyoto University
16:20-16:30	Closing Remark Masaaki Takanashi, Vice President, JILA

Presentation Guide

Oral presentations

Each oral presentation will be allocated a total time of 15 minutes; which consists of 12 minutes for presentation and 3 minutes for discussion.

Each session room is equipped with a LCD projector and a PC with Windows® XP or later Windows OS versions. Microsoft PowerPoint 2007 and Adobe® Reader are installed on the PC. Your data file should be compatible with Microsoft PowerPoint 2007 on Windows OS. The file prepared in Macintosh or older versions of software might not work properly. We recommend that you ensure your file works in the suggested hardware/software versions.

Please save your data file into a CD or USB memory and bring it to the venue 10 minutes before your session.

Poster presentations (Core Time: 15:10−16:00 or 16:00−16:50, May 19)

The poster should be posted on a 90 (W) cm × 210 (L) cm board with adhesive tapes. Please post your poster from 11:00 to 13:00 on the designated board in Room 902 or 903. You can keep it posted until 14:30 on May 21. The authors are requested to stay by their posters during the core time.

Poster presentations (Special Poster Session mainly discussed in Japanese,
Core Time: 13:40−14:20, May 21)

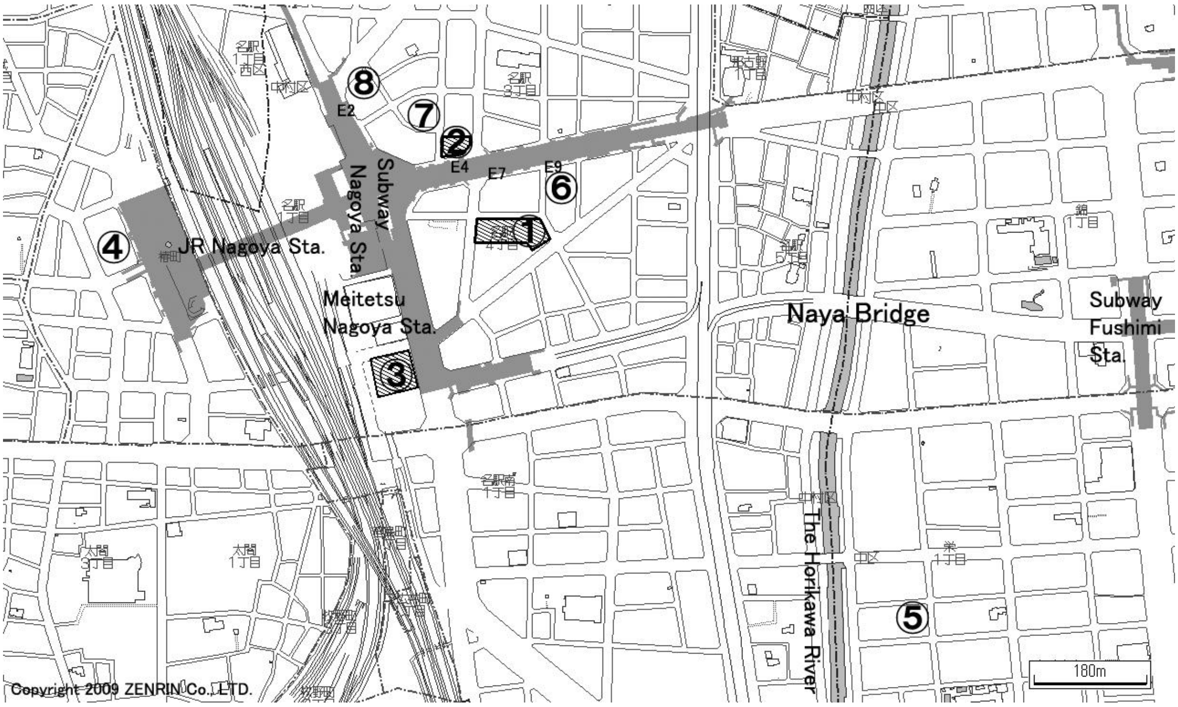
The poster should be posted on a 90 (W) cm × 210 (L) cm board with adhesive tapes. You can display your poster from 11:00 on May 19 to 14:30 on May 21 on the designated board in Room 902 or 903. The authors are requested to stay by their posters during the core time.

ポスター発表（日本語、コアタイム： 5 月 21 日 13:40−14:20）

ポスターは 90 cm（幅）× 210 cm（高）のボードに，粘着テープで貼って掲示してください。ポスターは，5 月 19 日午前 11 時から 5 月 21 日午後 2 時 30 分まで、会場（902、903 会議室）内の所定のボードに掲示可能です。発表者は定められた時間（コアタイム），ご自身のポスターの前で控えていただき，ご説明くださいますようお願いします。

ポスター（あるいはポスターのそば）には，必ず，英語のタイトル，連絡代表者と所属の英語表記もお示しください。ポスター発表（日本語）では，主に日本語により説明していただくことになっていますが，海外からの参加者のために，ポスター中のキーワードに英語を併記するなど，工夫をしていただけますと幸いです。

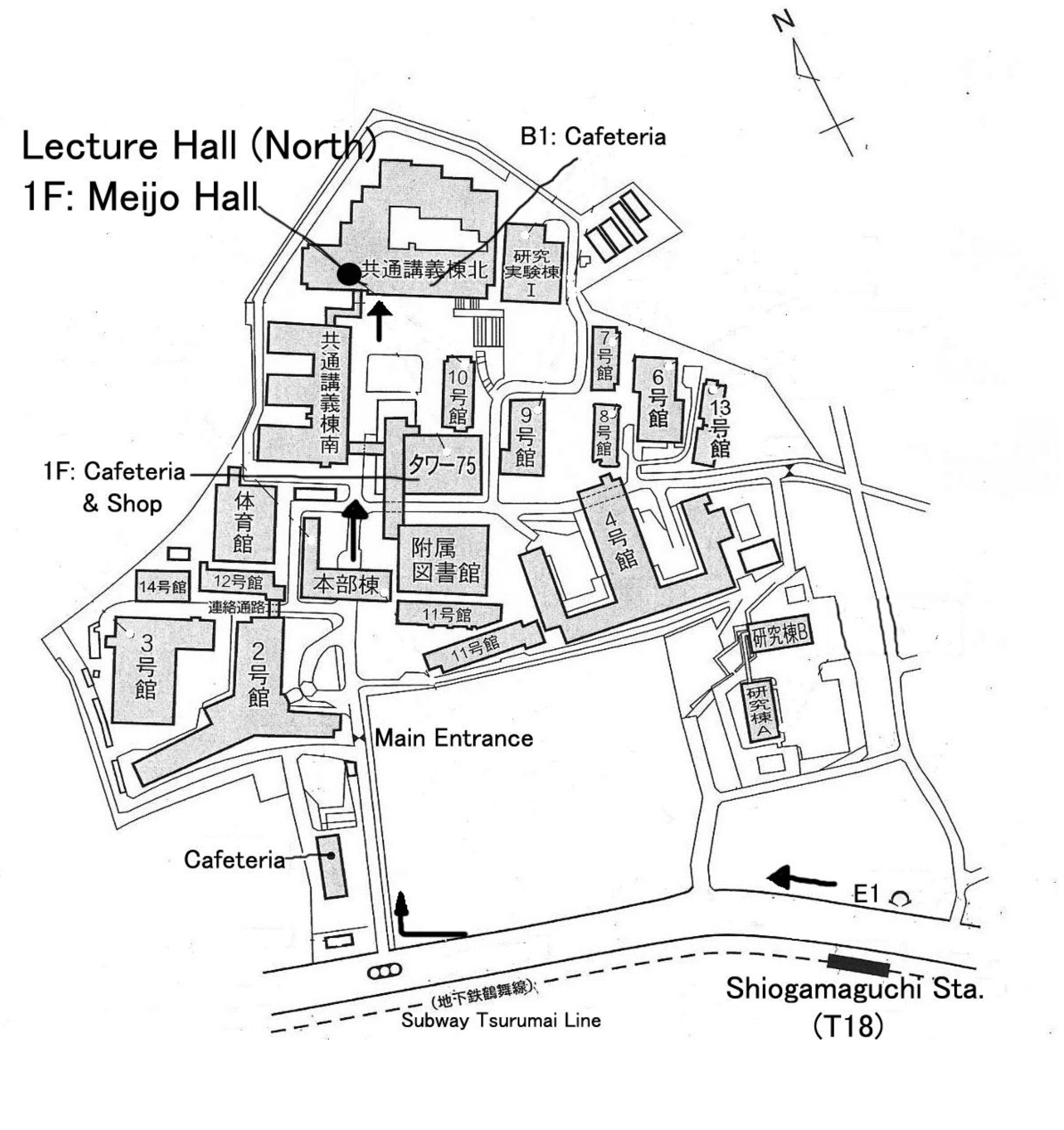
Map around the Venues (May 19 – 21)



1. WINC AICHI
   (the venue of the conference during May 19 – 21)
2. Meijo University Mei-Eki Satellite Office
   (SIA Building 13th Floor; Welcome Party on May 18)
3. Meitetsu Grand Hotel
   (11th Floor Kashiwa; Conference Dinner on May 21)
4. Meitetsu New Grand Hotel
5. Aichiken Seinenkaikan YH
6. Hotel Castle Plaza
7. Royal Park Inn Nagoya
8. Ekimae Mont Blanc Hotel

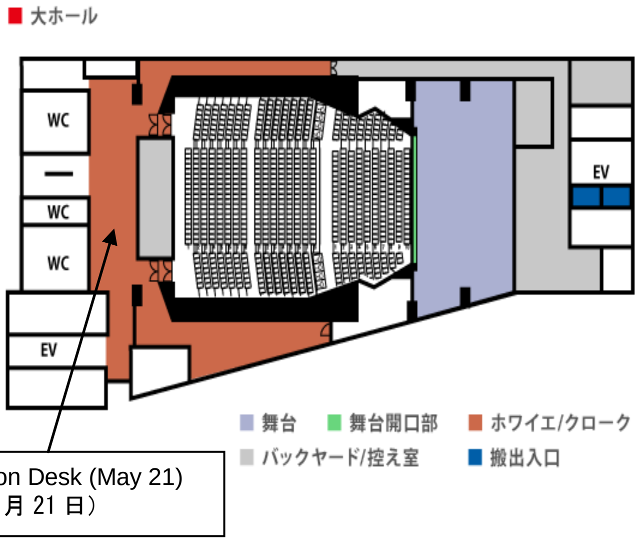
Map for the Symposium Venue (May 22)

Meijo Hall in Meijo University, Tenpaku Campus
Get on Higashiyama Subway Line at “Nagoya Station (H07)”, and change to the Tsurumai Subway Line bound for “Akaike” or for “Toyota-shi” at “Fushimi Station (H08)”. Get off at “Shiogamaguchi Station = Meijo daigakumae (T18)”. From the station, it is a 8-minute walk. In total, it takes about 40 minutes from the Nagoya Station.

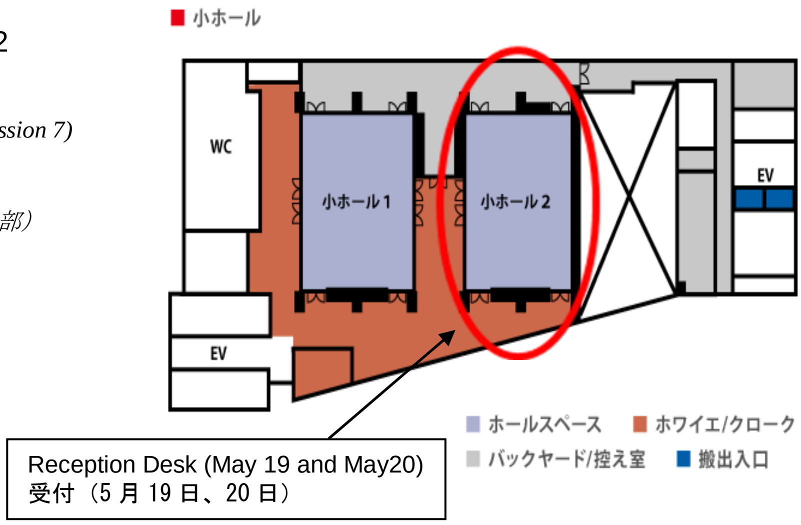


The Venue: WINC AICHI

2nd Floor / 2 階
WINC Hall / 大ホール
May 21
Keynotes, Workshop,
Oral Presentations (Session 8),
General Meeting,
Concluding Remarks
5 月 21 日
基調講演、ワークショップ、
口頭発表（セッション 8）、
総会、閉会挨拶



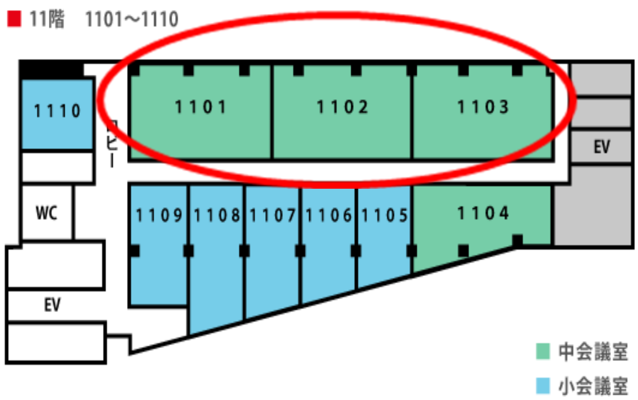
5th Floor / 5 階
Small Hall 2 / 小ホール 2
May 19 and 20
Welcome Notes, Keynotes,
Oral Presentations (A part of Session 7)
5 月 19 日, 20 日
開会挨拶、基調講演
口頭発表（セッション 7 の一部）



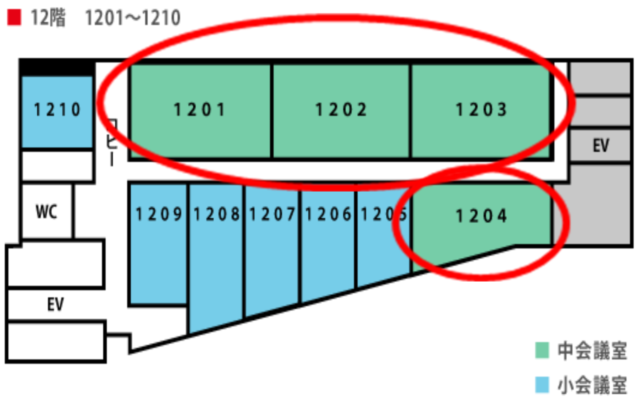
9th Floor / 9 階
Rooms 902, 903
Poster Presentations
ポスター発表

11th Floor / 11 階
Rooms 1101, 1102, 1103
Oral Presentations
口頭発表

Room 1110
Room for the Organizing Committee
実行委員会控室



12th Floor / 12 階
Rooms 1201, 1202, 1203, 1204
Oral Presentations
口頭発表



Mid-Conference Excursion (May 20)

The following 9 mid-conference excursions will be held on May 20 under the main theme of “Urban Biodiversity in the Ecological Network.”

Course A: Higashiyama forest hiking
Course C: Atsuta Shrine and the Horikawa river cruise
Course D: The Shonai river and Fujimae tidal flat
Course E: Mt. Togoku hiking (squirrel conservation activity)
Course F: Rice planting experience
Course G: Aioiyama Green Park and biodiversity greening
Course J: Satoyama and rivers in Toyota
Course K: Expo 2005 Aichi Commemorative Park

Post-Conference Excursion (May 23−24)

The following 3 post-conference excursions will be held on May 23−24 under the main theme of “Urban Biodiversity in the Ecological Network “.

Course 1. Kyoto, Osaka Cource
Kyoto Palace, Mt. Daimonji, coppice and burner’s hut for charcoal in tea ceremony and Osaka Expo Memorial Park.

Course 3. Shinshu, Yamanashi, Tokyo Course
National Biodiversity Center (Yamanashi), two national government parks (Shinshu and Tokyo), urban forests (Tokyo) and Bay Area Park (Tokyo)

Course 4. Chugoku Region Course
Two created wetlands, re-vegetation project site of a factory, forest management site by CSR (cooperate social responsibility) and natural beech forest
(This tour is supported by the Suntory Holdings Limited.)

Keynote Address

Introduction Keynote

Biodiversity and ecosystem services in urban areas for smart adaptation to climate change: "Do You Kyoto?"

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The local government of Kyoto, the city where the Kyoto Protocol was adopted, proposes to ask people, "Do you Kyoto?" Thus, they aim to encourage the development of Low Carbon Societies. However, beyond merely reducing carbon dioxide emissions, people should focus on biodiversity, which is the basis of the sustainable city that celebrates ecosystem services. "21st Century Environment Nation Strategy" (2008) (I was involved in the discussion for this strategy) is an official statement from the Japanese government that emphasizes comprehensive measures that integrate the three aspects of a sustainable society: a low carbon society, a sound material-cycle society, and a society in harmony with nature.

Not only Kyoto is a celebrated, ancient capital founded in 794, but it has succeeded in maintaining its status as a metropolis with unique amenities in Japan. Although Kyoto is blessed with natural beauty- which led a famous Confucianist in the Edo period, Sanyo Rai, to name the city "Sanshi-Suimei" or "blue mountains and clean water" - Kyoto has experienced severe destruction through civil wars or massive fires several times. However, the most notable characteristics of Kyoto are the innovative responses to these calamities. For example, reconstruction by Hideyoshi, the chief adviser to the Emperor in the 16th century, or cutting-edge modernization in the Meiji Era that used the natural environment of Kyoto to its advantage (A canal constructed from Lake Biwa was used as the first water power station in Japan to power street cars and develop villas with high-quality Japanese gardens). The development utilizing ecosystem services, implemented at the end of the 19th century, has become also an important element of the historic amenity of today's Kyoto.

As a result, City of Kyoto is expected to have some hints for a sustainable city with resilience relevant to the biodiversity. This paper will identify and discuss some relevant responses or good practices implemented in Kyoto with regard to its biodiversity, ecosystems, and ecosystem services.

The original city of Kyoto, Heian-Kyo, was constructed over 1,200 years ago. It is believed that Feng-shui geomancy played an important role (Honda, 1994) in planning the city. The theory gives us some clues for planning sustainable cities, including placement guidelines for forest ecosystems connected to the city. Forman (1995) cited Feng-shui concepts for sustainable land use with regard to urban forest ecosystems.

In terms of site planning and design, Japanese gardens are good solutions of land use that take advantage of the environment. Katsura Detached Palace, a villa with excellent architecture and associated gardens, was introduced to the Western world by Bruno J. F. Taut (1880-1938); it is an example of culture and nature coexisting in harmony. Most materials used for its construction such as wood and stone are of types commonly found in and around Kyoto; yet, the structure and design are quite unique. Katsura Detached Palace is constructed on the alluvial plane along the Katsura River. This means not only the advantage to use river water for the attractive garden ponds, but also the risk of flooding. As a solution in its design for the trade-off, the main building has high floors. Several signs on the posts under the floor mark the water levels of past floods (Okuma, 2007). The bamboo grove along the river bank and the unique bamboo fences, Katsura-Gaki, surrounding the garden might have mitigated the damage to the garden by filtering garbage. The history of four hundred long years now from the construction shows the significance of this smart adaptation to live in harmony with nature that provides us ecosystem services and also disasters. Considering the waterside ecotone is a key habitat of species threatened by urbanization (Science Council of Japan, 2007), and urban areas are at increasing risk because of extraordinarily heavy rainfall caused by the urban climate (Mikami et al., 2005), Katsura garden suggests us a win-win solution for the climate change.

On the other hand, cities change more or less original wildlife habitats into built areas. Consequently, broad, natural wildlife habitats inevitably become degraded, fragmented, and isolated. The Ogura-ike natural pond system, once the symbol of water, located in the south of a sound Feng-shui city and a national monument teeming with aquatic biodiversity, was changed to paddy fields for rice production. From the viewpoint of ecosystem services, the conversion was a trade-off between rice production and other wetland ecosystem services, including aquatic provisioning services, regulatory services such as a flood control system, and cultural services such as the famous Japanese culture of lotus watching.

Some forested areas have been changed to built areas. The degradation process can be described by applying island biogeography to analyze the effect of wildlife habitat fragmentation on biodiversity, regarding fragmented forests as islands. The so-called SLOSS (Single Large or Several Small) reserves issue is also an important topic for greenery planning (Morimoto, 2006; 2009). However, beyond this general theory, our field survey could make clear the significant role played by Japanese gardens in maintaining the species diversity of some taxonomic groups such as ferns, moss, and fish. These studies could suggest a smart response to overcome or halt biodiversity loss during urbanization.

Currently, however, the ecological integrity of forest ecosystems in and around Kyoto is threatened by an unusual mass dieback of pines and oaks. Mosses in Japanese gardens are also in crisis. These phenomena are examples of typical biodiversity crises in Japan (Japanese government, 2008). The moss is withering mainly as a result of the heat island effect (Iida et al., 2010) and is an example of Crisis 1, “Habitat degradation due to excessive human activities”. Oak wilt disease is an example of Crisis 2, “Degradation due to insufficient management”, and pine wilt disease is an example of Crisis 3, “Invasive alien species”. Considering the global biodiversity crisis caused by climate change, we should pay more attention to the response inter-linkage between Low Carbon Society and Society in Harmony with Nature.

In conclusion, I would like to highlight the importance of establishing Cities’ Biodiversity Index to make clear the target for smart adaptation to climate change. It is not a mere coverage of vegetation, but it should be assessed from the viewpoint of conservation of original habitats, sustainable use or management of natural and restored habitat in urban areas, ecosystem services and biodiversity footprints of the city.

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Keynote Topic 1

Planning and design of ecological networks in urban areas

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Green areas are an essential component of ecological networks in modern cities providing numerous ecological and social services such as improved climate, hygiene, aesthetics, recreation and environmental protection (including biodiversity). Historically urban green areas provided the early focus for the design of ecological networks. Urban planning history is rich with examples of creating links between different green areas within a city. Attempts at directional design of green areas date back as far as the 16th century in France with the Henry IV campaign aimed at improving Paris's appearance, addressing issues of public sanitation and creating new green public spaces such as squares, gardens and alleys of trees. Principles of Baroque urban planning in 18th century Europe saw green areas (first of all private gardens of nobility and boulevards) as an important part of grandeur Baroque cityscapes. Tree-lined alleys were the major contribution of French formal gardens and provided a model for street tree planting and also "socialisation of urban space" (Rogers, 2004). Urban squares contained important "green" and served as significant spaces for urban life. Formal tree groves, promenades and prototypes of boulevards in Paris in the 17th century were inspirational for many European cities. One very striking example was the plan of St. Petersburg (founded in 1703 by Peter the Great) where green areas in private gardens of the nobility created significant green "rings" along the Fontanka and Moika rivers (Dubyago, 1963). Interestingly, old Russian cities (13-17th century) always had quite a few green areas within city boundaries due to their urban planning structure (private houses with adjacent gardens), open areas next to churches and quite extended areas of common meadows.

The Picturesque landscapes of the 18th century were influential in creating a new city model in England "rus in urbe" (country-in-the city) where parks, gardens, landscaped squares and street green promenade plantings were used as a "softener" of hard cityscape and created a "greener" city. Urban green areas were visually and physically connected by systems of open grazed areas, gardens and road plantings. Democratisation of society during the 19th century Industrial Age resulted in introduction of public parks which became a crucial part of urban green areas. The science of urban planning tried to solve important problems of water, sewage and pedestrian circulation. The era of the modern city began. Urban settlements started to be shaped according to certain regulations and planning codes. By the end of the 19th century, the activity of Frederick Law Olmsted in US cities provided a very important concept of parkways - connecting different urban parks by systems of landscaped boulevards and roads with tree lines, sidewalks and bordering lawns (e.g., Park-and-parkway system in Buffalo, New York State, Riverside, Illinois, Chicago park system and Boston's Emerald Necklace). "The City Beautiful" movements in the US and New Zealand advocated the need for park systems as well.

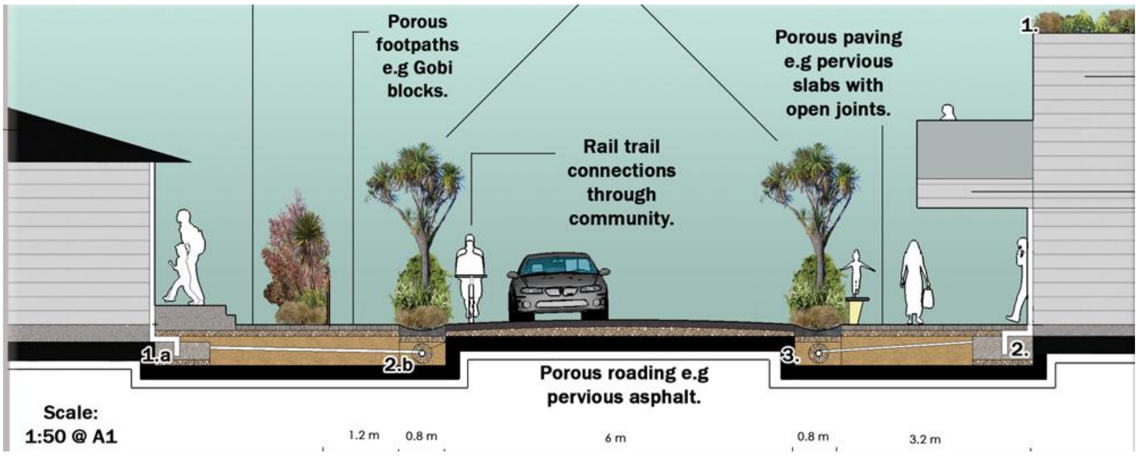
The Garden City movement in England (end of 19th century) and in Russia (1930's) both related to the socialist approach, explored models of new cities with greenbelts and rings of green open spaces, houses and gardens. Carefully arranged greenery and recreational facilities were core considerations for achieving a democratic goal of creating a new generation of urban settlements. In contrast, the New World explored mostly urban grid schemes. In the USA and New Zealand the city grid model was improved by including special places for green squares and some public parks. For example in Christchurch, New Zealand, large open spaces in the centre of the city were dedicated to the development of a public park and botanic garden.

In all mentioned examples urban green areas were seen primarily as part of a planning tool for improving city infrastructure, social functions and aesthetical performance (a way to make urban places more beautiful). The ecological essence of green areas was not completely understood at this time.

After World War II, western cities experienced redevelopment of the urban core and rapid growth of suburbia. Fast technological development led to environmental crises, loss of valuable natural habitats, and increased air and soil pollution. Growing knowledge of ecology as a science (including urban ecology) and reaction against urban environmental crises resulted in a new vision on planning and design of green areas as a whole system. The "Design with Nature" (1969) of Ian McHarg explored opportunities provided by natural ecosystems to urban land planning strategies. This was furthered via the environmental movement of 1970's -1980's in Western countries, where the introduction of concepts of sustainability and green urbanism "cities that are green and designed with functions in ways analogous to nature" (Beatley, 2000) called for new approaches to green urban infrastructure.

One of the significant contributions to the development of ecological networks was the greenway movement in Europe, the USA and Canada and the green corridors movement in some European countries in the 1990's. Most authors of these movements saw the roots of greenways in the greenbelt concept of the Garden City of Howard, parkways vision of Olmstead and National Park System in the US (Zube, 1995). Greenways employed various landscape ecology (corridors, patches, matrix, and connectivity), landscape planning (planning greenways on different scales), landscape architecture (design structure, species composition) and conservation biology concepts. The vision of greenways was as corridors (landscape ecology corridors) of "various widths, linked together in a network" (Fabous, 1995). Greenway planning was seen as tools for developing an urban ecological network. Visions of urban ecological networking in 1990's - 2000's also included design of blueways (rivers, lakes, canals etc.), railways, cycleways and even skyway (green roofs) (Turner, 1995). The concept of greenbelt is still very popular in some countries (China, Russia) and involves modern technological tools such as GIS for their analysis, planning and design (Yang & Jinxing, 2007; Kuznetsov & Ignatieva, 2003).

Planning and design of ecological networks in the modern era is seen as a multidisciplinary approach involving all kinds of "potential" ecological space within the city. Remnants of original natural vegetation are always prioritised in this networking as a unique source of native biodiversity and local identity (Florgard, 2009). Planted urban woodlands, public parks and gardens, riverways, wetlands and railways continue to be a focus for urban planners and landscape architects in their work on ecological networks and green infrastructure at a variety of scales. Residential private gardens, street plantings and cemeteries are viewed more and more from the angle of important patches and sources of biodiversity in urban green mosaics. Neglected lands such as wastelands and industrial sites with spontaneous vegetation and brown fields with contaminated soils are also included today as a potentially valuable "stepping stones" in ecological networks (Hough, 1995). With growing interests in alternative sustainable design solutions for cities such as green roofs, green walls and impervious pavements, these types of green spaces can be also valuable elements in ecological networking providing healthy environments and additional habitats for urban wildlife.



Modern planning and design processes of creating ecological networks calls for using progressive technology and sustainable practices such as Low Impact Development (USA) and Low Impact Urban Design and Development (New Zealand) at different scales from regional, to neighbourhood and individual property design. For example different types of green corridors and networks of optimized patch sizes will also include sustainable storm water management devices such as rain gardens and swales in New Zealand cities (Ignatieva at al., 2008). Urban street layouts will combine functions of cycle, pedestrian green and blueways (see figure).

Private gardens can be very important stepping stones in an ecological network. They can enhance native biodiversity by minimising traditional lawns and using of native plants and "spontaneous" wild vegetation instead of traditional high maintained "Lollipop" gardens.

A new multidisciplinary approach to planning and design of ecological networks in contemporary cities is needed to allow connectivity within the urban structures and with surrounding natural, semi natural and rural environments. New models of urban ecological networks should fulfil functions of respecting, conserving and enhancing natural processes, improving biodiversity, aesthetics, cultural identity and be an important framework for creating sustainable cities. Innovative planning and design approaches should be researched for successful implementation of a new generation of ecological networks. Developing countries at the moment are in the process of searching for their own approaches to creating green infrastructure and ecological networking that addresses their local ecologies and cultural histories.

Figure above: Proposal for a street in new subdivision in Lincoln Village, New Zealand. 2007. Design: S. Moultrie

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Keynote Topic 2

Management, Conservation, and Urban Biodiversity

Nilon, Charles H.

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The importance of urban biodiversity is debated by many in the conservation community. In my state of Missouri, the state's wildlife conservation agency makes no mention of urban areas as unique habitats and no mention of the biodiversity found in cities. Instead, the emphasis is on the impacts of development and urban sprawl on the diversity of native species. Savard et al. (2000) note that this approach to biodiversity conservation is common and that traditionally ecologists and managers have looked at the impacts of urbanization on biodiversity, rather than on the actual biodiversity of urban areas.

People who live in, study, or care about cities: ecologists, wildlife managers, conservation biologists, planners, and local residents have debated what biodiversity means in urban settings. Savard et al. (2000) noted the range of definitions for urban biodiversity and stressed the importance of defining the setting and scales at which biodiversity is being assessed, from a single urban lot to the larger region containing the city; and defining the meaning and goals of biodiversity conservation. My paper focuses on these differing goals and approaches to biodiversity.

In North America and many parts of the world, these approaches might be generalized as a wildlife conservation approach that focuses on rare species, the habitats supporting those species, and the processes that maintain those habitats; and a wildlife management approach that focuses on a wider range of species and that incorporates a greater link with residents' concerns and value.

Bird conservation projects in North America are an example of wildlife conservation approaches to urban biodiversity initiatives. Marzluff and Rodewald (2008) summarize approaches to urban bird conservation as:

- Protecting natural area for habitat and to improve quality of matrix;
- Planning explicitly for open spaces and natural habitats within new subdivisions;
- Using a wide variety of arrangements of built and natural spaces with developments
- Enhance and restoring habitat within existing open spaces and natural areas;
- Improving habitat quality within the urban matrix
- Celebrating urban biological diversity to foster connections between people and the natural heritage of their local ecosystems and regional biomes.

Burhans and Thompson (2006) illustrate the conservation approach in their work focusing on shrubland birds in urban parks and open spaces. Their work noted the conservation value of the areas for three species, but emphasized specific land management practices needed to maintain shrub habitats in the park.

The wildlife management approach to biodiversity considers a wide range of species and reflects the wider range of habitats that occur in cities. The London Biodiversity Action Plan and the Berlin Digital Environmental Atlas are examples of projects that have surveyed species across a range of built and natural habitats. Davies and Harrison (2002) documented the challenges for biologists and managers face in identifying and managing species that occur in uniquely urban habitats

The management approach also considers the role of the urban matrix and the species supported within the range of residential, commercial and industrial habitats. The University of Sheffield's Biodiversity of Urban Gardens project is an example of an effort to document the importance of residential habitats to regional biodiversity.

Finally, management approaches explicitly address people and their activities and values. These approaches range from developing habitat management guidelines for planners dealing with lot-scale redevelopment projects to efforts to involve low-income people in gardening and restoration projects that benefit rare or important species.

Conservation and management activities reflect ongoing changes in the understanding of urban biodiversity and what is needed to achieve meaningful outcomes for nature and people.

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Keynote Topic 3

Wetland restoration to enhance biodiversity in urban areas: a comparative analysis

Kim, Kwi-Gon[1)], Lee, Hoon[2)], Lee, Dong-Hyun[2)]

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On 11 January, the UN kicked off its official launch of 2010 as the International Year of Biodiversity (IYB). UN Secretary-General Ban Ki-moon called it a "wake-up call" to realize the failure of the protecting the natural resources, and asked all the nations and individuals for the participation to the global solidarity to protect the organism on earth.

In this aspect, the importance of the urban biodiversity has been emphasized. The urban biodiversity has such importance and role to the earth as, cities which only occupy 2% of the globe, contain half of the entire population, and contribute about 80% of the CO_2 emissions and 75% of the total energy use.

Urban nature conservation and restoration of biodiversity has grown in importance and richness as a theme over the recent decades. Many of professionals, scientists and policy makers, urban naturalists, the organizations, governmental and non-governmental, charged with biodiversity protecting now include urban programs in their work because they are aware of the values of wetlands in cities. The decision-makers and managers of urban land need to understand the priorities and issues that have driven this expansion of concern, and which set implicit and explicit goals for the planning and management systems. For issue-oriented wetland conservation and restoration, stakeholders' approach at the local level can start with households at the bottom level to deal with public health, climate change and livelihood issues. Many of the greatest world cities would not be what they are today if wetlands had not been drained, filled, and developed. World cities faced constant pressure to expand; and as their populations swelled, development spilled over into nearby wetlands - a trend that continues today.

After centuries of mistreatment, wetlands have shed their dismal image - a source of disease and pestilence, a quagmire of precarious earth and blood-thirsty insects, and are finally valued for their enormously important environmental and economic functions, such as flood control and the provision of wildlife habitat.

Wetland, defined as transitional areas between uplands and aquatic areas, are sources of urban biodiversity. However, wetlands face a barrage of threats from urban development. Despite of a plethora of laws, regulations and programs to protect them, wetlands are likely to encounter increasing development pressure. There is a need for new approach to integrating wetland issues into urban development.

Wetlands mitigation for any activity can be taken to avoid or minimize damage to wetlands, and to restore, enhance or create wetlands as well. New wetland tools are available for the wetlands mitigation including "wetland impact assessment". This paper will explore many of the current issues in wetland mitigation, and describe wetland mitigation strategies with case studies provided for illustration. It will include some general guidelines for successful wetlands mitigation based primarily on existing literature review in several cities.

The cases will be selected on the two points of view. The first case type will be on the linkage of urban nature point of view, with best practices of protecting and restoring urban biodiversity through the planning system. The cases from biodiversity strategy of London City, England, and that of Hanam City, Republic of Korea will be compared and analyzed.

The second case type will be on the detailed best practices on site-specific restoration cases. One of reprehensive cases can be “The London Rivers Action Plan: A tool to help restore rivers for people and nature”. Furthermore, comparison and analysis of cases between developed nations and less developed nations will be included. The comparison and analysis will be not only on biodiversity improvement point of view, but also various wetland functions point of view, including flood risk management, adapting to climate change, linking people to nature through urban regeneration, and connecting with the natural environment. Also, analysis on restoration, enhancement, and creation point of view will be conducted.

The goal, method and effect of the wetland restoration should be varied according to the city type. For instance, the effects of wetland in Coastal City can be different from the effects in Inland City. Furthermore, generic guideline should be tested according to different city types.

Good example is “Best Practice Guidelines for the Establishment at a Coastal Greenbelt (March 2009)”, published by IUCN. Cities should also be classified into cities in “Developing Countries” and cities in “Developed Countries” for such test.

In this regard, a workshop with the goal of development of “Guide for Urban Development, Biodiversity and wetland management” was recently held by UN-HABITAT and the Ramsar Convention. This guide which will be applied in a new program after tested in a selected city is expected to greatly contribute to achieving the sustainable development and the Millennium Development Goals (MDGs).

Keynote Topic 4

The ecology of urban areas and their functions for species diversity

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Introduction

Although the relationship between the urban environment and the occurrence of plants and animals is well known both in general (e.g. the characteristics of urban flora and fauna with respect to the urban heat island) and in detail for some cities and towns (e.g. comprehensive surveys of Berlin, Chiba, New York) or for specific urban habitats (e.g. city parks, railways, cemeteries), nevertheless great problems exist to understand the variety of the species diversity of different cities (Werner & Zahner, 2009).

On the one hand, the complexity of the ecology of urban areas, i.e. the variety of determinants and the spatial and temporal dynamic of cities, preclude simple starting points and lines of explanations. On the other hand, our knowledge is not really objective. Three examples of that: 1) We have a middle European and North American view, because an overwhelming number of published studies present results from those regions. 2) Our common scientific knowledge and our perception of biological diversity in cities are particularly determined by two taxonomic groups, higher plants and birds. Roughly estimated, more than two-third of all published studies deal with them. 3) Comparing the floristic maps of European cities, it can be noticed that the cities, showing species richness higher than the average, are often cities with universities housing numerous biologists within their borders.

Due to that, we have a lack of sufficient comparisons between various cities. In my presentation, I will demonstrate three approaches to get a better understanding of the relationship between patterns and processes of cities and the species diversity. The three approaches are: the embedded city, the urban matrix, and the urban patches.

The embedded city

If we describe the ecology of urban areas, we compare them with the ecology of the surrounding areas. Many studies notice that urban areas are warmer or dryer and forest habitats are more fragmented than forests outside of the cities. But towns and cities are embedded in varying biogeographical regions and landscape settings. For example, cities in parts of northern Europe, Canada and the tropics are set in forest landscapes (ranging from boreal forests to rainforests); cities in central and southern Europe are often embedded in cultivated agrarian landscapes, while some cities in Australia, the United States and Africa are located in steppe or even desert landscapes. Obviously, the relationship between cities and surrounding areas varies much more than often discussed, if we compare cities on the global level.

Cities are also embedded in processes of time. Many European cities were founded several hundred years ago and in contrast to a lot of current Asian or South American cities, they grew and grow more slowly and are smaller than those cities. The same is with the surrounding areas. In Europe, especially in the Mediterranean region we find a man-made landscape for thousands of years. Both the rural and the urban landscape are based on long adaptation processes of anthropogenic influence. We do not know such long-termed processes from Australia or New Zealand. That means, in Australia or in New Zealand the ecological distance to the bioregion caused by urban activities is manifold greater than in Europe. The species composition of urban areas in Australia or in New Zealand reveals a greater distance to the rural areas than in Europe.

Nevertheless the ecological distance of the species composition in urban areas to the composition of the surrounding areas, i.e. the proportion of native species of the bioregion, is a useful indicator to measure the impact of urbanization on biodiversity. Due to that, a measure of distance is appropriate for comparative indices, but to value various cities with respect to biodiversity, you have to bear in mind the points mentioned above.

The urban matrix

Structurally, a town or city can be viewed as a 'complex habitat mosaic' (Mazerolle & Villard, 1999). This habitat mosaic is made up of very varying sub-units. The principle picture of that mosaic, both the alternation of built-up and open areas and the mix of buildings and vegetation, is the urban matrix. Relatively few studies have investigated the correlations between the layout of the urban matrix and biological diversity. The function of the urban matrix for biological diversity in cities is underestimated up to now.

Several studies demonstrate that land use types like residential areas, representing a mixed structure of buildings and vegetation, have an important function for the biodiversity of urban areas.

Species can be classified according to whether they are able to move across or be limited by the urban matrix. Garden et al. (2006) define 'matrix-occupying' species as species using the matrix and moving more or less freely. By contrast, species for which the built-up areas represent barriers are termed 'matrix-sensitive' species. Matrix-sensitive species are confined to single urban habitats (patches), mainly green areas or urban wastelands, and are exposed to greater risks to local extirpation because of fragmentation and other potential changes to their habitat (Crooks et al., 2004).

There is a correlation between the general degree of vegetation cover to species richness in a city. If the proportion of green areas and vegetation elements is high, then more species can exist in and move across the urban matrix.

The urban matrix is not homogenous. On the one hand, we find clusters of high density and clusters of low density of buildings, of high disturbance and low disturbance and so on. On the other hand, there are breaks in the matrix caused by large green areas or linear structures like rivers, motorways and railway tracks.

Resistance and permeability are terms which should be used to describe the urban matrix and to get an understanding of the relationship between urban areas and biodiversity. We have no indicators and sufficient methods to identify those traits of a city.

Additionally, it is helpful to establish systems to distinguish matrix-occupying and matrix-sensitive species. Cook et al. (2002) and Godefroid and Koedam (2003) have established that matrix-occupying species also occupy patches and that, because of this, effects of patch size or distances between patches on species diversity may be concealed. If matrix-occupying species are omitted from the analysis of patch effects, clearer correlations between the structural characteristics of patches and species diversity can be identified.

The urban patches

Following the down-scaling, urban patches are the micro scale and at that scale we have to deal with the specific ecological conditions of a location.

A number of authors state that in terms of biological diversity, quality of habitats is determined by their soil parameters (especially for plants and soil fauna), structural features (which, for animals, means primarily the vegetation structure), the size of the area and by the age and connectivity of the habitats in question. More specifically, the more structurally complex, larger, older and less isolated a habitat area is, the better are the implications for biological diversity

(Cornelis & Hermy, 2004; Angold et al., 2006; Chace & Walsh, 2006).

In summary we can record, that:

- for highly mobile species, like birds, structural diversity of the vegetation is one of the most important factors;
- near-natural vegetation increases robustness and hence resistance to the intrusion of species foreign to the area;
- habitat size often correlates with an increase in habitat structures and the variety of microhabitats, it is often also linked with an increase in the number of species, but the positive correlation between species richness and area is a gross simplification;
- habitat age has a variety of aspects, they comprise pristine remnants, unchanged use and maintenance over decades or even centuries, and succession and the emergence of differentiated vegetation structure;
- the quality of habitat networks can be described as structural and functional connectivity. The main problem of corridors in urban areas is that they are too narrow, since little free space is available.

Conclusion

The problem is not, as some scientists suggest, a lack of documentation (Tait et al., 2005) or inadequate understanding of the distribution of individual taxa in specific cities, some of which are documented in great detail. The problem is that the complexity of determinants and the spatial and temporal dynamic of cities (Andersson, 2006) preclude simple starting points and lines of argument to explain causal links between biological diversity and cities (Kinzig et al., 2005).

If we want to compare cities by appropriate indicators and if we want to value cities with respect to urban biodiversity, then we need models helping us to understand and mirror the causal relationships between urban areas and biological diversity.

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Keynote Topic 5

Landscape ecology and urban biodiversity in tropical countries

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Introduction

Indonesia is archipelago country stretching from the west to the east. Landscapes, land uses and land covers are changing rapidly in response to a variety of economic, demographic and policy factors, especially after economic and political crises. Landscape changes due to changes in agricultural activities toward industrialization, urbanization, and commercial agricultural land have become serious matters in the most populated island, Java.

The urban landscape depends on the surrounding area, such as suburban, rural, and bio-regional landscapes that are shown on ecological watershed units. The uniqueness of urban biodiversity is influenced by the ecological networks among land uses in rural, suburban and urban landscapes. Therefore, ecological landscape management among rural, suburban, urban and regional scales should be integrated in the planning based on the landscape unit, a landscape with a variety of physiographic characteristics within a watershed, from the upper stream to the downstream. Biodiversity conservation is an object related to environmental services, which concerns to watershed functions, GHG emissions, landscape beauty. In another word, rich biodiversity of flora and fauna related to carbon storage in trees and soil. High biodiversity such as an Agro-forestry forms of land use reduces foot-print intensity by higher total bioproductivity (van Noordwijk, 2006). Biocapacity (supply) and ecological footprint (demand); over-shoot: gap between supply and demand (Fig.1). Integration or segregation of land use planning and management in agro-forestry landscape is driven by water resource, biodiversity, livelihoods, economy, land use planning, culture, and governance (Fig.2)

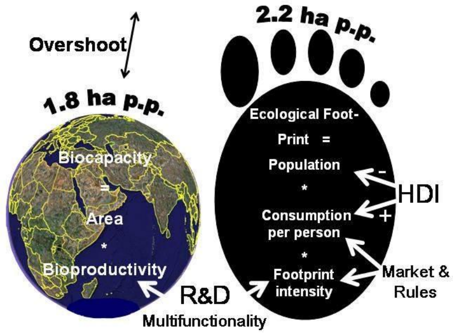

Fig.1: Overshoot: gap between supply (biocapacity) and demand (ecological foot print)

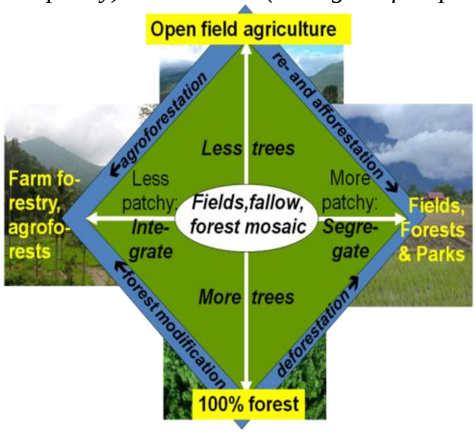

Fig.2: Integrated and segregated planning and management in landscape agroforestry system.

Urban Biodiversity and Green/Eco-City

The rapidly growing world population is exerting great pressure on the land, waters, and energy resources that are essential to productive tropical agriculture-rural communities and its bio-resources. By 2030, more than 60 percent of the world population will live in cities, up from almost half now and just a third in 1950. The growth poses huge problems ranging from clean water supplies to trash collection. Already, one of every three urban dwellers lives in a slum in the present time. Let us create green cities. Adding to this fact is that the United Nation goal of halving poverty by 2015 would not be met unless city planning becomes less haphazard.

Green city is a term used for sustainable city or ecological city. Activists mark June 5, the date of the first environmental summit in Stockholm in 1972, as the UN World Environment Day. The 2005 theme is ‘Greener Planning for Cities’, many of them hit by air pollution, fouled rivers and poor sanitation. In San Francisco, the main host of the 2005 event, mayors from more than 50 cities including Shanghai, Kabul, Buenos Aires, Sydney, Phnom Penh, Jakarta, Rome and Istanbul planned to sign up for a scheme setting new green standards for cities. Cities would be ranked from zero to four stars according to compliance with a set of 21 targets. And around the world, from Australia to Zimbabwe, activists staged rallies, cleaned up litter, organized poetry competitions or planted trees.

The Green City theme is related to Urban Environmental Management and ISO 14001 at the level of a City. The development and implementation of the EMS at the level of a city is a complex task involving a myriad range of tasks and actors. UNEP’s International Environmental Technology Centre recommends three steps in extrapolating the ISO 14001 to the level of city (Srinivas, 2006). Step 1 (Promotion of Eco-office): Reduction of energy use; Reduction of water use; Reduction of solid wastes; Promotion of recycling; Green Procurement; Step 2 (Promotion of Eco-Project): Using e-friendly materials; Using e-friendly equipment; Accelerate use of recycled materials; Green public engineering works; Develop green technology; Promote greening; Step 3 (Green City Planning): Set green guidelines for public works; Set green guidelines for housing; Enhance public transportation; Capacity building; Apply EMS to the whole city.

Biodiversity and Carbon Relationships

In order to establish green procurement, promote greening and set green guidelines, species diversity or biodiversity plays an important role in sustaining an ecosystem at present and in future. Forest conversion to intensive agriculture and monoculture plantations, urbanization and industrialization leads to a loss of biodiversity in any landscape. The rich biodiversity in natural or managed systems does not provide tangible benefits - a reason why local people may not be interested in conservation initiatives.

Payment for environmental services (PES) scheme are being proposed and tested in different contexts as a way to involve the local people in conservation practice (Nurhariyanto et al., 2010). The Rapid Agro-Biodiversity Appraisal (RABA) is a diagnostic tool designed to appraise perceptions of different stakeholders related to conservation in a target area and to assess the feasibility of a PES mechanism (Kuncoro et al., 2006). The Quick Biodiversity Survey (QBS) of indicator plant animal groups may provide sufficient information necessary for a RABA.

The UN Framework Convention on Climate Change (UNFCCC) regulates the Clean Development Mechanism (CDM) that includes, under specific rules, afforestation, and reforestation activities. To reducing emissions from deforestation and degradation in developing countries (REDD), voluntary market mechanisms, not part of the commitments to emission reduction that UNFCCC countries have pledged, target various combination of landscape level restoration and protection of tree cover and carbon (van Noordwijk, 2010).

Bogor Urban Landscape

Based on regional planning, Bogor Municipality would be developed as developing center of Wilayah VII (Bogor Regency context); supports 1.5 million population in 2009 (Jabodetabek Region context); as buffer zone of Jakarta and recreation resort for Jakarta citizens

(Indonesia context); as a center for International Conference (International context). Therefore, Bogor is proposed for trading and services city, industrial city, settlement resorts city, scientific tourism city, and education city.

Bogor has diverse land utilization, i.e. irrigated rice fields, dry fields, plantation estates, forests, lakes and fish ponds, *pekarangan*, settlements, and others (CBD, recreation resorts, industry and cemeteries). Urban agriculture activities produce rice, corn, soybean, cassava, sweet potato, peanut, yam, tomato, long bean and chilli. Some researches were hold in the landscape ecological unit of Ciliwung watershed (Fig. 3). This watershed covered Bogor District, Bogor Municipality, Depok Municipality, and Jakarta (a part of Jabodetabek Region).

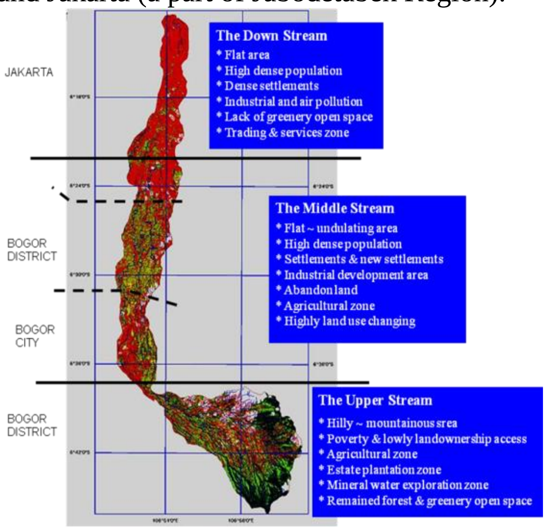

Fig. 3: Bogor land use in the unit of the middle stream of Ciliwung Watershed.

Bogor in the landscape level has highly habitat diversity. From the structure of green network, Bogor is surrounded by 4 mountains and tropical rain forests, i.e. Salak Mount, Gede Mount, Pangrango Mount, and Pancar Mount (Fig. 4). Some urban forests are available in or close to the city, e.g. Forda forest, IPB Darmaga forest, Cibinong forest, LIPI Ecopark and urban greenery of Sentul City. Through the corridors, i.e. river greenways, highway greenbelts, green railways among the mosaic landscapes, much wildlife of avian, insect, mammal, reptile, amphibian, and fish’s species migrate from one habitat to the others. Through greenways, the connectivity of green space was discussed in the theoretical and practical process of many cases representing effective networking systems of social, cultural, aesthetic and mental aspects in the large and densely inhabited urban areas (Tashiro, 2009).

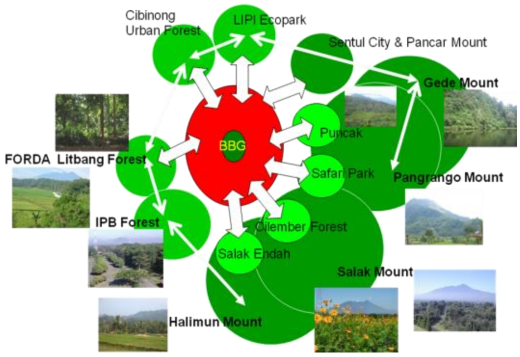

Fig.4: Ecological network among Bogor City and its vicinity.

Satellite City of Sentul

Sentul City is a township development with an area of c.a. 3,000 ha that is located 5 km from the city of Bogor. This city was established in 1994. It is 300 - 600 m above sea level and is a hilly area surrounded by mountains, forests and water falls. The average daily air temperature is min 22˚C and max 30˚C. This city has 65% green area (Utama, 2009).

In bringing renewal to Sentul City, the City of Enovation has 4 pillars of development in order to navigate the developing and building of Sentul City to be more comprehensive and rapid in accordance to the today’s demands and the future. One pillar is eco-city concept, which is expressed by plant biodiversity approach for garden along 6.2 km the main road. With an area of 27 ha, there are 6,518 trees that consists of 49 species. This is not including small trees, shrubs, bushes, herbs, lianas and grasses. Indonesia World Record Museum (MURI) has awarded Sentul City street garden as The Largest Street Garden for Township Development in November 2008. On August 2007, in collaboration with Indonesia Tree Planting Foundation (YTPI), the Go Green program is launched with the planting of 15,000 trees. This shows the active participation in increasing the quality of the area in Sentul City (Utama, 2009).

To strengthen the Eco City and Education City pillars, on July 21, 2009, Sentul City have signed an MOU with Bogor Agricultural University (IPB) to cooperate in four fields, which are: Development of Eco City Concept, Developing Green Implementation in Buildings, Developing Environment Management Method, Developing IPB Education Facility in Sentul City. The first step we have been conducting inventory of the urban biodiversity by land use unit. Various land uses, such as CBD, settlement and housing complexes, recreation resorts, parks, golf courses, forest and catchment areas. Based on the maintained landscape data, i.e. parks, garden, green belt and settlement, it is known that the area for greenery open space is 29,66 ha. We found high biodiversity of 76 species of trees; with total number of individual trees are 32,876. Environmental Impact Assessment results stated that in Sentul City was found 7 amphibian species, 23 avian species, 6 mammal species, 7 reptile species, and 7 fish species.

Conclusion

There is no doubt that the importance of biodiversity in urban areas should be kept in mind. So why not by starting in the city to reestablish biodiversity in the literal sense? (Rekittke, 2009). It would not disturb anybody, if animals and plants of the natural habitat begin to recolonise these three-dimensional extremes.

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Keynote Topic 6

Natural capital and indicators of ecosystem services and biodiversity in urban landscapes

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The constantly evolving urban landscape is a complex mosaic of human modifications, metabolic flows, networks and built structures and understanding how urban ecosystems work, how they change, and what limits their performance, add to the understanding of ecosystem change and governance in general in an ever more human-dominated world. Today, cities are facing enormous challenges, e.g. climate change and transformation to a future beyond fossil fuels. Urban ecosystems may have a large role in facilitating this transformation, since ecosystems provide flexibility in urban landscapes and help build adaptive capacity to cope with e.g. increased temperature and changing precipitation and through multiple other ecosystem services that promote human well-being.

The concept of ecosystem services has proven useful in describing how biodiversity and ecosystems are linked to human well-being, but there are considerable knowledge gaps about urban ecosystem services. Millennium Ecosystem Assessment covered almost every ecosystem in the world but did barely mention urban systems. On the other hand, the World Development Report (2009) the world's largest assessment of urbanization, omitted ecosystems altogether.

Cities provide a range of critical ES that are enjoyed by most urban residents. These include regulating services (benefits obtained from regulation of ecosystem processes like air- and water filtration); cultural services (nonmaterial benefits obtained from ecosystems, like spiritual enrichment, cognitive development, recreation, and aesthetic experiences); and the supporting services (necessary for production of all other ecosystem services. Urban vegetation may significantly reduce air pollution, mitigate the urban heat island effect, reduce noise of importance for urban citizen's wellbeing and for reducing impacts related to climate change. Green areas, vegetation and trees, also have direct health benefits, e.g. in a study from New York, presence of street trees was associated with a significantly lower prevalence of early childhood asthma (Lovasi et al., 2008). Green area accessibility has also been linked to reduced mortality (Mitchell & Popham, 2008) and improved perception of general health (e.g. Maas et al., 2006). In a review by Bird (2007), links were noted between access to green spaces and a large number of health indicators, e.g. coping with anxiety and stress, treatment for children with poor self-discipline, hyperactivity and Attention Deficit Hyperactivity Disorder (ADHD), benefiting elderly care and treatment for dementia, concentration ability in children and office workers, healthy cognitive development of children, strategies to reduce crime and aggression, strengthened communities, and increased sense of well-being and mental health. The distribution and accessibility of green space to different socio-economic groups, however, often reveals large inequities in cities (e.g. Pickett et al., 2008), contributing to inequity in health among socio-economic groups, although confounding effects are not always possible to separate (Bird, 2007).

Active management of green spaces is vital but seldom sufficient, there is also a need to protect, restore and manage surrounding ecosystems in order to maintain ecosystem services of value for human well-being and build resilience in the urban landscape. Urban settings hold a wealth of local people and interest groups that actively partake in such management of urban green areas. Such groups are particularly useful to more closely incorporate in urban planning and ecosystem management by creation of e.g. participatory management arenas.

After decades of mutual neglect and artificial divide between nature on the one hand, and cities with their respective urban processes on the other hand, the conservation community has started to shift its perception to include cities as a component of natural landscapes. Just as it is now increasingly recognized that in protected nature reserves, conservation will not be successful as long as it is at the expense of human aspirations, urban planners increasingly acknowledge that functioning natural systems such as watersheds, mangroves, and wetlands are indispensable for reducing vulnerabilities to natural disasters and building long-term resilience.

The urban landscape provides a public space for the cross-fertilization of minds and various disciplines, enabling a new perspective on man in nature, one that could place human well-being at the core, break the artificial and largely culturally biased divide between the pristine and the human-dominated ecosystems, and contribute to the creation of a new language, with signs, concepts, words, tools, and institutions that would gather rather than divide, broker conflicts rather than create them, and establish responsible environmental stewardship at the heart of public interest.

May 19 (Wed) 13:00−15:00 Oral Presentations

	Room 1101	Room 1102	Room 1103	Room 1201
	Session 1: Planning and design of an ecological network in an urban area Breuste JH and Ignatieva M (Chair: Breuste JH)	Session 3: Urban river, its ecological functions and integrated river basin management Lin Y-F and Kuo M (Chair: Lin Y-F and Kuo M)	Session 10: Designing low carbon societies in Asia Nakagoshi N and Arifin H-S (Chair: Nakagoshi N and Arifin H-S)	Session 11: Global warming and urban biodiversity: its status and strategy Kobayashi T (Chair: Kobayashi T)
13:00	Climate change, urban green and human health - new challenges in urban biodiversity and ecological networking Endlicher W, Gabriel K, Müller M	River corridor planning - a step stone to build up ecological network in greater Taipei metropolitan areas Kuo M	Hyperspectral canopy reflectance as potential tool to estimate and map pasture biomass and quality in a grazed pasture, Hokkaido, Japan Lee H-J, Kawamura K, Watanabe N, Sakanoue S, Nakagoshi N	Ecophysiological responses of an urban forest during 22 years of climate change Kobayashi T, Takahashi T, Hagiwara S
13:15	Multicriteria assessment of green infrastructure potentials and green space patterns in shrinking cities - a challenge for planning and design of an urban ecological network Haase D	Understanding urban rivers as coupled natural and human systems to address aquatic biodiversity and flood protection simultaneously: a case study on the Green River, Washington, USA Liao K-H	Succession, from traditional to disturbed forest system in West Kalimantan-Indonesia Karuniawan PW, Nakagoshi N	Changes of plant phenophases and their relation with recent warming in North China cities Dai J, Ge Q, Bai J, Wang M, Wang H
13:30	System dynamics simulation modelling as the tool in urban and ecological network biodiversity management Kavtaradze D, Lychkina N, Volkov V	Planning with climate change - urban wetland conservation towards innovative eco-city planning Kuo M, Wang H-C	Sustainability of mountainous watershed landscape societies: the difference between northern and southern areas of West Java region, Indonesia Kaswanto, Nakagoshi N, Arifin HS	Estimating aboveground carbon stocks of urban forest using LiDAR Kato A, Kobayashi T
13:45	Urban environmental governance and the creation of ecological networks in urban areas Mueller B	Analysis of habitat functions in urban river area - the lower Keelung River in Taipei Lin Y-F	Critical issues on green area, urban waste and coastal habitat degradation in Jakarta, Indonesia Suwandana E, Kawamura K, Nakagoshi N	Evaluating below ground carbon sequestration of urban parks in Tokyo, Japan Takahashi T, Kobayashi T, Kato A, Usui K
14:00	Planning ecological networks for urban biodiversity Yli-Pelkonen V, Niemelä J	The stormwater system as urban frameworks Tominaga M	Using GIS to assess potential urban biomass recovery from forest and green area waste in Kuala Lumpur, Malaysia Taib S, Suwandana E, Nakagoshi N	Improving the thermal environment by greening at a building site Suzuki H, Misaka I, Tashiro Y
14:15	Integration of indigenous biodiversity in landscape design: New Zealand case study Stewart G, Ignatieva M	Upstream and downstream ecosystems of the Rajjaprabha Dam, Thailand: anthropogenic-driven changes in function and structure Limsakul A, Tabucanon MS, Fujino T, Khottapong O, Paengkaew W, Kummueang A, Suttamanuswong B	Urban heat island and landscape: linking spatiotemporal variations in surface temperatures to land-cover and socioeconomic patterns Wang RH, Kawamura K, Nakagoshi N	Green infrastructure - contribution to adaptation to climate change in Greater Manchester Kazmierczak A, Carter J, Cavan G, Guy S, Handley J
14:30	How global trends may provide opportunities to enhance biodiversity and ecological networks in cities Snep RPH, De Vries EA, Van de Knaap W, Kuypers VHM		Urban greenery planning for low carbon societies in Asia Nakagoshi N, Kondo T	Urban biodiversity, climate change and demographic change: challenges for urban development in Germany from the perspective of nature conservation Kube A
14:45	Biodiversity trails: translating good science into good design Renata A, Wratten S, Meurk C, Prendergast TA			

May 19 (Wed) 13:00−15:00 Oral Presentations

	Room 1202	**Room 1203**	**Room 1204**
	Session 15: Restoration ecology network in Asia Kobayashi T and Morimoto Y (Chair: Morimoto Y)	General 1: Conservation biology (Chair: Natuhara Y)	General 2: Planning and design for biodiversity (Chair: Thomas S and Wako K)
13:00	Landscape-: architecture, identity and sustainability in Seoul Kuitert W, Jin B, Kim H, Lee M, Park M, Zoh W	Landscape analysis of suburban forest succession in the disturbance of the great cormorant Kameda K, Maesako Y, Makino A, Fujii H, Ishida A	Urban planning and design: protection of natural and cultural resources Thomas S
13:15	The role of urban parks in sustainable biodiversity conservation: Case study of Showa Kinen National Government Park Handa M, Ito W, Yamaguchi A, Ikegai H, Morimoto C	Conservation priorities for threatened Yatsu valley landscapes in urban fringes, central Japan Takahashi K, Hara K, Short KM	Urban biodiversity in the case of Istanbul: potentials and risks Tezer A, Aksehirli I
13:30	Conservation and creation of natural bare land in capital region in Japan Kuramoto N, Okada H, Ashizawa K, Sasaki T, Masuda N, Kitajima Y	Impacts of agricultural ponds change on biodiversity in the Yulin county in Taiwan Chou WW, Lee SH, Lai CH, Wu CF	Shrinkage of the corporate town Atenquique Vargas-Hernández JG
13:45	Coexistence between the human community and the Oriental White Storks Nakagai M	Distribution and habitat of a discovered cherry species in Tama hills, Tokyo,Japan Iki M, Numata S	Urban landscape dynamics and consequences on local biodiversity in a north-eastern district of Bangladesh: an analysis of small farm owners' preferences and attitudes Mukul SA, Munim SA
14:00	Cooling effect of green roof in Taipei Lin B-S, Lin Y-J	The impact of Off-Road vehicles on coastal dune vegetation on Ishikari Coast, Hokkaido in Japan Matsushima H, Kondo T, Naito H, Fuji A	Urban agroecology as a multilateral development tool: challenges and opportunities Moreno-Penaranda R
14:15	Comprehensive flood control and design with nature in the city Yamashita S, Shimatani Y, Watanabe R, Iyooka H, Moriyama T, Kakudo K, Yamashita T	Tripartite mycorrhizal symbiosis in achlorophyllous orchids, *Lecanorchis* spp. Okayama M, Yagame T, Yamato M, Iwase K	Biodiversity and zoo design Wako K
14:30	Biodiversity protection strategies for Asian new cities Tertilt TM		Urban design issues of Sotobori moat in the central area of Tokyo from the point of view of the urban landscape and ecosystem Akashi T, Morita T, Kitawara S, Akimoto H, Ogawa S, Iwai S
14:45	~~For little swan~~ ~~Qiu, J~~ (canceled)		City planning by conservation management of sacred forests and cultural landscapes Hasegawa Y, Kohsaka R, Okamura Y

May 20 (Thu) 10:20−11:50 Oral Presentations

	Room 1101	Room 1102	Room 1103	Room 1201
	Session 1: Planning and design of an ecological network in an urban area Breuste JH and Ignatieva M (Chair: Ignatieva M)	Session 2: Comparative studies of cities: links to urban biodiversity and urban design Nilon C and Mörtberg U (Chair: Nilon C and Mörtberg U)	Session 4: Ecological functions of terrestrial-aquatic ecotones in the urban area Asaeda T, Nishi K and Sekine H (Chair: Nishi K)	Session 12: Landscape planning, management and ecological education Ito K and Kamada M (Chair: Ito K and Kamada M)
10:20	Thirty years of field layer vegetation dynamics in remnant forest patches at the residential area Järvafältet in Stockholm Forsberg O, Florgård C	The use and value of bird monitoring for conservation policy and management Lepczyk C, Boyle O, Mueller W, Vargo T	Basic concept of applied ecological engineering and nature restoration projects of water's edge in Japan Nishi K	Introduction - thinking about landscape planning, management and ecological education in urban area Ito K , Kamada M
10:35	Morphogenetic conditions as a factor shaping green areas spatial structure in towns. case study of Western Poland Mizgajski A, Zwierzchowska I	Deserts and forests in the suburbs: effects of structure on biodiversity Warren P, Lerman S, Nilon CH	Effects of trapped sediment release from dams on tree sprouts on downstream sandbars Sakamoto K, Sekine H, Kawashima T, Asaeda T	Giving view point of small crab to kids for evaluating urban green space Kamada M, Inai S, Shinomiya R
10:50	Planning and design of an ecological network for urban ecosystem services - Salzburg Urban Cultural Landscape Breuste, JH	Hierarchical landscape effects on birds in 34 Swedish cities Hedblom M, Söderström, B	Control trial to invasive fish for biodiversity preservation in a dam reservoir - control using water level operation and effective use of captured fish Azami K, Osugi T, Kumazawa K, Funabashi S, Otsuka Y, Nakazawa S	Regeneration of Satoyama ecosystem services as an educational resource Sato T, Takahashi K, Takahashi D, Mikami K, Ando H
11:05	Planning and design of a green infrastructure as a defensive strategy to protect biodiversity and minimize climatic changes effects on a coastal urban environment in Southeastern Brazil Herzog C	Urban design, urban planning, and approaches to modelling urban birds Mörtberg U	Development of simulation model for forestation Sekine H, Sakamoto K, Nishimura T, Asaeda T, Ishii T	Urbanites meet urban biodiversity Werner P
11:20	Exurban development and planning ecological networks at peri-urban interfaces: An unexploited opportunity of urban design for adaptation to climate change Qureshi S	Using comparative studies to examine intercity versus intracity patterns of native species loss and biotic homogenization of urban floras Aronson M	Ecological health monitoring and assessment of the Lower Mekong River and its tributaries Parnrong Davison S, Campbell IC	Using school green roofs for environmental education Jim CY
11:35	Urban green management for urban ecosystem services in Karachi, Pakistan Anwar MM	Urban bird monitoring and comparative studies of cities Nilon CH, Warren P	Succession of aquatic macrophytes and their restoration in a marsh of which basin has been urbanized rapidly Amano K	Integrating ecosystems to evolving urban landscapes in Montreal, Canada Hodder D

May 20 (Thu) 10:20−11:50 Oral Presentations

	Room 1202	Room 1203	Room 1204	Small Hall 2
	Session 14: Contemporary SATOYAMA: to share urban and rural experiences and knowledge Yumoto T and Fukamachi K (Chair: Fukamachi K)	Session 16: Influence of landscape design on biodiversity Müller N (Chair: Parker T)	General 3: Cooperation toward biodiversity conservation (Chair: Nakai K)	Session 7: Valuation and monitoring of biodiversity and ecosystem services in cities Tonosaki K, Asano K and Kobayashi T (Chair: Tonosaki K)
10:20	Ecological service provided by Satoyama and culture Yumoto T	Trails and impacts of landscape design -a comparison of large cities in the new and old worlds Müller N	Conservation of urban birds leads to a cooperation between Birdlife Netherlands and construction companies Louwe Kooijmans J, Kwak R	Evaluation of biodiversity and ecosystem services on cities Kato M
10:35	Public perception of cultural services provided by Satoyama in Japan Iwata Y, Yumoto T, Morimoto Y	Influence of the design and maintenance of Japanese gardens on bryophyte diversity Oishi Y, Okubo K	Roles of a research institute in communication between research and society - The case of research forests in Malaysia and Japan Yamasuge K, Kinoshita M, Noor Azlin Y, Numata S	A mitigation case of costal dune wetland for conservation of biodiversity, at Sawada Spring Wetland, Ibaraki Prefecture, Japan Ichijo Y, Hioki Y, Tonosaki K
10:50	Current style Satoyama utilization to recover the forest health Kuroda K, Osumi K, Oku H	On the influence of historical park design on urban biodiversity in Europe Kümmerling M, Müller N	Considerations for Sustainable activities with conservation of Satoyama at Toyota city Oshima S	Technique for maintaining biodiversity under the rise of water temperature of river Fukudome S, Fujita S, Fukuoka S
11:05	The connection between urban and rural areas through the use of dwarf bamboo leaves in Kyoto City Abe Y, Fukamachi K, Oku H, Shibata S	The effects of design and location of shrine forests on urban biodiversity, with attention to cores and networks - a case study of the Meiji Jingu Shrine in Tokyo Fujita N, Hamano C	A study on the consensus building process for the Ten-noh River Restoration Project on Sado Island Takada T, Toyoda M, Kuwako T	Research on the cooling potential of urban greenery spaces in summer time Tonosaki K, Kawai S, Tokoro K
11:20	Ecosystem assessment of Satoyama and Satoumi in Ishikawa, Japan Horiuchi M, Nakamura K, Mcdonald A	Landscape design for wildlife: use and abuse Natuhara Y	Institutional effects on the conservation of urban *satoyama* forest: Trends in public land acquisition and participatory forest management Tsuchiya K, Takeuchi K	A study to estimate the amount of carbon stocks in urban green space Imai K, Tonosaki K, Ochiai, N, Murayama K, Ooishi T
11:35	Pattern and process of "Maeul", the Korean rural landscape Hong S-K, Kim J-E	An introductory of the urbanization in the tropics: rejuvenate the globe base on 'Tropical Green' concept Salimi R, Abd Ghani N	"Alien Watchers" project: a local governmental survey on invasive alien species as an emergency employment measures by Shiga Prefecture, Japan. Nakai K, Takakura T, Hayashi K	A measurement method of the ratio of vertical green coverage with leaves colors Saitoh M, Takizawa S, Tonosaki K

May 21 (Fri) 10:20−11:50 Oral Presentations

	Room 1101	**Room 1102**	**Room 1103**	**Room 1201**
	Session 5: Urban greening for human health Iwasaki Y and Imanishi J (Chair: Imanishi J)	Session 6: What should the landscape architects be in pursuing the symbiotic relationship between people and nature? Itagaki N, Ohashi Y, Hiraga T, Mukoyama M and Yairo H (Chair: Yairo H)	Session 4: Ecological functions of terrestrial-aquatic ecotones in the urban area Asaeda T, Nishi K and Sekine H (Chair: Asaeda T)	Session 7: Valuation and monitoring of biodiversity and ecosystem services in cities Tonosaki K, Asano K and Kobayashi T (Chair: Kobayashi T)
10:20	Application of medical research theory to elucidate the role of green environment in health promotion and the usefulness of suburban forests for human health Morita E, Sekiyama A, Nagano J, Fukuda S, Naito M, Wakai K, Kosugi S	"Landscape Design with Nature" towards the development of urban biodiversity Shinozawa K	Ecological functions of terrestrial-aquatic ecotones in the urban area Asaeda T, Rashid MH	A method to develop evaluation maps about biodiversity and global warming through ALOS Satellite Imagery (satellite launched by JAXA) Tonosaki K, Yamane N, Kanamori M
10:35	The relationship of hospital outdoor spaces and children's behavior Yamamoto S, Toyohara N, Hase N, Doi S	Intervention and natural dynamics - The Nature-Park Südgelände Berlin Langer A	Biodiversity of submerged macrophytes in Lake Teganuma area Shinohara R, Asaeda T, Isobe M	A basis for envisioning urban futures : spatial correlation of urban biodiversity (Biotope Data) with user-perceived values of city spaces (Sociotope Data), residential income levels, and property rights/management in Stockholm, Sweden Ranara J, Elmqvist T, Ernstson H, Liljeros F
10:50	A new utilization of urban green spaces for managing spiritual health of people Imanishi J, Nakau M, Imanishi J, Imanishi A, Morimoto Y, Watanabe S, Watanabe E, Baba T, Kimura M, Hirai K, Ito T, Chiba W	Urban development considering the surrounding environment Tomozawa T	Phytoremediation of endocrine disrupting chemicals in urban river water Akamatsu Y, Ikeda S, Osawa K	Potential and instruments of integrative urban landscape management system Finka M, Jamecny L, Kozova M, Zigrai F
11:05	The role of greenery in urban environments in relieving stress Iijima K	Health and landscape design Yamamoto N	Characteristics of microhabitat on dry riverbed in gravel-bed rivers Chibana T, Fujimori H	Governance, cities and biodiversity: perspectives and challenges of the implementation of the CBD at the city Level Puppim de Oliveira JA; Balaban O, Doll C, Gasparatos A, Iossifova D, Moreno-Penaranda, R, Suwa, A
11:20	The physiological and psychological effects of various green spaces exterior to a building for urban redevelopment Iwasaki Y, Nasu M, Ishii M, Takaoka Y	Landscape design and children's participation in a Japanese primary school - planning process of school biotope for 7 years Ito K, Fjortoft I, Manabe T, Masuda K, Kamada M, Fujiwara K	Experimental study on transition of velocity profile through a tall tree community on a flood plain Ikeda H	Economic, social and cultural importance of tree species diversity in emerging Nigerian urban centres: case study of Akure city Onyekwelu JC, Olagoke, AO
11:35			Biodiversity index in river habitat considering flood return period and magnitude Tanaka N, Yagisawa J, Kikuji Y	Evaluation of Higashiyama and Sacred Forests in Nagoya Kohsaka R, Hasegawa Y

May 21 (Fri) 10:20−11:50 Oral Presentations

	Room 1202	**Room 1203**	**Room 1204**	**WINC Hall**
	Session 13: Satoyama management and biodiversity Shibata S (Chair: Shibata S)	Session 16: Influence of landscape design on biodiversity Müller N (Chair: Müller N)	General 4: Planning and policy for biodiversity conservation (Chair: Nakagoshi N)	Session 8: Corporate responsibility for urban biodiversity & design Komatsu N (Chair: Komatsu N)
10:20	Influence of the restoration of vegetation management on ecosystem and biodiversity of Satoyama Shibata S	Influence of global landscape design trends on biodiversity in Russia Ignatieva M	Maximizing urban biodiversity in mega-development projects: strategic lessons learnt from a UK case study. Barber H, Hedges P, Fermor P	The significance of SEGES (Social and Environmental Green Evaluation System) in conserving urban biodiversity Ueno Y, Komatsu N
10:35	Change of woody- species composition in an early stage of plant succession after cutting in a suburban secondary forest dominated by *Chamaecyparis obtusa* Imanishi A, Shibata S, Nakanishi A, Osawa N	Influence of European park design on urban biodiversity in Southeast Asia Abendroth, S, Kowarik, I, Müller, N, von der Lippe, M	The urbanization of border landscape: threats and opportunities of regional biodiversity Chien H-T	Mitsui Sumitomo Insurance Surugadai Building as one of the activities for biodiversity conservation Yamamoto S, Shimada K, Yukishima Y, Haraguchi M
10:50	Effects of patch cutting on leaf nitrogen nutrition in natural regenerated hinoki cypress stands at different elevations along a slope in Kyoto, Japan\ Nakanishi A, Inagaki Y, Osawa N, Shibata S, Hirata K	Landscape characteristics correlated with the urbanization of wildlife Parker TS, Nilon CH	Land use and the occurrence of Human-Elephant Conflict (HEC) in Central Province, Sri Lanka Ranaweerage E	Environmental greenification and education program in the forest of Toyota Ikegami H
11:05	Logging impacts on forest carabid assemblages at the secondary forest in Japan Osawa N, Nakanishi A, Shibata S	A multiple function green infrastructure design to protect and improve native biodiversity in Rio de Janeiro Herzog C	The primary study of landscape health Hsu Che-Yu, Ou S-J	Employee-involved activity on conservation of biodiversity by utilizing the “Sony Forest” Kaga M
11:20	Range expansion of non-indigenous *Litsea cubeba* in a suburban secondary forest Nakamura A, Yasunobe N	Bringing indigenous biodiversity back into New Zealand cities Clarkson B	Impact evaluation of conservation strategies of cultural heritage on industry landscape and biodiversity Lin CP, Lee SH, Wu CF	Aiming at the construction of the ecological network in the city outskirts Hatakeyama Y
11:35	Dynamics of abandoned bamboo forests in an urban fringe landscape Saroinsong F-B, Sakamoto K	BiodiverCity - Key element to foster conservation of the Amazon Forest Carvalho E	Urbanization calls for innovative nature conservation - Current and future nature protected areas in Swedish cities Borgstrom S	An approach to the evaluation of the land use such as green space managed by enterprises Miwa T, Ito T

May 21 (Fri) 14:20−15:50 Oral Presentations & Workshop

	Room 1101	**Room 1102**	**Room 1103**	**Room 1201**
	Session 9: Citizen participation and biodiversity Hayashi M (Chair: Hayashi M)	General 5: Introduction and functions of plants (Chair: Kondo T)	Session 4: Ecological functions of terrestrial-aquatic ecotones in the urban area Asaeda T, Nishi K and Sekine H (Chair: Takahashi K)	General 6: Interaction between people and nature (Chair: Aikoh T)
14:20	Towards the Improvement of Biodiversity of Kobe City by citizen participation - examples of experiments of the city and its schools for the building and the use of biotopes by citizen participation Nishitani H	Greening methods to revitalize building and urban residual spaces Perez Baez M, Suzuki K	Ecological function of spring water, with particular focus on the growth of submerged macrophytes Takahashi K, Asaeda T	The relationship between urban forest visitors' motivation and their behavior in Nopporo Forest, Hokkaido, Japan Aikoh T, Tani A, Kaise M , Abe R
14:35	Empowering communities for the symbiosis with the crested ibis Toyoda M, Takada T, Kuwako T	Managing mixed perennial plantings by summer mowing Kircher W, Messer U, Kietsch U, Dunnett N	Important role of suburban paddy fields for fish habitation Minagawa A, Nishida K, Senga Y	Study on the continuity of residents' perception of rooftop biotopes with man-made ground in relation to the growth of multistorey residences in urban areas Kogiso Y
14:50	Game development for environmental education - biotope simulation game Takeyama H, Yamashita Y, Akazawa H, Nakase I	Planting design on filtering zones of private swimming ponds Thon A, Kircher W	Irrigation canals as habitats of freshwater fishes in suburban areas: a case study of irrigation canals in the Tama area, Tokyo Nishida K	A modern city with rich biodiversity - Hong Kong Cheng KS
15:05	An approach of new forest creation by self-producing regional characteristic seedlings in industrial area - trial by citizen's participation in Amagasaki Forest Central Green Akazawa H	Life cycle assessment of slope revegetation works Tachibana R, Chizuka T, Fukunaga K, Ohta T, Fujie K	Procedure for adaptive management at Sawada Spring Wetland, Ibaraki Prefecture, Japan Suzuki H, Tonosaki K	Natural green space: a case study from Kuching, Sarawak, Malaysia Hon J, Chai EG
15:20	Citizen-led biodiversity conservation activities and the collaboration (partnership) framework Mayumi K	Photosynthetic differential responses to elevated CO_2 and O_3 in four OTC-grown tree species in urban area Xu S, He X, Chen W, Tao D	Biotope restoration for enhancing biodiversity - a case in Arakawa River Nakano A	The change of a SATOYAMA landscape in Minamioogaya, Shiga Prefecture, Japan, for past 300 years Hayashi T, Matsuda S, Miyaura T
15:35	Park management plan and citizen's participation Hayashi M	Effects of urban green belts on the temperature, humidity and inhibiting bacteria Zhu C-Y, Li S-H, Ren B-B	Social roles of the citizens in participatory monitoring for aquatic ecotone in the urban river Uchida T, Asaeda T	The establishment and development of feng shui villages in Okinawa -from the perspective of remnant huge fukugi trees- Chen B , Nakama Y

May 21 (Fri) 14:20−15:50 Oral Presentations & Workshop

	Room 1202	**Room 1203**	**Room 1204**	**WINC Hall**
	Session 13: Satoyama management and biodiversity Shibata S (Chair: Shibata S)	General 7: Urban ecosystems (Chair: Njoroge JB)	General 8: Spatial analysis for ecological planning (Chair: Morimura A and Wu CF)	Workshop: Cities' Biodiversity Index Kato M (Chair: Kato M)
14:20	Initial regeneration after a cutting aimed for conversion of forest types in a suburban forest: a study of *Castanopsis* forest in Higashiyama, Kyoto Nakamura S, Ando M	Scaling up from gardens: avian diversity in a residential ecosystem Goddard M, Dougill A, Benton T	Object-based classification of land cover types using airborne LiDAR and high-resolution imagery data Sasaki T, Imanishi J, Ioki K, Morimoto Y	In this workshop, participants will discuss ideal index to effectively exploit potential of cities' biodiversity and their problem-solving ability. Please see another page for detailed information.
14:35	Effects of cutting system causes to species diversity of understory vegetation in origin Satoyama Taniguchi S	Forest bird-habitat relationship analysis in urban regions across the eastern United States Kato S, McGarigal K	Japanese watersheds characterization from an ecoregion point of view for ecosystem management Chen SF, Masuzawa T, Morimoto Y	
14:50	Vegetation management for conservation of species diversity in summer green forests Yamase K	Spatial distribution of avifauna in urbanizing landscape of Nairobi city, Kenya Njoroge JB, Nda'Nganga, Kariuki P, Natuhara Y	Analyses of long-term land use/cover changes in Japan using remote sensing and GIS Harada I, Hara K, Short K, Park J, Kondoh A	
15:05	An attempt of recovering *Pinus densiflora* forests in urban forests Wu Ch-P, Ando M	Ecological network through roadside slope of an expressway in Tokyo Shinoda T, Funahashi O, Iwata T	Predicting landscape pattern changes induced by highway constructs using landscape metrics and empirical land-use model in central Taiwan Wu CF	
15:20	Dynamics of secondary forests and the conservation Sakamoto K	Effects of forest fragmentation on mammal fauna at the western suburb of Tokyo Watanabe K, Takatsuki S	Asian ecological planning using Humantope index: land use duration pattern, cultural lands use pattern, land ownership pattern Uehara M	
15:35		Existence and migration routes of large mammals in urban landscape: discovery of a wild boar in the campus greenbelt Arima T, Noda E, Iki M, Yamasuge K, Shirayanagi K, Naito S, Erangar HR, Nakamura R, Yabe N, Numata S		

May 19 (Wed) 15:10−16:00 Poster Presentations (Core Time 1, Odd Numbers*)
16:00−16:50 Poster Presentations (Core Time 2, Even Numbers**)

Note: Odd numbers (P-1, P-3, ...) are assigned to Core Time 1 while even numbers (P-2, P-4, ...) are assigned to Core Time 2.

Conservation Biology

P-1 *
A habitat model of Magpie in the urban area of Beijing, China using a 3-D GIS map
Hashimoto H, Domon M, Oohata K, Li S

P-2 **
Relationship between the birds and public parks in a northern area of Fukuoka City, Japan
Fukui W

P-3 *
Conservation of wild Japanese squirrels in the forests of Nagoya City
Kitayama K, Nakazawa A

P-4 **
Landscape-scale distribution of Japanese hare in the surroundings of Tokyo based on pellet census in urban and suburban parks
Takeuchi T, Matsuki R

P-5 *
Effect of cutting management of kudzu vine on recovery of the nest site of Harvest mouse in Katura River, Kyoto, Japan
Hata S, Natuhara Y

P-6 **
Conflicting issues in conserving an endangered tiger beetle in an urban area- a case study in a compensatory created sandy shore
Watanabe M, Ota N, Kozuki Y, Kamada M

P-7 *
Conservation of Daruma Pond Frogs
Naito R, Kaneko S, Isagi Y, Natuhara Y, Morimoto Y

P-8 **
Installation of micro transmitter in Siberian Salamander (*Salamandrella keyserlingii* Dybowski)
Tazaki F, Sasaki Y, Makiguchi Y, Ueda H, Uchida T, Takayama S

P-9 *
Distribution and recruitment patterns of an endangered mud snail on an 'unexpectedly' created tidal flat
Kawai T, Ota N

P-10 **
Distribution and recruitment patterns of an endangered fiddler crab on an 'unexpectedly' created tidal flat
Ota N, Kawai T

P-11 *
Red Claws Crab, *Chiromantes haematocheir*, as an indicator for evaluating urban green space
Shinomiya R, Inai S, Kawaguchi Y, Kamada M

P-12 **
Study of soil animal communities for conservation of the regional ecosystem on endemic spring-fed wetland and Kaisho Forest of Aichi in Japan
Takeda M, Iwahata M, Katayama M, Hiramatsu T

P-13 *
Seasonal dynamics of fruiting of macrofungi in the EXPO '70 Commemorative Park
Oyabu T, Kanemura S, Ota K, Chihara Y, Myojin S, Shimono Y, Morimoto Y

P-14 **
Small remnant habitats in urban public properties: The potential role for conservation of grassland plant species
Koyanagi T, Kusumoto Y, Yamamoto S, Takeuchi K

P-15 *
Plant biodiversity assessment in urban historical sites: a case study in Trabzon city, Turkey
Acar C, Eroğlu E, Yalçınalp E

P-16 **
Railway edges plant diversity along an urbanization gradient in the Parisian region (France)
Penone C, Le Viol I, Machon N, Julliard R

P-17 *
Habitat of threatened species, *Rumex nipponicus* Franch. et Savat., fragmented in urban area
Uchida T, Arase T, Hayasaka D

P-18 **
Ecological traits and invasion patterns of curbside species invading the curbsides in Kyushu, southern Japan
Hayasaka D, Uchida T, Miyauchi D

P-19 *
Managed vegetation under power lines
Minami S, Fukamachi K, Osumi K, Oku H, Imanishi J, Morimoto Y

P-20 **
The possibility of natural regeneration of native vegetation on the Kirigamine Heights
Okubo K, Tamagaki M, Oishi Y

P-21 *
Restoration of grassland biodiversity from dwarf bamboo by reactivating seed bank
Kodama T, Kobayashi T

P-22 **
Conservation and management of coastal pine forest
Fujihara M, Miura H, Kuroda A, Sawada, Y, Oyabu T, Yamamoto S

P-23 *
Effects of irrigation network on the invasion process of alligator weed in the drainage basin of Lake Teganuma, Japan
Saito Y, Tomita M, Hayashi N, Hara K

P-24 **
Differences in aquatic plant diversity and vegetation cover among watersheds in a heavily urbanized drainage basin, Lake Teganuma, Japan
Tomita M, Saito Y, Hayashi N and Hara K

P-25 *
Relationship between aquatic plant distributions and environmental conditions in the drainage basin in Kamiina District, Nagano Prefecture
Oike S, Okubo K, Oishi Y

P-26 **
Evaluating plants species diversity across multiple spatial scales in the urban isolated wetland
Aizawa A, Kobayashi T and Tashiro Y

P-27 *
Sedimentation of the sand and mud over the seagrass meadow of *Zostera japonica* Aschers
Murakami T, Ohminami M, Kawakami K, Nakashima A, Hara Y

P-28 **
Comparison of levels of genetic variation of *Zostera marina* L. among different patches in small bay
Ohminami M, Nakashima A, Takeuchi T, Tanaka N

P-29 *
Evaluation of beach vegetation for conservation/rehabilitation in Tottori Prefecture, Southwest Japan
Nakata Y, Hioki Y

Rice Farming and Biodiversity

P-30 **
The factors affecting plant distribution in a fallow paddy field under consideration of nature restoration in Oguraike drained land
Matsumoto H, Imanishi A, Imanishi J, Susaki J, Morimoto Y, Natuhara Y

P-31 *
Restoration of yatsu landscapes and its effect on conservation of biodiversity
Hara K, Short KM, Takahashi K, Tanaka K, Shimojima H, Tomita M

P-32 **
The flora and fauna in suburban paddy fields in Shizuoka City
Inagaki H, Matsuno K, Fushimi N, Sugiyama K

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Effects of small reservoir pond on improvement of Satoyama biodiversity and ecosystem services
Takahashi D, Ide Y, Takahashi K, Mikami K, Ando H, Sato T

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Evaluation of species diversity and potential habitats of the SATOYAMA indicator species in Toki-Shonai River Basin
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Growth characteristics of woody seedlings emerged and established in a restored natural habitat for wildlife in an urban area
Tabata K, Morimoto Y

P-36 **
Decreasing five deciduous broad-leaved tree species in abandoned urban forest reserve
Kajiwara R, Kubota J, Fujii Y, Asahiro K

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Oyabu T, Ozeki Y, Fujihara M, Sawada Y, Yamamoto S

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Forest dynamics in an artificial evergreen-broadleaved forest
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Nishimoto T, Tonosaki K

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Hattori H, Yamamoto T

P-48 **
Environmental monitoring using a sensor network system in an attempt of regenerating Satoyama ecosystem services
Mikami K, Takahashi K, Takahashi D, Ando H, Sato T

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An ecological gift from social contracts to urban areas: graveyards; a sample of Trabzon city, Turkey
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Environmental management of a natural park by citizen volunteers, restored in an urban reclaimed land - an experience of the Tokyo Port Wild Bird Park
Ito K, Yagi Y

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Shimizu M, Sato T

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The history and management of Yamazakura (*Cerasus jamazakura*) landscape in Yoshinoyama
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Kojima T

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The activities of practical leadership training for conservation volunteer and interpreter
Asahiro K

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Local culture for the coexistence of people and animals- the case with cats in Tashiro Island
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Sacred spots as a means for enhancing biodiversity and living environment in urban and suburban landscapes
Short K, Hara K

Thermal Environment

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Linking scientists and science educators across the world through global climate change and urban phenology study
Gazal R, White M, Sparrow E, Gordon L, Arano K

P-58 **
Numerical analysis of changes in indoor and outdoor thermal environment for historical urban district in past decades
Sato R, Asawa T, Hoyano A, Kawai H

Green roofs

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Analysis of the solar control effect of residential trees (Yashiki-Rin) on the microclimate around dispersed houses in Tonami Plain
Kodaka N, Hoyano A

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Stormwater runoff simulation of water retainage green roof systems for sustainable hydrology in urban area
Kikuchi S, Koshimizu H

Landscape Ecology and Planning

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Assessment of open and green areas in Samsun City of Turkey regarding landscape ecology
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Urban expansion and the change of urban landscape in Trabzon
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A planning method for vegetation management that considers biodiversity in a national park- a case study of Daisen-Oki National Park, Japan
Chibu T, Hioki Y

P-65 *
Satoyama landscape change subject to landform in the fringe area of Japanese regional city from 1884 to 2002- a case study in Wakayama Prefecture
Motoyasu Y, Hara Y

P-66 **
Distribution of *Satoyama* in Japan and characteristics of the landscape change in urbanizing region
Takemura S, Miyamoto S, Kamada M

P-67 *
Comprehensive landscape mapping using GIS - a tool for green conservation and public involvement
Ohbi K, Suzuki M

P-68 **
Watershed environmental capacity looking at future sustainability in Japan- GIS quantitative analysis of accumulative human activities in relation to the Capacity of the Supporting Ecosystem Services
Onishi F

P-69 *
Study on the ecological base map for the landscape planning in Tokyo Bay Area
Katagiri Y, Saito N, Osawa S, Yamashita H , Ishikawa M

P-70 **
Instruments of integrative urban biosystems management- case study Bratislava
Jamecny L, Finka M, Kozova M

Landscape Design and Management

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An adaptation of the focal species approach for conserving forest-floor fern species diversity in fragmented shrine forests in the middle Kinki District, Japan.
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The effectiveness of seed sowing *in situ* to create low maintenance ornamental meadows for hostile urban environments
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P-73 *
Eco-mixed seeding and planting method for revegetation of diverse woodlands in towns and cities
Okamura T, Yoshii A, Sasaki Y

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Study on urban moss habitat patterns on artificial exterior material
Marui M

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Consideration on suitable microclimate of moss garden based on turf surface moisture dynamics of *Polytrichum commune* Hedw.
Iida Y, Imanishi J, Oishi Y, Morimoto Y

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Issues of delay in land development process by obtaining building permit in Malaysia and Ghana
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Forestation for landslide defence on civil engineering work in school district in Tokushima Japan
Iiyama N, Onaka T, Saito T

Education

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Practice and effects of ecological programs utilizing educational resources of Satoyama
Koizumi K, Yokoyama Y, Noro K, Kuramoto N

P-79 *
Environmental education curriculum for regeneration and use of Satoyama ecosystem services
Takahashi K, Takahashi D, Mikami K, Ando H, Sato T

P-80 **
The research of designing about children’s space for playing and learning nature- the comparison of primary school designing in China and Japan
Zhang YC, Ito K

P-81 *
Contribution of urban biodiversity to children’s play
Acar H

Use and perception by People

P-82 **
Perception of forest function by local people in TNGP West Java, Indonesia
Amelgia R, Nakagoshi N

P-83 *
Can endangered insect change people's mind on use of beach?
Ohnishi M, Kishimura K, Watanabe M, Kamada M

P-84 **
How do people evaluate nature-green space remaining in a city?
Inai S, Kamada M

P-85 *
Motivation and satisfaction of urban people in volunteer activities for *Satoyama* management in Hotani, Osaka, Japan
Ikawa N, Noda K, Kamada M

Horticultural Therapy

P-86 **
Horticultural therapy in Japan- Toward Nature& Humans Total Care
Kan Y, Terada Y

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Horticultural therapy and green care in Taiwan- Health Promotion & Humans Total Care
Chen J-J, Yen H-F, Chen V

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* This session is mainly discussed in Japanese and partly in English.

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PJ-1
Effectiveness and issue of wildlife passage on the road
Sonoda Y, Takeda Y, Matsue M

PJ-2
希少昆虫とその生息湿地の保全活動に対する高速道路建設の重要な価値
(Great values of construction of an express highway in conservation of a rare insect and terrestrial- water ecotone as its habitat.)
中尾史郎, 井上和彦

PJ-3
Distribution of terrestrial reptiles in river open space as the large scale ecological corridor running through Tokyo metropolis, Japan
Osawa S, Kuroda T, Katsuno T

PJ-4
Research and development on revegetation for biodiversity conservation in Field Museum Karasawayama
Hosogi D, Kameyama A

PJ-5
A biodiversity-oriented revegetation case of a factory in a cool temperate zone: the case of the Suntory Oku-Daisen Bunanomiri Natural Mineral Water Factory, Tottori Prefecture, Japan
Hioki Y, Fujimoto E, Sakano A, Iwase M, Kono M

PJ-6
海岸砂丘地での企業研究施設周りの修景技術　ー植生管理を中心としてー
(Landscaping technique surroundings of the training facilities in the costal sand dune- focusing on the vegetation management)
趙賢一，佐藤力，山野秀樹，山本紀久，日置佳之，大塚生美

PJ-7
集合住宅の屋上ビオトープの整備から維持管理の一連の取組み
(The approach to creation, maintenance of biotope at roof in apartment complex)
八色宏昌, 北川明介, 勝野武彦, 島田正文, 葉山嘉一, 藤崎健一郎, 大澤啓志, 山本紀久, 逸見一郎

PJ-8
練馬区におけるエコロジカルネットワーク　～いきものつながり～
(Urban ecological network of Nerima City in Tokyo, Japan)
中村忠昌, 岩崎哲也, 小谷俊哉, 駒井康一郎, 加藤 顕

Planning（計画）

PJ-9
Development of efficient planning systems as a communication tool for intensive forest management and consensus building in Miyoshi City, Hiroshima
Yamaba A, Sano T

PJ-10
An evaluation of threatened ecological land units and landscapes in Tokyo Prefecture
Masuzawa T, Imoto I, Kajinami J, Hiraki H, Sakurai K, Kitagawa K

Conservation of Biodiversity （生物多様性の保全）

PJ-11
里山指標種ハルリンドウの遺伝的多様性保全のための環境要因評価
(Evaluation of environmental factors for the conservation of genetic diversity in *Gentiana thunbergii*, the SATOYAMA indicator species)
味岡ゆい，愛知真木子，上野薫，寺井久慈，南基泰，小田原卓郎，那須守，横田樹広，米村惣太郎

PJ-12
Genetic heterogeneity among fragmented populations of *Viola grypoceras* in urban areas
Hatanaka Y, Hashimoto H, Isagi Y

PJ-13
東京都におけるチョウ類の衰退と再生
(On transition and restoration of butterflies in Tokyo, Japan)
立川周二

PJ-14
多摩川中流域における猛禽類の分布と季節的消長
(The distribution and the seasonal changes of Raptors inhabiting the Tama River in Tokyo)
渡辺幸太，倉本宣

PJ-15
京都大覚寺大沢池におけるソウギョのコントロールと風景の復元
(The population control of *Ctenopharyngodon idellus* in Daikaku-ji Temple Osawa-Pond and the restoration of the scenery)
春田章博，真板昭夫

PJ-16
流水による攪乱と河川植生の関係
(Effect of frequency of overwash on river vegetation)
丹羽英之，森本幸裕

PJ-17
「海辺の緑地マニュアル」に基づく産官学の技術者による自然再生への提案
(Nature restoration and revegetation methods around the coastal zone or urban harbor district)
輿水肇，鈴木誠司，鈴木秀男，中瀬浩太，浜谷信介，池田義紀

Forests（森林）

PJ-18
強度間伐地で伐り残した樹木が鳥類による種子散布に及ぼす影響
(Influence of remained trees at strong-thinned Satoyama on seed dispersal by birds)
境慎二朗、柴田昌三，寺井厚海

PJ-19
万博記念公園の森づくり　ー生物多様性豊かな森を目指してー
(The Expo’70 Commemorative Park Forest Regeneration Project- aiming at rich biodiversity of forest)
千原　裕，池口直樹，井上奈緒子

PJ-20
万博記念公園におけるオオタカの繁殖と生息環境保全について
(Northern Goshawks in Expo’ 70 Commemorative Park for breeding and the living environmental preservation)
井上奈緒子，池口直樹，千原裕

PJ-21
中部大学「あいち森と緑づくりモデル事業地」概要と活用法
(Outline and use of the experimental urban SATOYAMA forest at Chubu University, Aichi Prefecture, Japan)
南基泰，上野薫，愛知真木子，寺井久慈，小田原卓郎，那須守，横田樹広，米村惣太郎， 鈴木金幸 , 田中綾子

PJ-22
赤沢自然休養林における利用者の散策路の選択とその評価に関する研究
(The choice and evaluation of forest path by visitor: a case study in Akasawa Restforest Base)
張桐、佐々木邦博、上原三知

PJ-23
里山における竹林拡大の影響とその抑制に関する研究 -隣接するスギ人工林とモウソウチク林における下層植生と表土流出量の比較-
(A study about the influence and management of bamboo expansion in satoyama- difference of vegetation and soil loss between bamboo forest and Japanese cedar forest)
堀田 智洋， 伊東 啓太郎，明石隆宏，池田朝ニ，高嶋紀子

PJ-24
放置竹林における種の多様性
(Diversity of species in a neglected bamboo forest)
重岡廣男，石井秀和

PJ-25
Wild bamboo forest mapping and the growth estimation in “SATOYAMA” using satellite image
Kamagata N, Akamatsu Y, Imai Y, Tachikawa T

PJ-26
Small scale landscape of bamboos created by their specific utilization: A case study in Yungui highlands
Ohno T, Lu Y-X, Maenaka H, Yamaguchi H

Landscape Ecology and Planning （景観生態学と計画）

PJ-27
都市緑地のエコロジカルネットワーク評価による社寺林の保全管理に関する研究 -北九州市の都市緑地における鳥類の出現状況-
(Management of the temple and shrine forests by evaluating ecological network- appearance of birds at urban green spaces in Kitakyushu City)
阪田暁、伊東啓太郎、森田大也、橋本大輔

PJ-28
リモートセンシングデータを用いた都市近郊における里地の連続性の評価
(Network between paddy and forest in Satoyama Landscape analyzing by remote sensing data)
板谷明美

Education（教育）

PJ-29
“ケヤキだいすき！ 探けん隊”: 地域自然と和合する都市の構築をめざした ESD プログラムの創出
(“We love keyaki-tree!”expedition: an ESD program towards the nature-harmonizing urban life and environment)
平吹喜彦，林出美菜，最知智美，遠藤陽子

PJ-30
子どもの遊びと環境学習を目的とした都市緑地のデザインと活用に関する研究 -子どもの遊びプロセスと空間の関係性把握
(A study on design and using through play and environmental education in urban green park- relationship between process of children’s play and landscape)
山本礼子, 伊東啓太郎，榎本敬子，大村康一郎，松本識史，藤原勝紀

PJ-31
子どもの遊びと環境学習を目的とした環境デザインに関する研究 −小学校ビオトープにおける自然再生とその活用について−
(A study on the biotope planning for children’s play and ecological education- changes of the children’s recognition of spaces by experience in a primary school biotope in Fukuoka City, Japan)
富井俊，伊東啓太郎， 藤原勝紀，真鍋徹，大石悠乃，古賀亮人，廣渡寛佳

PJ-32
校内緑地をゲートウェイとして、里山で総合的に学ぶ: TGU/IC-フォレストと里山をむすぶ教育プログラムの創出
(Isolated university-forest as the gateway to Satoyama-studies: field activities in the TGU/IC-forest and rural sites)
内山槙子，平吹喜彦，小野寺裕太，三塚明典

PJ-33
生物多様性教育の 10 年/自然発見館の環境教育プログラム
(Our ten years of biodiversity education in Nature-discovery Museum)
神藤淳弘，重松明子

Design and Management （デザインと管理）

PJ-34
大橋“グリーン”ジャンクションの環境配慮手法について
(Environmental concerns relating to Ohashi Green Junction Project)
高橋重和，黒川誠司

PJ-35
高速道路における生物多様性の保全
(Conservation of biodiversity in the expressway)
赤坂俊幸，大岩春仁，小原智

PJ-36
自然にやさしい道作り（エコロード）
(Environmentally friendly roads- “Eco-roads”)
田村崇

PJ-37
住居の外部構造の違いが室内環境に与える影響
(The influence for indoor condition by difference of exterior-structural on housing- comparing with green roofs, green walls, glass walls and plaster walls)
池田祐介，伊東啓太郎，石松一仁，行平信義，高田修一

PJ-38
自然体験を目的とした河川空間デザインに関する研究ー遠賀川 4 地区における来訪者の行動と空間特性の比較ー
(A study on the riverfront space design for nature experience- considerations on users’ behavior related to spatial characteristics in Onga River)
秦祐二，伊東啓太郎，松本識史

PJ-39
生物多様性保全のための「庭の生きもの調査」
(Garden wildlife watch for conservation of biodiversity in Japan)
小河原孝生 、高畠千尋、古井亮太

PJ-40
里山公園のデザインと運営
(Design and management of Satoyama Park)
柳瀬邦治，横谷剛志，村永有衣子

PJ-41
小金井カントリークラブにおける生物多様性保全
(Conservation of biodiversity in Koganei Country Club)
白石雄治，森島啓司

Revegetation Technology （緑化技術）

PJ-42
生物多様性保全を目的とした薄層基盤屋上緑化の研究ー軽量土壌を用いた屋上緑化の有用性評価ー
(The research on green roofs of a thin layer base for the conservation of urban biodiversity- evaluation of green roofs with lightweight soils)
藤塚恭平，伊東啓太郎，三谷康範，石松一仁，池田祐介，西尾友佑

PJ-43
国際宇宙ステーションでの長期滞在に向けた植物ユニット「宇宙庭」の提案
(Plant unit “Uchu-Niwa” for lengthier stay in the International Space Station)
小田龍聖， 松井紫朗，森本幸裕

PJ-44
屋上ビオトープにおける除草管理の経年変化に関する調査
(Investigation into secular change of rooftop biotope vegetation management)
三浦寿幸，栗木茂，鈴木孝彦，岩崎哲也，八色宏昌

Community（コミュニティ）

PJ-45
ミツカンよかわビオトープ倶楽部—みんなで楽しく自然とつき合う活動実例—
(Community in cooperation at Mizkan Yokawa Biotope)
宮原一明，日比野容久，松原大三，石田保彦，藤本真里，赤松弘治，鑑本寛，行徳昌則

PJ-46
都市地域における生物多様性保全に向けた NPO の役割と課題
(Challenges and role of Non-Profit Organization for biodiversity conservation in urban areas)
岸村憲作，鎌田磨人，大田直友

PJ-47
市民と行政の協働によるカヤネズミの生息地復元－平井川の改修工事における植生回復の事例-
(Habitat restoration for the harvest mouse (*Micromys minutus*) in collaboration with citizen and administration: a case of revegetation on river construction in Hirai River, Japan)
辻淑子，畠佐代子，増澤直

PJ-48
滋賀県営都市公園「びわこ地球市民の森」における市民参加型の森づくりについて
(Creation of a forest in cooperation with the Citizens - case study in the Biwako World Citizens' Forest, the Urban Park of Shiga)
今井絋一，柳田英俊，苗村光英，伊藤誠哉

PJ-49
The possibility of the environmental monitoring by visual disorder person- the case study for integrating of the social welfare and the environmental conservation
Kogushi S, Taniguchi S

PJ-50
モンゴリ森守プロジェクト—愛・地球博記念公園における県民協働・参加による森づくり—
(Mongori Mori-Mori Project- manufacturing of forest by citizens collaboration and participation in Expo 2005 Aichi Commemorative Park)
桜井種生，角和保明，稲原章文

PJ-51
京浜工業地帯におけるトンボネットワークと生物多様性の市民参画
(Citizen participation in monitoring an ecological network and a diversity of dragonflies in the Keihin Industrial Zone)
田口正男，田口方紀

Biodiversity and Business
（生物多様性とビジネス）

PJ-52
cs-EFA：生物多様性を支えるビジネスに向けての新しいコンセプト
(cs-EFA : new concept for business supporting biodiversity)
細垣彩加，古川政行

PJ-53
生態系保全に考慮した庭づくり「5本の樹」計画の効果検証
(Verification of Gohon no ki gardening, garden-planning concept that considers ecosystem protection)
木戸一成、小河原孝生

PJ-54
An action of biodiversity conservation of OSAKA GAS Co., Ltd.
Yamaguchi Y, Tabata M, Sekioka H

Biodiversity and Culture
（生物多様性と文化）

PJ-55
里山の植物における生物多様性—日本の園芸，美術，詩歌のゆりかご
(Biodiversity of Satoyama plants- cradle of Japanese horticulture, arts and poems)
江南和幸

PJ-56
地域固有の「伝統的知」からみた生物多様性保全戦略に関する試論
(Local & conventional approach for biodiversity)
宮前保子

PJ-57
里山景観における水田畦畔木
(Free-standing-trees on paddy levees in satoyama landscapes)
三木裕子，深町加津枝，奥敬一，三好岩生

Abstracts for Oral Presentation

S1-1

Climate change, urban green and human health - new challenges in urban biodiversity and ecological networking

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In cities, global warming and the urban heat island are superimposed and lead to an intensification of summer heat stress. Moreover, as the IPCC (2007) claims, extreme weather events like heat waves will be more frequent in the future over most of the land areas. Urban heat waves are closely related to human health and are among the deadliest of all weather extremes. Consequences for human health have to be taken into account since mortality and morbidity show significant peaks in large cities during heat waves and are expected to keep on rising.

Urbanization and urban architecture have a profound effect on heat mortality. High night time and morning temperatures known as the urban heat island characterize the urban climate of the mid latitudes. In cities, vegetation generates a variety of services, e.g. noise reduction, air filtration and micro climate regulation. The latter is due to modifications in incoming and outgoing radiation fluxes, including the fluxes of latent and sensible heat, air temperature, wind conditions and air humidity. These effects contribute to mitigating the urban heat island on a local scale. This paper is analysing the thermo-physiological impact of urban green and discussing its importance for human health at present and in a changing climate.

Berlin, as Germany's biggest city, can be characterized as a remarkably green city with its more than 400,000 street trees, almost 13,000 ha of public green (including parks, squares, cemeteries and graveyards), and 16,000 ha of woods and forests. However, during heat waves, there exist large differences of perceived temperatures between inner city esplanades without green structures and suburbs with a great number of old gardens providing shadow. So, during the 1994 heat wave the expected mortality in Berlin was about 50 % higher.

Future urban planning has to include the effects of climate change. Green areas already play an important role as they contribute to mitigate the urban heat island and thus reducing thermal stress (Rosenfeld et al., 1998; Endlicher et al., 2008). In view of global warming, they will be one of the most important adaptation strategies in urban environments.

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S1-2

Multicriteria assessment of green infrastructure potentials and green space patterns in shrinking cities- a challenge for planning and design of an urban ecological network

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Whereas socio-environmental and ecological impacts of urban sprawl are widely discussed among scholars from both the natural and social sciences, the spatial consequences of urban shrinkage are almost neglected when discussing the impacts of land use or climate change. Within the last decade, shrinkage and perforation have arisen as new terms to explain the land use development of urban area faced with demographic decline, particularly decreasing fertility, aging, and out-migration. Thus, compared to well-known Greenfield development nowadays massive housing and commercial vacancies followed by demolition and perforation come to pass in many cities across Europe, the UK or the US. In consequence, a large surplus of urban brownfields has been created. Furthermore, the decline in the urban fabric affects social infrastructure and urban greenery of local neighborhoods. Here, urban planning enters into ‘uncharted territory’ since it needs to assess the socio-environmental impact of shrinkage. Although shrinkage is far from being a “desired” scenario for urban policy makers, this paper argues that a perforation of the built-up structure in formerly dense cities might bring up many positive implications and potential for urban biodiversity: it supports preserving indigenous vegetation and networking existing green spaces to improve ecosystem services provided by them. The paper introduces firstly an approach how to set shrinkage along with biodiversity into context using examples from Germany. Furthermore, this approach is to be extended by presenting an integrative indicator matrix focussing on especially ecological but also social impacts of shrinkage embedded in scenario analysis.

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S1-3

System dynamics simulation modelling as the tool in urban and ecological network biodiversity management

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Urbanization of the Biosphere is spreading silently, surely and not reciprocal. Sustainable development is well known phrase with multi meaningful, uncertain content that gives possibility to be correct in local activity and blame regional and global 'bad boys'. Field ecologists are often helpless in protecting small, medium and even big patches ecosystems just because decisions are done without taking into account indicators of sustainable development (SD) and in offices that are situated not in the forests, fields and meadows. Urban planners are practically alliterated in values of support biodiversity network in highly urbanized territories and being separated from other important specialists are ordered to do what they must do.

The Babylon Tower is our forecast image. We propose another way of cooperation to build SD, important to avoid specific arguments of each profession and offer some tangible, clear and possible to try different opinions, scenarios and discuss results that are good for us. In the 80's-90's in Soviet Union, urban ecological project started. "Ecopolis", that was based on theoretical background of coherent development of humankind and society, was tested in large scale field experience in Puschino science city (Moscow region). Biodiversity reserves were established; ecological regulation was invented and experiment in reintroduction of wild flora in boundaries of city was successfully fulfilled. Report on this experimental project was presented in Tsukuba science seminar "Urban ecology" - workshop of World Exhibition 1985.

In developing research activity, special attention was paid to system dynamic. System dynamics was invented and applied to urban development by Jay Forrester from MTI. Later, this method of building and testing models of super complicated system was used by Club of Rome (Dennis meadows group and WORLD3 model). The Limits to Growth spreads trough continents and generations for more than 35 years. In 1980, model of the global winter was build, examined and showed that there are limits in methods of war, cold war was finished, perestroika changed human values, behavior etc.

Attempts of making Babylon tower of SD in modern time might be supported by new instruments of human scale: common vision, system dynamics and simulation games of citizen. This triangle became the focusing glass of long-term human interests in certain everyday terms and scientifically could be openly proven and show non-obvious possibilities. This sort of adventures are with low risk of travelers and bring personal identification of what, why and how better to plan activity in the context of the regional biosphere dynamics and carrying capacity.

To avoid over concentration on our helplessness following only true vision of J. Diamonds "Collapse", let us impart on coherent mode of human activity - building system dynamic models on different certain ecosystems, regions and urban sprawls. The scenarios are different, choices became "disciplined by science and human group vision" just enough to connect biodiversity (with its own seasons, dynamics), territory planning with different land using, everyday limits of our behavior patterns duties, managing ecological risk and monitoring the life span of our families. If collapse is unavoidable, how can we help modern young generations pass it with minimum loss?

This presentation will demonstrate example of system modelling of urban development of Science city "Korolev" and planning project of this city done under supervision of Italian master Alessandra Casu. Possibility of scoping naturalists, managers and urban planning, sharing values of humans, professional groups and law of nature will be demonstrated on modelling of district SD. We need to work with new instruments to convert endless opinions into knowledge of Nature-Urban system behavior, design and choose scenarios that fit human "common vision" of moderate, but still Best Places (Utopias - this dream of humans is irreplaceable) and do not loose ourselves in tricky globalization.

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S1-4

Urban environmental governance and the creation of ecological networks in urban areas

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Establishing ecological networks in urban areas is far from new. As Botkin and Beveridge (1997) suggest, it has long been recognized that vegetation is the key to making cities more pleasant.

However, multifunctional ecologically based green networks are recently gaining more and more attention within the framework of the discussion about ecosystem services. They are supposed to make a contribution to achieving optimum gains for social, environmental and economic, i.e. sustainable urban development.

Although the role of ecological networks in urban development is widely recognized by landscape ecology and open space planning, urban planners, city officials, and local political decision-makers are often skeptic and reluctant to give open spaces and especially ecological networks a wider role in urban land use planning.

If at all, open spaces are merely perceived as an add-on to urbanism based concepts. They are seen as an added value to housing as well as industrial and service center developments. Also they are more and more given a role in urban regeneration. However, the logic of creating inter-connected open spaces, i.e. ecological networks is still hardly taken into consideration.

On this background the paper scrutinizes the role of urban environmental governance as a key factor for a broader understanding of ecological networks, as well as for giving them a wider and more important role in urban planning and development. Urban environmental governance is understood here as a multiple stakeholder approach, based on cooperation, joint learning, and consensus building. It refers to all stakeholders related to urban-regional development issues.

In the paper, cases from different countries are discussed, giving special attention to urban regions in Germany. The following four topics are highlighted: 1) the role of ecological networks in urban regions; 2) the relevance of environmental governance in urban development; 3) ecological network planning as an integral part of urban land use planning; and 4) conclusions and recommendations.

S1-5

Planning ecological networks for urban biodiversity

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Large and contiguous core nature areas, smaller green areas and ecological connections between them are the essence of urban regional ecological networks and essential for maintaining interconnected habitats for species and thus biological diversity. Thus, both local and regional level ecological networks are vital for maintaining ecosystem services in urban regions.

We present a case of planning and evaluating of the regional ecological network of Uusimaa Region, which is the most urbanized and most densely populated region in Finland. The landscape of the region is very fragmented due to built-up areas, roads and railroads. Furthermore, the region is facing heavy urbanization and population growth pressure, including urban expansion, urban sprawl and also consolidation of existing urban structure. The richness of biodiversity in the region is supported by diversified biogeography and land use, but the current urbanization and infrastructure level and the urban expansion pressure pose a challenge to maintain or enhance a functional ecological network in the region.

The ecological network of the region consist of natural elements such large forest areas, ridges, marshlands, sea, archipelago, lake districts and rivers and man-made elements such as fields, grasslands, heritage landscapes and local level green areas (parks, urban forests etc.) inside dense urban structure. The core areas of the ecological network of the region include conservation areas (incl. Natura 2000 areas), recreational areas and large and contiguous forest areas. Such forest areas do not have an official conservational status, but the aim is to minimize fragmentation of these core areas. Moreover, "green connections" functioning as ecological corridors are essential components of the ecological network of the region.

We illustrate some main challenges of planning and implementing an ecological network in this region, but also give encouraging examples of the good potential of planning a proper ecological network as a part of an urban regional land-use plan. We also present estimations of the structure and function of this ecological network, as well as its importance in providing ecosystem services to the inhabitants of this urban region. Furthermore, we address the relation of local (municipal/city) level ecological networks to the larger regional ecological network in the area.

S1-6

Integration of indigenous biodiversity in landscape design: New Zealand case study

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After colonisation began in the mid 19th century, by the turn of the century New Zealand cities and towns had experienced a dramatic loss of indigenous biodiversity. Several recent research programmes have highlighted a need for restoring and enhancing indigenous biodiversity in cities and towns. Urban biodiversity research was one of the main components of a Low Impact Urban Design and Development research program funded by the New Zealand government from 2003 to 2009. This research program also explored several scenarios for the integration of indigenous biodiversity into landscape design for New Zealand private gardens. Since urban planning structures in New Zealand have quite a strong emphasis on private gardens, one of the strategies for enhancing native biodiversity was education and promotion of native plants via local nurseries, local newspapers, garden magazines and garden flower shows. One of the most effective ways of increasing visibility of native plants in landscape design and attracting the attention and interest of local citizens was the establishment of Native Demonstration Gardens "Design with Indigenous plants" in the Christchurch Botanic Gardens. Three exhibits "Dry or Rock Garden", "Bush Garden" and "Formal Garden" illustrate how indigenous plants can be successfully grown in different combinations in private gardens in Christchurch. There are numerous native plants that can be used for private garden design, as well as for public and commercial planting design. For successful integration of indigenous biodiversity into private and public landscape design it is important to create a new landscape architecture vision that can be attractive and appealing to the majority of urban dwellers.

S1-7

How global trends may provide opportunities to enhance biodiversity and ecological networks in cities

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Now, at the beginning of the 21st century, the world as we know it is changing rapidly. As widely considered, this is predominantly the result of human activities and human-caused phenomena, including:

- ongoing urbanization because of human population growth and increasing preference of people to live in urban environments (Cohen, 2003),
- a growing number of people that has a high standard of living, resulting in an increasing demand for commodities and services to support this way of life (Cohen, 2003),
- ongoing destruction of habitats causing high species extinction rates, habitat fragmentation and the collapse of ecosystem functioning (Myers et al., 2000),
- climate change, resulting in more extreme weather conditions that directly and indirectly threat human existence.

All these trends can be observed worldwide, though locally there are large differences in terms of impact. Of all places, urban environments seem to be impacted extra, as here most human activities and human-caused disturbances have their focal point.

For decades, the ‘biodiversity’ aspect of urban environments has attracted little attention from both nature conservation organizations as from urban planners, developers and architects. This has changed recently, as awareness is rising that it is here - in the places where people live and work - that people and nature can be reconnected (Müller et al., 2008). However, the increasing popularity of ‘greening’ cities cannot be explained so much with the ‘reconnection’ argument. Much more, this is because policymakers, city planners and architects have discovered that humans may benefit from good urban ecosystem functioning. Especially urban vegetation may buffer negative impacts of e.g. climate change and air pollution, and enhance the quality of urban life, leading to an increase in e.g. green roofs and walls in city planning.

In our talk, we will discuss the current momentum for incorporating urban biodiversity conservation measures in city planning and development. This momentum is created by the general recognition of ‘urban green’ as (potential) solution for trends that may impact human life negatively. We will discuss the range of ‘greening city’ measures and will explore what large-scale implementation of these measures in city practice could mean for biodiversity conservation, ecological network functioning and the experience of nature by citizens. The insights we will present are based upon a range of both scientific and practical projects dealing with the innovative application of urban green (e.g. Snep et al., 2009).

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S1-8

Biodiversity trails: translating good science into good design

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Urbanization of the world's population has led to detachment of human society from nature and natural processes. This has resulted in degradation of ecosystem function and the life-supporting services upon which human society is reliant. Neglect of ecosystem services, that accommodates biodiversity and cultural values in good urban design and development, may ultimately compromise the sustainability of nature and people on this planet.

Education through information absorbed from direct experience of models and demonstrations is an integral part of restoring the connection between human society and the natural world. The restoration or enhancement of cultural landscapes in is an opportunity to provide the public with understanding through direct experience of ecosystem services, namely the benefits which people obtain from biologically diverse ecosystems.

The degree to which the public perceives and understands the benefits of ecosystem services is essential in gaining local and community support to further restore and enhance nature in cultural landscapes.

Planted areas of indigenous vegetation have ecological, aesthetic and intrinsic biodiversity merit but can be designed also to demonstrate ecosystem services and thus create multiple benefits. These designed spaces can provide visual cues to the processes and roles of ecosystem services. This approach has the potential to enhance the environment, public awareness and sensitivity. Such interpreted design has more meaning and thus can also add economic value for both private and commercial participants in the experience.

Scientific methods to enhance biodiversity in urban areas are ever evolving and we are seeing more environmental enhancement and restoration projects globally. However, if the concept of biodiversity and the illustrational or transformative benefits of ecosystem services do not translate into good landscape and urban design, future projects will struggle to gain community participation and support.

Biodiversity trails have now been designed at four high profile vineyards in the Waipara Valley of Canterbury, New Zealand. These vineyards are Pegasus Bay, Waipara Springs, Waipara Hills, and Torlesse Wines. These trails were implemented as part of the Greening Waipara Project which aims to restore and integrate biodiversity within this intensive horticultural landscape. Biodiversity trails have also been successfully incorporated into the grounds of both rural and urban schools, e.g. Omihi Primary and Te Kura Whakapumau I Te Reo Tuturu Ki Waitaha.

Biodiversity trails are proving to be an effective means of restoring biodiversity and natural character in the urban and cultural matrix while at the same time informing communities about the services that ecosystems provide, and reconnecting them to the uniqueness of New Zealand/Aotearoa, both the indigenous plants and dependent wildlife and associated traditional uses and customs of the tangata whenua [people of the land - indigenous people]. The public profile of ecosystem services and importance of nature conservation to regional identity and nationhood is being raised in these initiatives.

S1-9

Thirty years of field layer vegetation dynamics in remnant forest patches at the residential area Järvafältet in Stockholm

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The concept of preservation of indigenous vegetation within cities comprises utilization of the existing natural vegetation in areas where buildings and infrastructure in new city areas are to be developed. The concept includes environmental and economic advantages. The objective of the presented project is to enhance the knowledge base for preservation.

Since 1972, a research project is running in the nowadays suburban residential area Järvafältet in Stockholm, Sweden. Natural vegetation preserved within the residential area and in an undeveloped reference area has been surveyed from the time before construction begun through 30 years of residential use. Biotope changes have been presented in Isaksson (1974) and Florgård et al. (1984). Changes in tree cover were presented in Florgård (2000). Here changes in ground cover vegetation are analyzed. The ground cover vegetation development was studied using the CSR model of plant functional types and time-lag analyses.

Annual species turnover was found to be higher in the built-up area than in the reference area. However, the long-term rate of change was equal between the two areas. The development direction differed between the two areas in that the composition of the vegetation in the residential area moved more towards ruderality. The magnitude of the change in CSR space was however equal. Results show that urban use, in this case mainly trampling, affects field layer composition gradually. The deterioration was slow and after 30 years the question of the long-term survival of the vegetation is still open. The fact that observed changes progresses for a long time emphasise the importance of taking the temporal situation in consideration regarding remnant vegetation.

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S1-10

Morphogenetic conditions as a factor shaping green areas spatial structure in towns- case study of Western Poland

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This study concerns the degree to which morphogenetic features of lowland areas are reflected in the spatial distribution of green areas within towns. Morphogenetic qualities shape the features of components of the environment, i.e. the substrate and waters, thus determining soil and habitat conditions. This entails varied suitability of the areas for development, which gives grounds to hypothesis that the spatial structure of towns adapts to a certain extent to natural systems. The study encompassed medium-sized towns of Wielkopolska situated in diverse morphogenetic types: the morainic pleateau, sandur and valley. Selected towns were studied using cartographic and geostatistical analyses of the distribution of green areas in two periods in the 20th century and the present day. The study permitted to find that morphogenetic conditions played a varied role in the analyzed towns. Other factors significant for the preservation of biologically active areas were the town size and development stage combined with technological capabilities and the expected increase in the land rent as a result of investment.

S1-11

Planning and design of an ecological network for urban ecosystem services - Salzburg Urban Cultural Landscape

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Salzburg is a UNESO world heritage city, world wide known for its baroque urban design and surrounding nature. It represents a unique connection of urban and natural elements of the landscape. The city consists of urban and non-urban landscape parts and elements, designed originally in historic times of the last four centuries for urban, agricultural or urban leisure facilities. A special landscape quality developed over time was subject of specific planning but developed itself - the Salzburg Urban Cultural Landscape. This urban landscape quality can be investigated to determine its quality creating elements. It is further more necessary to develop a systematic evaluation of ecosystem services of all parts of the Salzburg Urban Landscape to preserve and develop its ecological functionality for the future. An ecological network for urban ecosystem services has to be the target. The city itself started in 2004 with a first step, steering document as central instrument to profile the Salzburg Urban Landscape as a unique heritage (Braum et al., 2005). This included a definition of selected nature defined urban landscape parts and of rules how to develop their special ecosystem service further. More investigations were undertaken until 2009 in the frame of a long-term research project, involving also students of Salzburg University.

Outgoing from a structural model of the urban landscape (Breuste, 2009) this dividing of the Salzburg Urban Landscape into different urban landscape types and their analysis shows how the historical designed landscape is actually providing ecosystem services in an ecological network of connected green areas.

Outgoing from the four nature types, natural, agricultural, garden and urban, different development and functional perspectives have to be developed to support these services.

The approaches are investigations on:

- Analysis of the Salzburg Urban Landscape by structuring of the urban area into urban landscape types,
- Determination of ecosystem services of these urban landscape areas,
- Creation of an ecological network of ecological services providing areas,
- Evaluation of the municipality defined development strategies for the urban landscape areas, and
- Evaluation of the actual urban landscape management for Salzburg.

Recommendations for further handling of urban cultural landscapes with experiences from the Salzburg case have been developed.

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S1-12

Planning and design of a green infrastructure as a defensive strategy to protect biodiversity and minimize climatic changes effects on a coastal urban environment in Southeastern Brazil

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Coastal cities historically have grown over wet areas in their expansion process. Rio de Janeiro growth has caused not only low lands transformations, but has expanded over the hills causing deforestation. The areas that are not occupied are mainly steep and protected by environmental legislation. Originally the area was covered by three Atlantic Forest (Mata Atlântica) biome ecosystems: mangrove, sandbank and Tropical Rain Forest. The biodiversity has suffered numerous impacts: extinction of endemic species by urbanization and deforestation; alien fauna and flora invasion; preference for exotic ornamental plants caused by European and lately American cultural influence on garden and park design, among others. There is a regional deficiency of urban ecology, as well as landscape planning and design formal education and research that restricts the understanding about the role of indigenous biodiversity in the city. Rio de Janeiro will have to cope with new challenges caused by even warmer temperatures and the sea level rise as a result of the climate change.

We propose a green infrastructure plan to protect the most preserved watershed situated in the urban limits. The area comprehends an expressive mangrove remnant surrounded by a protected massif partially covered by Atlantic Rain Forest and the last productive landscapes (fresh produce and ornamental plants). They are under threat of receding because of the imminent construction of the new transit system, which comprehends a tunnel, a toll plaza and a ring. The strategy is to defend the existent ecosystems patches and connect them through the riparian corridors and other open spaces. The green infrastructure framework is planned at the drainage basin scale. Local scale low impact landscape design is proposed to reach abiotic, biotic and cultural goals. This would prevent landslides, floods (that are extremely destructive, and is forecasted to get worse with higher temperatures) and enhance biodiversity. There is a potential to generate economic improvement with more visible food production through rural and ecotourism that could connect people with nature. The area could be more resilient to climate change and enable the mangrove migration in case of sea level rise.

Rio de Janeiro will host two major sports events in the coming years: Soccer World Cup and Olympic Games. City officials have the commitment to promote ecological urban improvements, like green stadiums, low greenhouse gases emissions activities among others. Many urban renovations and new infrastructures are being planned. It could be an opportunity to rethink the way urban development has happened and implement new and more ecological strategies. The green infrastructure plan could be a way to achieve multiple goals both for the people and the environment.

S1-13

Exurban development and planning ecological networks at peri-urban interfaces: an unexploited opportunity of urban design for adaptation to climate change

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The conservation of biodiversity, specifically in megacities of developing countries, is among one of the least addressed issues in the scientific literature so as in real world practice. Nevertheless, the potential of megacities as laboratories for ecological solutions is not much recognized. Thereof, the exurban development and its relation to biodiversity planning are among overlooked issues for planning authorities - especially in this vary part of the world (Pakistan). Nevertheless, its relation and potential to combat the climate change issues is a pending agenda for the scientific world. This paper addresses the issue of planning the ecological networks at peri-urban interfaces of the megacities which are highly dynamic by their very nature. The research started with the presumption that the exurban settlement pattern around Karachi has significant effects on the ecological characteristics of the metropolitan area of Karachi. It is mainly because this fast growing megacity - whilst unable to assimilate the pressure on it internally existing nature (urban green) - heavily depends upon the nature and recreational sites at the peri-urban areas. This pattern of land development at and outside of main metropolitan areas (as exurbia) has a wide ranging effects on the ecosystem functions through alteration in land-cover types and pattern. Ultimately, the ecosystem services are in imbalanced conditions and overall urban metabolism is disturbed. These nature spaces have further resulted in the development and fragmentation of exurban settlement patterns. Consequently, the phenomenon like urban heat island (UHI) and land surface temperature (LST) kept changing their pattern along urban-rural gradient. This study aims to evaluate (i) the pattern of exurban settlements and the nature spaces around the megacity Karachi, (ii) its relation to UHI and LST along urban-rural gradient, and (iii) their socio-ecological effects. Henceforth, this study seeks answer to the following research questions:

1) How did the spatial pattern of exurban settlement around Karachi change over time (1970-2009) and what are the ecological effects (biodiversity loss and land degradation) of land-use changes at the peri-urban interfaces of Karachi?
2) How did the nature spaces evolved around exurban settlements and how do they function socially and ecologically?
3) How could these dynamic zones serve as the potential sites for ecological design for human adaptation to climate change?

To answer these questions, remote sensing methods were used to delineate the exurbia and to evaluate the spatio-temporal changes land-use/land-cover. Extensive field surveys were conducted for ground validation and attribute mapping of the selected variables. Biodiversity loss, because of human induced land degradation, was clearly observed. LST was calculated using the Landsat ETM+ images, which helped to analyze the pattern of UHI. Furthermore, a structured questionnaire was used to analyze the perception of the people. However, some exclusive nature spaces were designed which are among the main attractions for the city dwellers. It was identified that these sites, as main component of the exurban land-use and as a counterpart of the main metropolitan, could be helpful to address several problems of the city - especially in balancing the temperature of the city. These results could be used to plan the protective or remedial measure wherever needed on priority basis. Furthermore, the preferences of people could be used for effective designing of the exurban settlements, its connectivity to core city, and its inclusion in planning to achieve the sustainability in urban areas.

S1-14

Urban green management for urban ecosystem services in Karachi, Pakistan

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Cities are a part of ecosystem and great bioregion. To preserve nature we need to integrate nature into cities. Whether it is green ways, wetlands, or protected watersheds that provide a habitat for wildlife or cultivated farm lands that preserve the generic variety of native species. Green areas contribute to maintaining and expanding the biological base for diversity that is essential for human survival. A well-planned urban greening program can secure a healthy sustainable future for the urban population of megacities of developing countries. The study focus on such a megacity i.e. Karachi in Pakistan with a population of over 15 million is lacking in the socially and economically healthy recreational places. On overall, Karachi has 1,256 open spaces including parks, playgrounds, and green belts and it is absolutely inadequate for the 4.5 % per annum growth of the Karachi. The study provides an overview of the developed and undeveloped urban parks of the city and their town wise development from 2001. The study also provides information about the role of city district Government and local Government in the development and maintenance of the developed and undeveloped parks. Park encroachment by other departments or local people is burning issue in the city and is also discussed.

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Karachi Master Plan (1974- 1985)

S2-1

The use and value of bird monitoring for conservation policy and management

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In order for biodiversity conservation policy, design, and management to be successful, it is essential to have as complete knowledge as possible about the species present (or potentially present) in the landscape or ecosystem of interest. As a result, within urban ecosystems there has been a dramatic growth in biodiversity research and monitoring, which much of it focused on birds. This focus on birds likely stems from the fact that birds tend to be conspicuous (i.e. colorful, large bodied, etc.), are easily distinguished from one another, and generally appreciated by people. Moreover, because birds are often used as umbrella species in conservation planning, they make an ideal taxa to use for monitoring. Within urban ecosystems, there are several long-term bird monitoring programs in the United States, including Audubon’s Christmas Bird Count, Cornell’s Great Backyard Bird Count, and the Tucson Bird Count. However, most of these programs are not designed with policy or management as the basis for their existence. One monitoring program that was designed to assess different management strategies and build a citizen science monitoring team is the Milwaukee County Avian Migration Monitoring Partnership (MCAMMP) located in Milwaukee, Wisconsin (USA). Specifically, MCAMMP has been monitoring birds across eight public parks in urban Milwaukee for the past five years to assess biodiversity patterns and species abundances in relation to park management practices through the use of citizen scientists. By using a citizen science approach, we have not only been able to monitor a greater number of times and locations, but have provided a means for citizens to become invested in the urban biota present in their ecosystem and thus increase their ecological literacy. The value of MCAMMP and similar monitoring programs to urban biodiversity is that they provide an easily implemented and useful approach for observing and evaluating implementation or changes in policy, design, and management. Moreover, bird monitoring can easily be refined to different cities or urban ecosystems in order to address specific policies and management approaches. For instance, bird monitoring in urban areas of Hawai‘i (e.g., Honolulu) requires a consideration of topography, neighborhood socioeconomic and demographic composition, and a sampling strategy that acknowledges a lack of seasonal variability, whereas bird monitoring in Milwaukee requires consideration of distance from Lake Michigan and seasonal variability. Besides considering the urban ecosystem of interest, it is also important to understand the natural history and ecology of the birds that occupy them. For instance, nocturnal birds (e.g., owls) or birds of prey (e.g., hawks) require very different monitoring approaches than many of the small perching birds that are typically investigated in monitoring projects. Likewise, different monitoring approaches vary in their robustness and thus it is important to consider what the goals and objectives are for the policy or management plan. By developing and using bird monitoring approaches, we can provide much needed information on the value and success of different policy, planning, design, and management decisions, with the added benefit that they can be compared between different urban ecosystems.

S2-2

Deserts and forests in the suburbs: effects of structure on biodiversity

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Since a large proportion of urban green space exists as privately owned yards and gardens, their management is a key component of urban biodiversity conservation. A small but growing body of literature is showing that some landscape designs in urban-suburban yards, gardens and parks harbor more native species than others. The issues for management, however, differ in arid versus forested regions. In drylands regions, water is a key resource. Irrigation of gardens and lawns contributes to altered bird and arthropod communities as well as changes in trophic dynamics. We present findings from Phoenix, Arizona, showing effects of two major landscape designs, mesic and xeric type plantings, on bird community structure. Native bird species demonstrated statistically significant and strong associations with drought-tolerant trees, while generalist species demonstrated strong associations with water-dependent trees. In contrast with arid regions, precipitous losses of urban trees in forested regions of the United States have raised concerns over effects on climate, water quality, and neighborhood vitality. Less attention has been paid to implications for biodiversity. At both broad and local scales, the decline of urban forests has clear impacts on wildlife. For species dependent on dead wood, such as cavity nesting birds, those the effects may be complex. We suggest that at broad scales, cavity nesting birds are associated with greater tree canopy cover. At the scale of individual trees, however, cavity nesters may benefit from the acceleration of decay in urban trees caused by stresses of urban life. We present findings from a variety of field studies in Baltimore, Maryland and suburban areas in western Massachusetts examining management of hazard trees and cavity nesting bird habitat. Management bird habitat in both arid and forested regions requires attention to multiple spatial scales and to human values and perceptions of landscapes.

S2-3

Hierarchical landscape effects on birds in 34 Swedish cities

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Swedish cities have relatively large proportions remaining woodlands in comparison to cities in western and southern Europe. However, these woodlands (fragments > 1 ha, structurally equivalent to natural forest stands) are under severe threat due to exploitation. Few studies have investigated how fragmentation of natural habitats affects biota in urban areas. Recent urban studies on biodiversity and species adaptation emphasize the importance of hierarchical studies including whole cities and their adjacent peri-urban (surrounding landscape) area, green areas (e.g. parks or urban woodlands) and the adjacent landscape (e.g. residential areas) and finally, the habitat at local level (Clergeau et al., 2006; Goodard et al., 2009).

The aim was to investigate how birds in local urban woodlands were affected by surrounding landscapes at different hierarchical levels. Specified aims were to: 1) compare bird abundances in woodlands along gradients from the city centre to the peri-urban area; 2) evaluate the importance of the proportion woodland within the city and in the peri-urban landscape to forest bird communities breeding in urban woodlands; 3) test whether fragmentation effects on birds were linked to the type of peri-urban matrix; and 4) compare the reproductive performance of great tits (*Parus major)* breeding in urban woodlands with different adjacent landscapes. Bird surveys were conducted in 474 woodlands located in urban and peri-urban areas in 34 Swedish cities (Hedblom & Söderström, 2010). Great tit reproduction was investigated in one of the cities in an experimental study of four urban woodlands surrounded by three types of other habitats: residential, high-rise building and grassland/golf course.

More than 12,000 individuals of 100 forest bird species were recorded. The results showed that the bird community of urban woodlands was characterized by species associated with deciduous forests and tree nesters, whereas the bird community of peri-urban woodland was characterized by species associated with coniferous and ground nesters. 12 species (out of the 34 most common recorded species) were significantly linearly associated with the proportion of urban woodland at city level and/or the proportion of peri-urban woodland, and another 8 species were associated with the interaction between these two factors. Local breeding bird abundances of 4 species were significantly positively associated with the proportion of urban woodland only in farmland dominated landscapes. Abundance of breeding great tits was higher closer to the city centre than in the peri-urban landscape. However, differences were also found in a smaller landscape scale (200 m transects) where densities were higher and hatch date were earlier in residential areas than in high-rise building and golf course areas.

The results indicate that fragmentation effects on local bird assemblages were affected not only the by local habitat quality but also processes acting on different hierarchical levels, such as the adjacent landscape and the matrix in the peri-urban landscape.

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S2-4

Urban design, urban planning and approaches to modelling urban birds

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The growth of urban areas today poses serious threats to biodiversity worldwide. Both the size of the urban population and the size of urban areas are projected to increase rapidly and the urban metabolism, the flows of energy and materials for supplying cities, extends far beyond the administrative borders of cities. These global changes, together with the location of cities close to highly productive ecosystems and natural resources, emerge as major challenges for sustainable urban planning and design if biodiversity is to be preserved and developed in the face of these changes. Moreover, the complex urban systems has been pointed out as dominant nodes for flows of information and resources (Grimm et al., 2008), which opens for high ambitions concerning urban planning and design with integration of biodiversity objectives. For integration of biodiversity issues in urban planning, more knowledge is needed on effects of urbanization on biodiversity components and on their requirements for long-term persistence in urbanizing landscapes. For such urban ecological studies to be useful for planning and design they need to be comparative and humans need to be integrated into the system of study (Alberti et al., 2003; Pickett et al., 2008). However, a closer look on e.g. native bird diversity reveals that despite the overall picture of urbanization as a major threat to biodiversity, urban biodiversity can still be high and the distribution of species differ greatly between individual species and guilds, and in space (Pickett et al., 2008; Mörtberg, 2009). This gives an interesting perspective for comparative urban studies, aiming to reveal the factors behind the observed patterns, and disentangling the influences of natural and pre-urban conditions, and the globally repeated urban landscape elements and processes. Data from monitoring programmes and meta-analyses of existing data sets need to be related to local habitat variables as well as landscape context and regional ecological settings, and at the same time to local urban land use and disturbances as well as wider urban contexts, such as shape and size of cities, infrastructure, human population and socio-economic variables. All these parameters represent complex and interacting patterns that need to be captured and quantified, through e.g. remote sensing and other sources, and integrated in spatial systems analysis modelling, combining spatial statistics and geographic information systems. In this way, patterns of urban influences concerning individual species, guilds, communities and overall biodiversity can be revealed, homogenisation trends can be detected and the findings can be used for comparative assessments and for guiding ecology-informed urban planning and design processes with biodiversity objectives.

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S2-5

Using comparative studies to examine intercity versus intracity patterns of native species loss and biotic homogenization of urban floras

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As the world becomes more and more urbanized, there is an immediate need to identify how the flora of cities change with increasing urbanization and how to manage these changes to preserve biodiversity. Previous research in North America and Europe has shown that non-native species increase and native species decrease with increasing urban area or human population density (Pyšek, 1998; McKinney, 2002; Deutschewitz et al., 2003; Aronson et al., *in review*). Often, this leads to biotic homogenization across cities but not necessarily within cities (McKinney, 2006; Aronson et al., *in review*). Contrasting patterns of intercity versus intracity patterns of native species loss and homogenization suggest that at these different scales, different processes may be influencing urban diversity. For example, in the New York metropolitan region, USA, I show that non-native species differentiate, not homogenize, plant communities with increasing urban land cover (Aronson et al., *in review*). Differentiation within cities could have significant ecological consequences for plant metapopulation dynamics and the sustainability of native plant populations in urban areas. Homogenization across cities may lead to the same world-wide urban plants inhabiting the most urban regions (McKinney, 2006). These patterns are not well understood and comparative studies are needed to understand the mechanisms at regional and global scales that influence urban biodiversity. I will discuss how comparative approaches could be developed to further understand the patterns and consequences of urban species homogenization and differentiation. Using collections and survey data, it is possible to compare urban floras at multiple scales within and across cities. With these data, we can address management implications for native and non-native plant biodiversity in an increasingly urbanized world.

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S2-6

Urban bird monitoring and comparative studies of cities

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Urban bird monitoring projects are conducted in cities worldwide, however little attention has been paid toward how these studies might be linked to allow for comparisons among cities that might assist in answer questions about bird populations and communities in urban areas. As co-investigators on a long-term urban bird monitoring study in Baltimore, Maryland USA, we want to understand how changes in residential neighbourhoods influence bird species composition, distribution, and abundance. We want to identify variables that both reflect these neighbourhood characteristics and are predictors of bird species composition, distribution and abundance. We are particularly interested in changes that occur at the residential lot scale that may be initiated by residents, at the block scale that may be initiated by groups of residents and local officials, and at the neighbourhood scale that may be initiated by local officials. In this presentation we will describe our efforts to develop a comparative study with another long-term bird monitoring project in Phoenix, AZ USA, and how this effort has been used to study relationships between bird species richness and socio-economic characteristics of urban neighbourhoods, comparisons of native and exotic species, and comparisons of bird communities among similar types of urban neighbourhoods. We will conclude by suggestion an approach for a more global study using urban bird monitoring projects.

S3-1

River corridor planning - a step stone to build up ecological network in greater Taipei metropolitan areas

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The greater Taipei basin is situated at 24.9 degrees north latitude, 121.6 degrees east longitude. It belongs to Tatun volcanic eco-system and has many radial river systems formed by volcanic movement. Influenced by the latitude, topography and climate impacts, the volcanic eco-system also possess northern growth limit of eco-patches of many temperate floras, which is high in biodiversity and habitat diversity value.

This paper applied landscape ecology theory and geographical-climate regions as research units to analyze the ecological characteristics of basin systems of Tatun mountain regions. It also used stepstone concept to connect rivers, streams, and green ways to establish a river corridor network and preserve both ecological amenity and habitat diversity. Research result will serve as reference to ecological infrastructure planning in Taipei metropolitan area, regional governance, and sustainable resources management for Yangmingshan National Park.

S3-2

Understanding urban rivers as coupled natural and human systems to address aquatic biodiversity and flood protection simultaneously: a case study on the Green River, Washington, USA

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In the recent decades many industrialized countries have started to rehabilitate degraded urban rivers. However, public perception on floods as well as societal goal of flood safety often limit-if not impede-the progress of improving ecological functions and aquatic biodiversity. It is well recognized that urban flood control practice, including building levees, channelization, dredging, etc., significantly alter natural flow pattern and simplify the complexity of aquatic habitats, contributing to loss of biodiversity in the urban river. However, the prevailing flood control practice does not guarantee safety as evident in numerous recent catastrophic flood events across the globe. The plight in urban river rehabilitation and flood safety indicates a need for paradigm shift in urban river management that should address flood safety and aquatic biodiversity simultaneously. Integrated knowledge of both human and natural processes is required to tackle complex environmental problems (Palmer et al., 2004). I argue that understanding urban rivers as coupled human and natural systems (Liu et al., 2007) is a necessarily first step to reach a better balance between aquatic biodiversity and flood protection in the city. The Green River near Seattle in the United States demonstrates a typical case facing both flooding and ecological rehabilitation challenges. Using an urban ecology conceptual framework that integrates humans and natural processes (Albert et al., 2003), in this paper I focus on the heavily-urbanized reach of the Green River (Lower Green River) and tease out its complexity of human and natural coupling. I examine the feedback loops between the following key system factors at various scales: 1) social and economic drivers, 2) patterns of flood infrastructure and aquatic habitats, 3) fluvial processes (hydrologic, geomorphologic, and ecologic), and 4) effects on flood risk and aquatic biodiversity. Based on the analysis I then identify key aspects of flood infrastructure design that could be reinvented for achieving flood protection and aquatic biodiversity simultaneously. The conceptual framework for assessing feedback loops in this paper could also serve as an evaluation framework to analyze plausible system-wide impacts by future changes in any key system factor.

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S3-3

Planning with climate change - urban wetland conservation towards innovative eco-city planning

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Due to the geographic climate, topographic and ecological characteristics, Taipei Basin is in high-risk state under the threat of climate change. However, it is still stand for the current political, economic and cultural development center of Taiwan. Under the historical urban development context, Taipei, which develops along the Tamsui River corridor, has to live with its environmental constraints, response to high water level on low land and stress of high-rising population growth in its hundred-years developing history.

Under the shadow of urbanization, the existing left over urban farm lands in turns become unique patches with high regional flood control, habitat protection, and wetland diversity value. This paper aims to apply ecological planning theory to establish an eco-community model in response to climate changes, and try to construct a liveable wetland network for an eco-city symbiotic with flood.

S3-4

Analysis of habitat functions in urban river area - the lower Keelung River in Taipei

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Urban area is a dynamic open ecosystem and extremely influenced by natural changes and human activities. It keeps continuously varying over time and space. Urban rivers, under the pressure of urbanization, play the role as permanent or "stopover" habitats for wildlife, and also as "bio-highway" to transport the nutrients, energy and organisms. Therefore, urban river and its floodplain are important ecotone for urban ecological services. However, the uncertain inputs and temporary impacts cause the degradation of biodiversity and ecological services in cities. It is necessary to have an inventory of habitat in the urban river area in its different components, ecosystem functions, and priority areas of conservations. Accordingly, the criteria of assessing habitat functions in urban river area can be grouped into "disturbances" and "biotope condition" to prove the environmental condition; then to evaluate the habitat functions by comparing with the condition of selective species (bird), which are shown in a scale of ecological values. The disturbance factors (pressure) show the influence of human activities both on land cover and water body. The biotope condition displays the naturalness, specific and vulnerability status of biotope types. For exploring and practicing the evaluation framework, the lower reach of Keelung River in Taipei City is taken as study case. The main findings of this study display the assets and weakness of lower Keelung River for serving habitat functions, which may help to indicate the condition of habitats and reflect the biodiversity in Taipei City. Accordingly, to propose strategic of rehabilitation on the urban landscape to maintain and improve the ecosystem services. The entire concept and the results may contribute to approach the integrated river basin management in Taiwan.

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S3-5

The stormwater system as urban frameworks

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A growing awareness of the value of urban rivers and streams requires attention to the stormwater system design. This presentation will be conveying a new aspect and approach of stormwater management, not just an engineering solution to clean the water, but a multi-functional approach to create a stormwater treatment as a core amenity to the urban community. The presentation will also describe the stormwater management design as a value of urban framework, including social and ecological function. Presentation part 1 will briefly describe the historical sequence of stormwater management practice, as well as what we learned from mistakes. Presentation part 2 will focus on a contemporary stormwater management design approach through innovative project examples, including details for water quality filtering technique. Part 3 will point out key points for a successful stormwater management design, and conclude with a goal; the best way to approach stormwater management in urban environment. The attendance of this presentation will come away with understanding of the multi functional approach to stormwater management, as well as the tools necessary to design and construct such projects.

Part1: ***What was missing in traditional systems of managing stormwater system?***

In 1973, the United States Congress mandated that pollutants be removed from urban rivers and streams to restore our rivers as healthy for wildlife habitats. In response to the federal regulation, professionals have been exploring means to treat urban stormwater runoff. Although in the last two decades, the method has resulted in negative impacts on our urban. The facilities such as water quality/detention ponds have been built with little consideration to their visual and social impacts to urban landscapes. These facilities are often pushed to the edge of site, and have no other function but treating water quality. This issue has drawn attention from the professionals, how to improve the stormwater management system, to better fit in the urban environment.

Part2: ***Learning from innovative projects, use 'stormwater' as a major frame work.***

Stormwater management system can have a multi-functional system that could contribute to the quality of urban life. Moreover, stormwater system could create a primary civic frameworks of the community. For example, the Menomonee River Valley Park in Milwaukee is a redevelopment project of 80 acres of industrial parcels and streets. The stormwater runoff, to be collected and treated in a centrally located 20-acre park, providing the local community with an invaluable public asset that would have otherwise been unfeasible. This stormwater management area gives structure to the park and allow for variety of landscape types, such as wetlands, meadows, and lawn spaces for active and passive recreation. Plants provide obvious aesthetic value to the park but also function to cleanse run of pollutants and to increase habitats.

Part3: ***How to make a successful stormwater management system in urban setting.***

Urban land is extremely valuable, and need to gain the greatest value. Therefore, urban stormwater management design is required to be functional, maintainable, and attractive in order to succeed. It is also key to involve the community and collaborate with other disciplines throughout conceptual to final design. The goal for stormwater management design is to bring the system integrated into the city's urban fabric, and create a greater potential to realize the civic value of a stormwater system.

S3-6

Upstream and downstream ecosystems of the Rajjaprabha Dam, Thailand: anthropogenic-driven changes in function and structure

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Streams are widely recognized as one of the most productive, biologically diverse and dynamic habitats, which are intimately linked to surrounding environment and play multi-roles in ecological processes. As stream ecosystems are so important economically and ecologically, better understanding of how they respond to multi-stress threats and their biogeochemical and ecological roles has become scientific challenges for sustainable management. In this study, eco-hydrology in the upstream and downstream of the Rajjaprabha Dam, a large multi-purpose dam located in tropical monsoon zone of southern Thailand with more than 20 years in operation, was intensively investigated during June 2007 - May 2008 at one-month intervals. The objectives are to compare similarities/differences in key aspects of eco-hydrological characteristics and to describe any possible anthropogenic-driven ecological changes. The results revealed that upstream ecosystem exhibited large seasonal variations in response to hydro-meteorological changes associated with the phase reversals of the southeast and northeast monsoons. The upstream site was characterized by relatively high inorganic nitrogen /phosphorus nutrients and dissolved oxygen with its saturation in range of 87-105%. These features are consistent with net metabolism ecosystem values being lower than 0 for all seasons, indicating heterotrophic condition which decomposition of allochthonous organic matter especially those from falling leafs is the predominant process. At the downstream site, however, there was a remarkable difference in flow regime due primarily to anthropogenically periodical regulation for purpose of power generation. Power spectrum analysis of daily outflow water data also showed no an annual peak, suggesting disappearance of natural rhythms of hydrological regimes at the downstream after the completion of the dam. The water at the downstream site was marked by extremely low dissolved oxygen but high ammonia concentration, resulting from discharge of anoxic deep water from the reservoir. Another change at downstream that is remarkable differences from the upstream can be seen in dominant species and diversity of periphyton and micro-invertebrates. On the basis of these results, there is evidence of changes in eco-hydrology that are primarily due to flow regime alternation caused by dam construction can have significant effects on the whole downstream ecosystem. Therefore, detailed assessment is needed for future work.

S4-1

Basic concept of applied ecological engineering and nature restoration projects of water's edge in Japan

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In 1997, "Introduction to Applied Ecological Engineering" was published in Japan. In this book, basic concept of applied ecological engineering in Japan such as "setting and testing hypothesis" or "learning from case studies" on civil engineering projects were described. At the same time, the Ecology and Civil Engineering Society was established in 1997 to develop a multidisciplinary approach to an ecologically sustainable future by concerned ecologists and civil engineers in Japan. In particular, the Society aims to promote scientific means by which to achieve 'coexistence of humanity and nature', 'conservation of biodiversity' and 'maintenance of healthy ecosystems'. Thus recent organizational adjustments have been made for the restoration and conservation of the natural environment encompassing not only riparian but also coastal, port, agricultural, forestry, urban area, park and other areas where people and nature interact.

During this period, changes have also occurred in social institutions in Japan. Following the revision of the River Law and the promulgation of the Environmental Impact Assessment Law in 1997, a new national strategy for biodiversity conservation was established (2002) and the Law for the Promotion of Nature Restoration was enacted (2003).

In the course of various responses to these changes our views and treatments of the natural environment have also changed. For example, the environmental assessment had been endangered species-centered in the past but the ecosystem as a whole became important in predictions and assessments. And the idea of 'adaptive management' has permeated through the practice of ecological engineering, projects aims to conserve the nature during construction has increased. However, since our knowledge of the consequences of various impacts on the natural environment is still insufficient and the methods of prediction still imperfect, we can say that the role of 'ecology and civil engineering' focusing on these issues and aiming at their practical application has now expanded enormously.

In this presentation, I will introduce basic concept of applied ecological engineering and some cases of restoration to avoid or reduce impacts focused on water's edge in urban area or other area for the future conservation of biodiversity.

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S4-2

Effects of trapped sediment release from dams on tree sprouts on downstream sandbars

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Dam construction has a significant impact on the downstream environment. Hydrological alterations such as the reduction in frequency and magnitude of floods and the increase in flow during droughts substantially change the downstream floodplain environment. Kurobe River is one of the steepest rivers (slope ~ 1/50) in Japan, transporting cobbles as large as 20-30 cm in diameter from the mountainous terrain to the river mouth. In the past 70 years, five dams have been constructed, one after another, from the upstream to the downstream of the river. In order to mitigate the impact of the sediment trapped by these dams, sediment gates were constructed in the two most downstream dams - Dashidaira Dam and Unazuki Dam - to release trapped sediment into the downstream. Since starting synchronous sediment release from Dashidaira Dam and Unazuki Dam, however, the formerly completely stony beds of the sediment bars and the river channel in the downstream have become covered with sand, and in the last several years they have become remarkably vegetated. The aim of this study was, therefore, to elucidate the mechanism of downstream tree sprouts resulting from sediment release.

Salix gilgiana and *Elaeagnus umbellata* were the dominant species on the sandbar. After the sand release in 2008, a thick layer composed of silt and fine sand accumulated up on the sediment surface. The thick layer composed of silt and sand was accumulated on the original sediment at the lower area, while patchy thin sand layers had formed on the coarse sediment surface at the higher area. A way of the breeding is different from *S. giliana* with *E. umbellata*, and *S. gilgiana* germinates from many seeds of the form of cotton, but *E. umbellata* germinates from little seeds of the fruit origin. When sediment released from dam, a lot of seeds of *S. gilgiana* were drifted ashore at the river side, but the *E. umbellata* inhabits the high area is hard to be flooded. Fine sediment accumulated at the river side when flood levels declined, thus a remarkable amount of sand accumulated in the flooded area. In contrast, relatively little sand accumulated at the high area is hard to be flooded. Thus, the high accumulation of sand in the sediment with much sprouts of *S. gilgiana* seems to indicate that the area was flooded when sand was released. A substantial amount of fine sediment, rich in moisture and organic matters, filled up in the gap of a stone and the stone next to each other. Because of blocked the sunlight by stones, the moisture in the sediment with much sprouts of *E. umbellata* is kept higher than in the sediment with much sprouts of *S. gilgiana*. After sediment release from dam, thus both sprouts are able to grow up, however, all both sprouts cannot grow up and calm down in the level that can inhabit by self-thinning.

S4-3

Control trial to invasive fish for biodiversity preservation in a dam reservoir - control using water level operation and effective use of captured fish

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Japan is an island country separated from the continent historically for a long time, so Japanese freshwater fish fauna has geographical features as inherent species. Some of invasive fish such as the largemouth bass (*Micropterus salmoides*) and the bluegill (*Lepomis macrochirus*) have highly adaptable ability in Japanese river and marsh. They can become dominated species as substitutive domestic species but destroy the balance of the Japanese freshwater ecosystem greatly.

As for the invasive species problem, it becomes a topic in Japan and some exterminating projects are done in many places including the Izu numa in recent years.

The authors invented a trap net extermination using water level lowering for biodiversity preservation in a dam reservoir and continue trials. From 2007 to 2009, the control trial tests using not only water level operation but also trap net were carried out at Miharu Dam which has been managed by Ministry of Land Infrastructure and Transport. Miharu Dam is a multipurpose dam introducing limited water level method, and the operation that decreases the reservoir level by 8 m has been done during the flood period from June to October every year.

In the breeding season from May to June, largemouth bass and bluegill flock to shallow area for spawning. The trap net is set up around the shallow area before drawdown for flood control. As water level decreasing, fish is driven into the net automatically. The significant feature in this net is to be able to capture fish while lived. The largemouth bass and the bluegill are exterminated as a rule and other fish is released again.

The exterminated invasive fish is used as a fertilizer and we are growing apple in cooperation with the local farmers. As a result, the number of the largemouth bass that had been captured by 71 individuals in 2007, decreased up to 26 individuals in 2008 and 17 individuals in 2009. On the other hand, domestic species such as *Carassius* sp., *Pseudorasbora parva* and *Hemibarbus barbus* increased by the extermination obviously.

S4-4

Development of simulation model for forestation

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In Japan, flow dynamics have an extensive between flood and usual, so river has many area over water unusual. This area is affected by stream at the case of flood, and be formed sandbars consisting of gravel in many cases. In recent years, sandbars consisting of gravel has been disappearing inside the river, and increases of vegetation on the sandbar in Japan. In Arakawa River such phenomenon has been observed from the later half of 1970's.

This vegetation on the sandbar was flushed by the flood caused by Typhoon 9 in September, 2007 and extended the gravel area, but soon be reproduction of vegetation about 1 year. It is not desirable to increase of vegetation for original environment of Arakawa River, and not good for the flood control because of an obstacle at the flood time. So it is doubtful for river management, and need to take exact measures, but we do not have an effective management of tree growth in river.

In this study, we developed the simulation model that could predict long-term tree growth and flushing of trees on the sandbar of Arakawa River. Developed model enable to predict quantity the growth of vegetation in usual, and flushing for flood flow and bed erosion at the flood. And we conducted simulation for a middle-term prediction about 10 years of forestation in sandbar.

S4-5

Ecological health monitoring and assessment of the lower Mekong River and its tributaries

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The lower Mekong River system supports many people whose livelihoods depend its products and services. Concern about its deteriorating water quality let to the establishment of long-term, intensive water chemistry monitoring. Recently, the MRC secretariat began bioassessment of the ecological health of the lower Mekong River system. The main objectives were: to test methods used elsewhere, to establish the Mekong's present status as a guide for future long-term monitoring, and to build up the capacity of the riparian countries to perform monitoring.

Several bioassessment methods were tested to select the most suitable techniques. Routine samplings were carried out from 2004 to 2007 at 51 sites, with 20 sampled more than once. The organisms examined were macro-invertebrates (littoral and main channel), benthic diatom, and zooplankton. A number of indicators were calculated and compared to referent sites.

The Ecological Health Monitoring program of the MRC secretariat has introduced a successful mentoring approach, consisting of a multinational team (Thai, Cambodian, Vietnamese, and Laos representatives) and an international mentoring team working side by side. Processes are in place that generate accurate results, led by a very capable multinational team.

Although not all the goals have been achieved, international mentoring has been proven to work, and has been well received. One of the drawbacks of this approach is that the length of the program dissuades financial supporters.

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S4-6

Succession of aquatic macrophytes and their restoration in a marsh of which basin has been urbanized rapidly

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Submerged macrophytes have significant role in controlling aquatic environment in shallow lakes and marshes. They can provide habitat for other species and control water quality by several ways including suppression on bottom sediments resuspension.

Inba marsh is located in Chiba, Japan and its basin has experienced rapid urbanization since 1960’s resulting in severe water quality degradation. Part of the marsh area was reclaimed to construct rice field. During this reclamation project, water management was changed dramatically and average water level was raised about twice as deep as previous situation (Kasai, 1993). Following these impacts, submerged macrophytes gradually disappeared and water in Inba marsh became turbid and high in organic matter and nutrients.

Although water quality of inflowing rivers has been improved due to water quality control investment such as the construction of sewage system since 1980’s, water quality in Inba marsh has not been improved compared to that of inflow water.

Shallow lakes are considered to have two stable phases. One is macrophyte-dominated clear phase and the other is phytoplankton-dominated turbid phase (Scheffer, 1998). Inba marsh is considered to be still in phytoplankton-dominated turbid phase. Therefore, besides measures to reduce nutrient and organic matter loading from its basin, several measures to try to restore the growth of submerged macrophytes have been started recently. These measures are briefly introduced and water quality changes due to the restoration are discussed by using numerical simulation. Results of numerical simulation suggested that if the area of submerged macrophyte cover can be restored to the magnitude of canopy-forming vegetation in 1988, water quality improvement can be achieved to satisfy environmental standard in Inba marsh.

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S4-7

Ecological functions of terrestrial-aquatic ecotones in the urban area

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There are several types of terrestrial and aquatic ecotones in the urban areas, such as lakeside and riverside ecotones, marsh lands, riparian floodplains and coastal shorelines. These ecotones perform many important functions to sustain a sound ecological system in the land-water interface. Lakeside ecotones are characterized with several types of flora zonations; terrestrial, emergent, floating-leaved to floating plants from terrestrial to aquatic gradient. Lowland river ecotones, on the other hand, have mostly emergent plant stands. These species zonations are formed due to the difference of ventilation ability and the tolerance of the species to physical disturbances. These species show higher morphological plasticity to adjust strong water flow. Common emergent species in the lakeside ecotones, *Phragmites australis*, *Typha angustifolia* and *Zizania latifolia*, colonize at different zones along the water depth gradient depending on their morpho-physiological characteristics. *Typha angustifolia* colonize at the deepest zone where strongest water flow prevails. It can adapt to such an environment due to its lower shoot density. The ramets of *Zizania latifolia*, in contrast, are highly aggregated with shoots and can withstand stronger flow. Both systems are as results of adaptation to reduce the drag of flows. *Phragmites australis* with relatively low tolerance to high flow grow mostly on the elevated area of the lake.

Terrestrial and aquatic ecotones accumulate nutrients particularly in the river. River water transports a large amount of nutrients including floating organic matters. Therefore, fine organic nutrients and silts accumulate inside riverine plant stands under low flow velocity and create fertile substrate for plant growth. The efficiency of floating matter deposition is related to the types and morphology of the aquatic plants. The deposition is high if they are submerged, while relatively low if they emerge. Some aquatic species seems to create the preferable habitat by this mechanism. *Sparganium erectum* has submerged and emergent growth stages in its life cycle and the shoots autogenously collapse in the emergent stage. The polymorphism of *Sparganium erectum* has rendered the species the ability to deposit fine silt and nutrients in its stand. Organic matters accumulation substantially increases at the post-collapse as well as submerged shoot stages. It seems the accumulation of fine sediments and nutrients contribute to create their favorable habitats and also ameliorate the water quality.

It is well known that terrestrial and aquatic ecotones are habitats for a variety of flora and fauna. As aquatic plant stands provide shelters for small animals against avian predators, plant stands become a corridor to access water. Complex plant structures in water are refuges for small animals from their predators, thus can contribute to increase biodiversity. At the same time, however, open water is required for some animals to detect their predators easily.

In spite of these functions of riparian flora, most of Japanese urban rivers had lost them. Large rivers have designed as compound channels, with an active channel along the center and the surrounding flood plains, intended for the dike protection and the usage for the playground. In case of small urban rivers, they are mostly single channelled and the side wall of the river is protected by the concrete panels. These civil engineering works have led to the disappearance of flora in the aquatic ecotones. The riparian floodplain is subject to frequent floods, thus is one of the most disturbed habitats. These areas are, therefore, often stony and become habitats for endangered pioneering flora and fauna or nesting area of birds. The colonization of herbaceous and woody plants is intensified these days due to the hydrological change and the modification of river channels. It is a tremendous threat for the pioneering native species in the riparian floodplain.

S4-8

Biodiversity of submerged macrophytes in Lake Teganuma area

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Submerged macrophytes play an important role in wetland ecosystems. A state of dense submerged macrophytes has high biodiversity in contrast to the eutrophicated, high phytoplankton state. For example, the dense colony of submerged macrophytes is considered as a refuge for zooplankton and small fish. However, the area of dense colony of submerged macrophytes has been diminished in all over the world for the several decades.

On the catchment area of Lake Teganuma, submerged macrophytes have been disappearing since 1960s. The reason is still unclear in spite of being suggested some factors (i.e. light, herbicide, and dissolved inorganic carbon [DIC]). In this study, we tested the hypothesis that free CO_2 can be the factor for the colonization of submerged macrophytes. The objective of the present study is, therefore, to determine the factors affecting the distribution of submerged macrophytes in a small canal, designed to lead water to a retention pond.

The length of the canal was approximately 80 m. The water surface was deepened to below the ground level 90 cm. This situation can well protect from the disturbance such as wind. The water characteristics were very different at the 22 m point of the canal. On the upstream side, water was very clear and dense macrophytes colony was observed. On the downstream side, it was assumed that water had with high phytoplankton with turbidity. At the upstream end of the canal, inflow water, which was mostly derived from groundwater, flows gently into the canal.

In the inflow water on the upstream side, submerged macrophytes, *Potamogeton crispus*, grew intensively (average 22.2 g DW m^{-2}); however, only a small amount of *P. crispus* was observed in the pond water (average 0.5 g DW m^{-2}). The free CO_2, nutrients in the sediment pore and overlying water, flow velocity, and photosynthetically active radiation (PAR) were measured. Light conditions and phosphorus concentrations in the sediment pore water appeared to be sufficient for the growth of submerged macrophytes. The level of physical disturbances was low (flow velocity ~0.044 cm s^{-1} at most). However, the inflow water had a low pH, which resulted in the free CO_2 being as high as 3.3 mg L^{-1}. Conversely, the pH in the pond water was high, with low CO_2 concentration of only 0.06 mg L^{-1}. It is likely that the production of *P. crispus* was suppressed by the low concentration of free CO_2 in the pond water, and that it was aided in the upstream region by the high CO_2 concentration, as well as the inhibition of phytoplankton blooming by the low TP concentration (~0.04 mg L^{-1}) in the inflow water. The low diffusion rate of substances appeared to sustain the conditions that resulted in a clear change in the distribution of submerged macrophytes.

The water source on the upstream side of the canal was groundwater which has usually high free CO_2 due to the high microbial respiration. Our study suggests that sufficient inflow of groundwater can consequently contribute to the high biodiversity through the restoration of submerged macrophytes.

S4-9

Phytoremediation of endocrine disrupting chemicals in urban river water

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In recent years, a small amount of endocrine disrupting chemicals (EDCs) were found in urban river water despite of EDCs elimination through sewage farm. Existing researches reveal that aquatic organism in the river ecosystem have a function of decomposition, accumulation and transformation of EDCs (Lai et al., 2002; Nakajima, 2007). Such a phytoremediation using aquatic organism is one of remarkable methods to remove such a very small quantity of EDCs. However, the characteristics of EDCs removal by aquatic organism are still not sufficiently understood.

In this study, the removal rate of EDCs such as 17β-estraziol (E2) and bisphenol A (BPA) by aquatic plant and periphyton is determined from laboratory experiments as a function of water temperature and weight of the aquatic organism. Field observations revealed that concentrations of BPA and E2 decrease with flowing down in Nikaryo canal, Tokyo, Japan, where the aquatic plant and periphyton grow thickly. The prediction model using the experimental result on the removal rate of EDCs can explain the observed decrease of EDCs concentration. These results suggest that the aquatic organism in urban river ecosystem has a self-purification capacity for EDCs.

S4-10

Characteristics of microhabitat on dry riverbed in gravel-bed rivers

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Dry riverbed provides several kinds of habitat for diverse creatures. In a gravel-bed river, dry riverbed is a part of alternate or double row bar and is covered with several sized material. Water course during normal flow discharge is created along the sharp edge of a bar and surrounds dry riverbed. The shape of gravel bars depends on following factors: amount of sediment supply from upstream, size distribution of supplied sediment, alignment of river channel, width/depth ratio, riverbed slope and shape of hydro-graph. Therefore, these factors are considered to be explaining factors of dry riverbed conditions.

In this study, more than 20 dry riverbeds in several rivers with same geological condition were investigated. The above explaining factors, however, are different among rivers. The relationship between their characteristic features and above factors was analyzed.

First of all, the characteristic features of typical dry riverbed were investigated in rivers where enough sediment is supplied from upstream and width/depth ratio is suitable for formation of alternate gravel bars. The shore side slope of dry riverbed corresponds to repose angle except upstream end of the dry riverbed. The shore slope at upstream end is quite mild. In this case the shore line corresponds to the edge of a gravel bar. On the dry riverbed which has not developed well, the shore side slope is milder and slightly changes from upstream to downstream. In steep rivers, however, the condition is quite different. Water course during normal flow condition is not along the edge of a gravel bar. The middle part of a dry riverbed is incised by water course. Hence, the shore side slope is quite steep even at the upstream end of a gravel bar. In this case, the edge of a gravel bar is found on a dry riverbed.

Secondly, the typical sorting pattern of riverbed material was investigated. In any case, riverbed roughness is large at upstream end of a dry riverbed because of the extraction of fine material during water level rise. Size of riverbed material is coarser at upstream and finer at downstream usually, but such a trend is not found in steep rivers.

Finally, the local deposition pattern of pebble and sand was investigated. Sometimes clear local deposition of fine material such as pebble and sand is found on a dry riverbed especially after small floods. On a steep edge dry-riverbed, upstream side of the dry-riverbed is completely covered by pebbles transported by small floods. On a gravel bar that has not developed well, streak of pebble is formed on a gravel bar. The pebble is transported and deposited along the main stream line of small flood. In a river where the sediment transport is affected by weirs or drop structures, pebble is found on the higher location of gravel bar, while the riverbed material under or just above the water level is composed of coarser material only.

As this study clarified, there are several kinds of gravel structure on a dry riverbed. And the gravel structure on a dry riverbed implies the characteristic features of the target basin. By observing the gravel structures on dry riverbed, we may be able to guess the river basin condition.

S4-11

Experimental study on transition of velocity profile through a tall tree community on a flood plain

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Vegetation community on flood plains has very important roles in terrestrial-aquatic ecotone in the urban area, not only from the ecological view point, but also from the view point of hydraulic engineering, human activities near the river, and so on. Vegetation community works as a flow resistance in a river flow, which needs some maintenance, such as mowing. For tall tree community, however, cutting of tall trees in wide area may not be realistic because of the remarkable change of the environment. The realistic maintenance of tall tree community may be mowing of the underbrush or trimming of the lower branch. Therefore, the effects of the tall tree community on the water flow must be investigated in detail.

In this study, a laboratory experiment was performed on water flow structure through tall tree community. The experimental channel is 50 cm wide and 7 m long. The model of the tall tree was composed of stem and crown. The stem part was formed with circular cylinders (1 cm diameter, 7 cm height) arranged at 10 cm intervals on the channel bed. The crown part was modelled with coarse-meshed material, which was set on the top of the stem part (Photo 1). The community model was settled over the whole width of the channel and the length of the community model was 4 m. The vertical profiles of time-average velocity and velocity fluctuation were measured at some locations from the front to the rear of the community model.

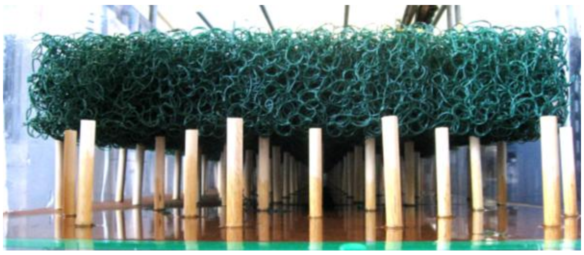

Photo1: Model of tall tree community

It is found that the difference of discharge and depth does not cause velocity difference in the crown, but it causes difference in the stem part. This is because of the difference of flow resistance (see Fig.1). In the upstream end of the vegetation, the velocity profile is immediately shifted from that in the front of the community to that of equilibrium state in the community, which generates remarkable downward flow. In the downstream end of the vegetation, a flow separation was observed behind the crown, which generates reverse flow along the water surface and increases velocity fluctuation remarkably. Therefore, it takes long distance to recover the original velocity profile without the tall tree community.

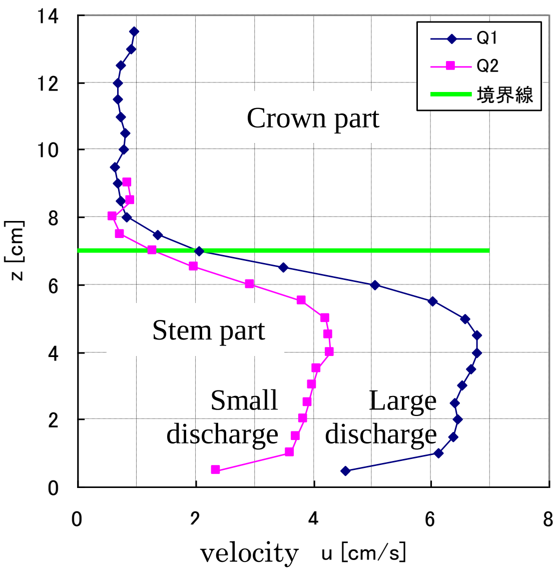

Fig.1: Water velocity profile in tall tree community

S4-12

Biodiversity index in river habitat considering flood return period and magnitude

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The vegetation in a river creates a valuable natural environment. However, forestation in the river sometimes becomes a problem because it reduces the river flow capacity toward the downstream. In addition, the excessive forestation by mono tree species sometimes affects the biodiversity in the river habitat. Then, the rehabilitation of the gravel river bed has been discussed recently. As to the prediction of forestation possibility in rivers, previous studies mainly discussed the wash out condition of trees. However, the degree of damage should be elucidated, because trees of which trunk are broken or bent down due to floods regenerate after the floods. In addition, the relationship between flood magnitude and biodiversity should be directly correlated. Therefore, it is necessary to evaluate the condition not only for washing out trees but also for breaking or bending tree trunks, and washout condition of perennial or annual grasses. The objectives of this study are 1) to clarify the indices for evaluating different breaking pattern of trees or grasses, wash out and trunk breakage or bending, and 2) to correlate the flood indices to the indices of river biodiversity.

The tree breaking and wash-out situation after two flood events were investigated with different location on gravel bars in the Arakawa River, Japan. Two dimensional unsteady depth-averaged flow model was applied to the Arakawa river for evaluating 2007 flood. Index for evaluating trunk breakage, Breakage or Overturning Index (BOI) (= d / d_{cri}), was defined, where d is the tree trunk diameter at the flood event, d_{cri} is the maximum tree diameter that the flood can break the trunk. For analyzing the washout condition of trees and perennial grasses or annual grasses, other indices WOI, where WOI is non-dimensionalized shear stress over non-dimensionalized critical shear stress of d_{84} (grain size for which 84% of the material weight is finer), or WOI_d, (WOI = 0.5 in this study), were defined.

The BOI and WOI expresses well the tree breaking or washout situation of trees and perennial grasses due to 2007 flood. Under changing the return period of floods from 3 to 40 years, BOI and WOI were evaluated at 3 locations with different relative height from ordinary water level. Trees which grew at lowest relative height among 3 locations could be washed out under more than 5 -10 years return period flood. In contrast, even if 40 years return period flood occurs, trees vegetated at highest relative height among 3 locations cannot be washed out (WOI does not exceed one), even though they can be broken (BOI exceeds one). They can easily regenerate at the habitat and sometimes accelerate the forestation. These results indicate that BOI and wash out index of trees (WOI) are useful for analyzing the possibility of the continuity of the forestation and discussing the necessity of the management.

The condition at which WOI_d is larger than one, and WOI is less than one, is correlated with the Shannon index calculated by the vegetation species map of three gravel-bed bars in the Arakawa River. However, even in that case, the trend is changed with the BOI. When BOI is larger than one, the index is positively correlated, but when the BOI is less than one, it is negative. The condition at which WOI_d is less than one has no relation with the Shannon index. The relationship between BOI and WOI or WOI_d has some possibilities to express the biodiversity at the habitat from flood’s physical characteristics of the gravel bar.

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S4-13

Ecological function of spring water, with particular focus on the growth of submerged macrophytes

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Spring water keeps year round stable temperature and high water quality. Its frequently low pH of water due to no consumption of CO_2 by plants maintains the high fraction of free CO_2 in the dissolved inorganic carbon, and thus enhances some particular submerged macrophytes, which prefer growing in spring water.

We observed the biomass distribution of the submerged macrophyte *Egeria densa* Planch. in the spring-fed stream, Kurohashi River flowing into Lake Biwa in Shiga Prefecture, Japan. Through this observation we would like to mention the ecological function of spring water on the growth of submerged macrophytes and the importance of spring water conservation.

Ecological function of spring water on the growth of submerged macrophytes - Extremely high biomass of *E. densa* was observed in the mid-stream reach, with relatively low pH (approximately 6.3 - 6.5), which was caused by the acidified spring water and high concentration of inorganic carbon. It was colonized from mid- to downstream, and its biomass was correlated with the concentration of free CO_2. It seems that free CO_2 was the limiting factor for the growth of *E. densa*, there. It is often reported that many submerged macrophytes have a proton pump system, which shifts the equilibrium balance of HCO_3^- and free CO_2 to leave free CO_2 dominant (Lara et al., 2002). Acidified spring water also supplies protons to increase the free CO_2 concentration. Thus, acidified spring water has an ecological function as a proton pump for submerged macrophytes.

Importance of spring water conservation - Submerged macrophytes are sometimes known as “ecosystem engineers” as they purify water by taking up nutrients up, and enhancing settlement of suspended sediments (Yarrow et al., 2009). The Kurohashi River is used as an irrigation canal, thus, is dredged and colonized submerged macrophytes are harvested and accumulated on the nearby field once a year, on the first Sunday of July. The trapped nutrients by the plant seem to be returned to the land and the amount flowing into Lake Biwa is curtailed.

Although spring water contributes to the intensive colonization of submerged macrophytes, which then maintains high quality of water, commonly to over Japan, in the observed area observed, too, spring water is recently declining drastically due to the development of the surrounding area. Spring water must be conserved to retain the high quality water environment.

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S4-14

Important role of suburban paddy fields for fish habitation

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Some freshwater fishes use temporary water areas like flood plains for spawning. In Japan, paddy fields and irrigation ditches correspond to these areas. However, land consolidation projects to increase productivity have been carried out in rural areas since the 1960s. Consequently, irrigation and drainage channels are separated and irrigation channels have changed from open to pipeline. There is a significant gap in water levels between paddy fields and drainage channels. After land consolidation projects, most fish cannot enter paddy fields and have lost their spawning areas. In contrast, urban and suburban areas have lost paddy fields to urbanization. However, unexpectedly, suburban paddy fields remain traditional structures and irrigation systems as dual-purpose channels, because of their locations suburban paddy fields were not targeted to promote agricultural productivity.

Fish immigration and migration between irrigation channels and paddy fields was investigated in the Fuchu Irrigation Channel, Tamagawa River System, Kunitachi City, Tokyo from 2003 to 2006. The Fuchu Irrigation Channel is a dual-purpose channel and the paddy fields in this area are small (10-20 acres). Seven of the 15-16 species of fish that commonly live in the Fuchu Irrigation Channel identified to enter paddy fields and *Misgurnus anguillicaudatus*, *Gnathopogon elongatus elongatus* and *Crassius* spp. spawned there. Fish movement was closely related to the water management of the paddy fields. Just after water intake, mature adult fish entered and spawned in the paddy fields, and at mid-summer drainage (about 50 days after transplanting) a large number of yearling fish moved from the paddy field to the irrigation channel. The number of yearling fish in only 6 acres of paddy field was 1,000-3,000 (Minagawa et al., 2006). *M. anguillicaudatus* is a typical fish that uses paddy fields during their life cycle and their numbers in irrigation channels is larger than in the main course of a river. Furthermore, the distribution of *M. anguillicaudatus* and *Carassius* spp. in irrigation channels is limited to areas near paddy fields where fish can enter (Nishida & Senga, 2004). Suburban paddy water areas are important zones for fish spawning and growth.

Because flood plains are located in the middle to lower reaches of a river, they overlap the major paddy field areas and urban areas. Until recent times, farmland in urban areas has been considered a menace to the supply of inexpensive land for housing and a disadvantage in the tax system of Japan. Only recently has the important functions of farmland such as a source of fresh agricultural products, open-space for disaster damage prevention, urban green space been recognized and there are increasing demands for preservation of farmlands. Farmlands, especially paddy fields in suburban areas are important for conservation of biodiversity and human amenity.

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S4-15

Irrigation canals as habitats of freshwater fishes in suburban areas: a case study of irrigation canals in the Tama area, Tokyo

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Over the past 10 years, we have researched the ecology of freshwater fishes and the characteristics of irrigation canals as habitats of these fishes in the suburban area of Tama, Tokyo. Our results showed that suitable habitats for local fish species persist in the form of irrigation canals and paddy fields in this area. Here, we present the conditions of irrigation canals and the ecological characteristics of freshwater fishes such as the mud loach (*Misgurnus anguillicaudatus*) in the Tama area.

In this area, paddy fields have been developed in earnest since the Edo period. Since this time, paddy fields have served as sources of food supply to Edo. However, because of urbanization, the number of paddy fields in the Tama area has reduced since World War II (Nishida & Senga, 2004). Consequently, the number of irrigation canals has markedly reduced.

Further, because paddy fields are no longer the predominant source of food, the irrigation canals supplying these fields have not been altered (e.g., by the addition of a concrete lining to the canals via land consolidation). Therefore, earth canals, perennial canals, and canals that enable the migration of fishes to and from paddy fields survive in the Tama area.

Our investigations of the irrigation canals in the Hino, Tama area, in summer, revealed that large numbers of juvenile and immature gold crucian carps (*Carassius auratus* subsp. 2, designated an endangered species by the Ministry of the Environment.), mud loaches, and field gudgeons (*Gnathopogon elongatus elongatus*) inhabit the sampling site near the paddy fields (Nishida & Senga, 2004). These fishes are known to migrate to and reproduce in paddy fields (e.g., Saito et al., 1988; Minagawa et al., 2006); thus, the sustained existence of these fishes in irrigation canals strongly depends on the presence of paddy fields.

We also examined seasonal changes in the density of fishes around paddy fields in Mukoujima canal. The population density of mud loaches was high in 2 sections of naturally formed riverbank: one where riparian plants are grown in summer and another where sand and silt are piled up in the winter. The population density of the field gudgeons was closely related with that of riparian plants, irrespective of the season. In summer, the population density of silver crucian carp (*Carassius auratus langsdorfi*) was well distributed in deep and slow-moving pools located upstream of a barrage. These fishes can inhabit canals in suburban areas because the paddy fields and the abovementioned environmental factors pertaining to canals persist in these areas.

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S4-16

Procedure for adaptive management at Sawada Spring Wetland, Ibaraki Prefecture, Japan

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Introduction - The Sawada spring wetland is located in the Tokai-Ajigaura sand dunes near Hitachinaka city in Ibaraki Prefecture. A wetland ecosystem, rare for its combination of sand dunes and spring water, has formed at the bottom of the valley of the Sawada River. The wetland originates from spring source points approximately 800 m inland, westward from the coast. The wetland extends into both the Hitachi Seaside National Government Park and Hitachinaka Port area, and is a valuable ecosystem inhabited by a great variety of aquatic life and wetland flora and fauna. However, because of the decline in the ground water level caused by port construction in recent years, the wetland has started to dry up and the ecosystem is degrading. As remedial measures, management guidelines were instituted in fiscal 2005. In this paper, we present a detailed step-by-step set of instructions as a practical implementation of adaptive management based on the guidelines.

Principles behind the management procedure - In designing this procedure, we noted that the Sawada spring wetland ecosystem has a distinctive biota because it is fed by cool spring water even in summer. The damselfly *Coenagrion terue* can be cited as a representative organism. This management procedure takes the damselfly as a representative biological indicator of the wetland and is focused on preserving a viable wetland ecosystem for its survival, while recognizing that from a biodiversity perspective due consideration must also be given to other aquatic life. To make the procedure easy to follow, specific aspects that could not be verified in theory were tested in the field, and the instructions were amply illustrated with photos, diagrams, and other graphics.

Monitoring as the basis of the adaptive management procedure - The main areas of management are as follows: 1) Habitat management to preserve the damselfly population; 2) Mowing and other forms of vegetation management to maintain the wetland (land-based) ecosystem. However, because the hydrologic environment of the Sawada spring wetland changes constantly, the state of the lakes and vegetation fluctuates irregularly with the hydrological changes. Simply continuing routine management practices would be insufficient to address the environmental risks. We therefore decided that, as well as field surveys and monitoring of characteristics such as the underground hydrology, damselfly populations, and wetland (land-based) vegetation, which are performed in conjunction with management tasks, we would also annually review the management procedures themselves based on their outcomes, and prepare an annual management action plan (management schedule and planning charts). In addition, as a risk management measure, we prepared a flowchart for selecting the necessary strategies and areas of management based on monitoring results in the following cases: 1) If the ground water level declines, consider emergency strategies before documented management procedures; 2) If monitoring shows that damselfly population levels are not being sustained, take measures such as temporary monitoring to select alternative lakes to manage. We also put together records and other documentation that would enable information sharing by organizations responsible for monitoring and management. This management procedure makes it possible for those responsible for wetland management to implement measures appropriate to the circumstances, by reading monitoring results and choosing what needs to be done. The problems of loss of expertise due to staff transfers, and the resultant management gaps, are also resolved through this adaptive management procedure.

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S4-17

Biotope restoration for enhancing biodiversity-a case in Arakawa River

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Biotope projects along Arakawa River - Along Arakawa River there are many biotope projects implemented to develop an ecological network. And it can be said that those projects along Arakawa River are more advanced amongst other projects carried out nationwide. Here is a brief overview of progressing biotope projects, which are important for developing the ecological network within Saitama Prefecture, along Arakawa River, an environmental axis for connecting the land to the sea.

Kitamoto Nature Observation Park, area of 33 ha, was established as an urban park in July 1992 by Saitama Prefecture. This is the result of the active approach to the government of Saitama Prefecture made by Ecosystem Conservation Society-Saitama (Eco-Saitama) and other citizens' groups. Since its establishment, the Park has been developed with the aim of securing an environment where the tertiary consumers of an ecosystem can breed, while preserving copses and wetlands. Grey-faced Buzzard (*Butastur indicus*) and Japanese Red Fox (*Vulpes vulpes japonica*) were set as the target species.

However, it was found that the conservation area was not large enough for the purpose of restoring the target species, because those species need an extensive home-range. Therefore, Eco-Saitama worked on Arakawa-Joryu River Management Office of the National Ministry of Land Use, Infrastructure and Transportation, to create a biotope including a natural pond and a watercourse in the area adjacent to Kitamoto Nature Observation Park, where wheat fields and meadowland were located on the water side land of Arakawa River dike. As a result, one of the largest biotopes in Japan, Arakawa Biotope, approximately 30 ha, was established in 1994. Together with the Kitamoto Nature Observation Park, the total area with rich biodiversity covers 60 ha. The breeding behaviour of Japanese Red Fox has been observed since 2001.

Arakawa Biotope became a catalyst for progressing the Arakawa River Ecological Network Plan. After the completion of Arakawa Biotope, Arakawa-Joryu River Management Office consecutively developed Mitsumata-numa Biotope, Oppe-gawa Biotope, and others. Currently, a nature restoration project at Taroemon Nature Restoration Project Area with the area of 400 ha has been progressing.

Biotope restoration projects in the future - Biotope projects have been implemented throughout Japan. But amongst them, Arakawa Biotope, created as part of the efforts to realize Arakawa River Ecological Network Plan, puts emphasis on networking biotopes. For this reason, it can be said that Arakawa Biotope is a pioneering example. Also, it is noteworthy that it was successful to make an extensive conservation area by laying two biotopes, Arakawa Biotope and Kitamoto Nature Observation Park managed by different governmental agencies, side by side. Through the effort a large area of wildlife habitats have been secured. In order to protect a healthy and robust ecosystem it is necessary that an extensive biotope area is preserved permanently not only for species having an extensive home-range such as Japanese Red Fox, that stays at the top of an ecosystem, but also for other species belonging to the same ecosystem.

Today we are facing the threat of biodiversity loss. The importance of biotope projects has been increasingly recognized. For implementing a biotope project, it is important to consider creating biotope networks along the river and also extending the networks towards inland from the river, so that nature conservation and restoration can be done more effectively.

S4-18

Social roles of the citizens in participatory monitoring for aquatic ecotone in the urban river

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Environmental monitoring has become more important than before for the last several years. In the urban area, however, monitoring is not much conducted compared with the countryside, particularly in reserved areas, likely because the biodiversity as well as the number of endangered species are much less in the urban area than the outside. The information is, therefore, substantially limited. Environmental monitoring is defined as the evaluation of quality and quantity, and functions of ecosystem.

The monitoring investigation is different from the inventory investigation that is aim to make the list of wildlife where is lives (Thompson et al., 1998). At the same time, civic participation will become an important keyword in future in the management of rivers. Under such circumstances, it is important that citizens understand characteristics of the river ecosystem, and participating in the management of river environment, based on the sufficient knowledge.

The important question is, then, "what kind of method is possible for citizens to understand the river ecosystem?" We believe that the periodical group observations of nature by citizen are the best way to promote the knowledge of citizens and also to obtain data for the management.

As an example, we will introduce the activity of 'Kitaku Kodomo-no-mizube (water front education project of Kita-ward Tokyo)'. Water front education project is supported by the Japanese Ministry of Lands, Infrastructure, Transportation and Tourism, to cultivate children mentally and physically, using the right hand side of the floodplain of Arakawa River, at 21.5 km from the river mouth. The area has a total area of about 2.4 ha and has two ponds, connected to the main river. Its maintenance is carried out by collaborative works of the committee, composed of neighboring volunteers, elementary schools, researchers, and river managers of the Kita Ward. The place is a part of an estuary, frequently sedimentated with fine grains and sand, is accumulated with drifting garbage. The committee member works to keep landscape, organisms and water quantity, etc., once a month continuously since 2005. In the monitoring of freshwater fish, we collect all fish in the ponds with cast net and brail net, identify and measure total length. It was found that swimming fish was more abundant just after the ponds were improved. Benthic fish, such as *Mugilogobius abei* Jordan et Snyder etc., was also recorded. Immature *Mugil cephalus* Linnaeus and *Acanthogobius flavimanus* Temmink et Schlegel colonize in the ponds in early spring, and grow until November, then disappear in December.

In conclusion, it is found that even simple citizen's monitoring is able to obtain the sufficient data for fish. Cooperative monitoring with citizen's community is particularly recommended.

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S5-1

Application of medical research theory to elucidate the role of green environment in health promotion and the usefulness of suburban forests for human health

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1) Application of medical research theory - In Japan, staying and/or walking in forests (shinrin-yoku) is believed to contribute to improvement in human health. Studies based on scientific evidence related to the effects of visits to forested areas are accumulating. In the medical arena, study designs of certification assessing effects on human health are being established. We apply this methodology to evaluate the effects of shinrin-yoku. The study designs have been categorized into approximately five types, with the highest-quality study design represented by a randomized controlled trial and the lowest-quality by an opinion-based report-i.e. one not based on scientific data. The efficacy of these studies will be evaluated in a fair. Studies with human participation should be approved by the Institutional Review Board based on the Declaration of Helsinki. The limitation and potential conflicts of interest of each study will be clearly indicated.

2) Usefulness of suburban forests and forests in and/or near urban areas for human health - Intervention study: Participants ($n = 19$; mean age ± SD, 42.2 ± 13.0) with high psychological stress levels were required to visit Toyota's Forest located in Toyota City near the megacity of Nagoya, on weekends during a two-month period. Scores on the 28 items of the General Health Questionnaire (GHQ) and the Self-rating Depression Scale were rated before and after the two-month period and found to have improved significantly. This suggests that a series of visits to forested areas contributes to a reduction in daily psychological stress levels. Cross-sectional studies: Frequency of forest walking was inversely associated with high stress defined as 4 >= scores on the 12 items of the GHQ and poor self-rated health both in the Nagoya and Shizuoka areas. The studies were cross-sectional, precluding a causal relationship from being drawn, but they suggest that frequent forest walking contributes to improvement in human health. Frequency of forest walking in Nagoya, a megacity, is significantly lower than that in Shizuoka area, as the percentage of forested area is 64% in Shizuoka Prefecture (Forest Agency, 2007) but only 3.7% in Nagoya (Aichi Prefecture, 2007).

Conclusions - To promote frequent forest walking for improvement in human health, the existence of urban forests or forests near urban areas is essential. An increase in forests in and/or near urban areas will therefore be required.

Acknowledgment - The intervention study was supported by the Toyota Motor Corporation. The cross-sectional studies were supported by a Grant-in-Aid for Scientific Research on Special Priority Areas of Cancer from the Ministry of Education, Culture, Sports and Technology, Japan.

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S5-2

The relationship of hospital outdoor spaces and children's behaviour

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A variety of ecological services for people in urban cities include providing the healing effects of nature for human activities. It is especially desirable to provide these services for medical facilities in urban cities where healing effects are required (Herrington, 1988; Ishii, 2008). Many people with various diseases visit the medical facilities, and their easy access to the ecological services is crucial for their enjoyment of them. However, there have been no established methods to access these services. Therefore, techniques for planting greenery, including a variety of plant species, and space design have been studied.

In this study, we examined green space in an urban area medical facility, focusing on children's activities and the variety of plant life, in order to accumulate basic findings for creating better green spaces.

The area studied was a green space located in a hospital in Osaka Prefecture, Japan. The green space was more than 200 square meters in area, located on a north-facing slope. Activities of each hospitalized child in the green space were observed, and the places where the activities occurred were recorded. The kinds of plants placed in the green space were identified. In statistical analysis, the relationship between the frequency of children's activity per space and greenery planted there was assessed.

The subjects for this study were eight hospitalized children. The space that all of the children used most was a planted area next to a rest shed, at a frequency of 250 times. The green areas where activities occurred most were flat, and had plants in planters, wooden boxes and the earth, and were used as resting spaces, with an average usage frequency per place of 26.2, followed by places on the slope at the back of the studied area, with an average usage frequency per place of 15.3. Specifically, both the flat and the slop places were dominantly used for growing vegetables. The places without greenery where the most activities occurred were at the entrance space and in the building.

These results indicated that it is more important to provide people with spaces where they can cultivate and grow plants compared with those where plants have been well managed. In other words, the existence of spaces suitable for cultivating and growing plants is crucial. The results also found that excessively planted spaces might limit the access for children's activities.

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S5-3

A new utilization of urban green spaces for managing spiritual health of people

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Contemporary society and human health - Lifestyle of contemporary society tends to be associated with psychological stress, not enough exercise and obesity. The lifestyle causes various diseases, known as lifestyle-related diseases, which has been a significant cause of death in developed countries. Integrated medicine that selectively incorporates elements of complementary and alternative medicine such as forest therapy, horticultural therapy and yoga draws increasing attention against the backdrop of limitation of contemporary western medicine and increasing cost of medical care.

Spiritual dimension of human health - Spirituality is considered as one of the most important elements in human health. Spirituality is related to revealing sense of who we are, why we are here and what our purpose for living are. It is the innermost part of us that allows us to gain strength and hope. The basis of spirituality is discovering a sense of meaningfulness in our life and coming to know that we have a purpose to fulfill (Thompson Rivers University, 2009).

A new-type integrated medicine in urban green spaces - We have proposed a new-type integrated medicine that thinks a great deal of space for healing and dimension of spirituality. Contacting with nature is essential in this concept because it provides opportunity to reflect ourselves in nature and to cultivate sense of unity with nature, which eventually leads to elevating our spirituality.

We studied effectiveness of the proposed concept in the Japan World Exposition ’70 Commemorative Park (Suita, Osaka Pref., Japan), which is accessible from nearby urban areas. The interventions consisted of forest therapy, horticultural therapy, yoga meditation, supportive group therapy for cancer patients as well as aromatherapy and herb therapy, once a week, for 12 consecutive weeks.

In the study involved 7 healthy elderly (Imanishi et al., 2009), we confirmed reduction of stress (serum cortisol) and improvement of negative feelings (POMS) by the intervention. In the study involved 22 cancer patients (unpublished), we revealed improvements in functional wellbeing and spiritual wellbeing (FACIT−Sp), reduction in cancer-associated fatigue (CFS) and improvement in quality of life (SF−36). Furthermore, the circadian rhythm was improved and immune function of NK cell activity increased.

Contacting with nature seems important for promoting our spiritual health. We should consider design of nearby natural environment from the viewpoint of human health as well.

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S5-4

The role of greenery in urban environments in relieving stress

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We are in constant interaction with our environment; we reside and work within it and lead lives in which we relax and travel within it. In order to live peacefully in this environment and strive to enjoy active lifestyles, we must reduce the various stressors that are inherent in urban spaces, build a vital and pleasurable environment that is based on the region's climate, while arranging the space so as to encourage the constructive activity of everyone, including the disabled and elderly.

The provision of green spaces plays an important role as a first step in reducing the effects on the human body that result from the materials, forms and other aspects of urban spaces; in other words, physical, chemical and biological stressors (Table1). It is necessary to continue to actively develop greening techniques on rooftop and wall, green roads and green railways, and to greatly expand the reach of such projects. Moreover, the green spaces that are built will function as green corridors, which provide a vital contribution to the protection of biodiversity.

The improvement of the perceived environment that this greening brings about is important as a second step. There are limits to the extent to which feelings of comfort and elegance can be provided in a monotonous urban environment using artificial means alone. In addition to covering the artificial materials of the urban space (thus alleviating the feelings of tension that they generate) and serving as a buffer material, real greenery will change with the seasons according to the regional climate and will attract birds, insects and other wildlife, providing peace of mind and the notion of a living environment.

As a third step, spaces in which humans can comfortably walk and exercise will be created. The creation of spaces that naturally promote exercise (such as plazas and paths lined with trees providing leafy shade, approaches where flowers bloom and grassy fields where one would naturally want to play sports) are important means of alleviating the various types of stressors that accompany the lack of exercise from which urban residents suffer.

Above, I have discussed ways in which greening can alleviate the causes of stress that are inherent in urban environments. Revegetation technology (landscape architecture) is a cornerstone of health studies and has also become an applicable field of research in recent years. If the urban environment is reconsidered from the perspective of preventive medicine, the development of a healthier urban environment with the effective use of green space can be considered an important reform of the current urban infrastructure.

Table 1: Types and Descriptions of Stressors

Type	Description
Physical Stressors	Changes in temperature and atmospheric pressure, noise, injuries, etc. (Worsening of hot environments, ultraviolet radiation, reflection)
Chemical Stressors	Substances such as alcohol, drugs, and suspended particulate matter (Air pollution, aerosols)
Biological Stressors	Bacterial and viral infections, allergies due to house dust and pollen, etc. (Infections, injuries and allergies caused by new distributions of organisms)
Emotional Stressors	Factors that cause anxiety, nervousness and other changes in mood. (The population density of spaces, landscapes that are cut off from nature (that offer no sense of the seasons), unstable landscapes)

S5-5

The physiological and psychological effects of various green spaces exterior to a building for urban redevelopment

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Relation between human health and green as ecosystem service - The greening space in the city is paid to attention as a base in an “ecological network”. When thinking from an ecological network, the greening space of the city is chiefly thought as bird and insect's living places. They gather in the greening space of the city, because there is a rested place, food and comfortable space. Human being who is the member of the ecosystem is the same. The people gather there if the greening space in the city is comfortable space psychologically and physiological. It is important that the future city planning take this conception. Urban green space increases by this concept's extending, and people can live comfortable and healthily. However, to make this concept known, the greening space of the city should examine the effect given to the person. It is a necessity of the “evidence”. Therefore, in this presentation, it reports on the result of investigating the effect given to person's physiology psychology in the greening space of the city.

The physiological and psychological effects of various green spaces exterior to a building for urban redevelopment - This study investigates the stress-relieving effects of various types of green space in the exterior of a building in an urban redevelopment project to maintain the comfort and human health of urban dwellers. Using data on physiological indicators such as saliva amylase concentrations, blood pressure and heart rate, as well as psychological indicators such as the Profile of Mood States (POMS) and the Semantic Differential (SD) method, green space in an outdoor semi-enclosed space, an outdoor open space, and a forest-like space, each featuring various properties of vegetative cover and spatial design, are compared with an artificial space with very little greenery. Analysis of saliva amylase concentrations revealed that those exhibiting a “stressful” concentration level in the artificial space had a “slightly stressful” concentration level when in the outdoor semi-enclosed space or the forest-like space. POMS data revealed that the forest-like space reduced tension and increased vigor. Consequently, the findings suggest that green space in rest areas can help to reduce stress levels in stress-inducing office space. Moreover, it is suggested that the forest-like space can be used for "Rest" because of the psychological calm and comfort it induces, the outdoor open space can be used for "Diversion of mind" because of the sense of refreshment and vigor it provides, and the outdoor semi-enclosed space can be used for both of these purposes.

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S6-1

"Landscape Design with Nature" - towards the development of urban biodiversity

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Landscape architects are expected to contribute to the development of urban biodiversity. Two different challenges may be encountered in the development of urban biodiversity— landscape design as a basic problem-solving approach and grand design to meet much broader goals. These are very different in terms of developing biodiversity, so landscape architects have to deal with many issues concerning the landscape and need to prepare new ways of thinking about landscape design. In order to avoid creating an artificial garden without any relationship to the ecological characteristics of an area, we should recognize the ecological characteristics of the area and design the landscape accordingly, integrating our design into the overall structure of the ecosystem. In this session, I would like to discuss the concept of landscape design "with nature." "Design with Nature," the well-known book written by Ian McHarg, introduced the idea of landscape planning using the overlay method. Today we will consider carefully what it means to do "with nature," rather than "of nature" or "by nature." To clarify this concept of landscape design with nature, I shall now discuss several examples, based on my experiences as a landscape architect.

(1) Using a multi-scale view for landscape design: To design a landscape, we must recognize the environmental structure beneath the landscape. This structure usually appears different at different scales; therefore, we need to realize that the biodiversity that we take into account is related to the particular area that we see and that it will change as we vary our range between larger and smaller areas. Thus we need to examine the landscape with a multi-scale view. We should grasp the hierarchical structure of the area's natural and cultural environment and integrate our design into that structure.

(2) Frozen period before starting design: Landscape design does not end with the completion of construction. Works of landscape design are influenced by various natural and artificial events, and we manage the changes to slow them down or even to stop them altogether. Thus landscape architects need to be conscious of the timescale of the effects of these events on our works. It is important not to be in a hurry to design while a given site is rapidly changing. By observing "frozen" sites that have been isolated from human influence for several years, we determine the natural structure characteristics of the site and traces of human impact more clearly; this helps us make better decisions about integrating the design into the site.

(3) Accountability for public landscape design: When designing a landscape, a landscape architect assembles a great deal of information in order to solve various problems and make decisions, but not all of this information will be used in the design. Nonetheless, not only the information that has been used in the design but also the unused parts may be useful in managing urban biodiversity. This unused information may offer basic knowledge about the previously existing urban biodiversity and about the reasons for the current landscape design, and also help in future designs. Thus the data should be gathered, arranged, edited, and opened to public as much as possible. The challenge of information handling also gives landscape architects a chance to show how they can clearly represent this information visually and graphically.

S6-2

Intervention and natural dynamics - the nature-park Südgelände Berlin

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Originally a freight rail yard, followed by a stretch of more than four decades of almost untouched wilderness, today the site is a conservation area and nature-park in which urban industrial nature is both protected and accessible to the public.

The concept for the nature-park had to address two challenges from its inception: how to open the site to the public without endangering the rich flora and fauna present while concurrently dealing with natural vegetation dynamics which would have eventually led to a complete reforestation of the site in a short period of time.

A concept of limited intervention transformed the already existing tracks into paths. These were augmented by the addition of a metal walkway construction traversing the four hectares of nature conservation area. It provides the general public access to the site without any direct impact on the vegetation.

In order to preserve the immense diversity of flora and fauna a typology of space was defined. The different succession stages characterising the transformation from rail yard to wilderness were to be kept and continued by using various maintenance interventions. In the case of the wild woods its succession was left unfettered whereas periodical interventions were undertaken in the meadows.

The remnants of the former train use are still visible. These include tracks running through the open meadows, signals and water cranes under the tree canopies and there is even an old turntable which has been restored.

S6-3

Urban development considering the surrounding environment

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Introduction - After the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, the public interest to biodiversity, global environmental, and the threatened species were raised. In this situation, the land readjustment project (19.7 ha) that I took part in at Inukura area in Kawasaki was implemented. In the project, the park named Miyamae utsukushinomori (beautiful forest) park was planned in collaboration with the local citizens' groups.

Park planning considering the nature with the local citizens' groups -

(1) Miyamae utsukushinomori (beautiful forest) park - The land readjustment project at Inukura which is located in the upper portion of the Yagamigawa River (reservoirs along the Tsurumigawa River) was completed after 6 years, in March 2006. This project was implemented by Tokyu Corporation accepting the commission from Inukura land readjustment association. This area was assigned to the model area of Biodiversity maintenance model regional plan. In response, Inukura land readjustment association developed the park in collaboration with Kawasaki city government, the NPO Tsurumigawa River network (TR net) and academic experts. After the completion in 2006, the park has been named Miyamae utsukushinomori (beautiful forest) park.

(2) Citizens' power to developing the park and growing valuable flora and fauna - By cooperation with the people living along the Yagamigawa River, the theme of the park was decided as "Eco-park that ties Yagamigawa River and the people living along the river". The development policy of the park was also decided as "Conservation of valuable flora and fauna (protection of the head of a river and maintenance of the marsh)" and we aimed at recovering the biotope and the firefly, and maintaining the coppice. The valuable animal like firefly were collected and bred until the complete of the park. It became possible to keep 637 tall trees and 326 bushes by leaving 7,000 m^2 without change (The whole area of the park is about 11,000 m^2). Valuable plants were collected and taken to home by foster parents such as TR net, local people, school officials, and Inukura land readjustment association to keep and grow up until the complete of the park. Moreover, *Prunus sargentii* (H=15.0 m) and nettle tree (H=17.0 m) were transplanted in the park as a symbol tree in April 2002.

(3) Participation of TR net in the management of the park - The park is managed in cooperation with TR net. Tokyu Corporation also collaborates to manage the park.

In the end - In the city planning, it is important to avoid an influence on biodiversity. This view is applied to the rooftop gardening plan of the redevelopment project which is now under contemplation (Setagaya, Tokyo).

S6-4

Health and landscape design

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Biological diversity and health - We can feel relief just to see a beautiful greenery scene. That is a brute react due to the necessity of plants for our lives. But, for the same scene, we react in the different way. Because we grew up in different places and in different experiences.

So, to make good landscape like we can feel comfortable, the best way is to make the familiar scenery for each place with appropriate plants. Especially for senior or sick people who cannot go far away and easily get down, greenery around them is really important. It is said that monotonous space make them disappointed and bring forward senile.

On the other hand, the senior, living in rural area like agriculture or fishing village, are energetic, because they live in their hometown where they are familiar with. The scene and communication in their hometown cheer up their motivation to live.

From this aspect, it is natural for landscape gardening to use native species and old naturalized species which have rooted through the ages. As people notice the effect of the endemic plants and such scenery spreads, endemic animals gather and grow proliferously. As a result, biological diversity will be kept.

Asahi-En (a senior care home) - In aging society, many senior people live in senior care homes or hospitals for the rest of their lives. In such facilities, existence of the greenery that is changing every second and stimulate their sensitivity is really important for mental health of residents and patients. So besides nursing care, it is necessary to make such spaces which give change to their everyday life, improve resident's affection and give chance to get well again.

However most of the service of such facilities is tend to be physical care such as inside buildings or care equipments. They do not care about psychic effect that people can receive from the scene from their rooms or greenery of the sites.

Who have charge of the role making such space is landscape architect. Especially, for houses where seniors and patients live, senior care homes or hospitals, we have to design in terms of psychic effect. Through the design of the landscape of Asahi-En, we hoped that residents could get inspiration and remind their memory in the familiar hometown scene changing day by day through seasons. And then they could improve and keep joy of life.

One word describing the purpose of landscape is "The home for the rest of our lives is the scene of our hometown". We defined following three concepts for space of Asahi-En: 1) a space where we can feel rich and varied seasons; 2) a space where we can enjoy familiar life; 3) a space where our five senses are inspired. And we defined for the scenery as hometown scenery where residents have spent their brightening days.

S6-5

Landscape design and children's participation in a Japanese primary school - planning process of school biotope for 7 years

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Introduction - There has been a rapid decrease in the amount of open or natural space in Japan in recent years, in particular in urban areas due to the development of housing. Preserving these areas as wildlife habitats and spaces where children can play is a very important issue nowadays. This project to design a garden in the grounds of a primary school in Fukuoka City in the south of Japan started in 2002. This project started by creating a school garden for children to play in help restore nature to a small part of Fukuoka City in the south of Japan. The aim of this project is to create an area for children's play and ecological education that can simultaneously form part of an ecological network in an urban area. Additionally, we would like to discuss how to plan and manage the existing open spaces from a landscape planner's point of view focusing on the methods used to plan it; the planning process as a whole and how the schoolchildren participated in this process.

Methods for the planning and design - *Process Planning* (Isozaki, 1970) was used to plan the school garden given the length of time the process was expected to take. Although we knew in which direction we wanted the project to proceed, it was difficult to predict what kind of flora and fauna would be established there in the future so we needed to choose a flexible planning method for this project. *MFLP, Multi-Functional Landscape Planning* (Ito et al., 2010) was used to plan the school garden for space scale planning. In other words, this is a method to think about how to manage the space for various ways. According to this method, the space is divided into a number of layers (layers of vegetation, water, playground and ecological learning), which overlap each other.

Results and discussion - The aim of this project is to create an area for children's play and ecological education that can simultaneously form part of an ecological network in an urban area. As a result of this project, 52 kinds of plants have started to grow in the garden and several kinds of birds and insects regularly visit it. In addition, research has shown that there are over 180 different ways in which the children play in the garden. Furthermore, they have learned about the existence of various eco-systems through playing there and their participation in 80 workshops related to the garden. They have also actively participated in the development of an accessible environment and have proposed their own ideas for the management of it.

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S7-1

Evaluation of biodiversity and ecosystem services on cities

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People have diverse and contradictory ideas about urban nature. They are resigned saying, “Contact with nature in urban life is crying for the moon. If nature is left in the suburbs, that’s fine.” But many people grow plants in their room and balcony. We cannot also laugh off people who actually say, “I want contact with green in my daily life but I don’t want bugs, fallen leaves, and weed.”

What should we evaluate of nature? And for what?

The answers are:

1) To identify the current situation and potential of urban nature (Urban Nature Index). It is often said that urban nature is in crisis. But this way of thinking easily bring about a feeling of resignation. It is necessary to show that more number of lives than people usually think is existent in cities and that cities are capable to recover healthy nature only if the important points are rightly understood.

2) To identify the native role that urban nature has (Urban Ecosystem Service Index). Nature is not entirely favourable for people. There is part of nature which seems unfavourable and useless on the surface but it plays an important role. People know as general theory that they should accept the whole thing. This point of view, however, has not been fully identified. It is needed to show the benefit of nature that is close to people and give them the clues to rethink about how to deal with the nature.

3) To identify the environment load caused by urban activity (Environment Load Index). It comprises both direct load on a city and adjacent ecosystem, and indirect load on ecosystem outside the city caused by biological resource consumption outside the city.

4) To identify the progress of tackles and success (Citizens’ Action Index). It is necessary to specifically show what to do and who should do it in order for citizens to avoid giving up. And sharing the fruitful outcome among the whole citizens is needed.

I would like to present how to develop an index which is suited to the four objectives mentioned above and monitoring and reviewing system.

S7-2

A mitigation case of costal dune wetland for conservation of biodiversity, at Sawada spring wetland, Ibaraki Prefecture, Japan

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Introduction - The Sawada spring wetland is located in the Tokai-Ajigaura sand dunes near Hitachinaka city in Ibaraki Prefecture. A rare wetland ecosystem consisting of sand dunes and spring water has formed at the bottom of a valley in the folded hills bisected by the Sawada River. The wetland originates from spring source points approximately 800 m inland, westward from the coast. Endangered plants and insects, such as the freshwater loach *Lefua echigonia*, the damselfly *Coenagrion terue*, and the aquatic plants *Iris laevigata* and *Sparganium erectum*, live and breed here. The area was formerly the U.S. Army's Mito Bomb and Gunnery Range. Following its return to Japanese ownership in 1973, the Sawada spring area was divided between Hitachi Seaside National Government Park and the Hitachinaka Port area of Ibaraki Port, and its boundary was set at a point 150 m downstream from the river source. In particular, because the port area at the lower reaches was zoned as commercial land in the Hitachinaka development plans, a variety of studies and surveys on the wetland's disappearing biodiversity have been carried out since 1993.

Instigation of a mitigation plan for conserving biodiversity and subsequent initiatives - In 1998, Hioki et al. drew up a mitigation plan that called for the creation of a new inland valley in the park land, modelled on the Sawada spring wetland. To assess the current situation, the mitigation plan used an environmental units model consisting of four elements: topography, soil, ground water level, and vegetation. Similar environmental units were then reconfigured to construct a biodiversity conservation scheme.

Detailed surveys of the natural environment needed for the mitigation work were subsequently carried out with the assistance of Hitachi Seaside National Government Park and Hitachinaka Port. The surveys were of many different kinds: They ranged from gathering basic data on ground water levels, spring water volumes, and other factors that support a wetland ecosystem, through to habitat and ecology surveys of organisms indicative of a complex wetland ecosystem. In particular, the damselfly *Coenagrion terue* was chosen as an organism indicative of the distinctive ecosystem of Sawada spring wetland, which is formed by large inflows of cool spring water even in summer. Population studies and surveys of the water temperature and vegetation in the ponds where the damselfly has its breeding grounds were undertaken. As a result of this work, in 2006 the management of Hitachi Seaside National Government Park drew up guidelines for managing the wetland. These were followed in 2010 by a draft manual of management methods to put the guidelines into practice. In addition, Hitachinaka Port management took steps to reduce the impact of a new phase of port construction on the Sawada spring wetland.

The future of Sawada spring wetland - With the revision of the 2010 port zoning plan, the Sawada spring wetland has changed to a designated a green area from its former designation as commercial land. This means that the wetland is now protected across both the park land and port district. In the future, we plan to conduct further studies with a view to restoring the lower reaches of the Sawada spring wetland which have started to dry up.

S7-3

Technique for maintaining biodiversity under the rise of water temperature of river

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Introduction - Under accelerating global warming, the rise of water temperature of river provides freshwater species harder conditions to live. I present the case that the construction of groin (traditional work for flood control) have restored the biodiversity of river. Around the groin area, the riverbed water gushed out, and also the still water area is created where the water temperature is stable throughout the year similar to natural pools.

The general situation - The site is the length of 500 m river channel at Umaji village, located at the upstream area of Yasuda River flowing through the mountains of Kochi Prefecture. The past river improvement had straighten the river channel, and the natural shoots and pools which diversify the river ecosystem had been lost. Therefore, we planned to recreate pools at the gently curving point. Groins and cross sectional masonry with small drops are adopted in consideration of the channel meandering. In this case, we set the body of groin emerging out about 3.5 m from the shoulder of riverbank sediment deposit, and buried the foot of groin 1.5 m into the riverbank to prevent the erosion of bank.

Environmental change of the river bed and bank after work - After one year and 9 months (Sep 3, 2008), we observed the water depth, flow direction, velocity and the grading distribution of the riverbed materials at the both of the up and down stream of the site. It was confirmed that the pool with 1.9 m depth was maintained between two groin works and the riverbed materials had diversity from sand to boulders. On the other hand, the cold fresh water gushed out from the masonry gap of the upper groin buried in the riverbank, and then the still water area was created at the downstream of the groin.

Inhabitation of fishes - We had the inhabitation research of fishes to evaluate the environmental function of the restored pool. The population density of fishes increased from 0.77 ~ 2.89 ind./m^2 to 1.94 ~ 4.58ind./m^2 as compared between before (Jul, 2007) and after the construction (Jul, 2008). The density around the groin was the highest among the observation points. Above all, ayu assembled at the head of the groin and amago trout, which is said to live at the stream below 20 degree, crowded at the groin area. We could judge it the effect of the groin construction.

Conclusion - In recent urban rivers, the exchange between river water and riverbed water was shut off, which results in the change of not only the function of the water purification but also the environment of water temperature. The revitalization of water circulation taking riverbed water into consideration would have the significance for the restoration of biodiversity.

S7-4

Research on the cooling potential of urban greenery spaces in summer time

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Originally, urban greenery spaces have a lot of roles such as environmental conservation, recreational function, disaster prevention, and landscape planning. Recently, in addition to these things, most of scientists insist that urban greenery spaces have a wide variety of potential which are relevant to biodiversity conservation, maintenance of ecological network, reduction of greenhouse gas emissions, cooling of surrounding areas. In these roles, especially, we considered that the cooling potential by greenery spaces are very important because the urban heat island phenomenon has become a serious object of public concern during summer. This is the reason why we research this subject.

Based on these ideas, this paper aims to clarify the cooling potential of urban greenery spaces in summer. First of all, we show that greenery space and anthropogenic heat emissions have a great effect on the temperature in downtown areas from the various data collected from 27 observation points in Minato-Ku, Tokyo. Second, we clarify the cooling potential of greenery spaces. From the regression analysis, it can be said that the cooling influence by greenery spaces of 22,500 square meters is equivalent to the heating influence by the anthropogenic heat released from 70 office buildings of the average size in Minato-Ku, this having a total floor area of about 211,726 square meters. Furthermore, the cooling potential of a greenery space of 22,500 square meters from July to September can be expected to reduce about 236 times as much quantity of carbon dioxide as the same greenery space absorbed for one year. In conclusion, greenery spaces in urban downtown areas have the function of air-conditioning given by nature.

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S7-5

A study to estimate the amount of carbon stocks in urban green space

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Background and objectives - Based on the Kyoto Protocol of the United Nations Framework Convention on Climate Change, Japan regards urban greening activities as a revegetation initiative. The objective of this study shall be to examine carbon fixation of biomass in revegetation activities and to establish a method for estimating its volume.

Study of the Estimation Method for Carbon Fixation from Revegetation:

a) Definition of Revegetation and Subjects for Estimation: Revegetation is defined as a direct, human-induced activity which causes an increase in carbon stocks in areas other than forests. In Japan, this includes urban greening activities (covering a minimum area of 500 m², including the planting of tall trees), in urban parks and roads etc., that have been performed since 1990.

Under the international guideline, LULUCF-GPG, the following 3 items are prescribed as subjects for carbon fixation estimation: (1) Carbon stock changes due to LULUCF activities; (2) Carbon emissions from lime application; and (3) Carbon emissions from biomass burning. In this regard, carbon balance estimation for the following 5 carbon pools is considered to be of particular importance: (1) above-ground biomass; (2) below-ground biomass; (3) litter; (4) dead wood; and (5) soil.

b) Estimation Method Study Results: A study was made of the types of greening activities that would correspond to revegetation and the area they covered. Eight sub-divisions including urban parks and green areas on roads, as well as public green areas and government-guaranteed private green areas, were designated as subjects for revegetation.

In regard to the categorization of factors for carbon removal by tall trees, methods were established for estimating annual biomass growth (carbon fixation) according to the ratio of tree type distribution. We estimate carbon fixation of biomass at 676.65 Gg-CO_2 in 2007.

Litter trap surveys facilitated assessment of the amount of fallen leaves generated as well as estimation of carbon stock changes, taking into consideration the ratio of litter moved off the site through management. We estimate carbon fixation of litter at 14.59 Gg-CO_2 in 2007.

Carbon stock changes due to dead wood were classified as, “IE (Included Elsewhere)” because the data for the number of tall trees per land area used in the estimation of living biomass activity data will be that which includes the results of withering and supplemental planting subsequent to opening rather than that at opening.

Carbon stock changes due to soil were classified as “NR (Not included in the report)” because sufficient data could not be obtained for estimating carbon stock changes in soil, although it was believed that soil was not a greenhouse gas source.

Conclusion - Through the series of studies, minimal methodologies were established for reporting on sinks in urban greening activities. Steps must be taken to improve the accuracy of these estimation methods in accordance with post-Kyoto Protocol discussions.

S7-6

A measurement method of the ratio of vertical green coverage with leaves colors

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Background - The urban green has the effects of absorbing and fixing carbon dioxide and also improving the heat environment of the urban area. Adding these physical effects, we should remind the psychological effect of the urban green which increase the comfort for human by improving the peaceful and calm feelings. MLIT (Ministry of Land, Infrastructure, Transport and Tourism) has conducted an experiment analyzing the correlation between the amount of the green in the city and the psychological effect at Roppongi Hills in downtown Tokyo July 2004.

Results: As increasing the amount of green in the scenery, the psychological effect of refreshing, peaceful and easeful feelings are improved and decreasing the uncomfortable feeling in a hot summer day. We feel “with a lot of green” by more than 25% of ratio of vertical green coverage.

Purpose - The ratio of Vertical Green Coverage is the occupied green percentage in the picture took by a specific way. As measuring method, there are grid way, planimeter way and image processing software, but much time and effort are required for those due to manual methods. And measuring differences are caused by persons. We have developed a way relatively easy to measure by using chroma territory of leaves.

Measurement method of the ratio of vertical green coverage - The newly developed method for the ratio of vertical green coverage analyzes the chroma of digital picture using the Uniform Chromaticity Scale (CIE1976UCSu’v’) and distinguishes the chroma territory of leaves, and calculates the proportion of its part for the entire picture as the ratio of vertical green coverage. To determine the chroma territory of leaves, we have observed trees at fixed points in a park for one year and specified it based on these data. Moreover we inspected those using the data of the leaves in the standard object color spectrum data base for color reproduction evaluation (SOCS).

Conclusion - The method we considered this time makes it possible to measure the ratio of vertical green coverage objectively and quantitatively avoiding the influence of the measuring difference by persons. As a result, the instantaneous measuring of the images of cityscape or simulated pictures are possible. It can be used to make the scientific inspection and comparison between each data using this method as a standard to monitor the urban green tract.

Considering the scientific effect of the urban green which improves the human comfort as well as the biodiversity preservation and the thermal environment improvement in the city, the urban green should be promoted much more.

S7-7

A method to develop evaluation maps about biodiversity and global warming through ALOS satellite imagery (satellite launched by JAXA)

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Introduction - Urban green spaces play an important role not only for biodiversity preservation but also for the adaptation to climate change. The significance of green spaces inside urban areas has become widely known, and therefore the increasing need for appropriate planning methods. The development of these methods involves the use of very specific information. In the future, in order to make continuous efforts to preserve biodiversity worldwide, it is necessary to devise versatile and relatively inexpensive methods. This study uses ALOS satellite image and reports the development of efficient and relatively simplified evaluation methods.

Green space classification data - Green space classification data showing the current situation of urban green areas were created by spectral characteristics. We used relatively inexpensive high-resolution pan-sharpening ALOS images. Classification of spectral characteristics of three areas: forests, grasslands, and water bodies, was analyzed from the image. Then, we evaluated the results and organized the problems comparing them with existing green space data created by interpretation of aerial photographs.

Biodiversity evaluation maps - From the data previously obtained, it was possible to evaluate some biodiversity functions. We were able to create three biodiversity evaluation maps based on the green space classification data:

a) Ecological map (index species: kogera (*Dendrocopos kizuki*) -woodpecker-):

To evaluate the degree of importance of the green spaces for the creatures living in urban areas, the ecological map was created using woodpecker as index species. The data obtained through the creation of this ecological map becomes more useful when combined with other geographical information, for instance to analyze the relation between the geographical position of different green spaces. We hope that this ecological map can be useful for the planning of green spaces.

b) Carbon stock map:

The carbon stock map was created by multiplying the green space area by the biomass conversion factor. This map allows to determine the amount of carbon regularly stocked in urban areas for the mitigation of climate change.

c) Cooling effect map:

To estimate the cooling effect provided by urban green spaces, the map was created with the urban green spaces “cooling effect” conversion factor to urban heat island phenomenon. This map can identify and help allocate green spaces that are highly effective in reducing temperatures.

Conclusion - The method developed in this study can provide useful information about urban biodiversity at a low cost. The biodiversity evaluation maps created by analyzing green space classification data showed the method’s potential for application on green space planning. We expect to employ this method as a standard technique for monitoring biodiversity of urban green spaces, using the results for comparative verification purposes.

S7-8

A basis for envisioning urban futures: spatial correlation of urban biodiversity (biotope data) with user-perceived values of city spaces (sociotope data), residential income levels, and property rights/management in Stockholm, Sweden

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In an uncertain world characterized by accelerated environmental change, the need to understand the interactions between humans and their environment - particularly in our ever more populated and resource-intensive cities - is more urgent than ever. Stockholm is unique in having pioneered extensive, though separate, surveys of the human and environmental values of its cityscape. User-perceived values of parks, open spaces, and other green areas have been documented in a sociotope map, while a biotope map documents ecological values throughout the city and their importance for biodiversity.

But how are these social and ecological values related to each other on a city-wide scale? Are areas of high social value (e.g. recreational or cultural-historical spaces) necessarily incommensurable with high ecological value? Are areas of low ecological value associated with particular kinds and levels of social value? What patterns and characteristics are revealed in areas of low social *and* ecological value as illuminated for example, by an examination of residential income levels and the kinds of property rights/management in these areas?

Explicit spatial analysis and correlation is thus applied to data from the Stockholm sociotope and biotope maps, residential income data from the Swedish Bureau of Statistics, and a property rights/management database in what is to our knowledge the first attempt to examine how social, economic, and institutional factors correlate with ecological values - and their importance for biodiversity - on a city-wide scale in Stockholm.

It is envisioned that such a process of analysis will provide helpful input to urban policymakers who hope to navigate sustainable urban development paths that balance social, cultural, and environmental values. For example, identifying the characteristics of areas perceived as having high social and ecological values could provide development models for areas identified as having low social and ecological values. The subsequent step, identifying possible actions in such targeted areas - e.g. ecological restoration, a transformation of recreation or cultural services, or the development of social networks - would require more in-depth investigation of these areas' current and historical environmental and social context. Key and diverse stakeholders could then be involved in a participatory, scenario planning process that envisions possible futures and discusses concrete steps for realizing them.

The whole process, from the initial surveying and mapping of social and ecological values and their correlation with each other and with economic and institutional data, to the implementation of specific actions envisioned through participatory scenario planning, could serve as a model of sustainable urban development for other cities in Sweden and throughout the world.

S7-9

Potential and instruments of integrative urban landscape management system

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The development of urban ecosystem is taking place within the framework of complex interactions between socio-economic, socio-ecologic and socio-cultural dimensions. Preservation and intelligent utilization of its potential on the basis of landscape-ecological knowledge has become a decisive factor of sustainable urban development. Individual phenomena of the development of the society and urban ecosystems are mutually interrelated not only in a multiplication, but mostly in synergic co-acting. They cannot be comprehended in isolation, not even within the framework of scientific investigation, nor at the level of the practice of regulatory interventions. In relation to this complexity, the ensuring sustainability of urban ecosystems is perceived as a cross-section problem of space-relevant activities directed on the management of urban development. They have to create a logically interrelated system of planning, operative-managing and executive or implicational instruments in the triangle of integrative spatial management systems - land-use planning, socio-economic strategic development planning and landscape planning. The need of such integrative approach has been underlined by European Landscape Convention constituting a tool oriented to quality of European diversity and to protection, management and planning.

Long tradition of landscape ecology in Slovakia and strong position of green movements in societal transformation processes after 1989 led to the development of the comprehensive system of integrated management of urban landscape regulating the changes induced by economic, social and environmental requirements of dynamic societal development. It represents a set of principles, planning, programming and executive activities and measures focused on achieving and sustain biodiversity and ecological stability in urban systems based on the development of territorial systems of ecological stability, renewal and careful use of natural resources, protection of natural and cultural heritage and on improvement the quality of environment according to defined standards. The core of this system at urban level creates the set of analytical and prospective instruments - landscape-planning database, environmental sectoral programs (waste, energy, water, and air), plan of territorial systems of ecological stability, landscape study for areas requiring special landscape treatment and most important integrative planning documents - landscape-ecological plan, strategic development plans and land-use plans. They are presented by the paper not only as representative examples of the instruments typical for Central European planning culture, but also as the inspiration for integration in the planning systems across different planning cultures.

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S7-10

Governance, cities and biodiversity: perspectives and challenges of the implementation of the CBD at the city level

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City governments have been fundamental to implement international environmental agreements, such as the Convention on Biological Diversity (CBD). Even though they are not legally bound by international agreements, which are signed by national governments, most of those agreements are in fact implemented at the sub-national level. Moreover, the CBD mentions one item the importance of cities and/or local governments in the conservation of biodiversity. The importance of city governance to tackle the challenges of biodiversity loss has increased as urban population has grown enormously in the last decades, particularly in developing countries. The way cities are designed, planned and governed influence the amount of their direct and indirect impacts on biodiversity.

This paper analyzes the general relation among city, local governance and biodiversity using the cases of several cities around the world. Initially, this paper will examine the relationships between cities and biodiversity by looking at what are the major influences cities can have on biodiversity loss or conservation within and outside the city boundaries (brown and green agendas), as well as the benefits of biodiversity conservation for cities, such as the provision of ecosystem services. The paper then moves to understand what are the main instruments and governance mechanisms that exist to make cities effective to implement the directives of CBD. The paper will be finalized with broader discussions on the general negative and positive effects of the urbanization process might have on biodiversity and CBD implementation in general, as well as provide some insights of how cities can implement policies to effectively tackle the obstacles to biodiversity preservation.

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S7-11

Economic, social and cultural importance of tree species diversity in emerging Nigerian urban centres: case study of Akure city

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Trees are known to be beneficial man and have played significant economic, social and cultural roles since time immemorial. Recent concerns (especially in developing countries) have led to increasing integration of trees within urban settlements. The economic, social and cultural importance of tree species in emerging urban centres in Nigeria was investigated using Akure as a case study. The city was stratified into: modern and ancient; commercial and residential; educational (secondary schools and higher institutions) and religious sections. Detailed tree species enumeration and their importance were carried out within each section. Demographic and developmental information were obtained from government records. According to Yoruba folklore history, Akure is an ancient city, established many centuries ago by a descendant of Oduduwa, the progenitor of the Yoruba race. Upon the creation of Ondo State in 1976, Akure became its capital. Since then, it has grown to become one of the largest cities in south-western Nigeria with a population of 387,087 inhabitants. A total of 66 tree species were identified in the various sections of Akure. Tree species dominance varied from one section of the city to the other. Within the modern, species with the highest relative dominance (RD) is *Caryota* spp. (RD=28.7), followed by *Polyathia longifolia* (RD=23.2) and *Mangifera indica* (RD=10.5) while within the ancient part, *Carica papaya* (RD=14.2), *Mangifera indica* (RD=12.9), *Cocos nucifera* and *Citrus* spp. (RD=10.3) dominated. The ancient commercial parts of the city are virtually devoid of trees while the modern commercial part is dominated by *Caryota* spp, *Polyathia longifolia* and *Mangifera indica.* The secondary schools were generally dominated by *Gmelina arborea* (RD=21.4), *Elaeis guinensis* (15.2) and *Mangifera indica* (14.5). The dominant species in some of the higher institutions were *Cocos nucifera* (18.1), *Mangifera indica* (16.3), *Delonix regia* (RD=15.9) and *Gmelina arborea* (12.1). Generally, the uses (in descending order of importance) of the trees in the city include: ornamental/aesthetic (38.6%), food/cash crop (36.6%), timber (10.5%), shade (9.0%), living fence (3.1%), medicinal (2.6%), and cultural purposes (0.8%). However, the importance of trees varied according to the social, economic and educational status of the inhabitants of the city. Within the higher institutions dominated by educated elites, ornamental/aesthetic (51.9%) and shade (16.8%) were the most important uses of the tress while in secondary schools, edible fruits (34.8%) and shade (18.7%) were most important. Within the ancient part of the city dominated by people without formal education, food/cash crop was the overwhelming (about 77%) importance of the trees. Although food/cash crop was also important within the modern part of city inhabited by rich and educated people, ornamental/aesthetic was the predominant use of trees. Trees were only used for cultural purposes within the ancient part of the city, especially around the old king's palace. Some trees, e.g. *Terminalia catapa, Azadirchta indica, Mangifera indica*, *Gmelina arborea* etc. were used for dual purposes, with the predominant used depending on the section of the city. For example, while *Terminalia catapa* and *Mangifera indica* are predominantly used for food/cash crop by inhabitants of the ancient part of Akure, they are used for shade within the modern part. Although medicine is not currently among the dominant use of trees in any section of the city, there are indications that it will play an important role in the future due to the increasing number of people using trees for medicinal purposes. The results in implies that the use of trees in Nigerian emerging city could be for economic, social, and cultural depending on the status of the inhabitants of the city sections. While the poor and uneducated use the trees for economic and cultural purposes, the rich and educated inhabitants use the trees for social purposes.

S7-12

Evaluation of Higashiyama and sacred forests in Nagoya

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With views to contributing the development of initiative by Nagoya, we review the development of biodiversity indicators in the urban context with focus on ecosystem services including recreational functions. Evaluation of Higashiyama and sacred forests (*Chinju no Mori*) are presented as an example of urban forest. In the review, the developmental histories of biodiversity and urban indicators are presented. The "DPSIR" (Driving force-Pressure-State-Impact-Response) model is presented and the main critiqued are summarizing. The alternative presented integrates sustainable use of ecosystem services into urban biodiversity.

In urban areas, including areas of Nagoya, the inclusion of social values from local residents and the public is increasingly regarded as a necessary, if not mandatory step. These are clear from the past experiences of Nagoya in Idaka and Aioi area as well. It should be noted that there is room for collaboration between all stakeholders, including policy-makers, scientist and local users (including immigrants), to identify relevant scales and time frames, linking local and global dimensions, and associate sustainability indicators with drivers of change.

In conclusion, it is suggested that selected approaches, including collaboration between stakeholders and integration of temporal and spatial scales, should be integrated into the model as a means of ameliorating certain structural critiques, namely to integrate ecosystem services into urban biodiversity indicators. Capturing dependence on ecosystem services (in direct or indirect ways) within the context of indicators remains a challenge. Furthermore, linking scientific findings of ecological trends with responding policies in the urban context is critical.

S8-1

The significance of SEGES (Social and Environmental Green Evaluation System) in conserving urban biodiversity

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Urban Green Space Development Foundation runs an accreditation system to neutrally evaluate the activities of businesses that are actively working to green the city and are dedicated to improving the social environment. This system is known as the Social and Environmental Green Evaluation System (SEGES). In addition to promoting the social aspects of business land usage, the system aims to raise the social value of quality green spaces generated by businesses, realize a style of town planning that supports co-existence of humans and nature and create a sustainable society.

SEGES evaluates green spaces managed by various bodies including businesses, factories, nature study facilities and private associations. It sets out a comprehensive framework to assess from a variety of perspectives how green spaces contribute to society and the natural environment. Assessment factors comprise 3 principles and 8 general rules based on SEGES standards. The evaluators are selected specialists in environmental management and green spaces who carry out field investigations and interviews based on candidates' individual skills and capabilities. The system involves interviews with senior management to ensure that the candidates have a vision for the future that is in line with overall greenery strategy.

The outcome of the assessment is then passed on to an evaluation and accreditation board that issues certificates after taking into account the results of the assessments and the interviews. The certificates are issued as badges in 5 grades:

- Superlative Stage: qualified after continuously accredited as Excellent Stage 3
- Excellent Stage 3: Excellent contribution to the society. Graded by score.
- Excellent Stage 2: Excellent contribution to the society. Graded by score.
- Excellent Stage 1: Excellent contribution to the society. Graded by score.
- Green Stage: Potential good green space.

Green spaces in factories and business establishments not only contribute to employee intellectual productivity and relaxation, but are also regarded as part of the company's Corporate Social Responsibility (CSR) activities. Green spaces contribute to society in a variety of ways, including acting as carbon sinks for global warming, modifying the heat island effect, recharging groundwater, and serving as places to connect local communities with nature. There have been many recent examples of these initiatives to conserve biodiversity being put into practice. Activities in privately owned green spaces, such as expansion of environmental education programs, conservation of the regional ecosystem in conjunction with local people, NPOs, experts and schools, are also a form of CSR activity that is easy for stakeholders to grasp.

One unique aspect of SEGES is that it evaluates both the system tailored to manage each particular green space, and the actual performance of that system. This comprehensive evaluation process employs three basic principles to assess green potential and innovativeness.

Activities by businesses to create and conserve green spaces within cities with little natural environment help to restore the connection between people and nature. Urban Green Space Development Foundation is committed to promoting SEGES, a business accreditation system designed to stimulate the efforts of various bodies to preserve biodiversity.

S8-2

Mitsui Sumitomo Insurance Surugadai Building as one of the activities for biodiversity conservation

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Mitsui Sumitomo Insurance Surugadai Building was built in March, 1984 and designed “green building”, which was conscious of saving energy and water. About 5,200m^2 which is 43% of its site area (ca. 12,000m^2) is green open space and it has been playing an important role as an “urban oasis” for environment improvement and landscape development in local area for 26 years. The soil depth of rooftop green space (ca. 2,600 m^2) is 1.5 m in maximum and about 130 of trees are there. Most of open space including rooftop is green reflects the will of the company’s president at the time of construction: “We will prosper together with the surrounding community and promote activities that energize the area with the community.”

On this basic idea we developed “Kleingarten” in a corner of rooftop in 2003 and let it to 25 groups of local residents and our employees for free. This pioneered a boom of roof vegetable garden of commercial buildings in Tokyo.

The greening also contributes to heat island mitigation. It is revealed that the surface temperature of green space is more than 20°C lower than that of highways and rooftops of surrounding buildings at the noon in the mid summer.

Our employees’ volunteer group has monitored wild birds coming to the building since 2006. And it reveals that the green space contributes to the formation of ecological network in local area. Consequently we are planning an improvement of landscape in terms of birds and insects in the redevelopment plan of Surugadai Building including reconstruction of an annex building.

We have expanded urban greening activities for biodiversity conservation to other buildings and we also execute other biodiversity conservation projects as below.

- Indonesia Reforestation Project: We have carried out the “Tropical Rainforest Recovery Project” in Republic of Indonesia to rehabilitate wildlife sanctuary, where was no tree because of illegal logging, for 6 years: from April, 2005 to March, 2010. We have already completed planting about 300,000 trees in 350 ha in March, 2009.
- Employees’ volunteer activities in wetlands: We have started biodiversity conservation activities in various wetlands in Japan.
- Leadership in Japan Business Initiative for Conservation and Sustainable Use of Biodiversity (JBIB): JBIB has launched in April, 2008 and as the chair company of 30 Japanese firms, we further joint studies concerning important issues on business and biodiversity.
- Business + Biodiversity “Leadership Declaration”: On the COP9 (9th UN Convention on Biological Diversity Conference) held in Germany May 2008, Mitsui Sumitomo Insurance signed Leadership Declaration and joined “Business+Biodiversity”, an initiative of the German government and leading companies.
- A series of symposiums “Stories of Life told by corporations”: Since 2007 we hold annual symposiums concerning biodiversity for business people.

S8-3

Environmental greenification and education program in the forest of Toyota

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Toyota Foresta Hills model forest is located in the loop-shaped greenbelt area surrounding the city of Toyota, called the “green orbit” or so positioned under the city’s Master Plan For Parks And Open Spaces. It aims to propose and advocate “a sustainable recycle-based society centering on forests” with concrete execution plans. In 1997, Toyota launched an environmental improvement project over 15 ha of its vast 75 ha company premises in the aim of regenerating Satoyama woodland and opened it to public. (Satoyama: Japanese coppice forests until approximately 1960s. Properly maintained Satoyama exhibits “co-existence of human activity and biodiversity”). Geographically, its vast site is segmented into 3 zones comprised of a forestry zone, conservation zone and utilization zone showcasing such institutions as a hygrophyte observation garden (restored biotope), natural ecosystem observation garden (constructed biotope), and conservation district for species around the Ise Bay (rare living being observation garden) as well as approximately 15 test areas including the Satoyama Learning Institute named “Eco-no-Mori House”. As the social demand has heightened for such facilities since then, Toyota expanded its project area into 40 ha.

While Toyota Foresta Hills model forest, continuously rolls out activities to conserve and energize healthy Satoyama or coppice forests, it also regularly monitors the local ecosystem to attain deeper understanding of the environment where Satoyama conservation activities are taking place and influences of such activities over the diversification of living things by accumulating data and identifying proper ways to conserve Satoyama. At the same time, these activities and findings are made available to the general public. Also, there are learning programs on the natural environment and programs to introduce the forests via man and nature interpreters.

In 2005, Toyota Foresta Hills model forest received an honor of Excellent Stage 3 from the 1st Social and Environmental Green Evaluation System (SEGES). This indeed gave deeper confidence and courage for our commitment and an opportunity to once again confirm the importance of this mission to maintain, conserve, and manage natural and environmental resources in the local area and the meaning of passing the precious resources to the future generations. In 2009, a new social contribution project, “Toyomori project” an initiative to develop experts who supports the local recycle-based society, was started in collaboration with the municipal (City of Toyota), NPO (Support center for sustainable regional design) from the perspective of “external communication,” one of KPIs for SEGES. In detail, its basic concept is to leverage expertise, know-how, and human resource of the municipal, NPO, and a company so as to realize a sustainable recycle-based society centering on the ecosystem of forests and to connect people in cities and local villages.

However, realizing that there is a limit to what one single company can bring in conserving local ecosystem, the “Fukuro (owl) Project” just commenced in 2008 with a partner, Sony EMCS Corporation Tokai Tec Kohda Site, as an initiative that overcomes corporate walls. In detail, this intends to conserve habitation of owls defining owls as one benchmark with collaboration between the Forest of Toyota and the Forest of Sony. That is, this is a challenge to promote both collaboration for habitat conservation and collaboration for social/environmental contribution programs. For the future, Toyota will continue to determine the relevant needs for environment and greenery, and promotes sharing know-how with our related facilities the Shirakawa-Go Eco-Institute and the Shimoyama project (under contemplation), as well as to promote construction and practical use of demonstration forests.

S8-4

Employee-involved activity on conservation of biodiversity by utilizing the "Sony Forest"

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Sony has been promoting the conservation of biodiversity including the corporate greenery activities strongly. In Japan, Sony EMCS Corporation Tokai TEC Koda Site (hereinafter the Koda Site) and Sony Semiconductor Kyusyu Corporation Oita Technology Center have earned the certification under the Social and Environmental Green Evaluation System (SEGES). The case of activity on "Sony Forest" in Koda Site is introduced as following.

The "Sony Forest" is a highly authentic secondary forest located on the premises of the Koda Site. The company uses this corporate green space to educate its employees and make contributions to the local community. The Koda Site is located in Koda Town, Nukada County, Aichi Prefecture, and situated at the south western end of the mountain foothills extending from Nagano Prefecture. With parts of it bordering the biologically diverse Hikoza Park and public mountain forests, the area has huge ecological potential. Of the total area of about 181,000 square meters, 42% - or about 76,000 square meters - constitutes a green zone. The "Sony Forest" occupies about 58,000 square meters of it.

When constructing a new plant, Akio Morita, who co-founded Sony and later became its chairman, sought to embody the concept of Sony's Founding Prospectus: Create a stable work environment where engineers who have a deep and profound appreciation for technology can realize their societal mission and work to their heart's content. He considered that a greenery-rich industrial park like the ones in the U.S. west coast would be an ideal environment for employees. Based on this idea, he chose Koda where nature was well preserved and established Sony Koda (as it was called then) in this location. Carrying on Morita's will, employees of the Koda Site have committed themselves to promoting greening efforts ever since the company's foundation.

To restore nature in the land that was developed when the plant was built, the employees have planted trees themselves and held workshops on greenery activities to build up knowledge while doing their regular work. Devoted to two purposes-corporate contributions to the local community and the conservation of nature-the "Sony Forest" offers a number of facilities, includeing athletic playground equipment, nature trails and observation decks, which are meant for local residents, especially children, to enjoy. This is based on the notion that human intervention will make for ecologically richer forests or, in other words, making effective use of forest resources will lead to the conservation of the natural environment. It also relates to the tradition of "SATOYAMA (rural agricultural area)" which the Japanese have long cherished. Since company-owned green spaces are susceptible to the impact of fluctuating business performance, ensuring the continued existence of these green spaces requires adding value to them. Value-added, well maintained mountain forests are easy to manage. That is the primary reason why the employee-led conservation efforts for the "Sony Forest" have continued until today.

The Koda Site has earned Excellent Stage 3 certification for five consecutive years since 2005 under SEGES for its earnest environmental activities such as the maintenance of green spaces, employee-involved conservation efforts and contributions to the local community mentioned above. Since 2008, the site has been engaged in a project to restore the "Sony Forest" as SATOYAMA, with the focus on biodiversity. Taking biodiversity into consideration, it is important for us to work closely with other projects in the region. Currently, the Koda Site is taking part in the "Owl Project," which Toyota Motor Corp. is pushing in its "Toyota Forest." A group led by employees is now addressing the challenge of conserving biodiversity in the region.

S8-5

Aiming at the construction of the ecological network in the city outskirts

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The decision to promote participation of companies to convention was adopted by COP9 of the Convention on Biological Diversity, and “Business and Biodiversity Initiative” started in COP9. Therefore, corporate activities for the biodiversity are expected more and more. Fujitsu signed the leadership declaration of “Business and Biodiversity Initiative” in May, 2008 and announced “Fujitsu Group Biodiversity Action Principles” in October, 2009. This action principle expresses the promotion of the biodiversity conservation by the use of ICT and the spread of biodiversity to the society.

In recent years, the residential development has greatly ruined the biodiversity of the city outskirts, has caused the heat island phenomenon because of the decrease in a green ratio, the decrease in the optical reflectance with asphalt and concrete, and the increase of the thermal absorption rates. It is also accelerating global warming. In order to solve these problems in the city outskirts, Fujitsu would like to construct the ecological network in Kawasaki district, Kanagawa Prefecture, where Fujitsu has the factory.

Up to now, Fujitsu acquired Excellent Stage3 of Social and Environmental Green Evaluation System (SEGES) by Urban Green Space Development Foundation at the Numazu factory in Numazu City, Shizuoka Prefecture, and has worked on the maintenance of green land. Now, Fujitsu is promoting the construction of the ecological network which aims at the maintenance of the biodiversity of the area in the entire Kawasaki district including not only the site at the Kawasaki factory but also the surrounding area.

It is necessary to execute the study of ecosystem in the region as the first step for the construction of the ecological network. The collection, accumulation, and analysis of the data about when, where, and how the species of wild fauna and flora live and grow are important. Fujitsu introduced the photo system by cellular phone utilizing ICT for the ecosystem study, and is trying to collect the biological information. In this system, investigator takes a picture of the living thing (or environment of the area it is living and growing) with the camera of the cellular phone with the GPS function, appends the picture in which the location information by GPS and time information were included to the mail, fills in the state of the living thing on the mail text, and sends the mail to the server.

The biological information of the mail server is sent to the database server, and accumulated in the biological information database. The biological information which should be collected is accumulated in the biological information database by decided theme. A lot of people’s participation becomes possible by selecting the theme which employee and local populace participate easily, and it is possible to raise participants’ biodiversity consciousness. And, the data accumulated in the biological information database can be displayed and looked on the map by the Internet.

In the future, Fujitsu would like to select the appropriate theme, to collect biological information by a lot of participant, to settle on the measure to conserve the biodiversity by analysis and evaluation of the collected data. Fujitsu is aiming to execute the biodiversity conservation.

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S8-6

An approach to the evaluation of the land use such as green space managed by enterprises

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Japanese private companies started to make joint effort to promote the conservation and sustainable use of biodiversity and launched "Japan Business Initiative for Conservation and Sustainable Use of Biodiversity (JBIB)" on April 2008. JBIB has two working groups. One is the Research and Development (R&D) working group, and the other is the Communication working group. The objectives of the R&D working group are to enhance knowledge of national and international actions for the conservation of biodiversity, and to develop the methods, indicators, and guidelines to monitor and evaluate the actions.

The R&D working group currently carries out research on simple and easy evaluation technique of land use in their business establishment from the viewpoint of biodiversity. The R&D working group also carries out research on the impacts of supply chain on the biodiversity, and makes explicit illustrations to show the relationship. As a result, we recognized that enterprises, in their business activities, give a serious impact on ecosystems and biodiversity through the land use as much as through procurement of raw material and utilization of genetic information. That is a reason why we study the evaluation of land use such as green space managed by enterprises.

Technique to evaluate a fitness degree at a point of view of the biodiversity of the land use is demanded in that study, because quantitative index is necessary for private entities to manage their activities. From such a background, we pay our attention to the land use of business establishment, such as main office and a factory, and to the green space managed and administered by the private entities in particular.

We made a evaluation list of land use to fill in tree classes and area of the green space or that of the surface permeable to water and air, and we started to use it experimentally. However, the business establishments are located in the places with ecologically different conditions. Therefore, we cannot explain the fitness degree of land use only by the evaluation list. So we also carry out research on the methods to monitor and evaluate the environment that employees can participate.

Those methods were studied primarily to estimate ecologically consideration degree of land use. However, those can be utilized not only in landscape plans as an environmental planning parameter, but can be utilized to monitor and evaluate the environment by employee participation. Finally those actions can lead to adaptive management.

S9-1

Towards the improvement of biodiversity of Kobe city by citizen participation - examples of experiments of the city and its schools for the building and the use of biotopes by citizen participation

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The Kobe City has the population of over 1.53 million, being the fifth largest city in Japan. The city has the area of 550 km^2, with 931-meter high Rokko Mountains, and Tanjo Mountains, and forests as timber resources and farmlands covering about 41% and 9.5% of the land area respectively, and the surrounding and well-known basin groups (about 6,300) of the country. And approximately 5 water systems flow through the city from which systems more than 20 rivers run through the urban area.

With these the Kobe City benefits from such diversified natural surroundings and ecosystems compared with the other big cities and towns facing the Seto Inland Sea area. However it has been pointed out that except for schools, parks, streets and rivers in the city, like the other cities in Japan the urban populated area of Kobe lacks greenery and water area without base points and their networks connecting such places in biodiversity. For the purpose of solving these issues, the Kobe City Government has laid out the "Biotope Network Kobe 21 Plan" in 1991 to take some measures.

Having been victimized by the "Hanshin-Awaji Big Earthquake" in 1995, elementary schools in the Kobe City began a campaign of environmental education for school children to strengthen their abilities to survive and empathize through various projects of creating biotopes on their own by the help of school officials, local residents, and private sectors. Thanks to these activities the children can have opportunities to directly touch and see living things and how they are living at school. At present 100 elementary schools out of 168, 11 junior high out of 104, 7 sewage plants and 22 parks, etc. have kept biotopes.

As for managing, organizing and utilizing such biotopes, biotopes themselves play not only an important role as a base and a network of biodiversity in urban areas but a place for environmental education for children in terms of hands-on learning. At school, biotopes help school children to learn in a various ways about many subjects like 'science', 'social studies', 'Japanese', 'art' and 'integrated study' not to speak of 'environment'. Furthermore, when a biotope is built, citizen participation is meaningful in improving partnership between schools and local residents, and teachers, children, and locals can altogether study the restoration and observation of ecosystems for empirical learning. With these, it has become a place to train people concerned and understand how important biodiversity is. We have also established and utilized a biotope in the premise of the "Environmental House For Future Kobe," one of the core facilities for environmental education, by calling for citizens to participate (6th year). There are voluntary-based workshops by local citizens held regularly for planning a biotope at school or in a region, and/or fostering leaders of nature observation activities at rivers and/or watersides. It also attempts to reserve plants and animals indigenous to Kobe in such biotopes.

We invite specialists to hold a seminar for training of leaders every year and/or create a manual of the "Guide to the management and use of biotope" for school children so that biotope will not be wrongly used in the name of restoration of nature or made into a base harmed by non-native species.

In this paper, I would like to outline and describe what we've done as well as the challenges we are facing. While the Kobe City is now drafting a "Strategic Planning toward Biodiversity of Kobe" according to the national law of the "Master Policy of Biodiversity," we will plan to roll out measures to deepen our partnerships in future.

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S9-2

Empowering communities for the symbiosis with the crested ibis

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One of the major projects for the conservation of biodiversity carried out in Japan is the reintroduction of the crested ibis (*Nipponia nippon*), which is locally known with the name of *toki*. This bird once became extinct in 2003 but has been preserved by virtue of captive breeding using a pair of birds brought from China. As a consequence of the success in increasing its population, the decision was made to release the birds to the natural environment in 2008 under the auspices of the Ministry of Environment. While the national government has been playing a key role in promoting this project, the collaboration among various stakeholders (e.g. local municipalities, local residents, university researchers, etc.) continues to be essential to developing sustainable plans of environmental restoration with the view to create a space in which both human beings and the crested ibis can live together in a harmonious way. In other words, a democratic decision-making process needs to be maintained in the project so that stakeholders can continue developing plans by taking into consideration their needs and concerns. The empowerment of local communities is critically important in implementing this democratic process.

This paper, based on field research concerning the empowerment of local communities in the project of reintroducing the crested ibis, aims to articulate the value of democratic decision-making in the conservation of biodiversity, and to clarify essential ideas that need to be taken into account in order to enhance public engagement. The locus of the project is Sado Island in Niigata, where the last wild population of the crested ibis was found. The authors have conducted forty-three workshops on this island in order to identify stakeholders, share their concerns, and to think together with them about how the conservation of this bird can be promoted in a sustainable way for local communities. Furthermore, the authors, via workshops conducted in collaboration with stakeholders, actually engaged in activities that aimed at improving local environmental conditions and realizing sustainable communities. As a consequence of these activities, this paper proposes three crucial factors for the successful promotion of the empowerment of local communities:

1. Invite a variety of stakeholders to decision processes by creating a safe communicative space in which they can share their concerns.
2. Remove a hierarchical relationship among stakeholders and give equal voice to everyone, who may be affected by or is concerned about a project.
3. Facilitate the process of collaborative deliberation in order to produce practical outcomes together with the participants.

These factors lie at the foundation of democratic decision processes, and need to be taken into consideration when we attempt to realize the active participation of various stakeholders in the conservation of biodiversity.

S9-3

Game development for environmental education - biotope simulation game-

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This game is learning tool supporting environmental learning in the elementary school. It consists of two stages “making school biotope” and “environment improvement at surrounding”.

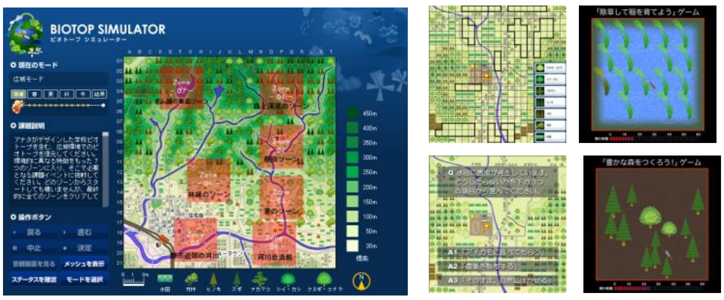
The former game consists of four steps as follows: 1) We make a choice between “the city school” and “the rural school”. 2) Make a choice between “the zone that was surrounded by a school building” and “the zone adjacent to park and pool”. 3) We set out 10 materials such as ponds, current, trees and flowers in selected zone. 4) At last, the creature which can appear in the biotope is written up to 23 kind of it.

It is decided whether a creature appears by following: 1) Select the zone: Surrounding environment provides various insects in the rural school and the zone adjacent to park and pool. 2) Create pond and water grass: Appearance of dragonfly is affected by existence of them. 3) Area of woods: When the forest covers a space of more than 50% of the site, the butterflies liking for forest appear such as common bluebottle and common glider. On the other hand, when the forest covers a space of under 50% of the site, the butterflies liking for open environment appear such as cabbage butterfly and grass-yellow. 4) With or without plants which a caterpillar eats: The butterfly appears when you plant trees which the caterpillar of the butterfly eats.

In the later, it consists of three type game: 1) Tree planting game: Children plant trees on land-use map with implications for biotope-network. 2) Mini-action game: They have to remove black bass selectively within the time limit. 3) Selection game: they choose from among 3 answers to the question about environment improvement. The children can learn the relationship between the creature and the environment in natural environments, and intuitively understand importance of the adjacent local environment and network environment of the wide area.

Objectives of the environmental education with this game: 1) Understanding of biological diversity, 2) Understanding of the interaction between a creature and its environment, 3) Understanding of interaction of people and natural resources, 4) Raise awareness about natural recovery and management, 5) Development of social attitude about management of natural environment. We receive a research grant from National Institution for Youth Education.

The game of making school biotope



The game of environment improvement at surrounding

S9-4

An approach of new forest creation by self-producing regional characteristic seedlings in industrial area - trial by citizen's participation in Amagasaki Forest Central Green

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Amagasaki City of Hyogo Prefecture is one of the main industrial cities located in the Hanshin industrial area. It faced various pollution issues from 1960s to 1980s. Now, 35.5% of the city is industrial use districts. Hyogo Prefecture and Amagasaki City promote "the Amagasaki Forest Plan for the 21st Century" with citizens. This community planning is aimed at the harmonious coexistence of nature, industry and livelihood in the area of about 1,000 ha in the south of Amagasaki City.

As the initiative project of the "the Amagasaki Forest Plan for the 21st Century", "Amagasaki Forest Central Green Space" was developed in the shore region. As the biodiversity conscious planting was planned for this Green Space, regional characteristic seeds were collected from surrounding watershed areas and mountains by members of the "Council for Amagasaki Forest for the 21st Century" that were composed of citizens, companies and the administration and promoted "the Amagasaki Forest Plan for the 21st Century". Then they began to plant these seedlings in the Central Green Space. As the preparation of the full-scale planting began, the specialized citizen group, "Ama-Forest Group" for collecting seeds, raising seedling and planting was established and took charge of about half of 200,000 plantings scheduled. After the group participated in lectures hosted by the administration, it was independent as a citizen group. Currently, the group collects seeds from surrounding watershed areas and mountains, raises seedlings in the agricultural field and plants these seedlings in the Central Green Space. Additionally, this citizen group teaches children the environment education in primary schools and by utilizing skills members achieved. They also work on the foster family system by which the group leaves seedlings with general citizens.

In Japan, industrial districts cover the shore area widely. Therefore, to promote biodiversity conscious environmental recovery, a method to create nature from scratch is needed. Currently, collecting seeds and raising seedling are absolutely imperative because regional characteristic seedlings are not distributed. It could be that a method of creating forests by citizens in the Central Green Space is one of models of the creation of biodiversity conscious environment.

Photo1: Local nursery in Amagasaki Forest Central Green

Photo 2: Planting activities by public participation

S9-5

Citizen-led biodiversity conservation activities and the collaboration (partnership) framework

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In recent years, Nagoya City has experienced a drastic decrease in green space. Rare animals and plants, including the Tokai hill land elements (plant species), inhabit the area today, and it is important that we protect them and preserve *Satoyama* forests. There were strong movements to protect the area's nature against the implementation of several local projects.

In 1998, instead of the opposing stances that had been taken between citizens and the government up until then, the "Aioiyama Oasis Forest Creation and Maintenance Project" sought partnership between the two camps. Later on, in the process of formulating the "Basic Concept for Higashiyama Forest Creation and Maintenance," with emphasis on citizen-led activities, the concept of collaboration (partnership) between the two became clear. In 2003, 22 citizen groups engaging in forest creation and maintenance activities gathered to form, in cooperation with the government, the "Nagoya Forest Creation and Maintenance Partnership Network." They share the common objectives of protecting and cultivating the nature of local communities and promoting collaborative activities while respecting the stance of each other. The Network has also worked with other groups and researchers, and new developments are now taking place.

In 2005, the Network helped monitor the temperature at multiple locations in the city to shed light on the state of the heat island phenomenon. Since 2006, insect collection by light trap has been carried out at five locations in the city.

Also in 2007, in collaboration with the government, the Network helped drain a pond to conduct a study on the animals and plants inhabiting it and to eradicate alien species. This led to the launch of the "Nagoya Ponds and Reservoirs Restoration Project" in the following fiscal year. Since then, the project has been undertaken as an activity that brings researchers and citizen experts together, maintaining a high level of academic expertise, and promotes the participation of many citizens. The findings of the project were presented in a meeting with the help and participation of many citizens. Momentum is building for the establishment of a "Biodiversity Center" that is to serve as a base for citizens' awareness raising/learning/action in support of nature.

As citizens of Nagoya, we are faced with immense challenges, including the deterioration of biodiversity and threats posed by alien species in our local *Satoyama* forests, wetlands, and ponds; the responsibility as citizens that receive vast benefits of biodiversity; and the creation of sustainable living declared in *Satoyama* initiatives.

The key to continuing forest creation and maintenance and promotion of biodiversity conservation activities in Nagoya after COP10 lies in developing a deep understanding of the local nature, acquiring expertise, implementing vast yet detailed works, and mobilizing citizen power for the implementation. To this end, it is imperative to establish "an entity" in which citizens and the government collaborate.

S9-6

Park management plan and citizen's participation

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Amid the so-called a "mature society" in Japan now, parks are seen as ones we use rather than we develop. Since the appointment of a manager was institutionalized in 2003 not only public organizations but even a private enterprise or a NPO has been able to join park management, and so we expect a new aspect of the development. On the other hand, it is the fact that the increasing demand of cost cutting and at the same time the improvement of quality in service is seen as a trade-off. However, from the extended view point of biodiversity what park management should be ideally and how it should be achieved in terms of technique has been yet developed so much.

In this report, I explain the past activities about the park management system and its technology that contributes to creating biological diversity with the knowledge we acquired. Since I have participated in the various activities conducted in the Awaji-Island Park as part of the Hyogo Prefectural Park for my own research in 2000 these have brought us much result. For my part I cooperated and supported these projects to promote the use and activities in this park. Since 2006, we have been engaged in the park administration committee of the Awaji-Island Park which was established for the improvement of communication in the Awaji-Island Park. And the first meeting was held last year. The purpose of this meeting was to increase the use of the park by more people and provide a lot of information about the activities held in the park. Hyogo Prefecture led the way to set up the committee for examining how the park management should be.

With the park having the area of 87 ha of nature, which is wide enough, we have made planning of how the park administration should be based on our research and analysis from the point of environment as well as its use. The environmental research this time includes fauna and flora, topography, and geology. And we also investigated the actual situation of the use by visitors and their activities. Information collected from the research on natural environment from the multiple points of views such as animals or plants, the degree of slopes, the changes and estimation of extending bamboo bush areas and/or evergreen trees, and trails is now stored as GIS data. According to these, we have already drafted various types of the plans for long, midterm and short periods in future with making action plans.

Volunteers and interpreters of natural environment are placed much importance in terms of human resource of the park focused on biological diversity. These involve several citizen groups such as "Friends of the Awaji-Island Park", "Interpreters", and the "Planting Volunteers" who have been trained and educated. The range of their activities are extensively broad including the management of bamboo bush, sustainable flower beds, nature observation, events in the park, volunteer guides, environmental education programs, interpretation, and replanting. In addition, a park coordinator has been newly appointed and his/her job is to support citizen's activities and/or carrying out relevant environmental educational programs.

The theme of the paper, the system of park management, means an institutional framework set for park management based on the research and analysis of the present situations. And the term, "technology" is a methodology of exploring natural environment, making guidelines for future, and for the education and development of human resources.

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S10-1

Hyperspectral canopy reflectance as potential tool to estimate and map pasture biomass and quality in a grazed pasture, Hokkaido, Japan

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Accurate and timely detection of pasture biomass and quality over wide area is required for more efficient management of grazing. The traditional methods for the estimation of forage biomass and quality require detailed sampling and expensive laboratory analysis, however, hyperspectral radiometer is able to be a potential tool to estimate pasture quality and biomass data (Kawamura et al., 2008). This study was conducted in a mixed sown pasture (7.1 ha) in the National Agricultural Research Center for Hokkaido Region in order to demonstrate the potential of a field hyperspectral radiometer to estimate and map green biomass (GBM) and crude protein (CP) concentration of forage.

Canopy reflectance measurements and plant samplings were made at 88 selected plots using 30 cm × 30 cm quadrat during 3-25 August 2009. Additionally, separate spectral readings of 347 quadrats on the permanent line plots (10 m interval), with no plant sampling, were made in the paddock for mapping purpose between 3-5 August 2009. Collected plant samples were dried at 70ºC for 48h to determine the GBM and the CP concentration which was measured using the Kjeldahl procedure. Partial Least Square (PLS) regression analyses with Genetic Algorisms based wavelength selection (GA-PLS) (Leardi & González, 1998; Leardi, 2000) and Full-Spectrum PLS analysis (FS-PLS) were performed to estimate GBM and CP concentration. The predictive accuracies were evaluated using cross-validated coefficient of determination (R^2) and root mean squared error (RMSECV) values. Spatial distribution maps of GBM and CP were generated from the separately measured canopy reflectance and the location (latitude and longitude) by applying calibration models. A geo-statistical approach was used to model the optimal spatial resolution in the paddock.

GA-PLS models gave better predictive accuracies in the GBM (R^2 = 0.60, RMSECV = 44.0) than FS-PLS (R^2 = 0.43, RMSECV = 49.3), and that in the CP (R^2 = 0.52, RMSECV = 2.0) than FS-PLS (R^2 = 0.37, RMSECV = 2.3). The semivariogram modelling's parameter "range" of GBM and CP were 108 m and 83 m, respectively, which suggest that the sampling interval should be less than approximately 40 m. Spatial distribution map of GBM and CP were generated with 10 m grid cells.

The authors would like to thank to Global Environmental Leader Education Program for Designing a Low Carbon Society of Hiroshima University its support to this study.

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S10-2

Succession, from traditional to disturbed forest system in West Kalimantan-Indonesia

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Forest succession which is the most important process for forest stewarding is under threat from modern land management system. Lawrence et al. (1997) stated that the nutrient-poor peat soils in West Kalimantan-Indonesia are not compatible with modern land management. Adequate fallow periods for the recovery of soil fertility, nutrient depletion and soil erosion is needed. Further, this degraded soil was commonly invaded by a grass *Imperata cylindrica* which creates retrogressive succession of the forest.

An assessment of forest land use was conducted in West Kalimantan to identify a variety of ethnic groups land use types and land management systems. The appraisal of land management systems, revealed the each ethnic group managed the land under their ownership.

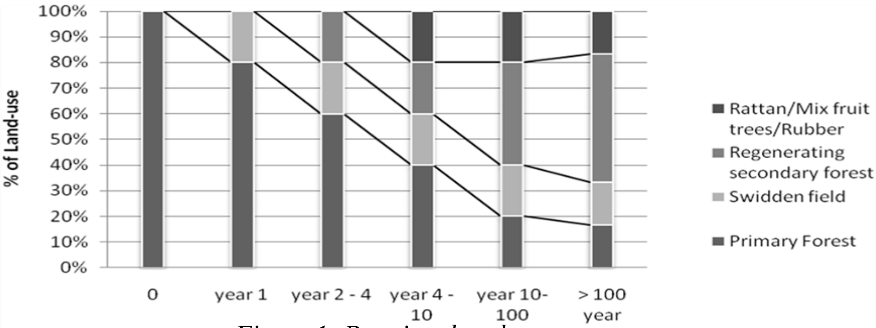

Figure 1: Rotational cycles

The rotational land management of Dayak (one of ethnic group) which can be seen on the figure above, is able to provide a complete forest succession from the opening of primary forest to rice-field, forest garden, fruit garden respectively and back to the forest again in a complete cycle.

Maintaining and multiplying traditional West Kalimantan landscapes with their land management system provides better forest succession cycles compared to other management systems on landscape (Abdullah Saiful Arif & Nakagoshi N, 2007). A combination of forest succession with cash crop, fast growing tree plantation and existing palm oil plantation should be a more successful approach to West Kalimantan landscape.

We would like to thank Takao Yamashita for giving a chance to visit and conduct the research in West Kalimantan and Hadi Susilo Arifin for a great suggestion. Also Global Environmental Leader Education Program of Hiroshima University for supporting this research.

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S10-3

Sustainability of mountainous watershed landscape societies: the difference between northern and southern areas of West Java region, Indonesia

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Both landscape architect and ecologist are concerned about current global emissions and climate change. Both have been recognized spatial heterogeneity primarily at coarser scales. Coarse scale heterogeneity appears in such patterns as, altitudinal gradients of wildlife distribution. The contrast between such environment types as bogs and uplands, grassland, forest in watershed landscape will be recognized. Therefore, the spatial context will enhance the ability to understand and work with patchy landscapes and their elements (Pickett & Rogers, 1997). A drastic decrease in global green house gas (GHG) emissions is required to prevent the most serve consequences of climate change. Thus, it achieves the ultimate objective of the UNFCCC to stabilize GHG concentrations in the atmosphere at levels which avoid dangerous climate change. The building of low carbon society (LCS) process in mountainous watershed landscape was assessed by using a landscape ecological-based approach. "Ecologically-based approaches to design are proper understanding of the environment of each site, positive construction, and manipulation of development" (Bradshaw, 1986).

The study areas were located within four watersheds in West Java region, Indonesia. They are Ciliwung, Cisadane, Cimandiri and Cibuni watersheds. These watersheds illustrate the condition in West Java region based on their orientation to the northern and southern (N-S) areas. The differences between N-S areas are due to a variation in land use change, land use pattern and sustainability of development. There are economic gaps between N and S with the N accounting for 88.63% of Java's gross regional domestic product (GRDP) as opposed to the S accounting for the remaining 11.37%. The influences of biophysical region and socio-economic-cultural domain on sustainability of watershed landscape societies (SWLS) were analyzed. Regarding the coinciding and/or congruence of N-S part, the bioregion of SWLS would be performed as self-propagating, self-nourishing, self-governing and self-fulfilling societies. Hence, the land ownership of societies contribution to these watershed landscape functions is being analyzed.

This research was supported by the Global Environmental Leader Education Program of Hiroshima University. All secondary data were supported by Watershed Management Agency (BPDAS) of Ciliwung, Cisadane, Citarum and Cimandiri, Indonesia.

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S10-4

Critical issues on green area, urban waste and coastal habitat degradation in Jakarta, Indonesia

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Extensive development in addition to the rapid increase of the human population in Jakarta, Indonesia, exacerbated by poor management of environmental-related planning, have evoked pressure on natural landscape and created negative impacts on the environment. Within five decades, the population size has tripled from 2.9 million in 1961 to 9.1 million in 2008. Satellite analysis of LANDSAT data recorded in 1972, 2001/2002 and 2008/2009 show a significant decrease in NDVI value from 99% to 11%. It is close to the value reported by Riswan et al. (2004) where the green open area in 2002 was 9.97%. Correspondingly, based on BPLHD Jakarta database, land use ratio for vegetation (agriculture, park and city forest) and unvegetated area (construction, river and lake) in 2008 is 94.9%:5.1%. Linear correlation coefficient between NDVI and vegetation area in 5 districts of Jakarta is $R^2 = 0.4498$, $y = 0.3268x + 65.354$.

The rapidly changing natural landscape and the increasing human population have worsened the water quality. Hence, Pollution Index (PI) of river water, ground water and seawater were measured using a method developed by Nemerow & Sumitomo (1970) based on the data provided by BPLHD. In total 67 sampling stations from 13 rivers, 75 stations from ground water aquifers, and 32 stations from the Jakarta Bay were analyzed. Unsurprisingly, the results show that none of sampling station in the river systems is unpolluted, and the rest 18% and 82% are classified into moderately and highly polluted criteria, respectively. Based on infiltration theory, the excessive usage of ground water may lead river water infiltration into freshwater aquifers (Lee, 1980). Therefore, only 16% of the ground water stations in the study site remain unpolluted, while the other 42.7%, 22.7% and 18.7% fall within slightly, moderately and highly polluted, respectively. In the bay, only 28.1% of the seawater stations remain unpolluted, while the majority falls into polluted criteria with 50%, 9.4%, and 12.5% following similar order to those of ground water, sequentially.

Urban waste is another pressure upon the city and its coastal environment. It is reported that about 29,676 m^3 garbage is daily produced within the city in 2009. The composition of garbage source consists of 53% (household), 33% (office and hotel), 9% (industry), 4% (market), and 15% (garden/street). Further analysis of environmental performance index by using AMOS structural equation model is still being conducted.

The authors would like to thank to BPLHD Jakarta for providing the water quality data, to Prof. Reiner Schlitzer from AWI Bremerhaven-Germany for the ODV software support, to BAPPENAS for the scholarship support, and to the Global Environmental Leader (GEL) Program of Hiroshima University for invaluable support for this study.

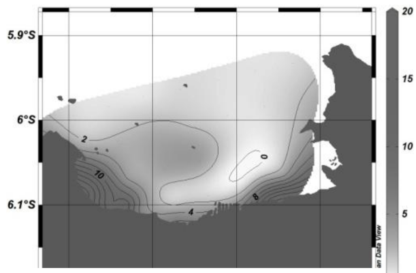

Fig1. Pollution Index of the Jakarta Bay

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S10-5

Using GIS to assess potential urban biomass recovery from forest and green area waste in Kuala Lumpur, Malaysia

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Urban forest and green areas are considered integral to the sustainability of cities (Gangloff, 1995), but sustainability of these areas is often ignored. Waste generated from mowing, pruning and maintaining forest and green areas in urban cities is always abundant and often left untreated in landfill site. Despite being an urban burden, this waste has the potential to be recovered and utilized. However, there is very limited information on the location and amount of waste generated. The approach taken here is based on consideration of urban planning system and its influences on the waste production and management system. The city of Kuala Lumpur, Malaysia was selected as case study. Focus was only given to open spaces and forest reserves areas, as declared in Kuala Lumpur Structure Plan 2020 (City Hall Kuala Lumpur, 2004).

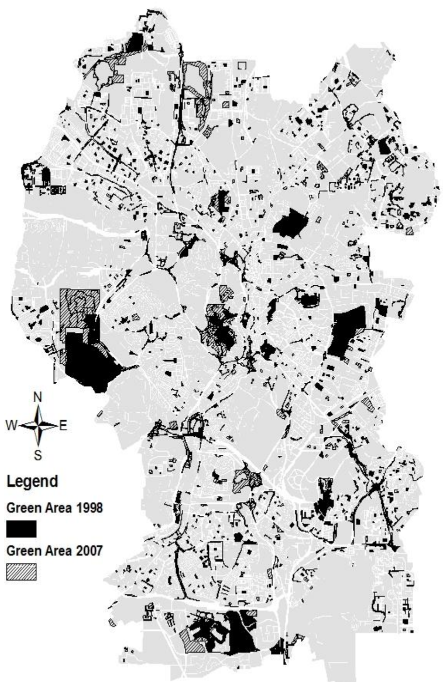

Fig. 1: Land evaluation (1998 and 2007)

Land evaluation was conducted using Geographic Information System (GIS) for the years 1998 and 2007 which shown 21.7% expansion in 9 years term (Fig. 1). Potential biomass contents were projected by analysing the changes of carbon storage in these areas. Estimation was based on the Normalized Difference Vegetation Index (NDVI) from computed LANDSAT data. It is assumed that 45% of dry-weight biomass of trees is carbon (Lieth, 1963; Whittaker & Likens, 1973). Using the NDVI value, considering the slope and intercept for the linear transformation, the carbon storage from green areas was calculated. After clarification on potential generation areas, characterization of waste generated from these areas was analyzed. To estimate landfilled waste amount, daily green waste disposed data for the month of January, 2010 was used as base data. Daily waste generation showed an increasing trend with an average of $R^2= 0.126$. Further analysis is continuing in order to determine the amount of carbon production that can be avoided if waste from these areas is converted into energy resources.

This research was supported by Global Environmental Leader Education Program for Designing a Low Carbon Society (GELs) of Graduate School for International Development and Cooperation (IDEC), Hiroshima University, Japan. The secondary data was provided by City Hall Kuala Lumpur, Malaysia.

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S10-6

Urban heat island and landscape: linking spatiotemporal variations in surface temperatures to land-cover and socioeconomic patterns

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The urban heat island (UHI) is a well-know climatological phenomenon associated with cities and the land surface temperature (LST) which varies greatly between different land cover types even in urban areas. Efforts to understand patterns, mechanisms and effects of urban heat island have been heightened recently, is important for the prediction of future evolution of UHI. Using a statistical approach, this study focuses on an analysis of spatial surface temperature and their relation with land cover and social factors. From the Landsat ETM image in Sep 14th2009, an extensive of database of city parameters, land cover, land surface temperature, normalized difference vegetation index (NDVI) have been extracted. The socio-economic factors that affected surface temperature were interpolated from the statistic yearbook including population density and energy consumption. The data has been converted into gridded data sets with a spatial resolution in 60 m.

Land surface temperature ranged from 18.47°C to 58.81°C with a mean of 40.61°C with a standard deviation of 2.46°C. ST patterns revealed the high temperature appeared in not only the city center but also the sub-urban district, most of the changes are due to the changes in land cover. For example, the Beijing Capital International Airport and surrounding major roads are warmer than the rest of the surrounding areas in Shunyi district. Farmland and forest are constantly cooler than other areas. In contrast, the value of NDVI varied from -0.95 to 0.99, with a mean value of 0.24 and a standard deviation of 0.25. Vegetation coverage especially parks with water bodies play an important role on decreasing the surface temperature in the downtown of city. The relationship can be confirmed by original regression analysis using land surface temperature and land cover data. LST was found to correlate significantly with seven variables, including NDVI, constructed land, water body, parks, road, population density and energy consumption (R^2=0.4591). NDVI, water body and population density were the three strongest factors with (R^2=0.4338). The result indicated that the spatial pattern of LST was associated with land cover though negatively correlated with population density especially in highly developed city center which is confirmed by previous study (Xiao et al., 2006). The population density ranged from 79 to 30,226 person/km^2 with a mean value of 2,005 person/km^2. Energy consumption and roads in this study did not exhibit the high relation with LST. This may be due to the energy consumption data including primary industry, secondary industry, tertiary industry and living consumption therefore to energy consumption patterns are not clear. For roads, it may be due to the vegetation coverage on the sides of the main roads in Beijing which distorted remote sensing data as it was difficult to distinguish between pixels.

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S10-7

Urban greenery planning for low carbon societies in Asia

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The Japanese government proposed a policy for the creation of low carbon cities, regions and socio-economic systems. In Hiroshima City, Nakagoshi et al. (2006) has evaluated the greenery planning history and current greenery systems as a tool for conservation of biodiversity and creation of low carbon cities as one of eco-cities in Japan. The effect of 60 years' of greenery recovery presents a relatively rich biotic environment in downtown Hiroshima. The area was once completely devastated by the A-bomb in 1945. Using historical and spatial analyses, a comparative study was conducted on greenery quality and quantity among Asian cities.

In this study, the landscape ecological indices were applied for understanding the structure and change of urban green spaces for cities including Jinan (China), Hanoi (Vietnam), Jakarta (Indonesia) and Dhaka (Bangladesh). Synthetic and functional analysis on the ecological corridor or the network of urban green spaces was conducted in nine Asian cities.

Urban landscapes offer a significant opportunity to increase active public participation in greenery construction and to promote conservation of the wildlife habitats. In the case of shortage of green spaces, eco-network/green corridor can save the quality and quantity of greenery. There are some proposals for eco-network in rapidly developing cities such as Jinan (Kong & Nakagoshi, 2006) and Hanoi (Pham & Nakagoshi, 2007). From GIS data analysis, it may be difficult to build an eco-network in Dhaka because of the chaotic urban development. In the Greater Manila, Philippines, severe damages on mono-cultural trees along avenues are often caused by pest outbreak, thus deteriorating the green network. We could learn an important lesson from this failure. Beijing (China) and Bangkok (Thailand), capital cities have hard problems of open space obtain because of the historical heritages throughout the downtown. Only Kuala Lumpur (Malaysia) has large green spaces and well-connected green corridors as a result of its greenery policy which started in the cities infancy. It is easier to obtain information about the structural features of green spaces than biodiversity in greenery. The achievements of initiatives to strengthen biodiversity conservation in developing countries in the tropical zone are very difficult to access, because most countries have no system for biological monitoring. As a solution to this problem, Mabuhay et al. (2005) developed new assessing method of evaluation of ecosystem functions by using molecular ecology. This technology was applied to evaluate the green spaces in Jakarta. The results show the relative poorness of soil microbial communities in the downtown compared with the peripheries of the city. Landscape ecology must develop a solution to above-mentioned urban greenery problems.

This study was conducted under the Global Environment Leader Education Program of Hiroshima University succeeded from the 21st C COE Program of the same university.

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S11-1

Ecophysiological responses of an urban forest during 22 years of climate change

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Urban climate changes for plant life in Tokyo:

Climate change is rather obvious in urban area than natural area. Though the increase of mean air temperature in Japan is 1ºC/100 years, that of urban area is more as 2-2.5 ºC/100 years. The case of Tokyo is most eminent as 3 ºC/ 100 years. The phenomenon of temperature increase is more obvious in minimum temperature than maximum temperature. Mean daily minimum temperature in January of Tokyo had been almost less than 0 ºC before 1950. However, that in 1900's was almost more than 2 ºC, and a thermometer hardly showed below zero. It suggests that Tokyo has been actually changed from temperate to subtropical climate.

Though the increase of summer temperature is 1.5 ºC, which is not so obvious as in winter, the effect of long-wave radiation from buildings is high. Relative humidity apparently decreased 10% from 1910's to 1990's. Summer drought consequently becomes frequent than before.

Study site:

Institute for Nature Study is located in Tokyo downtown. It has 20 ha of forest reserve, where 632 species of spermatophyte were observed. In this study, ecophysiological responses of a deciduous tree species *Cornus controversa* and an evergreen tree species *Neolitsea sericea* were studied since 1988. *C. controversa* is a most common deciduous tree of this forest. Though it increased from 448 in 1954 to 1400 in 1984, the current population was decreased.

N. sericea is a sub-dominant evergreen tree, and much increased from 6 in 1954 to 464 in 2002. The increase of evergreen and subtropical tree is common in this forest. The cause of development of such trees is usually explained as follows; anthropogenic introduction to urban area, rise of winter temperature, process of ecological succession, and avian seed dispersal which is dominant in an urban fragmented forest.

Ecophysiological responses of *Cornus controversa* and *Neolitsea sericea*:

9 and 7 sample trees were selected along two slopes for *C. controversa* and *N. sericea*. Sap flow and microscopic change of stem radius have been measured every 10 minutes for each sample trees. The measurement was continued during 22 years.

Though the stem growth of *C. controversa* was high until 1994, it declined gradually. Evapo-transpiration ratio which was calculated from sap flow and meteorological data is almost equivalent to canopy conductance. It was usually negative-correlated with vapour pressure deficit. But the relation was disturbed and the clear positive relationship was observed with soil moisture in 1995. Since small precipitation was continued from 1994 to 1995, *C. controversa* suffered serious drought damage in 1995. The decline of *C. controversa* after 1995 might be attributed to this damage. From 2004 to 2008, 689 trees died due to the attack of explosive population of moth. The mechanism of the burst of moth population and the damage of *C. controversa* will be discussed.

The stem growth of *N. Sericea* was stable during 22 years. The transpiration seemed to be activated since 1995. It might be correlated with the decline of *C. controversa* trees. The dominance of subtropical trees should be accelerated both by climatic change and the decline of temperate deciduous trees.

S11-2

Changes of plant phenophases and their relation with recent warming in North China cities

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In recent years, climate warming has lead to visible shifts of plant phenology, which were tested in almost every part of the world, in East Asia, in North America, in Australia, as well as in Europe. Here, based on more than 40 years of observations from China's Phenological Observation Network (CPON), we analyzed phenological changes in some cities, most of which distributed in North China and Northeast China. The purpose of this study is to find phenological changes in some key period, such as in spring and in autumn, and changes of some important phenophases, such as growing season and canopy duration. Syringa oblata, Morus alba, and Ulmus pumila were taken as examples in this study. We choose leaf and flowering events in spring and early summer, and the end of leaf yellowing in autumn as the main phenophases. The canopy duration (namely period between beginning of leaf flush and end of leaf yellowing), flowering duration (period between beginning and end of flowering) and growing season were calculated according to the above parameters. It is found that it is very popular for phenophases in spring to advance during the last few decades, but on contrast, most autumn phenophases delay. As a result, the canopy duration and growing seasons for most samples prolong more or less. And this will have great influence on the function of ecosystem, and can affect carbon balance of terrestrial ecosystem in a long run.

S11-3

Estimating aboveground carbon stocks of urban forest using LiDAR

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Carbon reduction activities approved by Marrakesh Accords include revegetation and forest management (UNFCCC, 2001). These activities are accounted as carbon credit. The carbon stock from forest is getting a major credit for emission trading. Industry generates carbon dioxide mainly sourced from fossil fuels is encouraged to replace the renewable energy as the alternative. Urban forest is, therefore, managed effectively as local energy resources. Beside the carbon storage, urban forest contributes the conservation of biodiversity, the aesthetic value of landscape, the prevention of disaster, the moderation of urban heating, the fixation of carbon dioxide, and the other ecological services. For all of these significant values, trees in urban forest should be inventoried and monitored precisely.

Conventionally field measured Diameter at Breast Height (DBH) has been used for estimating aboveground carbon stocks. Fujiwara and co-authors (2002) used the equation: $Y = a\{(X+c)^b - X^b\}$ [1] (where Y: yearly growth of dried woody biomass, X: DBH or tree height, a, b, and c: coefficients) and Matsumoto (2005) used the equation: $C = V \cdot D \cdot BEF \cdot (1+R)$ [2] (where C: carbon stock of forest biomass, V: stem volume, D: basic density, BEF: expansion coefficient, R: the ratio between above- and belowground biomass). To verify these modelling, extensive field sampling is required. The field measurement is time consuming and the sampled areas are limited. LiDAR (Light Detection and Ranging), therefore, takes an important role to quantify accurate tree attributes efficiently in a wide area. Moreover, LiDAR measurement is the most accurate to detect carbon change (Patenaude et al., 2005). In this study, tree parameters derived from LiDAR are utilized to estimate carbon stocks in urban forest. In urban setting, pruning prevents their growth and influences the estimation of carbon stocks. And the strength and frequency of pruning should be inventoried (Fujiwara et al., 2003). The multi-temporal LiDAR data can, however, quantify the exact change of tree shape to distinguish between pruning (loss) and the growth (gain) of tree crown shape through the wrapped surface reconstruction using airborne LiDAR (Kato et al., 2009). LiDAR approach is, therefore, the most efficient and effective way to estimate aboveground carbon stocks in urban forest.

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S11-4

Evaluating belowground carbon sequestration of urban parks in Tokyo, Japan

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Organic matters produced by plants from carbon dioxide and another minerals are used by various animals and microorganism as source of energy. A part of organic matters are supplied to the soil and remain as humus in the terrestrial ecosystem. Because the decomposition or mineralization of humus is difficulty, humus in the soil functions as carbon (C) sequestration for long time.

In Japan, some studies on urban parks as C sequestration have been carried out. Some earlier studies possibly underestimated urban parks as C sequestration, because they included plants but excluded soil.

Formerly, we investigated the C content of the soil (0-30 cm depth) in 19 urban parks in the Tokyo metropolitan area. Average C contents of turf, tree-planting area with plant management (with weeding and removal of fallen leaves) and coppice (or tree-planting area without plant management) were about 82, 79 and 120 Mg-C ha^{-1}, respectively (Takahashi et al., 2008), and were larger than the C content of trees in an urban park, as estimated in previous studies (Ichimura, 2006).

To determine how they function as C sequestration, data on C accumulation rate are also needed. We investigated carbon content of soil (0-30 cm depth) in 18 parks in Setagaya city, Tokyo. In this study, because we limited the source of supply of carbon to roots, vegetation type of study sites was limited tree-planting area with removal of fallen leaves. We examined the determination C accumulation rate from the years after the park established (12 - 76 years) and carbon contents (approximately 60 - 135 Mg ha^{-1}). However, the relationships between them were not clear. It seemed that the different in characteristics of initial soil used developing the park, number of visitor, history of land use, plant densities and others affect soil C content.

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S11-5

Improving the thermal environment by greening at a building site

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There are tangible signs of heat-island phenomenon in urban area due to the increase of concrete and asphalt surface, artificial exhaust heat from automobiles and air conditioners and the decrease of greenery area and water surface. In private sectors which occupy large parts of cities, it should be necessary to promote greening at building sites, such as green roof and green wall.

Based on the recent policies for mitigating the heat-island phenomenon, this study quantitatively assessed the effects of wall greening on the thermal environment in an urban district. We measured the radiation properties, evaporation, and heat balance of wall greening systems, and conducted simulation analyses of the thermal environment by modelling the actual district and using the measured values. The paper consists of five chapters.

Outdoor experiments were conducted to quantify the effects of wall greening. Measurements on walls covered by greening panels and concrete walls painted white revealed that greening panels had a heat flux property and reduced reflected solar radiation by about 60%. The mean radiation temperature (MRT) calculated from the measurements showed that the greening panels lowered the temperature by 10ºC at peak time. Wet black-bulb temperature (WBGT) and SET* (the new standard effective temperature) were calculated as thermal indices for body-sensed temperatures, and both showed that the green panels reduced the temperatures by 1 to 2ºC. The green panels were thus quantitatively verified to improve the thermal environment.

Then we tried to evaluate quantitatively the improvement effects of thermal environment, which was attributable to the latent heat of vaporization from the surface of wall greening. The evaluation involved monitoring the changes in weight of panel types of wall greening, calculating the latent heat flux by transpiration, and examining the reduction in sensible heat flux by wall greening. The analysis showed that 60% of the net radiation was absorbed as the latent heat flux in the wall greening panel, and it was effective for quantitatively estimating sensible heat flux control. The evaporation efficiency rate, which is shown an evaporation characteristic, was then calculated from convective and material heat transfer coefficients, which were estimated from SAT measurements. The resultant evaporation efficiency was 0.20 - 0.40.

Simulating with computational fluid dynamics (CDF) at a district in Chiyoda, Tokyo where the heat-island phenomenon is marked, based on these basic data above monitored, such as convective heat transfer and evaporation efficiency. The improvement effects of various degrees of building greening were quantitatively simulated using computational fluid dynamics (CDF). Greening of the walls as well as the roof was shown to reduce the air temperature and MRT in the district by up to 3ºC and SET* by up to 1ºC.

S11-6

Green infrastructure - contribution to adaptation to climate change in Greater Manchester

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There is widespread acknowledgment that climate change is happening now and is set to intensify. While mitigation efforts are essential for limiting the future extent of climate change, greenhouse gases have a delayed impact, and even if emissions ceased tomorrow there are decades of climate change already locked into the climate system. Therefore, adaptation to climate change impacts is crucial. Urban areas face particular challenges due to their high population density, which puts large numbers of people at risk of climate impacts. Responding to the threats associated with climate change such as heatwaves and floods, which are intensified by the character of urban areas, is therefore vital to create liveable cities for the future.

Increasing green space cover in cities not only contributes to enhanced biodiversity but also regulates temperatures and surface water runoff (Gill et al., 2007). Consequently, green spaces in cities reduce the risk to human health and life from heatwaves and flooding. The multifunctional character of urban green spaces has been encompassed in the concept of green infrastructure. Green infrastructure is now recognised by planning policies in the UK as an essential element of urban systems allowing their effective functioning.

This paper reports on an ongoing research project carried out by the University of Manchester-EcoCities (2008-2011). The project investigates the climate change scenarios for Greater Manchester in the North West of England and investigates the current vulnerability of the city-region to climate change impacts. The overall aim of the project is to provide a ‘blueprint’ for an integrated climate change adaptation strategy for the city-region, which will guide the decision-making process of local planning authorities and other stakeholders in the city-region.

This paper investigates the potential of adaptation to climate change in Greater Manchester with the use of green infrastructure in order to reduce the susceptibility of communities to heat waves and flooding. Firstly, vulnerability of communities to heat waves and flood events was assessed. This included a geospatial analysis of a number of indicators relating to the vulnerability of communities in the case of emergency, as well as the potential of people to recover after extreme weather events. Then, the land use in areas containing the most vulnerable communities (characterised by poor health and low income, high percentage of ethnic minorities, or large proportion of elderly or children in the population) was analyzed.

It was found that lack of green spaces coincides with areas that are inhabited by communities most vulnerable to heat waves and urban flooding. The absence of regulating services of green infrastructure means that the high temperature and flooding risks to people are further increased. Therefore, provision and enhancement of green infrastructure is recommended as an essential element of the portfolio of adaptation responses. These responses are context-dependent and have been classified according to the characteristics of the population and the neighborhood characteristics. These responses will form part of the adaptation blueprint for Greater Manchester and will help to make decisions regarding long-term land use planning for the city-region that take into account climate change.

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S11-7

Urban biodiversity, climate change and demographic change: challenges for urban development in Germany from the perspective of nature conservation

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In Germany, urban landscapes face different challenges including loss of biodiversity, impacts of climate change and effects of demographic change. Since German cities and urban agglomerations concentrate about 75 percent of the population, it is obvious that the efforts of nature conservation cannot stop at city boundaries but have to include cities and urban regions. In this context, the presentation focuses on various activities of the German Federal Agency for Nature Conservation (BfN) concerning urban landscapes such as the implementation process of the National Strategy on Biological Diversity as well as research and implementation projects.

In regard of biodiversity, cities and municipalities are important in two ways: One the one hand, they are places of diversity of species and habitats due to their unique mosaic of different site conditions at relatively narrow space. In addition, ecosystems fulfil essential ecosystem functions in urban regions and urban biodiversity is a decisive factor for living quality. On the other hand, urbanization is one of the major threats to global biodiversity leading to destruction, fragmentation and disturbance of habitats. This is why the general assessment of urban regions with regard to biodiversity is difficult. Definitely, biodiversity in urban regions must not be restricted to the level of species but requires a more complex consideration.

The interest for nature conservation in urban landscapes has been growing internationally and in Germany over the last years. The National Strategy on Biological Diversity which was adopted by the German government in November 2007 contains a vision as well as concrete objectives and measurements for urban landscapes (German Federal Government, 2007). Obviously, the strategy can only be implemented successfully in dialogue with all stakeholders. Especially cities and municipalities are important partners because their local action is decisive for safeguarding biodiversity. Therefore, in 2010 the BfN initiated a dialogue process with all German municipalities and cities aiming at the comprehensive consideration of biodiversity at the local level. The presentation will introduce the activities such as the declaration and the planned alliance of German cities and municipalities for biodiversity.

Climate change is a threat for biodiversity and living quality with high relevance for urban landscapes, because it will intensify the extreme urban climatic conditions. The presentation shows the results of the research project “Urban Nature in Climate Change” which aimed to clarify the beneficial functions of urban green spaces and to develop strategies for the adaption to climate change which at the same time contribute to the conservation of biodiversity and the improvement of living quality.

Cities and urban regions in Germany face further challenges such as demographic change, i.e. shrinking processes leading to urban derelict land which currently covers about 150,000 hectares. Due to the lacking demand for building purposes the development of green spaces is an important option and challenge for those areas. In this context, the presentation finally focuses on the ongoing implementation project “Urban Forests” aiming at the development of urban forests on derelict land in the city of Leipzig (Burkhardt et al., 2008).

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S12-1

Giving view point of small crab to kids for evaluating urban green space

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In the Erfurt Declaration (2008), URBIO emphasized importance of urban biodiversity, which is as only the chance to touch with biodiversity/nature for urban dwellers. Then do urban dwellers recognize its importance actually? If not, what kind of opportunity or device should be provided to urban dwellers to raise awareness? Answering to these questions by giving an example is the aim of this presentation.

A natural forest has been remained on an isolated hill, called "*Shiroyama*", which is situated at a centre of Tokushima City surrounded by rivers with brackish water. The forest has been designated as natural monument by the government of Tokushima city. Tokushima Castle used to locate on the hill, and remnant stonewall has been designated as cultural monument by the national government.

The space has been open to public as central park, and around the natural forest several items have been set for use of people; artificial stream and ponds for giving accents in landscape, road for walking, jogging and bicycle, rose garden and cherry trees for enjoying flower blossom, etc. According to results of questionnaire to 3,600 dwellers of Tokushima City, over 80% of dwellers have visited *Shiroyama*. The main purposes of visiting are use of these items, flower blossom watching in particular, and only 5% of visitors use natural forest for walking and environmental education. Forty percent of dwellers know that *Siroyama* has been designated as cultural heritage, while only 27% know that as natural monument. These facts represent that most of urban dwellers do not recognize ecological value of remnant forest, and not obtain ecosystem service positively.

It is necessary to develop a device to be aware of value of nature in the city. We, therefore, attempted to use small crab, *Chiromantes haematocheir,* as a material for raising awareness. Because the crab needs several landscape elements to complete its life cycle, it is suitable as an indicator for evaluating function of landscape elements composed of *Shiroyama*; the maturing and matured crab live in the forest as well as artificial stream due to necessity keeping humidity for branchial respiration, and use holes of stonewall as shelter. Matured crabs come down to river along the hill to release zoeae (life stage of plankton-like form) into brackish water, and larvae come back to the ecotone and to the forest. Thus quality of river water and terrestrial-aquatic ecotone is very important as well as terrestrial/forest condition.

Using the characteristics on habitat use of the crab, we made a program for environmental education and attempted it to kids of elementary school. The program was very simple, just ask kids to find out the crabs at first, then discuss on the places and their characteristics where they could and could not find the crabs. As a result, kids could get view points of the crab and easily understand functions of landscape elements.

It is considered that urban dwellers who have concern and enjoy biodiversity in city are still little, and thus it is important to find materials which can easily treat and well indicate history and environments of the local area, and then develop programs to raise awareness.

S12-2

Regeneration of Satoyama ecosystem services as an educational resource

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Recent deterioration of Satoyama ecosystems associated with loss of its ecosystem services in provincial cities of Japan is largely due to underuse and reduced management of the forest resources caused by decline of the values of forests for local residents, their main caretakers. In order to rehabilitate the values of Satoyama, creation of diverse modes of resource use and ecosystem services is essential in the modern socioeconomic as well as cultural contexts. We designed an experimental setup to reproduce traditional resource use and create new ecosystem services in a small Satoyama forest within the property of Nagano University in a provincial city of the central Japan to construct new resource use patterns of suburban forests in collaboration with local communities.

Various indigenous wild fruit trees are reintroduced to the experimental forest to create new agroforestry resources. These wild fruits also attract fruit-eating birds for bird-watching, and these birds are in turn expected to increase plant biodiversity by seed dispersal. A forest thinning system using ring-barking with circular peeling of barks at the base of trunks to remove vascular bundles is applied to sawtooth oak trees to produce dieback trees. The peeled trunks with abundant tree sap attract beetles for insect collectors, while these beetles and boring insects attracted to the dieback trees are also consumed by various bird species. Fallen leaves are collected systematically from the forest floor to test traditional composting method while producing cleared forest floor for growth of spring ephemeral herbs. A small reservoir pond is rehabilitated in the forest to create ecotones and habitat diversity as well as serving as recreational and educational resources. A network of web cameras and electronic sensors are established in the forest for automated monitoring of the changes of the habitats, biodiversity and ecosystem services following various interventions.

All these activities are synthesized in the “Toolkit for Regeneration of Satoyama Ecosystem Services” and embedded in the university curriculum of environmental education called “Creator of Forest Ecosystem services Course” consists of a series of lectures and field practical. Students are trained for basic policy of the regeneration of Satoyama ecosystem services, various methods of management and interventions upon forest ecosystems, monitoring of biodiversity and potential ecosystem services to evaluate the effects of human intervention upon Satoyama ecosystems, and the planning and practices of effective activities to take advantage of forest ecosystem services for sustainable development of local communities. After completing the required classes and passing the final examinations, the students are qualified as the “Creator of Forest Ecosystem Services”. In this paper, we describe philosophy, approach and potential impacts of the experimental regeneration of Satoyama ecosystem services in a provincial city in Japan, together with the principle and design of environmental education curriculum using Satoyama ecosystems and its potential educational effects upon human resource development for constructing sustainable suburban communities.

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S12-3

Urbanites meet urban biodiversity

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Introduction - The attention is increasingly being drawn to the fact that mankind's relationship to other species on the planet is being determined more and more by the values of the urban population (Miller, 2008). Perceptions and experiences of nature in everyday life thus assume a fundamental importance for the conservation of the Earth's biological diversity as well as making an important contribute to the quality of life of people in the cities (Petersen et al., 2007).

Two "best practices" from Germany will be presented which are focussed on the point, to bring citizens in contact with urban nature and urban biodiversity and, by that way, to increase the awareness about biodiversity.

The locations - The "best practices" are from Berlin and Frankfurt and both cities are specific cities, because Berlin is the secret German capital of urban ecology and Frankfurt the secret German capital of urban biodiversity.

Berlin- the Long Day of Urban Nature - The Long Day of Urban Nature (Langer Tag der Stadtnatur) is a Berlin-wide festival lasting 26 hours and will run the fourth time in 2010. It includes several hundred activities from tours of courtyard gardens hidden behind apartment buildings to nighttime searches. It presents a colorful picture of all the parks, zoos, teaching farms and other nature-oriented projects in Berlin. The approach is to bring citizens to places of urban nature.

Frankfurt- biodiversity, a campaign of the network BioFrankfurt - The BioFrankfurt network brings together 16 reputable institutions from the Rhine Main region and aims to increase public awareness for the meaning and importance of biodiversity. From 2007 to 2009, the network organized a campaign about the surprising diversity of animal and plant life in the city and its surroundings, and their important role for the ecological balance of the region. In contrast to Berlin, the main approach was to bring information about biodiversity to locations where many people are. Special video clips and films were produced, shown on info-screens at transport stations and so on.

Conclusion - Both cities and both campaigns are not typical activities of German towns and cities with respect to the topic urban biodiversity, but both campaigns are really best practices and good examples to be copied by other cities on the world.

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S12-4

Using school green roofs for environmental education

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Lands in compact cities are overwhelmingly covered by buildings and roads with little spaces left for vegetation. The opportunities offered by the vertical dimension are often ignored. Buildings are earnestly extended upwards to create elevated usable spaces. Every floor of the high-rise buildings is thoroughly used. Inexplicably, the fervour to maximize the use of hard-earned elevated space stops on rooftops. Paradoxically, with widespread deficiency in open spaces, most rooftops remain idle and denote a wasted resource. This is a treasure trove waiting to be converted into elevated gardens to add a new dimension to the urban landscape. School green roofs can potentially benefit a large segment of the community by using the green sites for teaching, learning, learned leisure, recreation and amenity. Green roofs in schools denote valuable nature in the city, nature in the school, and nature in the classroom. They embody rich knowledge contents, with potentials for teaching and learning activities. They offer living classrooms at friendly, familiar, convenient, accessible and safe sites in school grounds. The teaching and learning endeavours could be conducted under the supervision of teachers. They are particularly suitable for repeated observations and measurements associated with long-term environmental monitoring studies. Children can combine learning with playing in their encounters with the elevated gardens. Students can be encouraged to participate in the maintenance of the green roofs, playing the dual roles of both users and managers. With opportunities for direct contact with nature, children can witness and study the seasonal and other changes in the vegetation and wildlife. The sky gardens can serve as a platform to learn about the constituent components of an ecosystem, including soil, water, microclimate, vegetation, wildlife, and the interconnectedness of nature. The factors and processes, natural and human, in sustaining the green roof ecosystem, could be assessed. The study could extend from pattern to the dynamic dimensions of time and space by monitoring the changes in the ecosystem parameters. The active learning activities could venture into the realm of wholesome hobbies by developing student interest in horticulture, including the cultivation of ornamental and food plants. Such valuable learning activities, with the help of field observations and measurements, experiments and exercises, could reinforce student understanding of nature, and human impacts on nature leading to environmental problems, and the search for solutions to such problems. In using green roofs for educational purposes, students could break the barriers between disciplines to realize that knowledge has no artificial boundaries. A multidisciplinary approach helps students to explore the complex environmental issues, the understanding of which demand integrated analysis and interpretation. The learning activities could be designed to facilitate the acquisition of the scientific method of inquiry. They could nurture generic scientific skills of developing study questions, formulating hypothesis statements, field and laboratory observations, setting up experiments, collecting primary or first-hand data, data analysis, data interpretation, problem solving, drawing valid and evidence-based conclusion, independent thinking, lateral thinking, and discussions and interactions in a group. Some of the exercises require students to conduct systematic search for relevant information from the library and the internet. They provide opportunities to develop the full range of fundamental intellectual and transferable skills, including organizing information and ideas in writing and speaking (literacy), compilation of tables and data analysis (numeracy), depicting results in diagrams and graphs (graphicacy), and practical use of computer programs (computeracy).

S12-5

Integrating ecosystems to evolving urban landscapes in Montreal, Canada

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The close connection between ecosystems and human health has led to increased demand for enhanced quality of life and protection of the environment in cities. Striking a balance between natural and built up environments with a view to creating living areas favourable to citizen well being constitutes one of the major challenges facing cities today. In addition to providing important ecological, social and economic services, natural urban spaces are irreplaceable places of tranquility and escape for city dwellers.

Aware of this potential, the City of Montreal adopted in 2004 the Policy on the Protection and Enhancement of Natural Habitats. The Policy identifies ten *ecoterritories* located in areas under development but which also harbor some of the last remnants of countryside landscapes of substantial ecological value. By targeting these areas, the city seeks to make protection and enhancement of natural spaces a planning priority. The goal is to preserve and sometimes even recreate, within the evolving urban landscape, a sustainable ecological network made up of core areas, buffer zones and ecological corridors. These natural areas will in turn provide habitat for a wide variety of plant and animal life in close proximity to living areas, thereby greatly enhancing the quality of urban life.

The presentation will discuss the planning tools and the practicalities of consensus building which has proven most useful in the implementation of the Policy. It will also focus on how we can better bridge the gap between ecological and economic issues, as they pertain to urban development.

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http://ville.montreal.qc.ca/portal/page?_pageid=5697,32909558&_dad=portal&_schema=PORTAL

S13-1

Influence of the restoration of vegetation management on ecosystem and biodiversity of *Satoyama*

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A large part of *Satoyama* in present Japan is under unmanaged condition. This situation brings to Japan's secondary nature the decline of ecosystem and biodiversity. Degraded *Satoyama* vegetation began to change toward the climax vegetation for more than 200 years maybe. However, this change is difficult to accept as the natural change. Because of the long human management as *Satoyama* a lot of species was lost and impossible to recover. It means that we never give up the management of *Satoyama* forests and we should try to do again. But before 21st century Japan had not done any research in detail about the management of *Satoyama* ecosystem because *Satoyama* forests were not regarded as important ecosystem. Now, managed *Satoyama* forests are regarded as the important vegetation keeping high biodiversity, and the importance to understand the value of *Satoyama* ecosystem is recognized. Kamigamo Experimental Station, Kyoto University, Japan, located in northern urban fringe of Kyoto City, started the restoration research of *Satoyama* on 1999 to reveal the early stage of forest ecosystem change after vegetation management. Three small area of the secondary forest, former *Satoyama*, were intensely thinned except tall deciduous broad-leaved trees. Before and after the management the transition of forest floor environment, tree species vegetation, ground beetle fauna, seed bank condition and so on were investigated. During three years after management environment and biota changed dynamically. Vegetation started to recover just after management by coppicing and seeding from buried seeds and dispersed seeds from surrounding trees. The results of the seeding experiment of seed bank showed its high potentiality to recover rich *Satoyama* vegetation. Uncut deciduous broad-leaved trees seemed to function as perches for birds and to be useful to get the high-quality bird-dispersal tree species effectively. Through the observation a lot of broad-leaved tree species which are considered to compose *Satoyama* vegetation traditionally were found. The environmental change of forest floor brought large change to the ground beetle fauna. Through the investigation for ten years after thinning management it was shown that the initial management plan influenced effectively to the following environmental and ecological recovery. This kind of knowledge is important to restore and keep the high biodiversity in *Satoyama* ecosystem.

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S13-2

Change of woody-species composition in an early stage of plant succession after cutting in a suburban secondary forest dominated by *Chamaecyparis obtusa*

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Introduction - *Satoyama* (a type of secondary forests) in Japan have been mostly abandoned and the ecosystem has degraded since the 1960s. Recently, suburban secondary forests have been re-evaluated in terms of recreation and the conservation of indigenous biodiversity and culture. Some of abandoned secondary forests surrounding Kyoto city have been changed from pine and deciduous broad-leaved forests to forests dominated by *Chamaecyparis obtusa* as well as evergreen broad-leaved forests. In *C. obtusa* dominant forests, plant species diversity could decrease because closed canopy prevents seedlings of pine and deciduous broad-leaved species from germinating and growing. On the other hand, artificial gap creation have been tried in order to increase plant species diversity (e.g. Nakamura et al., 2005). The purpose of this study was to reveal the early stage of plant succession after cutting and to evaluate the effect of gap creation on increasing plant species diversity in *C. obtusa* dominant forests.

Methods - Cutting of small areas (0.06 - 0.09 ha) was conducted at a suburban secondary forest in Kyoto city in order to change dominant species from *C. obtusa* to *Pinus densiflora* and/or deciduous broad-leaved trees. The sprouted stumps, dispersed seeds and seedlings within the cutting areas were recorded after the cutting.

Results and discussions - No species disappeared and more than or equal to 10 species increased at all three plots (upper, middle and lower) by the end of the third year after the cutting. The Fagetea crenatae species, which are main components of deciduous broad-leaved forest, increased by six at the upper and middle plots and by four at the lower plot. It is considered that the cutting of small areas was effective in increasing the number of deciduous broad-leaved tree species.

As most advanced seedlings died after the cutting, it was deemed that they made little contribution to change of species composition. *C. obtusa*, dispersed by wind, occupied high percentage in seed dispersal and seemed to have great influence on regeneration after the cutting. The fact that only two species newly appeared in the third year indicated that dispersal of new species from surrounding forests were limited because the present study site was located within the forest of *C. obtusa* which has generally low species diversity of woody plants.

As for the upper plot, the intensive solar radiation, which was over 60% of relative solar radiation, reduced seed germination and seedling survival of *C. obtusa*, and the vegetation was shifting to the mixed forest of *P. densiflora* and *C. obtusa*. As for the middle and lower plots, the percentages of seedlings of *C. obtusa* were more than 50% in the third year after the cutting, suggesting that selective cutting will be needed for maintaining species diversity of woody plants.

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S13-3

Effects of patch cutting on leaf nitrogen nutrition in natural regenerated hinoki cypress stands at different elevations along a slope in Kyoto, Japan

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Leaf nitrogen nutrition of hinoki cypress (*Chamaecyparis obtusa* Endlicher) in a natural regenerated forest was investigated at three positions along a slope over a period of three years. The study site was located in the Kamigamo Experimental Station, Kyoto University, Kyoto, Japan. This area was once dominated by Japanese red pine (*Pinus densiflora* Sieb.et Zucc.) and naturally regenerated hinoki cypress in the subcanopy, but is currently dominated by hinoki cypress after the dieback of Japanese red pine caused by pine-wilt disease since the 1970s. At each slope position, nitrogen properties were compared in patch-cut plots (0.06-0.09 ha) and uncut control plots (0.04 ha). We hypothesized that higher leaf-litter nitrogen concentration in the patch-cut plots should increase nitrogen cycling. The objectives of the study were to determine: (1) whether nitrogen cycling varies with slope position and (2) whether patch cutting increases soil nitrogen availability and nitrogen concentration in fresh leaves and leaf litter. Nitrogen cycling at the lower slope was characterized by a higher rate of soil nitrogen mineralization, higher nitrogen concentration in fresh leaves and leaf-litter. The soil nitrogen mineralization rate and fresh-leaf nitrogen concentration in the patch-cut plots were higher than those in the control plots. However, leaf-litter nitrogen concentration did not differ between the patch-cut and control plots. The results suggest that slope position strongly affects leaf nitrogen nutrition of hinoki cypress and soil nitrogen availability. By contrast, patch cutting does not affect leaf-litter nitrogen concentration. These findings indicated that the leaf-litter nitrogen concentration of the remaining hinoki cypress trees did not change significantly. Therefore, hinoki cypress would not enhance forest nitrogen cycling through changes in leaf-litter nitrogen concentration after patch-cutting.

S13-4

Logging impacts on forest carabid assemblages at the secondary forest in Japan

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Hypothesizing that small-area logging (<1 ha.) largely influences the microhabitat of carbide beetles, we studied carabid beetles assemblage at Kamigamo Experiment Station (E135º45', N35º04'), Kyoto, Japan, during June 1999 to May 2001, with setting six plots: three experimental (logged; 30 m x 30 m, 20m x 20 m, and 40 m x 15m) and control (unlogged; 20 m x 20 m, each) plots. Totally, 303 individuals and 13 species of carabid beetles were collected at the station. This experimental area may be categorized into forest area, with a few disturbing from a viewpoint of species composition. The number of beetles per trap before logging was significant higher than that after logging in three species of large carnivores *Carabus dehanii*, *Ca. maiyasanus,* and *Ca. yaconinus,* and two species of large insectivores *Chlaeninus posticalis* and *Haplochaeninus costiga*, whereas the reverse was true in two species of small carabid species *Synuchus arcuaticollis and S. cycloderus.* Furthermore, before logging, *Ca. dehanii* had the widest niche in the carabid beetle assemblage in control and experimental plots, while *S. cycloderus* had the widest one after logging, and niche breadth of *Ca. dehanii* was straitened especially in the experiment plot. These results imply that large carabid beetles, i.e., *Ca. dehanii, Ca. yaconinus, Ch. posticalis,* and *H. costiga*, decreased due to logging even in a small area, whereas *S. arcuaticollis and S. cycloderus* may not be influenced by logging; they increased all the areas in 2000 and 2001. The weight of FH layer was affecting total number of beetles significantly in *P. latemarginatus*, marginally significantly in *S. cycloderus*. However, the percentage of soil water content and the mean value of the weight of L layer were not significant factor affecting total number of beetles in all the species. The results in this study suggest that 1) the richness of the FH layer and vegetation, i.e., the potential food abundance and habitat richness, plays an important role on determining species richness and the density of the carabid assemblages, and 2) even small-area logging gives a negative impact on the density of the large predatory carabids, which are regarded to be sensitive indicators of forest disturbance.

S13-5

Range expansion of non-indigenous *Litsea cubeba* in a suburban secondary forest

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The concern with species diversity and the influence of invasive species in secondary forests has been growing in recent years. We investigated range expansion and its processes of non-indigenous invasive species *Litsea cubeba* in secondary temperate forest. *Litsea cubeba* is dioecious and deciduous tree that belongs to Lauraceae. This species distributes in southern parts of Japan, China, India et al. Recently escapes from plantation in Japan were reported. We examined the distribution, seed dispersal, soil seed banks, seed emergence and seedling growth rate in Osaka and Kyoto. Range expansion was estimated from the transplantation record at Kamigamo experimental station and the distribution in Kyoto in 2002. There were only three trees of *Litsea cubeba* in 1954, 59 flowering trees, 33 female and 26 male trees were observed in 2002. The maximum distance between original planted and present location was 442 m. This led the range expansion rate with 9.2 m per year. Seed dispersal observation with seed trap and seed bank observation with extracting seeds from sampled soil (50 cm x 50 cm x 5 cm) within 30 m from seed source trees were performed at Kamigamo experimental station in 2002. Just beneath the seeded trees, density of both seed dispersal and seed bank were high. Dispersed seeds were only observed with the trap at 15 m distance. On the contrary, constant soil seed bank density was recorded at the location from seed source with 10 to 28 m distance. This showed that *Litsea cubeba* established the permanent soil seed banks. Seedling emergence observation at clear-cut site in Osaka showed that both *Litsea cubeba* and *Mallotus japonicus* that was a pioneer and rapid growth species were emerged at sites with large gap fraction rate. Comparison of gap fraction rate between emerged subplots of *Litsea* and *Mallotus* exhibited that *Litsea* could emerged in darker environment. Current seedling growth of *Litsea* was larger than that of *Mallotus* in open site. Furthermore shoot growth of coppiced tree was larger than that of *Litsea* seedling. *Litsea cubeba* is able to form permanent seed banks presumably because of its long seed longevity around planted area, and the disturbance will cause the germination and emergence. The advantage of rapid growth rate of both seedlings and sprouts from stumps will enable the range expansion and regeneration of *Litsea cunbeba* population in suburban secondary forest.

S13-6

Dynamics of abandoned bamboo forests in an urban fringe landscape

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Bamboo forest is one of the typical secondary forests in Japan, which were artificially maintained but later have been abandoned. It is principally important to understand dynamics of the abandoned bamboo forests in order to develop a proper management strategy for controlling massive expansion. The objectives of the present study are to demonstrate the expansion performance of bamboo forests, the relationship between expansion rate and environmental conditions, and culm invading process from the aspects of both the landscape scale and the stand scale.

The landscape study scale demonstrated bamboo forests' expansion patterns in urban fringes of Okayama City, western Japan. Data extraction and processing, and spatial analyses were performed using geographic information system (GIS). A parameter representing expansion rate of bamboo forest, afterward called as expansion distance index (EDI), was established and then used for evaluating the effects of slope steepness, surrounding land-use, and geological conditions on the expansion rate of bamboo forests. The results showed that among three factors, only the surrounding land-use type significantly affected the annual EDI. The mean annual EDI of bamboo forests surrounded by other secondary forest is larger than those surrounded by non-forest land.

The relationships between the expansion pattern of bamboo forest and the surrounding conditions in the landscape scale were confirmed in a stand scale study. This stand scale study analyzed the relationships between expansion in bamboo forests and the canopy structure of adjacent forest, which is characterized by relative height (i.e. higher and lower than bamboo forest), species composition of surrounding forests canopy (i.e. deciduous broad-leaved, evergreen coniferous, and mixed forest), and sparseness (percentage of crown projection area of canopy). The result showed that expansion and culm recruitment were more prominent in bamboo forest adjacent to lower forest than in bamboo forests adjacent to higher forests. Density and aboveground biomass increments in the bamboo forests edges showed negative relationship with closure (crown projection area) of canopy trees, the larger the crown projection areas of canopy trees, the lower the increments were. For the purpose of having a view on how living bamboo culms were distributed in invaded higher forest, the densities of living culms located under and between canopy trees were compared. The results suggested that culms establishments under canopy trees in invaded mixed forests were likely to be more frequent than under canopy trees in invaded evergreen forest. Overall, the discussion in this study clearly complements the explanation of the difference in expansion rate in bamboo forests due to the different type and relative height of surrounding forests. This study also provides additional information beyond findings in the landscape scale study. Specifically, there is a clear indication of the surrounding forest's closure as one more factor affecting the expansion rate, in addition to the forest type and relative height to bamboo.

S13-7

Initial regeneration after a cutting aimed for conversion of forest types in a suburban forest: a study of *Castanopsis* forest in Higashiyama, Kyoto

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Secondary forests in western Japan have been changing from pine and deciduous broad-leaved mixed forests to evergreen broad-leaved forests, because of the reduction of human activities. In Kyoto, the ancient capital of Japan, many suburban forests used to be covered with Japanese red pine (*Pinus densiflora*), but due to the pine wilt disease since 1980s, many pine trees have died and some of the suburban forests are changing into evergreen forests. Especially in the Higashiyama hill area, *Castanopsis* forests are expanding in a remarkable speed. This expansion is regarded as an ecological and scenic problem. Kyoto-Osaka District National Forest Office is heading for conversion of *Castanopsis* forests into mixed forests comprising not only *Castanopsis* but also naturally regenerated deciduous trees, by partial patch cutting, in Kodaiji-yama National Forest of Higashiyama. Although *Castanopsis* regenerate after cutting due to its high sprouting ability, deciduous pioneer species dominate before the recovery of *Castanopsis*, in Nansei Islands such as Okinawa. This shows the possibility for deciduous trees to form canopy before the recovery of *Castanopsis*, if all the *Castanopsis* were cut again with deciduous trees left. The objective of this study was to clarify the initial regeneration after cutting *Castanopsis* forest in Higashiyama.

The study area is located in Kodaiji-yama National Forest. A strip clear-cutting was carried out at a stand dominated by *Castanopsis*, in spring of 2000. Part of that stand was cleaned again in spring of 2008, except most of the deciduous trees. A 15 m x 30 m plot (plot1) was set up in the former area, and a 20 m x 20 m plot (plot2) was set up in the latter area. 28 and 25 quadrats (2 m x 2 m each) were set up in plot1 and 2, respectively. All tree stems taller than 1.3 m in both plots were tagged and recorded including species name, DBH and height, in spring of 2008, winter of 2008-2009 and autumn of 2009. Vegetation coverage of understory (below 1.3 m) was visually estimated on each quadrat by species, in autumn of 2008 and 2009. Hemispherical photographs were taken at both plots in summer of 2008 and 2009, and the canopy openness of each photograph was analyzed.

In plot1, the regenerated stand was dominated by *Castanopsis* again in 10 years after clear-cutting. *Castanopsis* occupied over half of the stand by basal area. They regenerated mostly by sprout and dominated the closed canopy. Meanwhile, deciduous trees such as *Ilex micrococca* and *Mallotus japonicus* occupied 18% of the stand by basal area. *M. japonicus* recorded a high mortality rate and it had only suppressed small trees, while *I. micrococca* had some larger ones. *I. micrococca* is a species which lives in evergreen forests and grows as 25 m tall. So it may have the ability to form canopy in regenerated stands.

In plot2, *I. micrococca* and *M. japonicus* comprised nearly half of the remnant trees by basal area. The growth in thickness of remnant deciduous trees in plot2 was significantly larger than that of deciduous trees in plot1, so the cleaning promoted the growth of remnant deciduous trees. In addition, the growth increment in thickness of large trees was superior to small ones. On the other hand, *Castanopsis* dominated the understory in 2 years after cleaning. Some of them grew to be 3-4 m tall and may overtake remnant *I. micrococca* in the near future. Therefore, further cutting of *Castanopsis* may be required in order to convert *Castanopsis* forests into mixed forests comprising *Castanopsis* and deciduous trees.

S13-8

Effects of cutting system causes to species diversity of understory vegetation in origin Satoyama

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In this report, we discussed the effects of forest cutting practices on plant species diversity in the understory of manmade coniferous forests, converted from Satoyama woodlands. Forest cutting practices and forest management that enhance species diversity in manmade coniferous forests were proposed.

(1) Strip cutting

An 18-meter-wide (equal to the height of the trees) contour strip of a 40-year-old even-aged forest stand of *Cryptomeria japonica* (*C. japonica*) was cut, and the number of plant species grown in the understory was examined 15 years after strip cutting. The maximum number of species found in the understory of the area subjected to strip cutting was 24, whereas the minimum number was 10. In the understory of the nearby reference forest stand of 55-year old even-aged *C. japonica* (ordinarily maintained), the number of species ranged from 13 to 5. The edges of the forest stand tended to have increased number of species and standing stock to a similar extent as those observed in the center of the area subjected to strip cutting.

(2) Line cutting

The first two in every seven rows of a 40-year-old even aged *C. japonica* forest stand were cut, and the processes of vegetation regeneration in the cut and uncut rows were investigated for 5 years. There is a secondary cool temperate broadleaved forest that is 300 meter away in a straight line from the *C. japonica* stand, and this served as an adjacent source of seed supply. Furthermore, because trees were harvested and transported by dragging after line cutting, the surface of the forest floor of the cut rows was extensively disturbed and the mineral soil layer was exposed. Because of this disturbance, the number of plant species in the understory of the cut rows was in the range of 2-4 in the first year after cutting, but gradually increased to 15-20, and then to 38 and 40 in the third and fifth years, respectively. On the other hand, the number of plant species in the understory of the uncut rows was in the range of 35-61 in the third year, and 57-72 in the fifth year. After the third year, the plant species found in the understory of the cut rows were very similar to the constituents of the adjacent broadleaved forest stand.

Relationships between alterations in canopy architecture and plant species diversity in the forest understory were investigated in two experimental forests. The results suggest that strip or line cutting that can regularly create and maintain big canopy gaps are effective in maintaining plant species diversity in the forest understory. Furthermore, it was suggested that plant species diversity in the forest understory can be controlled by hierarchical alteration of canopy distribution.

S13-9

Vegetation management for conservation of species diversity in summer green forests

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Satoyama (rural forests) has provided fuelwood and compost until before around 1960. *Satoyama* was thus used to provide many of the essential of daily life. However, the links between people and the forest gradually have grown weaker with the occurrence of the fuel revolution and the appearance of chemical fertilizer. These brought about a change in the environment within the forest. *Satoyama* is being damaged by climbers, bamboos and pine wilt disease. It has been clarified that the number of species in *Satoyama* is gradually decreasing with progressive succession.

The vegetation and management of *Satoyama* were studied for conserving the species diversity effectively and sustainable. For the purpose of creating the physiognomy of summer green tall forests and increasing species richness, coppice forests (summer green secondary forests) and pine forests (pine dominated secondary forest) were managed by selective cutting lucidophyllous shrubs and bamboo grasses, and by keeping dominant trees like *Quercus serrata* and *Pinus densiflora* intact. Twenty fixed quadrats (size of 100 m^2) were set in 13 areas under the "*Satoyama*" Management Project in Hyogo Prefecture, and the vegetation was investigated for 9 years after the selective cutting so-called "Hyogo-model" vegetation management. The number of species increased markedly during the first 5 years after the selective cutting, as compared with the number before this selective cutting, except for some areas in which species such as *Dicranopteris linearis* were dominant. Species that increased on the forest floor can be classified into phytosociological elements. The main species that increased after the selective cutting was summer green secondary forest elements, the dominant species in the coppice forests. The ratio of the number of disappeared species against those of the number of species that appeared was low for the summer green secondary forest elements while the ratio was high for the grass elements and forest edge elements. These species were not the dominant species in the summer green secondary forests.

Therefore, it is considered that moderate improvement of light conditions after "Hyogo-model" vegetation management promotes the growth of summer green secondary forest elements, resulting in increase of species richness in the summer green secondary forests. In addition, a second selective cutting at the time when the number of newly appeared species reached a plateau after the first selective cutting was considered effective to keep the species richness.

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S13-10

An attempt of recovering *Pinus densiflora* forests in urban forests

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Due to long-term deposits of management and pine wilt disease, the *Pinus densiflora* forest has sharply declined in Japan, since the 1990s. A lot of degraded forests due to pine wilt disease were seen, in which *P. densiflora* were rare and subtrees assumed advantageous position. In many locations where *P. densiflora* survived against pine wilt disease, the management objective of re-induce the *P. densiflora* forest was effectively carried out. While the research on the recovery of *P. densiflora* in forests degraded by pine wilt disease was a little, we analyzed the impacts of different thinning intensities and ground treatments on initial regeneration of *P. densiflora* in forests affected by pine wilt disease. In these degraded forests, we set up four study subsites of various thinning intensities: a clear-cut subsite; a heavily thinned subsite; a weakly thinned subsite; and an unthinned subsite. At the four study subsites, we set up four, two, six, and two experimental plots, respectively. Each experimental plot comprised two subplots: a 1-m^2 humus-free (A_0-free) subplot and a 1-m^2 A_0-intact subplot. In each subplot, we conducted a four-year survey on the growth of sown *P. densiflora* seedlings; and monitored the changes in the light environment and the recovery of understory vegetation for four years after the seeding. Although our results indicated that thinning boosted the initial growth of seedlings, the growth of seedlings in the heavily thinned A_0-intact subplot was minimal. We believe that this was because heavy thinning promoted the overgrowth of understory vegetation and restricted the growth of seedlings. However, in the A_0-free subplot of the heavily thinned subsite, the understory vegetation seldom overgrew, allowing the seedlings to grow quickly. Furthermore, four years after thinning, the canopy openness at 1.3 m height remained at ≥35%. Therefore, removal of the A_0 layer after heavy thinning may be the most effective and labor-saving operation for *P. densiflora* regeneration.

S13-11

Dynamics of secondary forests and the conservation

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Secondary forests that used to be artificially maintained are called "*Satoyama*", and have been abandoned since the 1960s because they lost economical values. In these secondary forests, the structure has been changed in various processes, and degradation for specific biodiversity has probably occurred. Therefore, these changes and the mechanisms should be demonstrated, and based on them the restoration and conservation measure should be implemented. In this presentation, the dynamics and the conservation of secondary pine forests damaged by pine wilt disease in the warm-temperate zone will be reviewed and discussed.

Most of pine forests have been abandoned and damaged by pine wilt disease in the western part of Japan. Fujihara et al. (1992) has pointed out that the magnitude of dieback by outbreak of this disease depends on the succession stage. Therefore, it is likely that the mass dieback is accelerated by the abandonment of pine forests. After this mass dieback, understory-dominant species have displaced damaged pine trees and the forests have been developed (Fujihara, 1996). However, the disturbance like this dieback causes only the deficiency of canopy layer and does not intensively affect the understory and forest floor (Veblen et al., 1991; Sakamoto et al., 2003), consequently the succession often depends on the species composition of advance growth in understory, and the forests are often dominated by a few of subtree or shrub species, which have possibilities causing a decline of biodiversity. In these pine forests, it is required to artificially induce the regeneration for the restoration of both pine forests and more developed forests.

An effective way to restore the pine forests is to induce regeneration of pine tree species by the implementation of *Satoyama* management regimes, which include removal of understory and organic layer on the forest floor. These treatments are likely to facilitate growth of remaining canopy pine trees, germination of seeds, and survivorships of seedlings (Iwasaki et al., 1996; Sakamoto et al., 2004). This regeneration by pine tree is probably effective also for the restoration of more developed forests because the establishment of board-leaved tree species is expected through the process of repeated restoration of pine forests. Accordingly, regeneration of broad-leaved tree species in this implementation is also an important subject to be examined.

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S14-1

Ecological service provided by Satoyama and culture

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The word Satoyama in Japanese implies literally the mountains nearby human settlements. In fact, Satoyama is a heavily human-impacted ecosystem which people have been repeatedly used, for harvesting firewood, making charcoals, collecting litter and leaved-branch for manure, obtaining wild plants and fungi for foods. In the other words, we can define Satoyama as an ecosystem which has been modified by human being for the purpose of obtaining “blessing of nature” or provisioning ecosystem services in sustainable ways. Also, Satoyama connotes not only the landscape itself, but also traditional wisdom or knowledge for obtaining sustainable ecosystem services as well as culture which has been developed under rich flora and fauna in the Japanese Archipelago. The landscape of Satoyama is characterized by a mosaic of different land uses to obtain different types of ecosystem services. In southern parts of the Archipelago, paddy field cultivated began in the small basin, alluvial fan and fluvial terrace, not in large delta. Owing to tiny fragmented topographic areas, monoculture has not developed in Japanese agriculture until recently. Agriculture in Satoyama in hilly area is a typically multi-crop culture, including not only annual crops such as rice, wheat, barley, beans and vegetables, but also perennial plants as fruiting trees, bamboo. Broad-leaved tree plantations for firewood and charcoal began in the sixteenth century, using coppice stand of kunugi trees (*Quecus actissima*) for charcoal production. People harvested the sprouting stems at an interval of 8 to 10 years as wood for charcoal. Also, mulberry trees (*Morus bombysis*) were planted for feeding silkworms, and were coppiced. People planted saplings of *Q. actissima* and *M. bombysis* in the terraced field, because they regarded them as crops. As people have been obtaining various materials from Satoyama, the sustainable managements and utilization based on traditional ecological knowledge (TEK) have been done. In the rural culture, techniques to produce tools, textures and medicines from various kinds of woods, bamboo, herbs, grasses and sedges are most developed. Although those techniques are regarded as out-of-date because of world-widely commodity distribution, learning such a rural TEK is still very attractive for younger generations in green tourism. As Satoyama provides various materials, people have intentionally kept high diversity of useful plants and animals. Also, as Satoyama is a mosaic of various land use and provides various habitats including ecotone, unintentionally high biodiversity has been kept too. A mosaic land use for obtaining various ecosystem services and TEK associated them can be found not only in Japan, but also in other regions in the world. It is called as Satoyama in Japan, Maeul in Korea, Munoa in Sarawak (Iban), Malaysia. Especially regions with subsistence agriculture based on paddy field have their own TEL to maintain and utilize plant materials in sustainable ways, which lead to, more or less, the conservation of biodiversity intentionally and unintentionally. A message from Satoyama studies is not a nostalgic one “going back to the past”, but a highly contemporary one: TEK in each region for obtaining ecosystem services in sustainable way gives us a hint for building new lifestyle of health and sustainability, and for establishing a compatible way of biodiversity conservation and utilization.

S14-2

Public perception of cultural services provided by Satoyama in Japan

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The revaluation of rural areas is required for the future management of agricultural land and secondary forest called Satoyama, which are also related to the conservation of biodiversity in Japan. In 2008, a Japanese newspaper company conducted the “100 Japanese rural landscapes contest”, which resulted in the gathering of more than 4,000 nominations form the public, which were in turn used to analyze public perception of Satoyama. The nominated sites were given coordinates and combined with topographic datasets using GIS, and classified into landscape types using cluster analysis. A text mining tool was used to extract keywords, biological names and cultural services from the written appeals in order to investigate what aspects of Satoyama landscapes are valued.

The nominated sites were divided into 6 Satoyama types; Forest Type (forest 88%), Mixed Type (forest 50%, paddy field 20%, other agricultural field 10%), Urban & Suburban Type sites (built-up land 50%), Paddy Field Type (paddy field >60%), Other Agricultural Type and Coastal Type. More than 60 percent of the nominated sites were classified as Forest Type, which indicated that the image of the idyllic Satoyama in Japan is represented by the deep mountain areas far from urban areas.

The words related to the ecological services were extracted from the words appeared more than 10 times. Among those, more than 70 percent of the services were defined as cultural services, which were roughly divided into Landscape, Feelings/Senses, Future/Time, Culture/History, People/Living and Tourism/Recreation.

Forest Type and Paddy Field Type showed the relatively similar values which were associated with Landscape, Feelings/Senses, Culture/History and People/Living. Especially Forest Type was strongly associated with the keywords *Beautiful*, *Traditional rural life style*, and *Sites to Visit,* and Paddy Field Type was significantly associated with the words *Seasons* and *Furusato* (Home). Both rural residents and urban residents living outside of the regions nominated to the sites, but rural residents valued Feelings/Senses and People/Living whereas urban residents valued Landscape more. It shows that the landscape beauties and the place to invoke history and people’s senses were important to attract urban residents to the rural areas.

Mixed Type and Urban & Suburban Type showed the relatively similar values which were people/Living and Tourism/Recreation. The words *Biodiversity* were significantly associated to the sites, and especially bird species were strongly associated to Urban & Suburban Types. It indicates that the green areas or agricultural field remained in/besides urban regions were valued due to the sites for recreation and nature activities by urban residents or NPOs.

Other Agricultural Type and Coastal Type were more associated with the words defined by provisional services rather than cultural services, such as fruit, vegetable, pasture and fish. The only cultural services associated with Other Agricultural Type were the words *Landscape* and *Research,* and Coastal Type with the word *Future*.

The result showed that the contemporary Satoyama have different challenges and roles depending on their types, yet each sites have variety of cultural services. To investigate these cultural services might be the key to share urban and rural and to the sustainable Satoyama management in future.

S14-3

Current style Satoyama utilization to recover the forest health

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Recently "Satoyama" forest surrounding rural communities is widely declining by epidemic diseases. Pine stands had decreased by the pine wilt disease caused by an exotic nematode, *Bursaphelenchus xylophilus*, that was induced a century ago (Zhao et al., 2008). In addition, mass mortality of oak trees caused by a fungus, *Raffaelea quercivora*, is increasing year by year in the Honshu island of Japan from 1990s (Kuroda, 2008).

The factors promoting the declining were investigated and the technique to recover health was discussed. This wilting disease of oak trees is occurring in the forests that had been used for fuelwood and charcoal production and then left unmanaged from the energy revolution started in 1950s, or that have grown after the extensive pine wilt. Traditional coppicing by periodical cutting of 15 to 30 years intervals had stopped around 1980 and therefore 40- to 70-year-old oak stands are distributing everywhere today. An ambrosia beetle, *Platypus quercivorus*, which vectors the wilt pathogen from dead to healthy oak trees, can propagate effectively in aged and thick trunks. Due to the extensive population growth of this beetle in aged Satoyama forests, infested area is enlarging every year. Infected and dead trees, which must have been utilized for fuel in old days, are left untouched today and are also participating in the spread of the pathogen. After the decline of oak trees in Kansai and Tohoku districts, shrubs and small tall trees are dominantly regenerating and replacing, therefore the vegetation is drastically changing. Soil erosion also is concerned. To recover healthy Satoyama forests, rejuvenation of oak trees by the reutilization of coppices will be effective.

NPOs and local governments are actively trying to re-manage once abandoned Satoyama. However, cut logs are mostly unused and left in the stands, and inducing above-mentioned wilt diseases. In addition, thinning is not effective to sustain broadleaved forests, because the next generation is difficult to grow in the shade of big trees. Activities without knowledge on the forest health and regeneration sometimes promote the decline. To maintain healthy Satoyama, forest management combined with the utilization of biomass, fuelwood for instance, and the contribution of the community will be very important. The authors published a booklet for the current style Satoyama management targeting local governments and volunteers (Kuroda et al., 2009), and started a social experiment to reconstruct healthy Satoyama in the Kansai district. In that experiment, people of the district manage Satoyama forests by themselves cooperating with researchers who provide them with techniques to recover healthy oak forests.

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S14-4

The connection between urban and rural areas through the use of dwarf bamboo leaves in Kyoto City

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In the past, satoyama woodlands were managed by local people who used various forest resources in agriculture and for their livelihood. Since the 1960s, however, fossil fuel and chemical fertilizer have replaced many forest resources, resulting in break of the relationship between local people and local resources. Today's under-use and under-management of satoyama has led to a decrease of biodiversity, and to the loss of knowledge and techniques necessary for the efficient use of local resources.

In Japan's satoyama secondary forests, forest-understory-dominating dwarf bamboo is widely distributed. Dwarf bamboo leaves are forest resources that have been traditionally used to wrap foods and to thatch roofs of traditional farm houses. Kyoto City, which has satoyama areas that are close to the urban area, still makes use of such leaves today. Dwarf bamboo leaves are gathered in nearby rural areas and used in the urban area to wrap traditional sweets and make 'yakuyoke-chimaki' which play the role of charms against evil during the traditional 'Gion-matsuri' summer festival. Today, however, the traditional link between the urban and the rural area through the use of dwarf bamboo leaves has weakened due to the depopulation and aging of people in the nearby rural area, and also as a result of the mass flowering and death of many dwarf bamboos from 2004 to 2007.

In our investigation, we identified factors that currently play a role in this rural-urban link, and that may be important for preservation of the connection in the future. We determined how dwarf bamboo leaves are gathered in the rural area and how they are used in the urban area today. Results indicated that dwarf bamboo leaves were gathered only in Hanase-bessho and Momoi village areas. Leaves from these areas were suitable for traditional use in the urban area thanks to their smooth undersurface. Production of dwarf bamboo leaves was increased thanks to intensified satoyama management. The smell of gathered leaves was enhanced by traditional processing after gathering. This suggests that the connection between the urban and the rural area was based on the quality of dwarf bamboo leaves and on the local knowledge of the characteristics of local resources and of related techniques. To conserve this interesting rural-urban connection, it will be important to manage local resources wisely, and to hand down local knowledge and techniques related to dwarf bamboo leaves to future generations.

S14-5

Ecosystem assessment of *Satoyama* and *Satoumi* in Ishikawa, Japan

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Ishikawa Prefecture, Japan, satoyama also known as "traditional rural landscapes" consists of secondary forests, paddy fields and settlement covering about 60% of the total land area. It has rich coastal ecosystems, which consists of over 580 km coastline with seaweed beds, rocky and sandy shores, and abundant coastal resources so-called *satoumi*. *Satoyama* and *satoumi* project have been initiated to address the pressing problems caused by human activities of agriculture, forestry and fishery activities. There is no large-scale urbanization or population convergence since the Meiji era in Ishikawa Prefecture. After the high economic growth in the 1960s, the population and capital convergence to the metropolitan areas on the Pacific side widened the regional gap between the metropolitan areas and the Sea of Japan side, including Ishikawa Prefecture. As a result, this region suffered from serious ageing and declining population crisis which will lead to anticipated collapse of villages together with their ecosystems and local cultures, if these problems cannot be addressed.

The Ishikawa Prefecture *satoyama* and *satoumi* Ecosystem assessment started in 2008. It was made possible through the cooperation among Operating Unit Ishikawa/Kanazawa, United Nations University-Institute of Advanced Studies (UNU-IASOUIK), universities and, local and national government. This on-going effort is a part of the Sub-global Assessment of *satoyama* and *satoumi* in Japan (Japan SGA), which has been developed and led by UNU-IAS in 2006. This assessment follows and applies the framework of the sub-global assessments developed by the Millennium Ecosystem Assessment (MA; Millennium Ecosystem Assessment 2005). It aims to summarize the changes in *satoyama* and *satoumi* to understand the current conditions and issues, as well as the direct and indirect drivers of change, to speculate on the trends for future changes, and to create scenarios and recommend policies for the utilization and conservation of *satoyama* and *satoumi* in the 21st century.

As a result of this assessment in this region, bottom-up approach has been achieved through the active participation of the prefectural offices and local administrative agencies from the cities, towns, and villages information collection and the focus group discussions. Furthermore, tremendous amount of data in Ishikawa regional area regarding *satoyama* and *satoumi* were collected and organized according to the purpose. Information gaps were identified and future research priorities were established highlighting the missing information to fill in these gaps.

As an offshoot of this assessment, Kanazawa University established a new project in Noto Peninsula in 2009. The project aims at local revitalization and creation of regional businesses in the entire region through exchange activities, corporate activities for social responsibility (CSR) and/or trainees from research institutes and universities from local institutions and abroad.

Results suggest that a strategy is required for holistic management of the people and its resources such as agriculture, forestry and fisheries in the region. Scientific assessment including creation scenarios for the utilization and conservation of *satoyama* and *satoumi*, and the exchange activities in urban areas are some activities, which contribute towards effective conservation of *satoyama* and *satoumi* biodiversity and revitalize the community in the face of social and economic conditions.

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S14-6

Pattern and process of "Maeul", the Korean rural landscape

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Actually there are no corresponding word 'Satoyama' in Japanese in Korea, but 'Maeul' in Korean is very similarly unique in Korean terminology. In general meaning, rural landscape is well explained the Satoyama and Maeul as entity of holistic human and nature system. Rural landscape is multifunctional integrated systems structured by balance of natural and human disturbances as driving forces of landscape creation. Ecological pattern and process of rural landscape is, therefore, significantly related to socio-economic situation on ecosystem resource. To understand the status-quo of rural landscape in Korea, therefore a multidisciplinary approach is indispensable. In this presentation, I will explain the importance of rural landscape system and human system (such as indigenous knowledge) as a whole through the landscape research from rural to coastal (and island) areas. Moreover, through this presentation, I will summarize the future research on rural landscape system in Korea in view of socio-economic systems as well as complexity of biological and cultural diversities.

S15-1

Landscape: architecture, identity and sustainability in Seoul

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A city is an occupation pattern that sits on the substrate of a landscape. It is a landscape of soil, water, topography, potential vegetation, and patterns of earlier human occupation. Favourable units of the landscape, such as in Seoul the rolling hills, were a good place to live - flood plains were not. With increasing technological means, natural parameters are less important, but never absent. It is possible to build a city in a flood plain, but economic resources are required to maintain the urban landscape: the more artificially it is built, the more resources are needed for its maintenance. Reversing the argument it ultimately means that we cannot sustain such efforts of maintaining our cities. Therefore, the landscape under today's modern city needs to play its role, and should be called in again to improve the sustainability of the urban system. And more than that: if landscape is readable, understandable, usable, and enjoyable, it brings back identity and a sense of place as well.

Analysis - Seoul is, on a regional scale, a valley framed by two mountain chains, cut by the river Han. The present study identifies the structure of this landscape on the basis of soil maps. These are interpreted to identify a system of rolling hills and terraces, alluvial valleys, river terraces and fluvio-marine plains that stretches between the two mountain chains. Each landscape unit, thus defined has its own potential vegetation, deducted from a set of vegetation maps, and detailed vegetation studies. Mountains will develop oak and pine tree forests. The rolling landscape for example, will have a richer, mostly deciduous forest; but, traditionally, most of it was under arable cultivation, forested parts were remnant secondary village forests with a lot of pines; and so on. Rolling terraces and valleys came in occupation early: villages and small scale agriculture took complex, and small scale patterns. Many landmarks in the human mind, like centres of villages, or old footpaths were found on the rolling terraces and in the valleys. Also today, these are not anonymous places: schools and universities in Seoul take up positions in the foot hills of the urban landscape, subway-stations are often found here. The fluvio-marine plains were in use as rice paddy with a dynamic ecology. Later in the developing city these became anonymous mass-produced housing estates, with other human dynamics.

Landscape architecture - After analyzing the western half of Seoul, a test case was set up, to see how the original landscape can be made to reinforce the city, and how strategies for sustainability in landscape architecture can be developed. Sustainability is then found in a landscape system that not only endeavours to reinforce the natural ecology of the urban landscape, but also the use and enjoyment of the natural world by humans. By planning the city with water and vegetation, using the data from the landscape analysis, urban open space can be developed as being part of the whole system of landscape, extending and connecting urban open space to the regional scale of the mountains and the river Han. Four pilot projects by students showed how design can induce sustainability, based on our landscape analysis. I intend to present the analysis and the four projects as a power-point presentation for URBIO.

S15-2

The role of urban parks in sustainable biodiversity conservation: case study of Showa Kinen National Government Park

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Background and aim - Along with Japan's rapid economic development, urban green space has declined. In the national capital region, in the 40 years from 1965 to 2005, a total of 206,000 ha (22%) of green space was lost. There is a need to restore urban green spaces and promote the development of green networks, both to conserve biodiversity and to ensure sustainability. Against this background, this study focused on urban parks, looking in particular at Showa Kinen National Government Park (hereinafter, *the park*) located in Tachikawa and Akishima in Tokyo, with the aim of clarifying how urban parks contribute toward sustainable biodiversity conservation.

Methods and results - The park (planned area: 180 ha) was created on site of the former United States Tachikawa Military Base as a green restoration project. Works started in 1979 and now 162.5 ha are open. Annual visitor numbers have reached 3.6 million (in fiscal 2008). In accordance with the aforementioned aim, this study proposed three hypotheses for investigation and validation.

Hypothesis 1: The park contributes to biodiversity conservation through the development and management of biological habitats; Following a fauna survey at the beginning period of the development in 1980, a survey of fauna and flora was conducted in 1993 and every five years thereafter. According to the quantitative analysis of changes, the 1980 survey (Showa, 1980) recorded 77 insect species whereas the 2008 survey (Showa, 2009) recorded 800, indicating a tenfold increase in insect species over the 28-year period. Multivariate analysis of the relationship between the park environment and organism types was also performed. This demonstrated that the environmental framework supporting current (2008) biota within the park consists of spatial openness (open vs. closed) and environmental humidity (dry vs. wet). An environmental classification map comprised of five zones, including forest, grassland, and wetland, was made. This allowed us to identify the various environmental features, and the diverse organisms in the park.

Hypothesis 2: Public awareness and informative messages at the park help ensure sustainability; We examined change and performance conditions with regard to the various events and programs involving biodiversity conservation (e.g. "Come Back Musashino" Project) and information dissemination (e.g. displays, original botanical guide book, collection of biota information named "Bio-archives", and websites), and analyzed their effectiveness.

Hypothesis 3: Collaboration works with volunteers help ensure sustainability; Focusing on a volunteer group at Komorebi Hill in the park as an example, we analyzed its significance, including its history and activities (e.g. in fiscal 2008, the group worked on 71 occasions, with a total of 1,991 people participating), success factors and the reaction of general park users.

Conclusion - Based on the results of the aforementioned surveys, we came to the conclusion that the validity of the hypotheses (1, 2 and 3) was proved, indicating that creating green networks and contributing to sustainable biodiversity conservation is an important role of urban parks.

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S15-3

Conservation and creation of natural bare land in capital region in Japan

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There are a lot of natural bare land in maps in the Meiji era about 130 years ago. Now natural bare land becomes smaller and smaller to decrease plants and animals which live there.

We study ecosystems of natural bare land in the capital region in Japan in order to conserve and restore them. Herbs in cobble riverbeds, nesting grounds of little terns and herbs in tideland were studied with the mechanism of habitat conservation (Ashizawa et al., 2008).

The flagship herb in cobble riverbed is *Aster kantoensis* Kitam. (EN in Japanese RDB), a monocarpic aster with a large flower. Until 1990's, ecology and conservation ecology of *A. kantoensis* became almost complete. We started ecological restoration studies in 2002. The ecosystem of the middle course of the Tama River was restored by cobble riverbed which was covered with *Robinia pseudooacacia* L. in 2002. On new cobble riverbed, *A. kantoensis* grew thick but competitive large weeds became dominant in 2009. We prepared new cobble riverbed again in 2009. We will observe seedlings of *A. kantoensis* in spring of 2010.

Little terns (*Sterna albifrons* Pallas, VU in Japanese RDB) nested on concrete leaves at the Morigasaki sewage disposal plant in 2001 and failed to propagate. The Little Tern Project laid cobbles and artificial cobbles in order to stop propagating. Then thick vegetation cover grew on artificial cobbles, and little terns abandoned their nesting grounds. Natural cobbles have no weeds, so project replaced artificial cobbles with natural cobbles and little terns propagated well in 2009. We studied the relationship between color of cobbles and propagation of little terns.

The flagship herb in tideland is *Aster tripolium* L. (VU in Japanese RDB), biennial thick-stem aster. The conservation ecological study of *A. tripolium* has just started. It was revealed that *A. tripolium* has no permanent soil seed bank, it will die out because of a small population.

Revegetation is traditionally thought of as good practice. But there are plants and animals which live in natural bare land, their conservation are needed so we have to preserve and restore natural bare land.

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S15-4

Coexistence between the human community and the Oriental White Storks

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Toyooka, a city where people live together with storks: our challenge is to materialize the coexistence between storks and human beings. This challenge to conserve 'one species' has proliferated from a mere conservation project to a comprehensive sustainable development strategy.

Re-introduction of Oriental White Storks -

Currently there are only around 3000 Oriental White Storks (hereafter Storks) living in the world. They are one of the endangered species according to IUCN.

In the past, there were many storks inhabiting all over Japan, however, its population became extinct in 1971 due to degradation of its habitat. Since Toyooka was the last habitat remained in Japan, a re-introduction project was initiated here. The ultimate goal of this project was not just to increase the number of storks but also to release (re-introduce) them in the natural environment.

Sustainable development through coexistence with storks -

To re-introduce storks into natural environment, creating a rich environment with rich biodiversity is not sufficient. It also requires change in our society itself, a society which can coexist with the storks.

Due to the comprehensive nature of the project, multi-sectional and multi-stakeholder approach was introduced. One of the unique characteristics of our challenge is the way these approaches were applied by setting-up a mechanism for consensus-building among different stakeholders. This has lead to a great success.

1) Promoting Environmentally Friendly Farming - Conservation of multi-functionality of agricultural farm land
2) Developing a Strategy for environmental and economics sustainability - Promotion of sustainable economic activity for the private sector
3) Restoring wetland:
    a. Large-scale wetland - Restoration through public project
    b. Small-scale wetland - Restoration by various stakeholders
    c. Linking above-mentioned wetlands with rivers to maintain the whole riverine system
4) Hosting a "Workshop for accumulation of knowledge" where various stakeholder convened to discuss the issue related to re-introduction of storks
5) Promoting education for sustainable development through experiential learning

Currently there are over 30 storks living under natural environment and every year new chicks are born resulting in increase of its population. Some of them have even flown out of Toyooka. Toyooka's challenge soars high on the wing of storks diffusing Toyooka model to various parts of the world. Storks might come to your city next!

S15-5

Cooling effect of green roof in Taipei

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To save energy and reduce carbon emissions, green roof was thought an important way to mitigate urban heat island effect. Green roof is lightweight and requires minimal maintenance. Many studies investigate its substrate composition and influence of substrate on plant growing. Fewer studies focus on the cooling effect of green roof. The purposes of this study were to monitor the temperature variance of green roof and to compare the cooling effect difference of various plant species that are widely used in green roof in Taiwan. Further, the relationship between plant characteristics and cooling ability was also investigated. Twelve platforms covered by different plants were built, which simulate green roof and size 1x1 m^2. For each platform, we measured the plant characteristics and floor temperatures. Control floor temperature (without platform) was measured simultaneously. The results show that green roof had cooling ability. Platforms covered by different plants reduced roof floor temperatures ranged 12.90 to 22.20ºC. Plant height, plant albedo, growth type, photosynthesis type, and leaf thickness of plants determined their cooling power.

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S15-6

Comprehensive flood control and design with nature in the city

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Rivers nurture life and attract people seeking recreation and pleasure. They are an indispensable element for environmental design. However, a river becomes a source of trouble with the overabundance of water. Rainfall recently tends to intensify in urban areas; runoff increases beyond the capacity of the river and the drainage system due to relentless urban development. Floods become an uncontrollable event in big cities unless radical, comprehensive measures are taken.

In July 2009, the city of Fukuoka, Japan experienced a flood disaster along the Hii River, which runs through densely populated, concrete-covered areas of the city. The drainage system was overwhelmed and the river overflowed due to heavy rainfall and rapid runoff. The event led citizens in its watershed to plan and implement, in collaboration with academics and local governments, comprehensive flood control. The plan aims not only to mitigate floods but also to revitalize the river environment and populated communities in urban areas.

This study reports the activities led by the citizens: They organized and carried out civic forums, workshops, and fieldwork to share views as to how the flood disaster was caused, how floods in the watershed should be controlled, and how the river environment should be rehabilitated.

As a result, the citizens devised recommendations on comprehensive flood control for municipalities to help prevent both devastating inundation and environmental degradation. The recommendations include how the runoff should be reduced in each land use category such as irrigation ponds, school properties, parks, municipal facilities, and residential areas. In response, the local governments immediately created both intra- and inter-organizational networks, which are quite rare in Japan, to make flood control much more effective and environmentally friendly.

Finally, the study claims that the comprehensive flood control is to set the stage for the urban design involving natural elements, especially rivers.

S15-7

Biodiversity protection strategies for Asian new cities

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For many years landscape architecture professionals are developing approaches to re-construct habitats in the hope to protect biodiversity. These protection strategies do work with more or less success here in Asia. In best-case scenario, created wildlife habitats work as themed gardens to attract tourists. Rapid urbanization and the development into urban mega structures leave no space for traditional biodiversity programs. Urban planners and architects often do not even attempt to work on this topic and assign biodiversity issues to remote places in the mountains. But the results are shocking if people grow up without any connection to nature; bats turn into vampires despite traditional Chinese thinking, bees become dangerous unwanted animals, shrubs grow 'unruly' if they grow out of geometric forms. Even the health of urbanities is deteriorating fast due to the lack of contact with nature. Furthermore, the worldwide change of climatic conditions will create migration not only of human populations but also for all other species. Cites and urbanized agglomerations occupy such a big land space in nowadays that they have to take over responsibility for biodiversity protection. And planners; especially landscape architects, have to respond to this task. Cities in Asia are facing numerous challenges, which call for new strategies in protection local biodiversity:

- High space constrains & high land prices
- High disturbance by human activity
- Creating new habitats that have never exist before (gardens on high-rises)
- Lack of data on local biodiversity resources & environmental awareness
- Commercialization of urban green landscape & design processes
- Peoples mind is driven by 'cleanliness' and 'safety' perceptions
- Wide climate gap between natural and urban environment
- Large urbanized agglomerations without landscape connectivity

With traditional methods for biodiversity conservation these challenges are difficult to overcome. Therefore, this paper wants to introduce a new protection strategy. Compared to the traditional method of active 're-construction' I would like to focus on the self-healing properties of nature itself. We might call it a 'passive protection method' because humans do not bring 'actively' back their concept of natural habitat. This sounds very simple and easy but of no means, it is not! Urban Planning has to be forced to leave 5% of land to the nature… totally untouched; just free without any other functions. Nature will design it's habitat with it's own rules of dynamic processes, and with it's own aesthetics of wilderness. This might be very hard to be accepted by designers and architects because they lose work but they also have the chance to learn from this process. This might be difficult to be accepted by general urban dwellers whose mind-set have been deeply influenced by commercials. This might be difficult to be accepted by politicians who see a lot of monetary loss.

However, this strategy will never fail and it solves the problem of lacking data and knowledge of 'original nature'. This strategy is not depending on habitat remnants in places where everything was bulldozed down. It gives space for plants which are adapted to these bio-physical conditions and can settle down without high-cost technology. It gives space to newcomers to enable also migration of flora and fauna for more suitable places during climate change. It solves the sourcing problem of suitable plant varieties because nurseries can only provide a very limited range. And last not least, these naturalized areas are highly dynamic which makes them especially interesting not only for children. Localized vegetation concepts give people a place of sense in contrast to globalize unifying design fashion trends. Despite all these advantages, the main hurdle will be people's appreciation for the 'beauty' of urban wilderness.

S15-8

For little swan

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S16-1

Trails and impacts of landscape design - a comparison of large cities in the new and old worlds

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Alien plants - intentionally and unintentionally introduced for landscape design - are regarded as a main source for plant invasions. They cause significant higher impacts in the new worlds than in the old. When comparing large cities as main drivers of this process the proportion of alien plants in Europe with 25% is not significant higher than in North America with 32%. Our assumption for this study was that we must compare not the total city floras but the most frequent species, to get clearer information about the biological impact of cities and the effects of former landscape design. To do this we compared the fifty most frequent spontaneous vascular plants in the following cities: Berlin, London, Rome and Yokohama as well as New York, Los Angeles and San Francisco. The study revealed that cities of the old and the new world differ substantially in the proportion of alien taxa they contain. In Berlin, London and Rome it is 10-15% and in Yokohama 50%. In the three North American cities it is over 80%. It was found that plants introduced from Europe are most successful in US cities, whereas in the European cities North American plants show a significant lower proportion of naturalization and are less competitive. When comparing the list of invasive plants in European and North American countries these former results are reflected.

S16-2

Influence of the design and maintenance of Japanese gardens on bryophyte diversity

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In this study, we evaluated the role of Japanese gardens in the conservation of bryophyte (moss) diversity, with focus on the design and management of gardens. We selected a Japanese garden and its adjacent green spaces (secondary forest, lawn, and urban park) in Kanazawa, which is in the northwestern part of Japan, as the study sites. We recorded or measured the bryophyte diversity, environmental variables (substrate types, tree density, vegetation cover, topographical relief), and maintenance methods (weeding, trimming, and creation of restricted areas) in circular sample plots of 5 m diameter along the transects spanning the length and width of each green space. The richness of bryophyte life forms and species were exceedingly higher in the Japanese garden than those in other types of green spaces. The main features of the garden were high heterogeneity of substrate types, tree density, and topographical relief. A notable maintenance feature of the garden was intensive weeding, tree trimming, and high percentage of restricted areas. Considering the strong correlation of each life form with certain microclimatic conditions, the high heterogeneity of the environments in the garden can increase the richness of life forms and species. This high heterogeneity appears to be related to the design of Japanese gardens which recreates various natural landscapes in miniature. The maintenance features can also contribute to the high bryophyte diversity in the garden, because bryophytes are vulnerable to be covered by other vegetation and prone to continuous trampling. The results of our study indicate that Japanese gardens may play an important role in the conservation of bryophyte diversity in urban areas.

S16-3

On the influence of historical park design on urban biodiversity in Europe

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The design of parks in the New World according to European fashions, especially the English Landscape Gardens, is considered today as a main source of biological invasions as well as driver of the loss of regional identity.

In our research we are focusing on the question if in Europe - where the landscape gardens were developed in the 18th century - they are a benefit or a threat to biodiversity today? A main goal of the design of these gardens was to form an idealised landscape and on this background habitats and plants of the surrounding cultural landscapes have been used to shape these parks. Therefore three main questions are resulting for our study:

1. How have these historical landscape gardens in Europe been designed in detail (e.g. plant material, design principles)?
2. How important are the historical landscape gardens for biodiversity today, on the levels of habitats, species and genes?
3. And further, if the historical landscape gardens are a benefit for biodiversity today are there implications to be made for a sustainable modern park design?

Our investigation area comprehends three large historical landscape gardens in Weimar, Germany, founded in the 18th century. They are today part of the UNESCO world heritage “Classic Weimar”. First studies pointed out that these landscape gardens are centres of biodiversity within the urban area and are contributing essential for the conservation of plants and habitats of historical cultural landscapes.

S16-4

The effects of design and location of shrine forests on urban biodiversity, with attention to cores and networks - a case study of the Meiji Jingu Shrine in Tokyo

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In order to promote biodiversity in urban areas, it is important to understand the historical transition, expanse of ecosystem networks, and the process of spiritual and cultural blessings of these areas. It is necessary both to preserve an area's individuality that has been shaped by history and culture, and to look at the long-term use of urban space from a wide, landscape-based perspective. The present report examines the effect of shrines in cities from two scales, i.e., core and network, and reveals the influence of the location and design of shrine forests on urban biodiversity.

Shrines are facilities of the Japanese Shinto religion. The shrine and the forest have long had a close association, and the forest is an essential element for maintaining the majesty of the shrine. The forest at Meiji Jingu Shrine is an expansive, extremely serene woodland. This splendid forest covering 72 hectares is actually a man-made forest, this fact is a source of pride to numerous landscape designers and planners. Before that, most of the land was farmland or meadow, with only about 1/5 being forested, nearly all of which consisted of groups of mixed small trees. The basic objective of the plan was to create a climax forest. Planners put tremendous effort into designing a climax forest that would be maintained through natural regeneration, that is, a forest that would have its own cycle. With the exception of the prevalence of camphor trees, over the course of 80 years from initial creation this process led to the formation of an evergreen broadleaf climax forest that is identical to a natural forest.

Hundreds of small open/green spots exist in centre of Tokyo. Shrines, temples and parks assume their role. By comparing the distribution morphology of their locations analyzed by GIS, it was found that shrines and parks tend to be dispersed and temples tend to be concentrated for distribution in each point. 68% of shrines are built on a slope. To investigate the geographical features and the relationship with ecological resources, a continuous green space unit is generated by the formation of a buffer in the spaces of forests that contain shrines and the surrounding green space. The features of green spaces of shrines with high burden sharing are that they are located in transformed, steep land or transformed, open land. The aspect of continuing green space units with shrine forests as reference points in relation to the green spaces and geography is not always consistent with the geographically-specified shape of slope; nevertheless, it is demonstrated that shrine forest spaces become the standard in the region, and a unit is formed along the geography among other green spaces.

The network described here is not really expressed as a state of physical connections among multiple ecosystems. Therefore, it may be difficult to claim that the network that links shrine locations has increased urban biodiversity. However, because shrines are religious facilities, there is little concern that they can be as easily destroyed or demolished as other types of land uses or facilities. Consequently, strategically and intensively utilizing shrine forests as part of landscape design in urban greening plans may be one desirable means of improving biodiversity and ecosystem services. In this sense, it can be said that shrines in cities have potential value for promoting urban biodiversity.

S16-5

Landscape design for wildlife: use and abuse

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Landscape design with appropriate targets and ecological knowledge is important in the conservation of biodiversity and sustainable development. The objective of this paper is to review and explore methods for evaluation of landscapes design for wildlife. Three important processes are to evaluate potential of the site, to make compensation of the past loss, and to form of network.

In Japan, mega cities have developed in flood plain. Sand dune, tidal flat, reed bed were original landscapes. Because most of these landscapes are lost in Japan, it is important to restore these landscapes. However, these landscapes are neglected in urban landscape design. Other examples of past loss are a mosaic of farmland and woodlot and riparian ecotone.

Potential capacity of the land for wildlife habitat is determined by size of the habitat, history of the land, distance to the species source, matrix surrounding the habitat, etc. Relative importance of these elements varies depend on taxonomic groups. Mobile species, such as birds, need a large space, but immobile species, such as ants are influenced by the history of the land. Estimation of a potential of a local space or a landscape to realize an ecosystem or species' habitat is important.

Ecological network is valuable both for people and wildlife. Green corridors in cities provide relaxation spaces. However urban planners often forget needs for wildlife. For wildlife, ecological networks are effective if viability of the species' metapopulation increased by the networks.

We compared the response of various taxonomic groups, birds, butterflies, ants, trees and ferns, in Osaka, Japan in order to examine relationships between the abundance and arrangement of the habitats, and life history trait of the species. We presented species specific responses to habitat fragmentation. Species richness decreased more rapidly in birds than ants from the urban to rural ends of the urban gradient, and butterflies were intermediate. Birds were influenced by the habitat area and distance to species source. In contrast, ants were less influenced by habitat area, but were susceptible to the history of the isolated habitats. In ants, trees and ferns, some rare species occurred even in small habitats and the small habitats contributed to species diversity in the urban areas. Simultaneously, variation of the life history affected the distribution of species. For example, *Parus major* could breed in urban area by using scattered trees in an urban matrix; their home range enlarged in the urban area to secure sufficient food.

S16-6

An introductory of the urbanization in the tropics: rejuvenate the globe base on 'Tropical Green' concept

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Did we realize that half of the global human population live in the tropics! Tropical climatic region lies in between the tropics of Cancer and Capricorn covers four major tropical areas which are Tropical Asia, Tropical Africa, Tropical Ocean and Oceanic Island. Typical tropical can be found beyond 23º 26'. It covers and occupies a climatic zone of approximately 40% of the land surface of the earth, and home to almost half of the world's population. Tropics are also the origin of the early world human civilization era.

In reality, we cannot avoid further development for achieving the highest technology and economic growth in the realm of current and future human civilization. What we mean by higher technology? We as an intelligent human creature have learned from our predecessors and current technological know-how on the perturbation of the environment and continual destruction of biodiversity which contributed to the current dilemma (world climate change) and survival.

Now where do we go? Do we choose to be extinct? Natural interaction plays an important role to find balance of urban biodiversity between man, development and its environment. Plants play as a vital element in this role of interaction with human and living things. Not as sources of foods but also an important process in photosynthesis releasing oxygen to the environment and living creature. Biodiversity processers help to sustain the climatically change and reducing heat especially in urban environment. Thus, it increases human comfort and convenience.

Tropical Green concept is important and critical application or method in mitigating and task rejuvenating the tropics civilization in the context of urban development. All efforts and human knowledge must strive towards building up a new era of human understanding, ethics, and spectrum of thinking about urban development and peripheral activities to save the planet. It is critical at any point now and in any technological know-how undertake in relation to urban development should or must take a serious consideration in this integral part of man and environment.

S16-7

Influence of global landscape design trends on biodiversity in Russia

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The entry of the Russian Federation into the global market economy has resulted in an acceptance of many Western landscape architecture trends, including design schemes, construction and plant materials. The collapse of the Soviet Union ended the planned socialist system of large plant nurseries and public park typology: parks of recreation and rest, residential parks and green areas between multistoried buildings. The only private gardens that existed in Soviet time were dachas - small plots of land with summer houses - primarily productive landscapes (growing fruit and vegetables). During Soviet times the majority of plant material was locally grown and based on native species. Due to the severe climate Russian cities did not experience problems with naturalized non-native species. Only a few of “escapees” were a problem, for example *Heracleum sosnowskyi* and *Acer negundo*.

Globalisation introduced to the Russian landscape market typical design examples from Western European and US private gardens. European nurseries provided a wide range of introduced species that were never before grown in private or public gardens and in many cases were not suitable for cold Russian winters. Use of introduced “global” plant material and western landscape design in public and private green spaces resulted in Russia entering the “globalised” pool of urban plants. Gardens are now losing native plants and local identity. The latest tendency in Russian landscape architecture is for a very eclectic design language: lawn as an essential element, rock garden, groups of dwarf exotic confers (juniper, pine, spruce and fir), mixed borders of gardenesque annual and perennial plants. The elements of old “dacha” productive landscape survive as small patches of vegetable rows in extended gardens of New Russian gardens as nostalgia for “the old days”.

S16-8

Influence of European park design on urban biodiversity in Southeast Asia

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Western garden design in cities of the New World is regarded as one of the main sources of plant invasion and can lead to the loss of local identity of cities.

In this study we investigate the City of Bandung in Indonesia, which was established as Garden City by Dutch city planners in the beginning of 20th century. Accommodating splendid and colourful ornamental tree and shrub species, western park design is still evident in Bandung's parks and presents the only remaining green structure, which is only 6% of the city area. Bandung is now one of the fourth largest cities in Indonesia and the fastest growing region of the country.

The study focuses the question to which extent historic plant use has influence on tree and shrub diversity in parks and analyses trends of spontaneous rejuvenation of species.

We investigated 10 parks of different age in Bandung and analyzed tree and shrub species as well as occurring seedlings. Historic plant schemes and species lists were analyzed to compare species composition from colonial times with present species occurrences. The role of native species will be of interest to evaluate the potential of natural vegetation in Indonesia, which has one of the highest biodiversity globally. In a further step, seedlings of tree and shrub species in each sample plot were documented and analyzed to answer the question which species have the ability to reproduce in present settlement conditions. The investigation aims to detect risks of invasive spread of tree and shrub species into surrounding area and should give recommendations for future plant use in regard to secure a suitable urban green system.

S16-9

Landscape characteristics correlated with the urbanization of wildlife

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Urban areas offer diverse landscapes primarily designed for human use. The composition and complexity of these areas can vastly affect the population dynamics and behaviour of wildlife. Investigations on various taxa of urbanized species often describe similar behavioural (reduced fear of humans, altered activity patterns, and increased intraspecific aggression) and population dynamics (higher densities and reduced dispersal) adaptations that contribute to survival in urban habitats. However, little is known regarding landscape features of cities that may be associated with these adaptations. The objective of this study was to identify features of urban areas, at the habitat and landscape scales, correlated with the behavioural and population dynamics of urbanized wildlife. We quantified characteristics of urban landscapes (tree cover, number of trees, building cover, number of buildings, and habitat size, canopy cover, tree basal area, and number of trees) and evaluated relationships to gray squirrel (*Sciurus carolinensis*) populations in six urban parks. Models were developed for wariness, aggression, activity patterns, and population density for gray squirrels. Models for population density used combinations of landscape characteristics and models for behaviour used combinations of landscape characteristics and population density estimates. AIC was used to evaluate models and determine the best approximating models. Squirrel density and canopy cover were the most efficient predictors for wariness; squirrel density, patch tree basal area, and matrix tree cover for aggression; patch size, canopy cover, and number of matrix trees for squirrel density. Density and canopy cover were the most efficient predictors for wariness ($AIC = 48.42$, $W_i = 0.500$); density, patch tree basal area, and matrix tree cover for aggression ($AIC = 39.54$, $Wi = 0.567$); patch size, canopy cover, and number of matrix trees for density ($AIC = 57.40$, $W_i = 0.237$), and density for activity ($AIC = 34.02$, $W_i = 0.253$).

S16-10

A multiple function green infrastructure design to protect and improve native biodiversity in Rio de Janeiro

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Historically alien ornamental plants are used in gardens and parks design in Brazil. Rio de Janeiro's Botanical Garden, founded in the early XIX century, was a propagator of exotic species used up to now in private and public projects. The result is a globalized landscape, which imitates European and American styles in all scales. The Botanical Garden is located in the skirts of the Tijuca National Park (which protects remnants of the Atlantic Rain Forest), at the Macaco's river watershed. This drainage basin presents a myriad of urban situations that represents what happens in various parts of the city. It has been heavily transformed during the urbanization process that caused original ecosystems suppression. During this process the impacts were many, we can cite some: informal occupation in the Macaco's river riparian corridors; formal high income class residential developments in the slopes facing the Botanical Garden; landfill of the lagoon shores to create land for further occupation; channelization of the river in the lowlands, among others.

The proposition is the design of a multiple function green infrastructure with abiotic, biotic and cultural goals. It goes from the high slopes all the way to the lagoon (Lagoa Rodrigo de Freitas). Floods are recurrent, causing several ecological damages. One of the key points of the proposal is to promote storm water infiltration through several landscape design possibilities. Rain gardens, bioswales, bioretention, renaturalization of the river banks and lagoon margins and green roofs are some of them. Native species were selected to be planted on these new spaces. A renovation of part of the lagoon shore would permit the water tides to flow, in order to enhance biodiversity of mangrove and sandbanks indigenous vegetation. It aims to replace many degraded gardens where usual alien ornamental species were planted several times, but don't grow properly.

One of the main targets is to give visibility to natural processes and original ecosystems. The green infrastructure is designed to raise public awareness about the role of nature in human life. Incorporate the popular Botanical Garden in the project is a way to interact with researchers, public officials and residents.

S16-11

Bringing indigenous biodiversity back into New Zealand cities

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New Zealand's 20 largest urban centres vary considerably in terms of their extant indigenous biodiversity resource in the built up matrix (from <1% to almost 9%) and approach to protecting and enhancing it. To achieve a universal target of 10% ecosystems dominated by indigenous species in the built up matrix will require a range of approaches from restoration of existing remnants to reconstruction of ecosystems. Ecological barriers to overcome include altered soil conditions and processes, rapidly shifting and often warmer microclimates, and novel species assemblages. Despite these limitations, there are unique opportunities to conserve indigenous plants and animals not possible in extensive wildland tracts. For example, grazing by farm animals can be completely controlled and avian predators such as weasels and stoats are less abundant in city environments. And the volunteer worker is nowhere more abundant and capable of being mobilized. Perhaps the most significant challenge to achieving the 10% target, however, is to coordinate action between management agencies so that regional or catchment scale ecosystem processes and function are restored. Further, a convergence of many skills including engineering, landscape architecture, aboriculture, horticulture and ecology is needed to undertake successful restoration in city environments. Examples will drawn from several North Island cities to illustrate how coordination, convergence and integration can assist in bringing indigenous nature back into the city and reconnecting urban dwellers with their natural heritage.

S16-12

BiodiverCity - key element to foster conservation of the Amazon Forest

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Located in northern Mato Grosso State, Brazil, the city of Alta Floresta (High Forest) (49,000 inhabitants) is part of the so-called “gateway to the Brazilian Amazon”. The settlement started in the mid 1970’s, with individuals coming from the south of Brazil with no previous knowledge of the Amazon forest, causing a strong pressure with unsustainable land usage that resulted in the destruction of approximately 70% of its native forests. Due to inappropriate agricultural practices (such as the use of fire to devastate huge areas of natural forests) and the absence of economic alternatives besides of clear cutting timber harvesting and extensive cattle farms the area became the front line of the “Arc of Deforestation”. Today, the habitat loss moves unchecked into the heart of the Amazon configuring the most dramatic loss of biodiversity of our time. Stopping this process by the immediate implementation of new economic alternatives through a new mentality of protecting and fostering local natural resources must be a major concern at regional, national and global level.

As the population moves to cities throughout the world searching for jobs, better health care and education, the Brazilian Amazon region follows the same pattern. The Amazon which encompasses nine different states in Brazil, has approximately 21 million people, of which 15 million (70%) live in urban areas and only 6 million (30%) in rural areas. As the actual destructive model of urbanization in Brasil grows on cities, the rural areas follow the same example. Therefore a more nature oriented urban model with a close relation of man and environment must be built.

The “BiodiverCity” that Alta Floresta aims to become consists in revitalizing the natural structure of the area (rivers, hills, forests and lakes) and make it interactive with the population creating a functioning environment to local flora and fauna species. Basically the project consists of creating and/or protecting existing corridors of forests and water bodies inside the city limits. These corridors will allow local fauna to utilize and move inside these fragments. Part of these areas will be integrated to public parks and fragments of primary forest which still exists. Today these remnants of pristine forest totalize approximately 4,000,000 m² inside the urban area. An example of the high ecological importance and balance of these fragments is the presence of an active Harpy Eagle (*Harpia harpyja*) nest inside one of them. The intersections where rivers cross the existing city structure, such as roads and bridges, special elements will be implemented so that terrestrial mammals can move without interruption inside the corridors. Mammals such as monkeys will have nets and ropes connecting trees from both sides of the roads causing no harm to the animals. Bicycle tracks will be established as an alternative way of transportation outside these forest corridors in these transition areas. Public buildings will be designed in these areas such as schools, kindergarten and public libraries to motivate the integration of the population with the forest. Alta Floresta aims to implement a City Botanical Garden composed by several interconnected protected areas inside the urban area and could be a major step towards the production of scientific knowledge to foster social and economic development not only to the region but to mankind.

This process is one of the first steps in order to set a new mindset model for the city of Alta Floresta preparing people to change their behavior towards nature and becoming an example to the whole Amazon region.

G1-1

Landscape analysis of suburban forest succession in the disturbance of the great cormorant

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The suburban forests in Japan have historically been used as a natural resource (e.g. fertilizer, fuel). Through the utilization and management of the forests, people have interacted with the organisms living in the forests. As a result, people and organisms have created unique forest landscapes in suburban areas.

The great cormorant *Phalacrocorax carbo* is a colonial piscivorous bird, which breeds in forests near water. It damages forests by picking twigs for nest building and supplying a large amount of nutrients to their colonies as excreta. The forest vegetation is sometimes severely damaged by the cormorant’s breeding activities, but the vegetation of the colonies gradually recovers after the abandonment by the cormorants. Some colonies have been maintained for more than one hundred years. Because such colonies maintained for a long time were often made in suburban forests in Japan, the interactions between the cormorants and people might affect the maintenance of the colonies and the succession of the vegetation in the forests. In this study, we analyzed, using GIS, the plant succession as a result of disturbance by the great cormorant and management by residents in the suburban forest.

The study area is the ‘Unoyama’ colony in Aichi Prefecture, Japan. In this area, residents collected great cormorant's excrement for fertilizer until the 1960's. We examined aerial photographs of ‘Unoyama’ from 1947 to 1995 and tried to distinguish the breeding areas of the cormorant, areas of open, low vegetation, and forested areas. In addition, we also collected the data of the breeding areas from previous papers and the present vegetation from field surveys. The data of people’s utilization and management of the forest were obtained by interviewing residents who had collected cormorant guano in ‘Unoyama’, and from regional documents and the official documents in Aichi Prefectural Archives. We analyzed the effects of the cormorant’s breeding and people’s utilization and management of the forest on plant succession in the ‘Unoyama’ forest.

From the interpretation of the aerial photographs in comparison with previous research, the movement of the cormorant’s breeding area caused retrogressive succession from forests to open areas or grasslands. The aerial photographs also showed that the forests soon recovered after breeding areas moved. The memories of the residents and the regional and official documents showed that the Japanese black pine *Pinus thunbergii* was planted in the open areas to attract the cormorants to re-colonize in the ‘Unoyama’ area. The areas of pine tree planting by the farmers before 1960’s and the government in 1967 and 1968 were closely correlated with the areas of rapid forestation in the aerial photographs. The field survey in 2005 showed that the recovered areas were not pine forests at present, but rather dominated by deciduous broad-leaved trees such as *Celtis sinensis* var. *japonica* and *Rhus succedanea* and evergreen trees such as *Machilus thunbergii*. The rapid change from open areas to evergreen forests suggests that pine planting and/or cormorant guano might facilitate the plant succession. The cormorants had once disappeared from the study area in 1970 and re-colonized the recovered forest in 1990. In conclusion, vegetation of the ‘Unoyama’ forest has been drastically changed within several decades as a result of damage caused by birds, and anthropogenic influences on forest recovery.

G1-2

Conservation priorities for threatened Yatsu valley landscapes in urban fringes, central Japan

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To successfully balance development with preservation of biodiversity, a full and accurate understanding of local topography and land use patterns, as well as zoning plans based on this understanding, are required. This study focuses on ‘Yatsu’ valley traditional agricultural landscapes in central Japan. This landscape is a beautiful and biodiverse example of the Satoyama, as Japan’s traditional agricultural landscape is known, and has developed over more than 2000 years of interaction between people and the natural environment. This research was implemented in Sakura City, located in Northern Chiba Prefecture, an area that is within commuting distance from Tokyo and is rapidly urbanizing, but still retains extensive yatsu valley agricultural landscapes. This study is designed to help develop conservation strategies for these valleys. As the first step, a system was designed for prioritizing the remaining valleys. To estimate the ecological value of each valley, the distribution of natural water seeps, two species of birds of prey, common buzzard (*Buteo buteo*) and gray-faced buzzard-eagle (*Butastur indicus*) and six species of frogs were employed. To further evaluate individual Yatsu landscapes, 17 valleys were identified and assigned an overall ecological rating. In addition, vulnerability to future development was estimated for each valley as a function of the distance from the nearest train station. The results of research identified the yatsu valleys that have high ecological value and at the same time are vulnerable to development. Two valleys in particular stood out as being of greatest value. One of these, the Azeta Valley, was also shown to be highly vulnerable, and thus was ranked as the highest conservation priority. These results will hopefully be of use to government agencies involved in development and conservation planning in Sakura City, and the methodology should prove applicable in many other structurally similar areas.

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G1-3

Impacts of agricultural ponds change on biodiversity in the Yulin county in Taiwan

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Yunlin County has large number of agriculture ponds. They have irrigation and production functions and they are also the ecological habitation in the areas they are located. Unfortunately, following the urban development and major public construction as well as the expansion of communities, the agricultural ponds are decreasing in number and in area.

The purpose of this research is for studying the changes in biodiversity of agricultural ponds. We took the bird survey data of Chinese Wild Bird Federation between 1995 and 2005 and the Digitized Land Utilization Map of National Land Survey and Mapping Center of Land Administration Department and conducted the survey of agricultural ponds of Yunlin County. Logistic regression models were used to predict the probability of disappearance of agricultural ponds and probability of 10 appearances of frequently seen birds. The models created 4 different types of agricultural ponds. Type 1 is high bird appearance and disappearance probabilities; Type 2 is high appearance probability of birds but with low disappearance probability; Type 3 is low probability of appearance of birds and high probability of disappearance and Type 4 is low probabilities in both appearance and disappearance of birds. At the last, we provided suggestions for ecodiversity conservation of agricultural ponds.

Findings of the research indicated that Type 1 agricultural ponds has good ecological environment but need to avoid large scale development and need to set up regional ecological restoration plan for conservation. Type 2 and Type 3 agricultural ponds are suggested to maintain the status quo. Type 4 agricultural ponds may conduct environmental restoration to increase the biodiversity of agriculture through improving ecological environment of agricultural ponds.

G1-4

Distribution and habitat of a discovered cherry species in Tama hills, Tokyo, Japan

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Cherry species is one of the most familiar plants in Japan, and is common in secondary deciduous forests. In 1992, a new wild cherry species *Prunus tama-clivorum* Oohara, Seriz. & Wakab was discovered on the Tama hills, western Tokyo (Oohara et al., 2004). This new species was named as "Hoshi-zakura" in Japanese and described as a new species in 2004. According to Oohara et al. (2004), estimated number of individuals was less than 100 and the species was listed as a CR (critically endangered) species in the Red list of Ministry of the Environment of Japan in 2007. However, few studies have been conducted about this species since the discovery in 2004 although ecological characteristics of the species help to develop conservation and management methods in urban landscapes.

The aim of this study is to clarify current distribution pattern of *P. tama-clivorum,* by gathering various information on the species. We confirmed the distribution of the species reported by public administrations and cherry species enthusiast, and surveyed literature information for understanding of land use and land use changes of the Tama Hills where the species was observed.

We found at least 140 individuals at 13 places, in Hachioji city, Tama city and Machida city, suggesting that the previous study underestimated number of individuals and spatial range of distribution. 67% of all individuals were found in abandoned secondary deciduous forests in the two parks (Oohira Park and Kataso Yato). However, some individuals were regularly planted on the developed land in parks or roadside. These results suggest that there may be two types of populations; large population under the abandoned secondary forests and small population (or some individuals) that artificially planted. On the other hand, seeds and seedlings of the species were not observed around the trees, and we speculated that outgrowths from trunks may be important to maintain population of the species under natural condition. Thus, we conclude that the distribution of this species may consist of two types of population, and also that further studies are required to understand ecological characteristics of the species for ecologically suitable management and conservation.

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G1-5

The impact of Off-Road vehicles on coastal dune vegetation on Ishikari Coast, Hokkaido in Japan

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Ishikari Coast of Hokkaido is one of the important natural coasts in Japan because there are undeveloped, no artificial construction, sandy beach and dunes covered by coastal plants widely, although which is located close to Sapporo city where 1.9 million people populate. Since the ORV (Off-Road vehicles) drive in coastal area were observed in 1980's in Japan, they become an important factor that has greatly impacted the coastal sand dune systems and their ecological systems. To protect these dunes, Hokkaido prefecture had enclosed these areas by ropes for keeping out ORV driving in dune area since April 2005. To evaluate the effect of enclosure with ropes quantitatively, we monitored the recovery of coastal plants, like the number of species present, vegetation height and percentage cover in this study.

Four transects were selected within 1.5 km width of Ishikari Coast. Four environmental situations, based on vegetation cover and terrain, were selected in each transects as 1) foredune damaged area, 2) middune damaged area which were divided in two conditions as blowout and non-blowout area, and 3) backdune damaged area. We installed the 2x2 m quadrat in each area and also contrast quadrat next to each quadrat in 2005. Totally, eight quadrat and eight contrasts were analyzed in this survey. We compared the number of species present, vegetation height and percentage cover change of each situation from Oct. 2005 to Oct. 2009.

After five years past, the number of species recovered 55% (middune quadrat) to 81% (backdune quadrat). These species, which have rhizome systems like *Elymus mollis*, *Carex kobomugi*, *Ixeris repens* etc., were contributed for dune recovery. But the vegetation height and cover did not well recover compare with controls than other research (Brodhead and Godfrey, 1977; Matsushima et al., 2000). We observed ORV drive in survey site except backdune area, and the ropes were cut every week. Such disturbance will prevent the recovery of vegetation cover.

Backdune area which were not disturbed during this survey periods (five years), recovered the number of species, but the components of quadrats were different. Control quadrats of backdune were usually dominated by *Rosa rugosa*, *Miscanthus sinensis* and *Poa pratensis* (Kentucky bluegrass), but the damaged quadrats were mainly covered by *Lathyrus japonicus*, *Carex kobomugi* and *Carex verna*. The mean vegetation heights were also lower in damaged quadrats (10.8 cm) than control (43.3 cm).

This result indicates that the enclosure with rope reduce the number of ORV drive in dune area, but still not enough for recovery of coastal plants. And backdune areas took much time to recover, not enough at least five years, even if we could stop ORV drive in this area.

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G1-6

Tripartite mycorrhizal symbiosis in achlorophyllous orchids, *Lecanorchis* spp.

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Lecanorchis spp. are achlorophyllous orchid plants which are distributed from Southeast Asia to East Asia with northern limit in Japan. Achlorophyllous non-photosynthetic nature means that carbon compounds required for their growth depend totally upon the supply from the mycorrhizal fungi colonizing in the root cortical cells, and referred to as myco-heterotrophic plants. Classification of the genus *Lecanorchis* is based on the epigeous morphological characters, but remained to be clarified. One of the objectives of this study is to contribute the taxonomy of these orchids by giving the new insights from the molecular phylogenetic analysis. The other objective is to obtain the knowledge about the mycorrhizal fungi, which could contribute the clarification of ecological features and leading to the conservation of those endangered species listed as category CR or NT in the Red data book by Ministry of the Environment (Yahara et al., 2003). Among the *Lecanorchis* spp. within Japan, 9 taxa including *L. nigricans*, *L. flavicans* var. *acutiloba*, *L. kiusiana* var. *kiusiana*, *L. kiusiana* var. *suginoana*, *L. virella*, *L. japonica* var. *japonica*, *L. japonica* var. *hokurikuensis* and *L. japonica* var. *kiiensis* were selected and 103 specimens in total with both shoots and roots are collected from Niigata Pref. to Amami Island. Molecular phylogenetic analysis was conducted both among the plants and their mycorrhizal fungi based on their ITS regions of nuclear rDNA. Most of the plant taxa relationships assigned by morphological characteristics are confirmed by molecular phylogenetic analysis. However, both varieties in *L. kiusiana* were clearly separated, suggesting they could be located in the different species, whereas *L. virella* and three taxa in *L. japonica* were all belonged to one lineage without clear separation, suggesting indiscriminate relationships among them. However, these data were based on only one region of rDNA ITS, and we are going to include other regions for more accurate analysis. On the other hand, most of the mycorrhizal fungi in *Lecanorchis* spp. were detected to belong to only three lineages of *Lactarius* spp. Some *Russula* spp. were also detected, but no specific lineage is indicated. In *L. flavicans* var. *acutiloba*, specificity to one lineage in Atheliaceae was obtained. Other fungi such as Thelephoraceae and Sebacinaceae were also detected. As a result, the fungi colonizing in the roots of *Lecanorchis* spp. were all ectomycorrhizal fungi of woody plants in Pinaceae or Fagaceae, which indicates that both *Lecanorch*is orchids and the surrounding woody plants could share the common mycorrhizal fungi. Therefore, carbon compounds as photosynthates are supplied from woody plants to their mycorrhizal fungi through ectomycorrhizal symbiosis, and are then transferred to *Lecanorchis* plants through the hyphal networks of mycorrhizal fungi. This tripartite symbiotic system could support the growth and propagation of this kind of achlorophyllous orchids in nature. For conservation and propagation of these *Lecanorchis* orchids, not only protection of surrounding woody plants but also non-disturbance of hyphal networks of underground mycorrhizal fungi are required.

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G2-1

Urban planning and design: protection of natural and cultural resources

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The basis of planning and design of urban ecological networks / free open space will be discussed with regard to natural geographic conditions of land form diversity.

Landform diversity is a basis of Historic Urban Landscape (HUL), Landscape Ecology, and Human Perception of Landscape and Urban Scenery - The complementary elevation-depression forms of land surface are shown in a figure in Thomas 2007 (after Richter 1962; modified) (e.g. rolling hills with slope ridges, erosion channels). The elevations as remains of upper plains (areas of divergent slope curves [orthogonal trajectories of contour lines]) are complementary to the “dendroform” depressions as erosion channel networks (areas of convergent slope curves). The land form diversity represents all geographical factors (geology, soils, hydrology, local and micro climate, natural vegetation, dry / wet sites including potentially flooded areas). The more extensive the roughness of terrain carving, the more diverse is landscape ecology, and the more diverse is also the scenery. The most decisive characteristics of land forms are (i) altitude difference of an area, e.g. a watershed, and (ii) relief roughness (frequency of complementary elevation-depression forms).

Depression / valley areas along streams, rivers, deep lines, “finger-like” by erosion processes - with their larger lower parts - within the complementary. Elevation networks as remains of (former) upper plains, with ridges, hilltops, slope shoulders - as their larger upper parts - are sensitive areas for urban landscape planning and design. Preference of high land form- and biodiversity for ecosystems and free open space!

Elevation network / hill ridge chains:- 1) Natural resources: Protection of dry vegetation complexes; 2) Cultural resources: Network of preferred areas for single public buildings, monuments, gardens, viewing areas over town, at least jetting out points

Complementary natural finger-like depression networks:- 1) Natural resources: Network of green belts in cities, with natural indigenous vegetation, mainly near deep lines, never filling up /damming for gaining agricultural areas (exception: ponds); 2) Cultural resources: Historic architectural monuments should be protected by buffer zones (up to ridge lines / watersheds) against optical over-lapping, outsized shapes, impairment of scenery

Recommended calculation principles for protective distance zones (free open space, low buildings) between monuments and new (high rise) buildings in different land form positions are represented. Never level the natural land form diversity at large scale by filling up erosion valleys, and / or excavation / removing natural elevations.

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G2-2

Urban biodiversity in the case of Istanbul: potentials and risks

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Istanbul, city of diverse cultures, node of worldwide-known historical heritage, attraction location for economic opportunities, important national and international level of services, and so on. The list can be extended and many other significant features of Istanbul can be added to this list but shortly, Istanbul represents a small scale model of Turkey as a bridge in between differences. On the other hand, there is another feature of Istanbul which is not well-known as much as these characteristics. This is basically the outcome of its unique geographic location (dispersed on two continents and scattered into three pieces with Bosphorus and Golden Horn) mixture of two climatic characters (Mediterranean and Black seas) and diverse geomorphologic structures. These natural characteristics have been modified not only by the nature but also by the people who took place on this unique geographic location through history and resulted to bring out very rich biodiversity abundance. Although Istanbul is approaching fifteen million people and each year almost 300,000 people have been added mostly with migrated population, on the other hand, Istanbul's biodiversity abundance is still comparable at the global scale with its relatively small geographic area.

This paper aims to focus Istanbul's infamous biodiversity abundance and habitat characteristics with a comparative assessment process and with regard to the potentials and risks of urban development dynamics. The latest 1/100,000 scaled environmental master plan of Istanbul (2009) will be used to make basic scenario analysis on the natural heritage of Istanbul.

G2-3

Shrinkage of the corporate town Atenquique

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This paper focuses on the effects the transfer of ownership from a state-owned Paper Mill Company to a corporate private ownership has had on environmental and economic shrinkage in Atenquique. This transfer was the result of the ongoing economic process of globalization, after the industrial boom of the paper mills during the second half of the last century. The paper also focuses on how the employees of this Paper Mill Company live and how they have been affected by globalization and how they feel about their paper mill's new corporate owners. The methodology used was descriptive and exploratory. A sample of ten workers at the company who lived in Atenquique was chosen for an interview. After being inhabited the town of Atenquique developed in terms of population, society and economy. On the other hand the Industrial Company of Atenquique grew during the period when it was a property of the Mexican State. After the company's privatization, the town started to decline and shrink in three above-mentioned variables. The impact on the environmental and economic development has initiated the shrinking and declining of Atenquique and the surrounding cities and towns

G2-4

Urban landscape dynamics and consequences on local biodiversity in a north-eastern district of Bangladesh: an analysis of small farm owners' preferences and attitudes

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Being one of the world's most densely populated countries, Bangladesh has relatively poor forest coverage and per-capita land designated for conservation. The rapidly increasing population also exerts tremendous pressure on country's limited land resource alike many other resources. Consequently, over the last years, the country experienced a rapid change in its' conventional land use practices, which evidently most conspicuous in urban areas where people from countryside's have been gathering for better living facilities. We conducted an exploratory study to understand the urban landscapes dynamics and their perceived impact on local biodiversity in Sylhet city - one of the fastest growing urban areas in the north-eastern Bangladesh. Thirty small urban farm/homestead owners were selected randomly and interviewed through a pre-structured questionnaire. The farm/homestead situations of the respondents were analyzed and data regarding landowners' perceptions and attitudes towards different land use systems, their probable impacts on biodiversity and the changing role of plants were collected. Study revealed a noticeable change in the land-use pattern of the area, most of which took place within the last decade. A rich farm composition was also evident during the study noticing 52 different tree species with highest proportion of trees under age group 15 to 20 years. Survey also indicated that respondent's maintained trees in their farm/homesteads mainly for aesthetics (64%), followed by fruit production (17%), timber (7%) and to hold the ownership of the land. Study identified a negative attitude of the respondents to maintain their farm/homestead only for plants, since in a changing perspective they consider it not an economically viable land-use practice. The respondents also opined that, avifauna are the most adversely affected community in the area by the present trends of land-use change. A reserved green zone to minimize the negative impact resulted by changing urban land-use trends/practices that should be managed by local government and conservation agencies is necessary to reduce the vulnerability of local biodiversity and ecosystem health.

G2-5

Urban agroecology as a multilateral development tool: challenges and opportunities

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The CBD does not focus precisely on urban spaces, nor does it address agricultural biodiversity per se. Yet in this paper I argue that the Convention can actually be an integrative, comprehensive framework from which to make positive contributions to the multilateral development agenda (e.g. World Bank, UNEP, UNDP, FAO, national agencies, etc) with respect to tackling two of the most compelling challenges in a growing and rapidly urbanizing world: global environmental sustainability and equitable social development. Accordingly, the paper addresses the challenges and opportunities of using such framework in the design, implementation, and evaluation of international development projects focused on fostering social equality and ecological integrity in urban spaces, while contributing to reducing the ecological footprint of cities and thus improving biodiversity conservation. That is, transforming the urban fabric into an agricultural and ecologically productive space that provides ecological services and agricultural goods for its inhabitants, while creating job opportunities and fostering clean technological development.

The paper starts by providing an overview of the main ecological and social shortcomings of modern agricultural development (e.g. diversity loss; high carbon emissions; pollution; social exploitation; corporate control; loss of traditional knowledge; etc) and widespread urbanization (e.g. loss of natural habitats and thus species; reduction of ecosystem functionality; social inequality; marginalization, etc). Next, I address the main conceptual and developmental concepts within the CBD that can contribute to integrate urban development with sustainable agroecological management (e.g. considering the diversity of life in the context of the ecosystems in which it occurs; addressing ecological and social aspects; focus on governance issues at different scales, etc). Then the paper moves to provide specific examples (whether currently projects being implemented or as development models) of ways in which the ecological and social fabric of the city can be transformed into an agroecologically productive and progressively governed space which contributes to preserving diversity while improving human livelihoods (e.g. urban agro-gardens using traditional varieties and local knowledge; vertical farming and private sector involvement in technological development; municipal cooperatives for agroecological restoration and unemployment reduction; etc). The paper closes by providing a critical overview of the challenges and opportunities of such projects and, more generally, of using urban agroecological management strategies as multilateral development tools (e.g. lack of appropriate concepts and methodologies; pre-established cultural and professional conventions as to what constitutes sustainable urban development; lack of adequate governance mechanisms to address urbanization and agroecological management in a holistic way; etc).

Ultimately, the paper aims to provide innovative yet critical insights for improving global diversity conservation efforts using the CBD as a framework for the international development agenda while focusing on urban growth and agroecological management.

G2-6

Biodiversity and zoo design

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Zoo exhibits are appropriate media and spaces to understand biodiversity. There, diversity can be understood at three levels: the individual, the species, and the ecosystem. In general, zoos exhibit many species as individuals. The arrangement of zoos has developed from the systematic to the zoogeographic and to habitat arrangement. Recently, habitat exhibits which are designed to exhibit species in relation to their native habitat have become especially important. Because the habitat exhibit is designed to show the interrelations between the individuals, the species and the native habitat in an ecosystem, it is a space that fosters understanding of biodiversity. These interrelations will be concretely expressed in the landscape of the exhibit.

At the individual level, landscapes should create an environment in which the relation between individuals and populations can be observed. At the species level, species should be exhibited not in parallel but in a way in which interspecific relationships can be understood, including the predatory relation of carnivores and herbivores. Moreover, the landscape formed by herbivore's grazing and browsing is an expression of the relations between animals and plants. At the ecosystem level, it is necessary to exhibit different biome systems such as tropical rain forest, savanna, and desert, and to model landscape features specific to native habitats, such as rivers, lakes, marshes, meadows, forests, rocks, and caves. Exhibiting the relations between species and between individuals in those landscapes leads to an understanding of the relation of biodiversity in the individual, in the species, and in the ecosystem.

Habitat exhibits that provide a window on biodiversity are just beginning to emerge in Japan. In this presentation, I will introduce the habitat exhibits of the Asian forest and African savanna at Tennoji Zoo in Osaka (Figs. 1 and 2), the chimpanzee forest at Yokohama Zoo (Fig. 3), and the red panda forest at Chausuyama Zoo in Nagano (Fig. 4). To improve the quality of the habitat exhibits, and to create spaces where the relation between the species and the native habitat can be understood, it is essential to design landscapes that minimize the use of artificial materials and are based on planting and variations in terrain.




(From left to right) Fig. 1: The Asian forest at Tennoji Zoo, Fig. 2: The Savanna at Tennoji Zoo, Fig. 3: The chimpanzee forest at Yokohama Zoo, Fig. 4: The panda forest at Chausuyama Zoo.

G2-7

Urban design issues of Sotobori moat in the central area of Tokyo from the point of view of the urban landscape and ecosystem

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Sotobori moat was built in the 1600s with the aim of protecting Edo castle (actually the Imperial Palace) as part of a double surrounding water barrier system consisting of an inner moat (Uchibori) and an outer moat (Sotobori). These moats have a special value in the central area of Tokyo as elements of urban design, not only because of their size but also because of their quality since they bring a fine landscape and rich ecosystem into one of the most densely built-up areas of Japan. Furthermore, since the site is one of the large basic topographical features of the region and forms part of the ecosystem, it is necessary to consider the moat on both large and small scales to conceive the future of this special site. But, traditionally, physical site planning has been carried out only for the interior of the given area and it is rare to consider the surrounding environment, especially the ecosystem. This situation has to be changed. Thus we are confronting new questions; how to observe and recognize the site in a holistic way, how to represent the results, and how to plan using the results.

To this end, we have begun with the observation and representation of the site by making a digital atlas. As a digital atlas has a common axis for time and space even though it may consist of different kinds of thematic maps with varying scales, times and ways of representation, the main tool of this research deals with urban spatial and biodiversity. Thus, the purpose of this presentation is firstly, to discuss the utility of the digital atlas for holistic urban design, and secondly, to report on the first result of making the atlas, especially the contribution of the detailed base map of the site which includes a bathymetric representation of the moat to show the relationships between the topography and the environmental phenomena.

(1) Atlas: Sotobori moat has a huge water basin surrounded by sloping banks with thick greenery where many kinds of animals live, namely birds, water birds and aquatic creatures. The relief of this area is full of variety, which creates dynamic landscapes. Thus, the contents of the atlas may include a base map with relief representation and information on the following:

1) hydrographic system
2) climate
3) vegetation
4) animals
5) equipment and buildings
6) human activities
7) plans of urban design

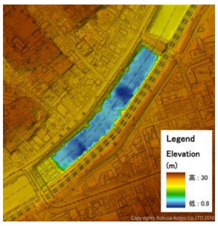

Fig1. Base map with relief representation

(2) Base map: Data from a 2 m grid digital terrain model (source: Kokusai Kogyo) was used to represent detailed land relief. But these data did not contain bathymetric data of Sotobori moat. Thus we made a survey and collected data on depth, which revealed the relief of the bottom. The invisible bottom relief and topography of the left bank shows the continuity of the relief between them. It may be supposed that water current and spring water exist there. The base map may be used to represent data from 1) to 7) by layering each map. This will allow the urban biodiversity of Sotobori moat to be understood.

As the result of the first step, the spatial structure of Sotobori moat became much clearer by revealing the relief of the bottom. A good base map is useful for understanding urban spatial and bio diversity, which will contribute to the creation of holistic urban design.

G2-8

City planning by conservation management of sacred forests and cultural landscapes

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The present study aimed to solve the problem of the conservation management of sacred forests in the urban area by conducting two surveys, and to obtain data on the management of hardware and software for it.

Investigation 1- Questionnaire survey of software (event/festival) and management problem that targeted Shinto shrine in Nagoya City and four cities in outskirts.

Investigation 2- Case research into system of maintenance of sacred forest in the Shiroyama Hachimangu shrine of Chikusa-ku, Nagoya. As for this forest, it is located in westernmost in the east part of Nagoya city hill, and the importance of maintenance is high as a forest that is the nearest from the Nagoya central area.

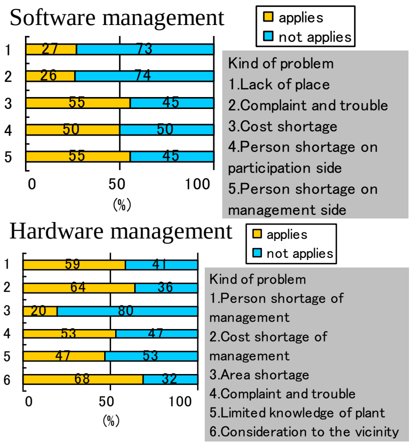

Fig 1. Management problems

Investigation 1 focused on the maintenance of software (events/festivals). The survey revealed that there was a shortage of funds and personnel on the management side and participation side in the case of about half the sacred forests (Fig 1). With regard to hardware maintenance, in the case of 70 percent of the sacred forests, problems/complaints were caused by considerations.

Investigation 2 deals with the problems concerning the management of sacred forests: complaints about fallen leaves and cladoptosis from the local populace (problem 1); palm of the exotic species due to lack of maintenance, thick growth of bamboo grass and the kudzu vine (problem 2); and the increase in the cost of dealing with the withering of the growth of *Quercus variabilis* attacked by *Platypus quercivorus* (problem 3) (Fig 2). The reasons for each problem were assumed to be as follows.

Problem 1 is caused by the constant shifting of the local populace and decrease in concern for the forest. Problem 2 is due to the collapse of the system of management by the local populace, talent, and shortage of funds. Problem 3 is a result of an unprecedented large diameter lignification caused by the frozen maintenance of the forest (the statutory regulation is also partly responsible).

An NPO formed by the member outside the region in 2009 started the maintenance of sacred forests. So conducts workshop of exterminating of exotic species and environmental study, there is especially not a collision with the resident, and achieving constantly improving results with regard to problems 1 and 2. As for problem 3, it is felt that positive support by the administration is necessary from public interest of the forest viewpoint.

Conservation management of sacred forests would entail not only the efforts of regional organizations and Shinto shrines, but also support from NPOs and the administration.

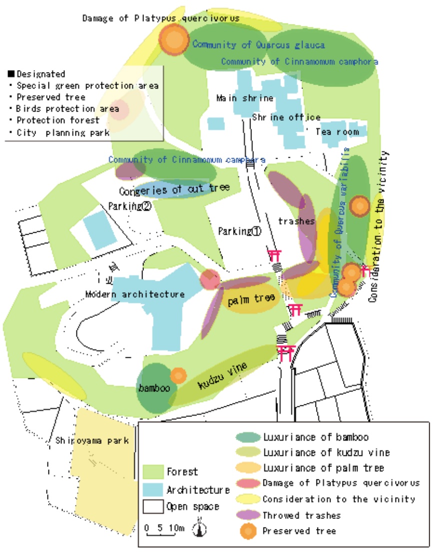

Fig 2. Condition of Shiroyama Hachimangu shrine

G3-1

Conservation of urban birds leads to a cooperation between Birdlife Netherlands and construction companies

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For long, the house sparrow (*Passer domesticus*) was by far the most common bird in The Netherlands. Because of recent drastic decline in numbers, the species became Red Listed in 2004. As the main part of the house sparrow population lives within city boundaries, this draws attention to the fact that cities are rapidly changing, and degrading as a habitat for birds. This was the reason for Birdlife NL to start a program on the conservation on urban birds.

Through a point count scheme based on the Dutch postal code system, data are being collected on birds in cities in the breeding season as well as in winter. Citizens can easily join the program by counting their own postal code area. The program delivered the necessary information on birds in cities to develop:

- a benchmark for urban birds
- a state of the urban birds in 2009

The latter compares the trend of 40 species in urban and rural areas. The differences are surprisingly great. With the benchmark, the numbers in actual point counts are being compared with expected numbers. This shows whether a location is relatively rich or relatively poor in urban birds. For both the benchmark and the state of the urban birds, the bird species are lumped in 'guilds' not based on biological family but on landscape use; nesting site for the breeding season, and food for the winter. Therefore, giving a direct implication of the conservation measurements needed in a certain location e.g. city.

The benchmark goes together with a handbook on the conservation of urban birds. The book is the first and most complete overview of conservation measurements to be taken for birds in urban areas in the country. It can be used by municipalities and citizens as well as the building industry. The most challenging of all stakeholders is, of course the building industry. To make the book easy-to-use for the construction companies, a checklist was developed in cooperation with the biggest contractor in the country, B.A.M. This is a quite revolutionary cooperation. As most construction workers are poorly educated on ecology, the checklist consist of simple Yes or No questions, that lead to an advice of what conservations measurements can be taken on a building. The checklist was tested in three pilots and is now free to use.

Although conservation never happens as fast as conservationists may want, the urban bird program of VBN gets a lot of attention in the country. There is a close connection between urban bird species and citizens, birds can symbolize the connection between citizens and nature, and improve the liveability of cities. Birds can be seen as a symbol for the quality of life of humans.

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G3-2

Roles of a research institute in communication between research and society: the case of research forests in Malaysia and Japan

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Forests located in universities or research institutions have multiple roles in not only supporting research and education, but also for biodiversity conservation in a region. Since the importance of the communication between research and society was emphasized in science and technology policy in Japan (e.g. The science and technology basic plan of Japan), university and research institutes have made many attempts to promote communication with the society using research or university forests (Yamashita et al., 2004). However, most of institutes are struggling to meet the social expectation except their research results. Institutional and/or operational problems in communication activities between researchers and the society is one of the reasons in Japan (Suzuki et al., 2010).

Forest Research Institute Malaysia (FRIM) promotes not only environmental education, but also eco-tourism activities by opening their facilities and its forests. In fact, FRIM's facilities include a canopy walkway and nature trails that attract about 200,000 visitors a year from home and abroad (Numata et al., 2010). The fact suggests that many Japanese institutes with forests have possibilities to enhance their performances for direct contributions to the society.

In this study, we examined several components of eco-tourism activities by questionnaire survey and interview. Firstly, we identified the organizational structure of FRIM. For FRIM's eco-tourism activity, an independent section exists, and consists of 18 research scientists, 4 forester/rangers and 11 supporting staff who are engaged in research and operation for eco-tourism activities. Secondly, we examined relationship between the research and operation of eco-tourism activities in FRIM, suggesting that there is a positive linkage between research and eco-tourism operation. On the other hand, in order to understand Japanese research institute, an interview and literature investigations were done to a Japanese research institute. We found several educational programs for students and local residents in Japanese research institutes. However, an interviewee suggested that such implementation of programs does not necessarily give incentives to the research scientists and their department because researchers are evaluated primarily by their research performances. Moreover, we also found that Japanese institutes have hardly set up individual sections which focus on eco-tourism. Hints to promote utilization of research resources in software and hardware forms and expected roles of a research institute in communications between research and society will be discussed.

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G3-3

Considerations for sustainable activities with conservation of Satoyama at Toyota city

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Introduction - There are several groups that work for conservation of Satoyama at Toyota city in Aichi Prefecture. Those groups have started such activities more than 10 years ago. In recent years, “Satoyama” became famous rapidly and is widely recognized as an important theme of nature conservation by Japanese people. Because Satoyama is an existence that is very close to Japanese people’s life for a long time, it seems that this type of nature will be more and more worthwhile. But now, steps for conservation or revival are not enough to take over to next generation. The biggest factor may be that those fields used as Satoyama: productive forest for firewood, charcoal, lumber or edible wild plants, are private properties. Secondary factor is that those groups have not been managed as a sustainable organization. Because, they do not have definite goal or purpose, they do not have enough number of leader or staff who can manage such groups in many cases. This research was conducted to obtain solutions for secondary factor, and questionnaires for knowing differences of consciousness between: leader or staff of the group; and members of the group who participated as volunteers, were carried out.

Methods - Questionnaires were conducted by cooperation with Sanage Satoyama Club that work on conserving traditional rural landscape and Gifu-cho: indigenous butterfly in Japan, at Mount Sanage. Cooperation of some other groups working in Toyota city was also obtained. The age of almost all members of the groups were around 50s to 70s.

Questionnaires were made by referring to organization theories. Fig.1 is a model of effectiveness of organizations by Quinn and Rohrbaugh (1983). First dimension indicates focuses of effectiveness, and second dimension indicates structures of an organization. Furthermore, questionnaires were designed for analyzing tendency: (1) mission, (2) purpose and (3) approach for each group. Then, answers were obtained by leader or staff and other members by using same questionnaires, and analyzed those results.

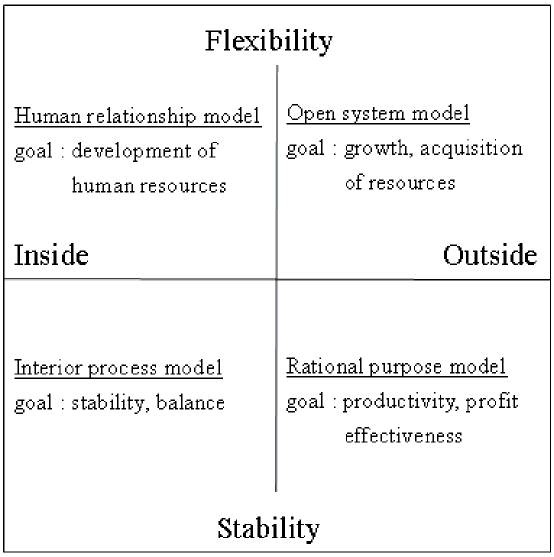

Fig1: Model of organization

Results - It was found that each member of those groups has different desires and purpose, in many cases. However, almost all members wish for a common purpose, and that makes the group active. Moreover, the most important result is that almost all members of those groups desire to enjoy activities in the forest or Satoyama, but not to conserve Satoyama or nature resources.

If we want to succeed to make Satoyama worthy for the next generation, we have to manage between desire of members of those groups and the demand of society, and edit new relationship between human society and nature.

G3-4

A study on the consensus building process for the Ten-noh river restoration project on Sado Island

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One of the most important concerns in river restoration is to promote a restoration project in accordance with local needs and interests by incorporating the process of consensus building. The value of consensus building processes has been articulated in governmental guidelines for river restoration and management in Japan. As a consequence, the number of consensus building cases has been increasing since the end of twentieth century. This tendency indicates that it is critical to establish the evaluation framework of consensus building processes and to promote relevant public participation. The purpose of this paper is to identify essential factors that need to be taken into consideration when constructing a consensus building process in a river restoration project.

The authors have engaged in the management of the consensus building process in the Ten-noh river restoration project carried out on Sado Island, Niigata. This project has been conducted with the view to re-introduce the crested ibis to the natural environment. Since ecologically rich watershed needs to be restored in order to create favourable environmental conditions for this bird, Niigata prefecture has been promoting various river restoration projects on this island. The Ten-noh river restoration is the largest project among them. In this project, the authors have conducted a series of workshops in order to identify key stakeholders, to examine their interests and to consider possible solutions to identified issues.

By reflecting upon the preparation and implementation of the consensus building workshops, various stakeholders are involved in the Ten-noh river restoration. Particularly, fishermen in Lake Kamo had negative opinions about the project. Through the workshops at which local residents and administrative officials discuss the restoration plan, fishermen made a proposal to promote a comprehensive environmental project involving the restoration of the Lake Kamo and other participants approved of the proposal. Nevertheless, to carry out comprehensive restoration in Ten-noh river restoration project is very difficult because the river and the lake are administrated by different governmental bodies. Hence, local residents, governmental officials, and university researchers, in collaboration, established Sado Island Lake Kamo Water System Restoration Research Center (KAMOKEN). KAMOKEN is an organization to solve problems with crossing the administrative boundaries. Moreover, people have developed diverse activities along with their own interests, for example, not only the ecological issues but also the development of tourism, local traditions, and landscape design. The participants began to acknowledge importance of restoring “local commons” as a result of these activities. As a consequence, various local residents including fishermen became cooperative for the Ten-noh river restoration project.

As a result of field research, I have extracted the following two key factors that contribute to consensus building processes in river restoration: (1) Establishing an appropriate organizational structure for creative problem solving, and (2) Constructing a common vision based on stakeholders’ interests. These points are helpful not only for establishing criteria for evaluating the quality of public participation but also for providing practical guidelines on how to design consensus building processes.

G3-5

Institutional effects on the conservation of urban *satoyama* forest: trends in public land acquisition and participatory forest management

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Satoyama, secondary woodlands in Japanese traditional agricultural landscapes, provides multiple ecosystem services (Takeuchi, 2003). Traditional management practices are important for the provision of recreational and biodiversity functions. The loss of economic values of *satoyama* resulted in abandonment and subsequent loss of ecosystem services. Thus new management systems need to be introduced to *satoyama* through policies or other economic incentives. Conservation strategies of municipalities play an important role for this task and the effectiveness of the strategies may relate to available budgets, instrument types and administration efficiencies. We performed a cross-border analysis of conservation strategies in the urban fringe of the Tokyo metropolitan area and quantitatively assessed the increase in protected area of three neighboring municipalities. Studies across boundaries between neighboring administrative units are especially useful for studying the effects of regulations, subsidies, and political systems (Bürgi et al., 2004).

We chose three municipalities (Hachioji, Hino and Machida) to examine histories and patterns of *satoyama* conservation. All municipalities locate in 40-50 km distances from the central Tokyo, where the rapid decrease of the area of *satoyama* woodland occurred during the last decades. Conservation ordinances of those municipalities have been classified based on the changes in land ownership and management. Eight instruments have been selected from three municipalities and classified into four ownership types and three management types. Our research has been conducted through four steps: 1) relative ordinances have been selected and interview to municipal officials was conducted; 2) archival research has been conducted to clarify area coverage, designated year and managers of the area; 3) maps of *satoyama* woodland have been made for three periods; and 4) archival data has been transferred into geographic data and overlayed with the maps of *satoyama*.

As a result, private ownership lands with no conservation designation occupy most of the *satoyama* woodland in all three municipalities. This type of land decreased dramatically through all period in all municipalities. Public land acquisitions are the dominant tool for the conservation in Hachioji and Hino, on the other hand the other measures play an important role in Machida. In Machida, local ordinances are playing important role than the other two municipalities. Citizen volunteer group management is rapidly increasing in recent years in Machida, and the reason of success in citizen volunteer group management in Machida is the adaptation of "citizen forest" approach in two ordinances. However, there is not much success in the similar type of ordinance of Tokyo metropolitan government. Interviews with officials revealed that less communication between prefectural officials and citizens might be the reason of low efficiency. This result implies that sometimes administrative efficiency is critical in determining effectiveness of policies rather than the general type of policy.

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G3-6

"Alien Watchers" project: a local governmental survey on invasive alien species as an emergency employment measures by Shiga Prefecture, Japan

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Impacts of alien species are now recognized as one of the major threats to biodiversity. Thus, control of invasive alien species is an important option for environmental policies. The Japanese law "Invasive Alien Species Act" enforced in July 2005 stipulates "Invasive Alien Species = IAS" as the targets for strict regulations. Until now, some 100 taxa have been selected as "IAS". Following this law, Shiga Prefecture enforced a new ordinance for coexistence with wildlife in May 2007, in which "Local IAS" is stipulated with similar but weaker regulations. Fifteen taxa have been selected as "Local IAS".

The law and ordinance officially select the target alien species to be controlled and serve as a good framework for executing a variety of countermeasures. In order to carry out actual countermeasures, it is necessary to grasp the present situations of distribution and ecology of such alien species to be strictly controlled. However, alien species - even those that are highly invasive - tend to be abundant around, but neglected by the public in general. This is because: (1) alien species tend to establish populations in urbanized or rural environments that are modified through anthropogenic processes rather than in intact nature; (2) those who take interest in biodiversity are likely to observe wildlife where alien species tend to be less common; and (3) most floral and faunal surveys required prior to environment-altering development projects are carried out with a focus on conservation of native endangered species. Due to these adverse trends for sufficient monitoring of alien species, it is rather difficult to raise public awareness or ask participatory survey on alien species. Nevertheless, we should always be conscious about the growing possibility of invasion and expansion of alien species around us for their effective and wise control.

Considering such necessity to watch alien species, Shiga Prefecture has decided to start the "Alien Watchers" project for 3 years from 2009 as a part of emergency employment measures by the Ministry of Health, Welfare and Labour, Japan. From September 2009, 18 employers have engaged in field surveys on a total of 17 alien species which were selected based on easiness of *in situ* identification of the species and unnecessity of special techniques or skills for finding or observing: 2 mammals and 5 plants for terrestrial-habitat survey; and 1 turtle, 1 frog, 1 fish, 1 crayfish, 2 snails and 4 plants for aquatic-habitat survey. Among 7 "Local IAS" which were confirmed to establish populations within the prefecture area, 5 species were included.

Because this project was conducted as a part of emergency employment measures, most of the persons except a few skilful leaders were employed irrespective of their experiences or skills, e.g. finding, capturing and identifying of the species, recording of the data, reading of the maps, etc. Unskilled persons learned such necessary skills after adoption through engagement in actual surveys with the aid of skilful leaders. As a result, the system for field surveys by 6 groups of 3 persons has been completed. Thereby, conditions for executing prefecture-wide alien species surveys in urbanized and rural areas have been established.

In our presentation, we will show the results of the first year for several species, including raccoon *Procyon lotor*, apple snail *Pomacea canaliculata*, lanceleaf tickseed *Coreopsis lanceolata*, with evaluation of this kind of alien species investigation.

G4-1

Maximising urban biodiversity in mega-development projects: strategic lessons learnt from a UK case study

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This presentation unearths the strategic opportunities and threats in protecting and enhancing biodiversity within two scales of mega-development: 1) the Thames Gateway eco-region, which is the largest regeneration area in Europe and is the hosting location for the London Olympics in 2012; and 2) the strategic mega-development of Eastern Quarry, the largest mixed-use development scheme in the UK when it gained outline planning permission in 2003. Eastern Quarry will provide five urban villages, and is set within the Thames Gateway itself - which promotes ecological aspirations.

These mega-developments are essentially one case, studied at different spatial scales in order to provide nested theories, necessary for realistic recommendations to maximise biodiversity through a systems approach. Whilst the findings are applicable to any major development scheme, the scale of this mega-development and its context here have passed a new threshold of complexity, requiring a new understanding. This is due to size, varied temporal and spatial scales, numerous actors with overlapping and competing responsibilities, and the trans-disciplinary and trans-boundary nature of the biodiversity issues.

The complexity itself is one of the main threats to realising the opportunities, which can lead to the proliferation of inaction and green-wash. Three key findings of the research show that:

1) At the contextual scale of the Thames Gateway, the main biodiversity opportunities exist within the prioritisation, and provision of locally appropriate prescriptions for biodiversity within strategic documents. These documents relate to Green Infrastructure (GI), visions, design briefs, development procedures, policies and legislation. Additionally, opportunities also exist through collaboration, champions, media and social interpretation and enforcement.

2) At the individual mega-development scale of Eastern Quarry, the main biodiversity opportunities relate to project management, documentation synchronicity, socio-ecological resilience, organisation cultures, communication - both between actors, and of the biodiversity proposals, and innovative multi-functional design solutions.

3) The opportunities of both scales can be achieved or threatened by types of governance, accountability, politics and development procedures.

Threats to these opportunities can affect biodiversity at every lifecycle phase of an individual development scheme.

The research involved an extensive review of non-academic and academic literature, as well as interviewing all key professionals directly involved in the Eastern Quarry development, and some key professionals and academics involved in the Thames Gateway. Action research, both as an ecological consultant to Eastern Quarry, and previous environmental planning roles were employed, along with a questionnaire and other case study findings from the wider research project. Recommendations to maximise opportunities and limit threats will be highlighted in the presentation.

G4-2

The urbanization of border landscape: threats and opportunities of regional biodiversity

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This paper mainly concerns the biodiversity in border region with the influence of urbanization due to the transformation of the status of international border landscape. Obviously, the role and function of border region has changed tremendously over years, such as western Europe, U.S.-Mexico and many parts of the world. The astonishing amount and types of cross-border activities has transformed once-isolated border landscape into urbanized.

Urbanization affects on ecosystem and biodiversity in borderlands indeed is the crucial issue that draws worldwide attention to the management and land use of border landscape. This presentation attempts to highlight the transformation mechanism and to discuss influencing factors. The specific characteristics of the border region in terms of the biodiversity after urbanization over time are also illustrated. The research results then offer understanding of the threats and opportunities for contributing to biodiversity planning in the urbanizing border landscape.

The political borderline, both natural and artificial, divides the landscape and become authorized by different nation-states. The status of border landscape could be disputed or peaceful due to the relation of adjust nation-states. Accordingly, various categories of borderland, conflict, transformed and friendly borderland, produce different land use policy and result in particular ecosystem and biodiversity development. However, due to the global political geography influence, the functions and features of borderland are changing and the status of border landscape, which also transform from conflict (armed/closed) to peaceful (borderless/open). Consequently, cross-border activities such as work, business, migration, tourism and transborder cooperation lead to population growth and expansion of border cities or towns.

Urbanization becomes a major transformation of border landscape. In terms of biodiversity in such urbanized and integrated region, on the one hand, the growing cross-border activities are the most dominant current threats to the biodiversity of border landscape; but on the other hand, the coalition of landscape planning of both sides is the great opportunity to contribute to the establish biodiversity effective management policy. The study of positive and negative aspects will assist to seek the comprehensive strategy to develop the border landscape in the biodiversity perspective.

G4-3

Land use and the occurrence of Human-Elephant Conflict (HEC) in Central Province, Sri Lanka

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In 1996, IUCN declared Asian Elephant as one of the most endangered species of large mammals, and this status has not improved ever since. It is identified that the Human-Elephant Conflict (HEC) is the single main threat for Sri Lankan elephants (Fernando, 2005). Habitat loss due to the degradation of natural forests with the increase in human population and the land used for agriculture, village expansion and irrigation development has created the HEC (Gunaratne & Premarathne, 2006).

The objective of this research is to study the occurrence of HEC in relation to agricultural land use in the Central Province, Sri Lanka. HEC data in 2009 and the regional information were collected through face to face interviews during field visits and referring data available at local conservation and administration authorities.

This region has a human population of 2,423,966 and it is the second highest populated region in the country. The main forest types are montane forests and submontane forests. These forests consist of scrub forest, grassland and water resources and were used to be good habitat for elephants (De Silva, 2007). However, from the 18th century, these forests were cleared in large scale for tea and coffee plantations. Consequently, there were elephant extinctions in most parts of the region and HEC incidents have been constantly recorded. Sigiriya is recorded as a high HEC vulnerable area in the Central Province.

The agricultural pattern in Sigiriya differs according to rainy and dry seasons. During the rainy season, paddy rice is cultivated and people practice slash and burn cultivation method to grow vegetables. Since 1990 (when the area was designated as a Sanctuary), this traditional cultivation method has been prohibited, and villagers started vegetable cultivation in their home gardens. Three types of HEC incidents could be identified: crop damage, property damage and human death or injury. The most severe and common type was crop damage. Crop damage occurred during the paddy rice and vegetable maturing and harvesting period. Secondly, property damages occurred mainly during the period where people had their rice harvest stored in their house. Further, the interview results showed that home gardening may have resulted in increasing property damages. In contrast, the third type of HEC was very low. However, two people were killed by an elephant attack in 2009. This increased frustration of villagers towards elephants.

The agricultural land use has a relationship with the occurrence of HEC incidents. At the same time, the findings suggest that there are other factors of HEC such as rainfall and life cycle of elephants.

G4-4

The primary study of landscape health

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Landscape health, a new concept emerging from landscape ecology and ecosystem health, is the subject dealing with ecosystem health for landscapes which are seriously polluted and degraded, even facing with the risk of disappearing under the disturbance of intense activities from human beings. Patil (2002) had raised growing concerns about global landscape and ecosystem health, especially for their ability to maintain the function and service of mankind. However, the context of landscape health is quite diverse based upon interpretations from different professions. Therefore, for being used as a foundation for related researches in the future, the aim of this study is to explore the primary context of landscape health. By employing internet searching technique, the study first selects landscape health, ecosystem health, health city, landscape metrics, and sustainable development as keywords to search topics published in the academic journals related to landscape and ecology. Then, the study elaborates concepts, features, evaluation methods, and indicators of landscape health and ecosystem health. From landscape perspective, the study proceeds with profound analyses to exclude inappropriate dimensions. By doing so, better explanations about landscape health can be proposed. The results indicate that there is no unified concept up to present time and most of studies are still at the stage of concept discussion. To quantify indicators of landscape health and make it as a basis of diagnosis and warning system in the future, it still needs more fundamental researches. The study suggests that human activity, environmental change and degradation of ecological service function, and the relationship of human health and threats of ecosystem health needs to be discussed profoundly. Moreover, the study thinks that the integrated perspective, including natural, social, economic, and cultural dimension, should be adopted when doing landscape health evaluation.

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G4-5

Impact evaluation of conservation strategies of cultural heritage on industry landscape and biodiversity

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Since the promulgation of Culture Heritage Preservation Act in 2005, Taiwan has different conservation strategies for industrial buildings with cultural heritage value and has made cultural heritage conservation mechanism such as Designated Monument, Setting Monument Preservation Area and Registration of Cultural Landscape. Other than the conservation scope expanded from single-point buildings to the related facilities and land, it also placed emphasis on the integral maintenance of the main body of building and the surrounding environment. In this research, we targeted on Taiwan industrial building conservation cases, Chutsumen Hydropower Plant: the designated monument; Takao Plant of Roof-Tile Company (brick kiln): set monument preservation area; and Chiaotou Sugar Refinery: the registered cultural landscape, to describe present execution mechanism of cultural heritage conservation presently, and further discussed the impact on the industrial landscape and biodiversity of urban and rural areas of different cultural heritage conservation strategies.

The results of research indicated that the industrial building conserved as Designated Monument is only taking the land where the building is situated, as the scope of conservation. It has limited change in the morphology to the industrial landscape and to the biodiversity. Since the greening of empty land is limited, it has the lightest impact. In the part of Setting Monument Preservation Area as conservation strategy, the scope of conservation, in addition to the main body of building, it includes also the peripheral land to be the landscape buffer area. It has rather significant positive impact on the industrial landscape and biodiversity. In the conservation approach of Registration as Cultural Landscape, since it conserves not only the space where the material cultural heritage is located, it covers also external landscape, even the surrounding town and the source of raw material for processing. So it has the most significant effect on industrial landscape and biodiversity. According to the above analysis, the conservation scope of industrial building and the mode of utilization of peripheral land are the main causes of impacting industrial landscape and biodiversity. In future, thinking may be of conserving urban and rural industrial landscape through cultural landscape multiple conservation approach to establish the harmonic and close relation between natural ecology and cultural landscape.

G4-6

Urbanization calls for innovative nature conservation- Current and future nature protected areas in Swedish cities

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Cities constitute everyday landscape for the majority of Earths' population that thereby benefits from local ecosystem services provided by urban green areas. Both within research and policy, there is a growing interest of urban nature as a necessary part of the global biodiversity conservation programs. However, urban landscapes represent different social and ecological characteristics compared to, for example rural landscapes. Because of these characteristics, the implementation of nature conservation frameworks in cities requires reconsideration of key nature conservation issues, such as why, where and how to protect urban nature in a purposeful way. By analysing current patterns of nature conservation in landscapes with different degree of urbanization, this study is a contribution to the discussions on general challenges of urban nature conservation.

Sweden is a country with long and strong traditions of urban planning and nature conservation. In 1909, the first national park was established and in the 1960s, the first comprehensive nature conservation legislation came into force. Today, approximately 10 percent of Sweden consists of protected areas, mainly nature reserves. Modern urban planning started in the early 19th century and became regulated by law in 1874. Hence, long records of different planning strategies and their consequences are available, which can help to improve the understanding of urban dynamics in relation to general nature conservation. Currently the conventional nature conservation policies are used in the governmental efforts to safeguard urban nature in Sweden. In this study, official data of Swedish nature conservation was statistically evaluated in all 209 municipalities of southern Sweden. Nature conservation patterns, described as the number, size, age, land cover patterns and objectives of designation, of all 1869 nature reserves were analyzed in relation to degree of urbanization.

The analyses showed that nature reserves in cities are fewer, but larger and have a higher diversity of land covers. The land cover compositions showed no differences between urban and rural nature reserves. However, urban nature reserve land covers differ more from their surroundings. For example are agricultural lands and wetlands to a larger degree underrepresented, and grasslands overrepresented in urban landscapes. Furthermore, the urban nature reserves are founded upon more and more socially oriented objectives of designation. The objective outdoor recreation is for example more common in urban nature reserves, while preservation of environments dominates the rural nature reserve designations. These patterns of urban nature conservation are probably an effect of the urban context rather than a conscious strategy of adaptation to the specific urban characteristics. Consequently, contemporary urban nature conservation planning in southern Sweden mainly protects remains of nature from the urban landscape in which it is embedded. This means that urban nature reserves are separated from the rest of the urban landscapes, which risks to jeopardise their long-term ecological and social viability and hence the provision of local ecosystem services. The results of this study call for a new, more integrative approach to urban planning, where innovative nature conservation strategies are included in the overall design of cities, to ensure a long-term urban sustainable development.

G5-1

Greening methods to revitalize building and urban residual spaces

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In recent years environmental problems such as heat island effect and global warming have become focus of attention. Industrial pollution, excessive usage of means of transportation and the increase of hard-gray spaces in the cities are among the main causes. Therefore, the necessity of increasing urban green spaces and the idea of incorporating natural areas to create healthier and enjoyable cities are beginning to be considered all over the world.

Many solutions are being developed concentrating on energy reduction and maximization in the usage of natural resources. Practices such as designing more energy efficient buildings by the integration of green technologies and using eco-friendly materials are carried out in some countries. Nevertheless, in most of the cases these solutions are considered to be applied only to new developments and, although they can certainly contribute to the reduction of environmental damages, the possibilities to increase green spaces in established cities are limited because available areas gradually become occupied.

On the other hand, little attention has been paid to the valuable opportunities represented by existing buildings and the spaces related to them such as walls, rooftops, balconies, etc. As a result, cities that are relatively well endowed with green spaces still have many residual areas which have the potential to be activated and reused with the implementation of greenery that can help to reduce the environmental problems and significantly contribute to its restoration.

The purpose of the present study is: 1) to analyze different greening design methods which can be applied to those existing urban residual spaces in order to revitalize them and create more green areas even if there is not enough space available; and 2) to demonstrate how the improvement not only of the environment but also of people's living conditions can be achieved by the symbiosis between city and nature.

Three different greening projects held in the Kansai area are studied before and after a greening revitalization proposal and the findings are discussed. Furthermore, ten existing green areas in Kyoto, Osaka and Nagoya are surveyed to find out people's attitude towards urban greening and the results are analyzed and compared using the Sustainable Environment Assessment Method (SEAM) proposed by Professor Suzuki's Laboratory. Finally, based on the obtained results, further studies and future applications for urban greening are suggested.

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G5-2

Managing mixed perennial plantings by summer mowing

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Urban green space planning offices usually evaluate perennial plantings as knotty and expensive in maintenance. Besides, weeding cutting is very time intensive if worked out individually to remove wilted inflorescences. In a series of trials at Anhalt University in Bernburg, mixed perennial plant combinations were developed since 1998, which can be completely mown in late winter without any individual cutting (i.e. Fenzl & Kircher, 2009; Messer, 2009).

Blossomy meadows in semi natural landscape often are mown twice. Derived from these examples, an additional June mowing was tested to increase the visual display in late summer. A pre-trial was implemented with a big amount of solitary planted perennials (without competition - “ex situ”, see Kietsch, 2005). Cutting in June directly above soil surface was beneficial to the further development of *Aster amellus* ‘Sternkugel’, *Aconitum lamarckii* and *Salvia nemorosa* ‘Mainacht’, whilst *Stipa calamagrostis*, *Platycodon grandiflorum* and *Tradescantia x andersoniana* suffered and were not recommended to this treatment.

Further on, 18 perennial mixtures were tested under two mowing regimes: 1) Mowing only end of February; 2) Mowing end of February plus mowing mid of June. The effects under the competition between diverse species within these artificial plant communities were different to the results from the *ex situ* trial mentioned above. Advantages were evaluated in a better stability of the stalks of late flowering species such as *Aster laevis*, ground coverers (*Viola, Omphalodes*) were benefited by better exposure to light in summer and autumn. So did species with taller inflorescences but mainly basal foliage (*Gypsophila*, Pink Star) and *Muscari botryoides* as a bulb plant hibernating with lush green leaves. The weakening of competitive forbs and especially grasses (*Stipa calamagrostis*) effected a better structure in the overall visual display of some plots, also *Platycodon grandiflorum* reacted positively in mixtures. As a disadvantage, no significant reduction of the weeding input could be reached, even a greater total maintenance time was measured through the additional mowing process.

As a final conclusion, we recommend to mow the perennial mixtures recommended in Fenzl & Kircher (2009) every late winter solely. But if a several year old planting has developed to a thicket by some competitive tall species, a one-time June cut can bring a satisfying structure back into the visual display and prevent the need to completely exchange the whole plot. There is only one certain combination called “Blütenwoge” which is suggested to additional June mowing every year.

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G5-3

Planting design on filtering zones of private swimming ponds

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Since the 1980s natural purified swimming ponds were introduced in Europe and this increasing market for Landscape Architects is improving urban live quality. If used as a part of an overall rainwater management, it has also an effect on water retention and microclimate. For maintaining this sensitive ecosystem, it is mandatory to keep the phosphorus content under 0.01 mg p/l (FLL, 2006). Through an intensive filtering of the water body nutrients are declining to oligotrophic conditions, so that commonly used "traditional" waterplants are showing nutrient-deficiency symptoms disturbing their vitality and visual display. There are narrow resources of submerged plants with low nutrient demands but a great diversity in species from oligotrophic fens and bogs. Pilot projects with swimming ponds with adequate plant communities on emerged marginal filtering zones (Kircher, 2007) lay the basis for a current research project at Anhalt University. It is focussing 4 main aims: 1) visually and functionally satisfying plant selection and combination (including *Sphagnum* mosses) for oligotrophic conditions on flushed/perfused filtering zones; 2) optimizing the filter system concerning its impact on vegetation and water quality; 3) reducing the transpiration loss to avoid P-input by lowering the demand on refill water; and 4) using shallow constructed wetlands on roofs as alternative locations for water purification systems including a thermal benefit onto the building.

Tested variants: Factor A: vegetation type (A1: 8 eutrophic wet meadow species; A2: 8 oligotrophic lime fen species; A3: 5 Sphagnum bog species). B: hydraulic inside the filter system (B1: perfused downward; B2: perfused upward; B3: no active pumping).

First results can be summarized as follows:

1) Water flushing from the bottom upwards effected the best vigorousness to the eutrophic wet meadow variant (A1-B2), whilst the overall aesthetics of the lime fen plots tended to best evaluation results if perfused from the surface downward (A2-B1)
2) All plots showed neutral to alkaline conditions. Nevertheless in A3 *Sphagnum palustre* reached suitable growth rates and pleasing visual quality, but thrived only without active water movement (A3-B3)
3) Lowest transpiration reached the lime-fen plots (A2), also convincing in visual display
4) Lime-fen is a suitable wet roof garden planting bringing a certain temperature reduction


Swimming pond - pilot project with marginal lime fen planting


Trial plots in Bernburg. In the foreground a lime fen variant (A2)


Sphagnum bog (A3-B3) - *Sarracenia purpurea* & *Pogonia ophioglossoides*

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G5-4

Life cycle assessment of slope revegetation works

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Japan, being located in monsoon Asia, is rich in natural features such as seas, mountains, and rivers. However, it is prone to frequent natural disasters such as earthquakes, typhoons, and volcanic eruptions. It is important to safeguard infrastructures such as dams, roads, and railways against these disasters. Many slopes are made by building infrastructures. Slope revegetation work plays an important role in slope failure prevention and environment, landscape, and biodiversity conservation. Recently, carbon sinks by revegetated plants and soil are also drawing attention in addition to those. In future, revegetation slopes located between man-made structures and natural environment will play a key role.

Construction of revegetation slopes consumes energy. Therefore, energy consumption of slope revegetation work was calculated by some reports. However, all materials are not included in the calculation (Tachibana et al., 2009). CO_2 uptake in revegetated slopes is not without a “carbon cost” from CO_2 during work. Then, in order to estimate the net global warming potential of slope revegetation works, especially the energy consumption and CO_2 emission, is estimated by life cycle assessment. Figure 1 shows life cycle assessment of a slope revegetation work. The papers, reports, and hearings of companies that use lath netting work, slope crib work, and material spraying work are assessed. And the carbon balance in the revegetation slopes is roughly estimated from carbon sinks by revegetated plants and soil.

Results show that the energy consumption and CO_2 emission of the manufacturing materials are 1.2 to 5.3 times and 1.5 to 7.5 times respectively, as large as those of the driving construction machine. Thus, the results show that the environmental load of manufacturing materials is more important than that of driving constructive machines used in the slope revegetation work.

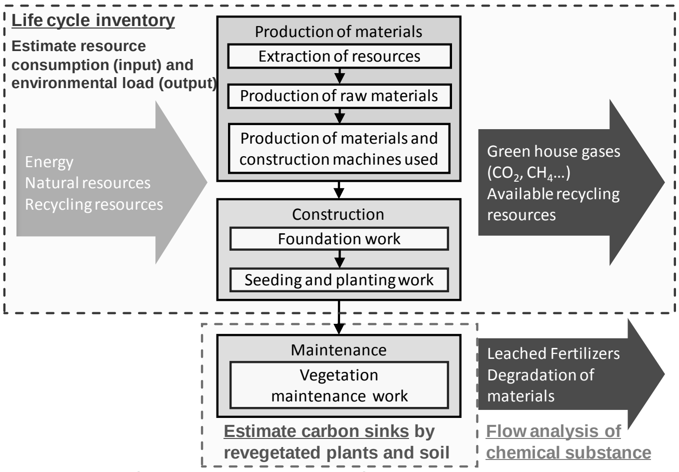

Fig. 1: Life cycle assessment of a slope revegetation work

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G5-5

Photosynthetic differential responses to elevated CO_2 and O_3 in four OTC-grown tree species in urban area

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Under background of global climate change, photosynthetic response under elevated CO_2 and/or elevated O_3 has being the topic of discussion in many papers throughout many years. In recent years, we examined whether or not four urban tree species (*Ginkgo biloba*, *Pinus tabulaeformis*, *Quercus mongolica* and *Pinus armandii*) grown in open-top chambers (OTCs) under elevated CO_2 (above 700 ppm) and/or O_3 (nearly 80 ppb) will acclimate after long-term exposure in an urban area, Shenyang, the northeast of China. We studied the annual or diurnal patterns of instantaneous photosynthetic measurements, as well the activities of photophosphorylation in chloroplasts and the contents of photosynthetic pigments and the chlorophyll fluorescence of trees. Our results suggest that the responses of four tree species differing in O_3 sensitivity showed different evidence of photosynthetic acclimation under either elevated CO_2 or CO_2 + O_3. The hypothesis was confirmed that elevated atmospheric CO_2 alleviated the damaging influence of elevated O_3 on the four urban tree species under the combination of the two gases. Both *Ginkgo biloba* and *Pinus armandii* did not show photosynthetic acclimation, but *Quercus mongolica* and *Pinus tabulaeformis* show photosynthetic acclimation after long-term treatment under elevated CO_2. These results presented here illustrated the complexity and uncertainty of photosynthetic responses of urban tree species to elevated CO_2 and O_3. Elevated CO_2 can modify the reaction of leaves or needles to elevated O_3 by increasing the net photosynthetic rate, photosynthetic products, the activities of photophosphorylation, photosynthetic electron transport rate and the quantum yield for PSII photochemistry. Thus, elevated CO_2 seems to decrease the detrimental effects of O_3 on photosynthesis of urban tree species.

G5-6

Effects of urban green belts on the temperature, humidity and inhibiting bacteria

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As a very important part of urban green space system , green belt plays an irreplaceable role in the construction of green space and improvement of ecological environment. In order to provide scientific basis for the construction of urban green belts, the effects of the different width of urban green belts on the temperature, humidity and bacterial rate were analyzed by the small-scale of quantitative measurement. In this paper, six-green belts with different width including 6 m, 16 m, 27 m, 34 m, 42 m, 80 m along the west fourth ring road of Beijing were investigated in July of 2009. The air temperature, relative humidity in six-green belts were measured once every two hours from 8:00 to 18:00 every day for continuous seven days, and the bacteria rate measured at 9:30. The results show: 1) the temperature and relative humidity benefit increases as the width of six-green belts rises. The green belt of 6 m width has a little effect on the decrease of temperature and unobvious effect on the increase of humidity; it has an comparatively obvious effect with the width of 16 - 27 m; an obvious effect with the width of 34 m; an extremely obvious and stable effect with the width of more than 40 m. Analysis of variance shows that the differences of air temperature and humidity between six-green belts with different width and control group reach significance level. Based on Duncan’s post hoc tests ($p = 0.05$), it can be concluded that the critical width of urban green belt for the obvious effect on the decrease of temperature and the increase of humidity is around 34 m (green cover percentage must be about 80%), as the effect is better, and the optimum width is around 42 m (green cover percentage must be about 80%); 2) regression equation Y (humidity) = 184.721 - 4.038 x (temperature) is built based on regression analysis between the temperature and humidity in six different width green belts, which indicates that the relative humidity decreased by 4.0% with every 1.0ºC rise; 3) under optimum condition, the positive effect on the decrease of bacterial rates of green belt is more than the negative effect. The bacterial rates decrease as the width of six-green belts rises. It has a more bacterial rate in plot 1, plot 2 and plot 3 than the control group, and a less bacterial rate in plot 4, plot 5 and plot 6 than the control group. The reference width of urban green belt for the obvious effect on the decrease of bacterial rate is around 34 m (plot 4). Based on Duncan’s post hoc tests ($p = 0.05$) according to the average bacterial rate in three days, analysis of variance shows that there are no significant differences among the plot 1, plot 3, plot 4 , plot 5, plot 6 and the control, with significant differences between plot 2 and other plots.

G6-1

The relationship between urban forest visitors' motivation and their behavior in Nopporo Forest, Hokkaido, Japan

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Rapid aging society accelerates the demand of recreation in nearby nature. Urban forest offers the opportunities for daily exercise and natural experience to urban residents (Lee et al., 2002). It makes a great contribution to maintaining people's health and relaxing the stress from crowded urban life. Increasing demands of recreation in urban forest and varying activities cause crowded situations and some conflicts among visitors (Arnberger, 2006). Compared to rich recreational studies in remote natural areas, studies about visitors' behavior and attitudes in urban forest have been scarce. This study explored visitors' behavior and attitudes in Nopporo Forest, Hokkaido, Japan.

Nopporo Forest is located in suburban area of Sapporo city, Hokkaido, Japan. The forest covers an area of 2,051 hectares and is the largest park located on the outskirts of a city in Japan. In 1968, it was designated as a Hokkaido Prefectural Natural Park. The forest is characterized by a mix of coniferous and deciduous trees, has several artificial ponds, and harbors a rich diversity of animals and plants. It provides several facilities such as a visitor center, interpretive trails, museums, as well official hiking trails of about 40 km and some social trails, and several parking lots. The number of visitors (including museum visitors) was estimated at about 659,000 in 2005. About 80% of the visitors counted in 2006 were walkers, followed by bicyclists, joggers and dog walkers. We conducted long-term visitor monitoring and on-site interviews of visitors at several trailheads in 2006 and 2009. Passive infra-red visitor counters were installed at trailheads. Visitors were asked to answer the questions about their demographic attributes, frequency of visits, motivations and the routes they followed at trailheads.

The results of monitoring showed that more visitors entered at accessible trailheads thorough the year; on the other hand, less visitors entered at remote trailheads. Most of respondents were more than 50 years old, and live in less than 30 minutes walk from the forest. Although enjoying nature and exercise were the highest motivations on the average, motivations of each visitor were varied depending on their activities and behaviors. The forest contributes to the well-being of residents. The difference of their motivations also affected their choices of trailheads and routes. Visitors choose the trailhead and routes, which seemed to be suitable for their motivations. Results suggest appropriate forest management and facility development based on the forest characteristics and the demand of visitors. Understanding the visitor behavior and their decision makings will be helpful for managers to develop more effective information distribution and education program, achieve sustainable management of urban forest and visitors.

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G6-2

Study on the continuity of residents' perception of rooftop biotopes with man-made ground in relation to the growth of multistorey residences in urban areas

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Building residential complexes from the viewpoint of coexistence with the ecosystem in coordination with local communities has become common in recent years. These complexes are significant in increasing green areas, prioritizing ecological considerations, and maintaining aesthetics of city streets. Thus, it is reasonable to believe that residents can live an affluent and pleasant life. With this trend in mind, the author targeted residents of Urbane-bio Kawasaki and analyzed their perception in order to understand their perception of rooftop biotopes in an urban district area. Urbane-bio Kawasaki is one of the early projects developed with careful consideration of environmental impact. Surveys were conducted in 2003 and 2007, and thereafter, surveys targeting the entire area were conducted because a high-rise apartment block was added. Furthermore, regarding rooftop biotopes built on artificial grounds and close to home following an increasing number of multistorey buildings in urban areas, the author analyzed the change in residents' perception in time and the differences in perception according to the building location and floor, before examining their perception of rooftop biotopes.

As a result, about 90% of multistorey apartment residents had positive feelings toward rooftop biotopes, and 50% of the residents were aware of the existing biotope in the building. Continuity in the perception and awareness of rooftop biotopes was identified, and the same applies to the residents in the high-rise apartment building. Few residents of building No. 3 noticed the view of the biotope, and the majority was found not using the facility at all. The reason for this is the fact that the biotope was not built along the line of people's movement. It has become clear that with regard to the use of the rooftop biotope, the number of passersby noticing the biotope depended on whether the biotope was built along the line of people's movement, while intended use had nothing to do with the construction or number of floors of the building. Although residents had favorable view to the existence of the biotope, many had particular demands in the way it was built and/or the quality of maintenance. For this reason, it was identified that sharing the objectives of building a biotope between the developer and residents has become more important in order to sustain high feedbacks on the biotope from residents.

In addition, the residents who did not directly use the facility were found to confirm the presence of the biotope for reasons such as added value, elevated status, and environmental friendliness of the residential complex in which they lived. It was also found that a biotope had motivated approximately 30% of the residents to choose the apartment complex.

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G6-3

A modern city with rich biodiversity - Hong Kong

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Hong Kong is a highly developed modern city and has “a city of charm” reputation with dotted skyscrapers, unique colonial-style architectures, abundant wonderful shopping malls and dining restaurants. The total land area of Hong Kong only has about 1,100 km^2, with a total 7 million population recorded in 2008. However, it is surprised that only 20% of its land area have been urbanized, and 38% of territory is designated as country parks or special protected areas for conservation. By past, it is true that Hong Kong government has played a critical role for the management of public protected area settings since 1970s. At present, government had designated total 41,644 hectares (about 38% of Hong Kong's total land area) as the public protected areas, that including 23 country parks, 17 special areas, 4 marine parks and 1 marine reserve in Hong Kong. According to the survey from Agriculture, Fisheries and Conservation Department (AFCD), more than 95% of the terrestrial and freshwater species live and breed in these protected areas, this current protected area system has make the great contribution to our natural environment and biodiversity.

There are recorded more than 3,100 species of vascular plants, of which about 2,100 are native; some 50 species of mammals; 480 species of birds; 160 species of freshwater fish; 80 species of reptiles and more than 20 amphibian species. Insect diversity is also very high with more than 230 species of butterflies and 110 types of dragonflies. It is surprised that at least 25,000 wildlife species breed and flourish within our limited land areas and which is recorded more than the whole United Kingdom and Northern Ireland’s total (Agriculture, Fisheries and Conservation Department, 2008). It attract more and more Hong Kong residents and foreigners to join local “Green Tours” or travel to the countryside for the Hong Kong nature treasure in recent years, especially after SARS.

The main objectives of the presentation are to introduce: the current biodiversity condition; and the current local ecotourism “Green Tour” development in Hong Kong.

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G6-4

Natural green space: a case study from Kuching, Sarawak, Malaysia

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The increased intensity of land use and expansion of urban areas have resulted in the conversion of natural green areas into human dwellings, towns, roads and business premises. The current extant of green spaces have rapidly decreased, often substituted with reconstructed and rehabilitated man-made parks, where exotic species are usually introduced. Sometimes, artificial foliages are used to create a false sense of green scenery. The objectives of social functions such as recreation or relaxation may be achieved at some levels, but missing out on the important aspects of ecological roles and functions these spaces should have served. Within a 30 km radius of the city of Kuching in the Malaysian state of Sarawak, there are five gazetted protected areas consisting of three national parks, one wetland reserve and one urban nature reserve. This paper discusses the case study of an urban park, which has maintained most of its natural forms of habitat, and its roles in providing for ecological and social services. Sama Jaya Nature Reserve, a multi-purpose urban forest park, is a legally and perpetually protected site. It houses numerous museums, is used as a study site for research and conservation related activities, and contains facilities for public enjoyment and recreational activities. More importantly, the array of flora and fauna biodiversity present enhances the values of the area in fulfilling the cultural and social services of the community here.

G6-5

The change of a SATOYAMA landscape in Minamioogaya, Shiga Prefecture, Japan, for past 300 years

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Satoyama landscape is characterized by a mosaic pattern of different land uses, such as secondary forests, secondary grasslands, crop lands, paddy fields, irrigated ponds, and settlements. Since the land use pattern changes depending on social and economic conditions, demonstrating the long-term trends in the boundary between the secondary nature and the agricultural and resident areas is necessary to understand human-nature relationship.

Minamioogaya village is located in a suburb of Kyoto city, Japan, and between Lake Biwa and Seta hill. Most of the residents have been farmers and utilized Seta hill forest to collect wood fuel, building timber, mushroom, etc. Based on the two kinds of old documents, which were stored in the village, the change in the land use patterns of Minamioogaya was estimated. One is the cadastres showing the parcel name, the subdivision lot number, the ownership, the dimensions, the land use categories of each parcel subdivision. The first cadastre was created in 1690, and was repeated in 1737, 1778, 1813, 1834, 1861, and 1877. The other old document is the cadastral map, which was drawn in 1877 and is showing the boundary of parcels and parcel subdivisions. By combining these documents, the land use patterns for 1690 to 1877 were mapped. In addition to these maps, the land use map in 2004 also applied to analyze the changes in the land use pattern of Minamioogaya village. The land use categories were reclassified into four groups: forest, farmland, resident area, water area. Then, the dimensions of these four categories were calculated after georeferencing by using ArcGIS.

The area of Minamioogaya village has increased from 4.05 km^2 in 1690 to 4.58 km^2 in 2004 as the result of the land reclamation from Lake Biwa. The composition of land use categories of each year also have changed. While 58% of the village area was covered by the forest in 1690, 64% of the village area was occupied by the residence in 2004. The resident area has drastically extended after 1877. The farmland and the water area had increased gradually during 1690 to 1877, 65% of the village area was cultivated in 1877, since then these areas have decreased. These results indicate that the shift of the land use pattern in Minamioogaya can be divided into two periods. The first period from 1690 to 1877 can be interpreted as the agricultural development period, and the second period beginning in 1877 clearly exhibits the urbanization. Moreover, these results indicate that the boundary between the secondary forest and the agricultural and resident areas have shifted dramatically in these 300 years.

G6-6

The establishment and development of feng-shui villages in Okinawa - from the perspective of remnant huge Fukugi trees

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A feng-shui village landscape features Fukugi (*Garcinia subelliptica Merr.*) tree lines surrounding every house and orderly laid out roads. Such a green landscape, which is assumed to be planned or reformed during modern Ryukyuan period around 300 years ago, is well preserved in Okinawa island and its nearby isolated islands. But it is still a mystery to the historians when and how these Fukugi trees were planted. In order to clarify the development process of the house-embracing Fukugi trees, as well as the distribution of feng-shui villages in Okinawa, we have visited almost all the traditional villages and measured the biggest Fukugi trees. The field survey area is on Okinawa Gundo, which includes mainland Okinawa and its nearby isolated small islands. It was found that huge Fukugi trees older than 200 years, cluster around the core area around Kami-asagi or Haisyo inside the village. Both Kami-asagi and Haisyo are sacred places where guardian gods were summoned in order to hold ceremonies and rituals. Biggest trees found in mainland Okinawa is estimated to be 370 years. Fukugi trees older than 300 years also exist in some villages. These old trees might have been planted prior to the period from 1737 to 1750 when Saion was in power, during which Fukugi trees were planned and recommended. In summary, Fukugi trees might have been planted as windbreak around the houses before Saion period, however, the current house-embracing Fukugi tree landscape came into being during the Saion period based on feng-shui concept.

G7-1

Scaling up from gardens: avian diversity in a residential ecosystem

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Background - As urbanization increases globally and the natural environment becomes ever more fragmented, the potential of urban green spaces for biodiversity conservation grows. Private gardens are often a major component of this urban green space: in the city of Leeds, UK, they comprise 30% of the urban area and 54% of the total green space. We currently see a scale mismatch in the management of gardens for biodiversity: they are managed by householders at the individual scale, but in reality groups of gardens form networks of interconnected “garden patches” that could provide significant habitat for mobile taxa such as birds.

Research questions and methods - The current research aims to assess the ecological and socio-economic factors that drive bird diversity within private gardens at multiple spatial scales in the city of Leeds, UK. In particular, we are looking to answer three questions:

Q. 1. What is the spatial configuration of garden patches? Landscape ecology tools including GIS, landscape metrics (calculated using Fragstats) and the visual interpretation of aerial photographs were used to quantify the spatial configuration and composition of private garden patches at multiple scales.

Q. 2. How do socio-economic factors influence garden patch structure and garden management? Socio-economic and garden management data were obtained through a combination of UK census data and an individual household questionnaire survey. The questionnaire was distributed to a stratified random sample of households across the city and completed by 533 respondents.

Q. 3. How is bird diversity related to garden patch structure? Bird point counts and vegetation surveys were undertaken in 90 gardens within 18 neighborhoods across 6 wards of Leeds. This nested sampling design allowed us to test explicitly for the relative influence of local (i.e. garden) versus neighborhood (i.e. garden patches) versus landscape (i.e. city)-scale factors in determining avian diversity.

Results and implications - The results of preliminary data analysis will be presented and discussed. Bird diversity is influenced by patch size and vegetation complexity, and this in turn is related to a range of socio-economic factors. Since many of these drivers operate beyond the scale of the individual garden, the challenge is to find ways of incentivizing neighbors to develop a common “management plan” for their gardens. Such a plan could arise from top-down policy (e.g. tax relief, planning regulations) or bottom-up initiatives (e.g. community participation projects) and will help to maximize the provision of wildlife-friendly habitat within residential landscapes.

G7-2

Forest bird-habitat relationship analysis in urban regions across the eastern United States

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Although there are many studies that investigated a bird-habitat relationship at a local/patch scale, few examined the relationship at a broad, urban regional scale. Urban regional studies are needed because: the majority of the people in the world now live in urban areas; many of the areas rich in biodiversity fall in urban regions; and the studies can aid in developing regional conservation goals for species, such as birds and large mammals, with high mobility. The main research question is: What is the relationship between forest bird abundance and the surrounding landscape characteristics, especially, forest area and its spatial configuration? The North American Breeding Bird Survey and the 2001 National Land Cover Database were combined. Eastern Wood-Pewee (*Contopus virens*), Wood Thrush (*Hylocichla mustelina*), Black-and-white Warbler (*Mniotilta varia*), Ovenbird (*Seiurus aurocapillus*), and American Redstart (*Setophaga ruticilla*) were selected to be indicators of forest loss and fragmentation. The bird survey routes that are within the breeding range and the Metropolitan Statistical Areas (i.e. urban regions) in the eastern United States were selected. The original land cover classes were aggregated to seven classes; "forest" was one of them. Three buffers (i.e. 180 m, 2010 m, and 6000 m) were created around each bird survey route. Three categories of measures were taken from each buffer: percent land cover class, landscape structure measures of forest land cover, and landscape-level metrics based on the entire land mosaic. The mean route-level abundance of the selected forest birds over five years was used as the response variable in regression analysis. For each species at the three buffer sizes, simple regression and multiple regression with variable selection were conducted. Piecewise regression was also conducted to detect percent forest thresholds. The results of simple and multiple regression analysis were similar and almost identical across scales. In all simple linear models, percent forest was positively correlated with bird abundance (p-value < 0.05). In the additive, full multiple regression models, 14 variables explained the most variance (> 40%) in Ovenbird (OVEN), then Black-and-white Warbler (BWWA) (> 37%) across scales. The variables always explained the least variance (< 26%) in Wood Thrush (WOTH). Variable selection revealed that for OVEN and BWWA the percentage of forest cover in a landscape always contributed most to explaining the total variation in bird abundance in the reduced models; similarity to forest cover in a landscape and contrast-weighted forest edge density were the second most important variables. For WOTH landscape mosaic diversity and contrast-weighted forest edge density were important predictors. Although overall, there were no clear thresholds, piecewise regression analysis identified the percent forest thresholds for BWWA and WOTH. Given the "noisy" bird survey data, even this weak suggestion of thresholds may be significant for conservation. Planning and management implications of the study are: (1) species-specific habitat requirements need to be taken into consideration even for species with similar life history; (2) to conserve the selected five woodland-breeding bird species together as a group, the percentage of forest cover in a landscape should be high but some forest edges and/or edge contrast should also be maintained; therefore, (3) the conservation efforts of the selected forest bird species should focus on forest preservation and restoration, securing a sufficient amount of forests first before considering their spatial configuration and/or connecting them with corridors; and (4) the threshold percentage of forest cover would translate to conservation planning actions such as prioritizing land management or acquisition options, and targeting areas for restoration.

G7-3

Spatial distribution of avifauna in urbanizing landscape of Nairobi city, Kenya

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Most urban landscapes especially in developing countries are being transformed to a less natural state at an alarming rate, creating markedly different conditions for urban wildlife and avifauna. By preserving remnants of fragmented landscapes, valuable habitats and wildlife can be preserved (Fiona & Ralph, 2005; John et al., 2005). The urban land cover of Nairobi has experienced remarkable change in the last 3 decades (Njoroge et al., 2009), yet local knowledge and studies of urban processes on bird communities is scarce. This information needs to be availed and applied within a context of urban ecological planning system. Thus, a study was designed to assess the spatial distribution and composition of avifauna in the urban landscape of Nairobi city, Kenya with the objective to determine the bird species composition and to establish the relationship between avifauna and habitat composition along the urban environmental gradient.

Sampling sites were selected through a systematic sampling method of 5 km^2 grids of the map of the study area about 1,575 km^2. A total of 21 sites that represented different land cover / land use types of the landscape were surveyed for birds. Bird identification and counting was done for each site by distance sampling using point count technique as described by Bibby et al., (1998). Birds' censuses were repeated 4 times covering the wet and dry periods. Species abundance and the Shannon Weaver species diversity were computed. Using the species and environmental data from remote sensing, the data was subjected to regression and ordination analysis. About 40 different families of birds were observed of which the families of finches, raptors, warblers and weavers, sunbirds and thrushes were the most common in the study area. Species related to bush and scrub habitats were most common at a rate of about 31%, followed by grassland species at about 20% and forest species at about 16% rate. There was no significant difference in species diversity between the seasons. Less disturbed areas such as Ngong forest areas had low abundances of birds but high species richness. Pristine sites such as those within the Nairobi national park were species rich and exhibited high species diversity. Despite the high pressure for urban development, urban planners and managers in Nairobi can enhance survivability of various bird species by protecting remnants of existing indigenous forests, regulating human settlement and conserving the wetland areas within.

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G7-4

Ecological network through roadside slope of an expressway in Tokyo

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Forestation on roadside slope has a very significant meaning in expressway construction. Roadside slope is between artificial concrete road and natural forest. It is buffer of both field, and it is influenced by human impact, and by natural ecological succession.

For better relationship between road and nature, the Central Nippon Expressway Company (post Japan Highway Public Corporation) has forested 1,300 hectares of road side slope for 40 years, not only on embankment slope, but also on cut slope. A lot of local species trees were planted because local species are more profitable than other species on the site. Nowadays, in the Ken-O Expressway; ring road which go through 50 km around Tokyo metropolis, local genetic seedlings are planted. Cropped seeds around construction area, are sowed and grown up as local genetic seedlings in greenhouse of Nexco, because high quality forestation method is acquired for national park conservation.

Local genetic forestation method was tried more than ten years ago, and was applied for Hachioji Junction construction nine years ago. Now the forestation is under investigation and is going to be evaluated later. Here, we mention about outline of the investigation, and about one of the results.

Vegetation survey and soil biological survey were done on four slopes - A slope: nine years passed after planted; B slope: seven years passed after planted; C slope: two years passed after planted; and T slope: *Illicium anisatum- Abies firma* association as control.

In the A slope, seventy percent of planted seedlings was disappeared, and new species came in from reserved area and grown. Vegetative succession goes on profitably. In the B slope, ninety percent of planted trees was alive. Slope direction and soil humidity is adequate for vegetation. There are not severe competitions among individuals. In the C slope, fifty percent of planted species have disappeared. Slope direction is south and soil humidity loses easily. *Albizia julibrissin* invaded in the slope, and vegetation is going to success by this leading species.

From the result of vegetative and soil biological survey, two hypotheses were built. First, gymnosperm and fern are used as index plant, and the number of these species is more, slope vegetation is more stable ecologically. Second, the number of common species with control slope increase by time passing. These hypotheses will be proved by our continuous study.

In the Ken-O Expressway, we also set biotope using rain water drainage, animal path of culvert box, and so on. We construct good expressway not only for people, but also for all living thing.

G7-5

Effects of forest fragmentation on mammal fauna at the western suburb of Tokyo

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We surveyed mammal fauna living in fragmented forests of different size and distance from the continuous forests at Hachioji city, a western suburb of Tokyo, Japan from February to December, 2009. The urbanized flat ends at the western part of Tokyo where hills and mountains abruptly appear. At the latter places, continuous forests prevail, while forest fragmentation is going on at the hills, and the flat lands are mostly urbanized. This transitional area is thus suitable to study the effects of forest fragmentation on the diversity of mammals. We expected that mammal fauna would become poorer as the forest fragment size decreases and the distance from the continuous forests increases. The forest fragments were categorized into "Small-Close", "Large-Close", "Small-Far", and "Large-Far". "Small" means the patches smaller than 100 ha, and "Close" means the patches within 500 m from the continuous forests. Each 5 sensor-cameras were set at these forest patches. A total of 1,090 shots were taken, and 14 species and "mice" were taken by the cameras. They were categorized into the large natural mammals (wild boar *Sus scrofa* and sika deer *Cervus nippon*), the medium- or small-sized natural mammals (red fox *Vulpes vulpes*, Japanese marten *Martes melampus*, Japanese weasel *Mustela itatsi*, Japanese squirrel *Sciurus lis*, Japanese hare *Lepus brachyurus*, and Japanese macaque *Macaca fuscata*), the ruderal mammals (raccoon dog *Nyctereutes rocyonoides*, raccoon *Procyon lotor*, masked palm civet *Paguma larvata*, badger *Meles meles*, and "mice"), and pets (dog *Canis familiari*, sand cat *Felis catus*). Frequency indices (FI) were calculated (numbers of shots/camera-nights x 100). FIs largely declined for large-natural and other natural mammals with distance, while they were constant for ruderal mammals and increased for pets. These results indicate that natural mammals were vulnerable to forest fragmentation while ruderals were tolerant and pets are favoured by it. An unexpected finding was FI of medium/small-natural was highest at Close-Large (even larger than continuous forests). We thought that this is partly because the continuous forests would afford natural mammals as a "source" and small size of the patches would promote the shooting chance by confinement like "islands". This promotion seems to be supported by the result that FI of the ruderals were also largest at Close-Large and Close-Small. In essence, effects of forest fragmentation strongly affects mammal fauna, and the two factors function in that: 1) distance seems to decrease natural mammals; and 2) size reduction seems to decrease them but as far as the patches locate close to the continuous forests, the apparent fauna increases according to confinement effect. It is also worthy to be reminded that even at the urbanized areas, as far as forest patches exist, at least ruderal mammals can live, which has long been overlooked. This study proved this by a new technique - sensor cameras.

G7-6

Existence and migration routes of large mammals in urban landscape: discovery of a wild boar in the campus greenbelt

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The importance of urban green area is being emphasized for conservation of biodiversity (Goddard et al., 2010). However, the natural environment has been rapidly fragmented due to urbanization in Tokyo, Japan. Tokyo Metropolitan University (TMU) located in the western part of Tokyo (35°37'36", 139°23'37") has a campus green belt with a secondary forest of 10 ha. Several mammal species such as raccoon dogs (*Nyctereutes procyonoides*) and badgers (*Meles meles*) inhabit here (unpublished data). Since the campus greenbelt is isolated from the neighboring green areas by arterial roads, it had been believed that large mammals never inhabit in this site. However, a wild boar (*Sus scrofa*) was captured by the camera trapping in July 2009. Holes and footprints that are supposedly signs of existence of wild boars were also observed here. These suggest that large mammals such as the wild boar can migrate between some green areas in urban area of Tokyo. Here, to understand how large mammals use the urban green areas and landscape, we investigated the distribution of wild boars and estimated their plausible migration routes between the green areas thorough the following three methods: imagery analysis, gathering sighting information of wild boars by interviews around the site and cost distance analysis on Geographical Information System.

From the imagery analysis, three large green areas were observed in about 2 km, but the campus green belt was isolated by several arterial roads running horizontally at both the north and south. In addition, residential zones with high-rise housings dominated surrounding area of the site. These results indicate that no direct and safety routes for the wild boar migration exists between the site and adjacent green areas.

The interviews marked that wild boars have been repeatedly seen in the west of the Route 16, far western side of the campus green belt. Moreover, wild boars have been also repeatedly seen and captured at the southern green area, which is one of the large green areas around the site. On the other hand, there is no information about wild boars in the other green areas which are located at the north and west side of the site. These results suggest that plausible home green areas of the wild boar existed on the southern green area.

Finally, we estimated plausible migration routes for the wild boar by the cost distance analysis. This analysis is the method that assumes a cost value on each landscape and shows the lowest cost pass for the migration; e.g. 200 on the residential zones, 40 on the major roads, or 1 on the green areas. As a result, the most possible migrate routes to the campus greenbelt was shown on the southern side of the site where wild boars have been repeatedly seen. However, it is also proved that the wild boar needed to pass thorough at least 250 m on the residential zones for reaching the site.

These results imply that wild boars have the ability and do use urban landscapes between green areas as means of migratory routes, regardless of human activities.

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G8-1

Object-based classification of land cover types using airborne LiDAR and high-resolution imagery data

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We evaluated the integration of discrete return LiDAR data with high resolution near-infrared digital camera data for object-based classification of land cover types in the Expo'70 commemorative park, Japan. The LiDAR data and digital photographs were simultaneously acquired from aircraft-based flight over the entire area of the park on October 2004. Several metrics, including canopy height model (CHM) and normalized differential vegetation index (NDVI), were calculated from both of data to be used in subsequent analyses. Field survey data of land cover types were obtained and converted into polygons in ArcGIS 9.2 software (ESRI Inc., USA).

In order to investigate the availability of LiDAR data, two different data combinations were tested in all of following analyses, integrating LiDAR with digital camera or using solely digital camera data. Object-based analyses were performed using Definiens Professional 5 software (Definiens AG, Germany), and ten land cover types were classified, including trees, lawn, road and water surface. First of all, the basic image objects were created using multi-resolution segmentation algorithm in Definiens software. The segmentation parameters were manually defined after much trial and error. GIS polygons based on field survey were overlaid with created image objects, and the overlapping image objects were defined as the sample objects of the polygon's land cover. Sample objects were divided into "training objects" or "validation objects".

Object-based classification was conducted using standard nearest neighbor method in Definiens software using a number of feature values of training objects. In addition, conventional pixel-based maximum likelihood method was used to be compared with the object-based method.

Classification accuracy was measured using validation sample objects for each classification result by a standard error matrix. The overall accuracy of object-based method was higher than pixel-based method. Moreover, the overall accuracy of the classification integrating LiDAR data was higher than those using only digital camera data. The LiDAR-based features data seemed to be significant in object-based classification because it could provide three-dimensional information, including height and laser intensity.

G8-2

Japanese watersheds characterization from an ecoregion point of view for ecosystem management

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Ecoregion is a useful concept in landscape-level ecosystem management at hierarchical spatial scales transcending administration boundaries. This study suggests ecoregion-based planning units for Japan, and applying it to watershed framework which is a logical topographical boundary. This study focused on delineating physiotopes to counter intensive human impacts and lack of natural vegetation. Physiotope-based ecoregions were delineated at two hierarchical spatial scales using their main controlling factors: a) macroscale - regional climate regime, main tectonic regions and biogeographic boundary; and b) mesoscale - landform and geological classes. Resulting physiotope-based ecoregions were overlaid with the watershed map to characterize its landscape structure. Various landscape metrics were calculated using FRAGSTATS to quantify the heterogeneity of Japan's watershed characteristics. Results show that Japan's watersheds and physiotopes can be grouped into three broad regions of similar landscape structure, composition and complexity, which coincide with Japan's geological, climatic and paleobiogeographical history. At macroscale, watersheds under most climatic-tectonic regimes display differences in landscape structure and composition. Understanding the overall environmental heterogeneity of watersheds and physiotopes is useful as a base map to study ecological processes and patterns, and in devising broad-scale ecosystem management strategies.

G8-3

Analyses of long-term land use/cover changes in Japan using remote sensing and GIS

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The objective of this study is to identify the potential natural vegetation and land use/cover changes in Japan from 1900 to 1985 using GIS techniques, and to clarify how the present forest vegetation areas are influenced by historical processes. To track these long-term changes in the Japanese landscape, land uses in Japan for 1900, 1950 and 1985 were digitized from 1:50,000 topographic maps prepared by Himiyama (1998, 1999). The results of the analyses showed that the area of agricultural land increased noticeably during the period from 1900 to 1985. Over recent decades, however, rapid urbanization has caused a shortage in the agricultural labour force and subsequent abandonment of farmland in some regions. In other regions, urban sprawl is now spreading outwards from major cities such as Tokyo, Osaka and Nagoya, engulfing the surrounding rural landscapes. The national percentage of forest area increased slightly over the study period. As demonstrated by the Land Use Information System (LUIS) (Himiyama et al., 1995), overall forest area rose from 72.1% in 1900, to 74.4% in 1950, and to 75.3% in 1985. In the data used for this study, forest cover is divided into four categories: broad-leaved, coniferous, mixed and other. The long-term stable forest types (broad-leaved forest, coniferous forest and mixed forest) retained in these areas are all in the climax or secondary forest. Its percentage is 63.7%. The results showed that broad-leaved forest, which comprise the climax forest for most of Japan, dropped markedly, giving way to mixed forest, agricultural land and urban land. Historically, a decrease in mature forests was accompanied by an increase in mixed secondary woodlands, such as deciduous oaks that were coppiced for firewood and charcoal on a cycle of approximately 10-15 years. By coppicing and cutting of undergrowth, villagers were able to maintain these woodlands in a secondary stage. In recent decades, however, the general availability of fossil fuels has accelerated the abandonment of these coppices, which then revert to their original pattern of natural succession. Also, during this period the changes in forest pattern were highly influenced by the national forestry policy, under which large stands of native broad-leaved forests were clear cut and replanted with commercial timber species such as *Cryptomeria japonica* and *Chamaecyparis obtusa*. At Tokyo University Information Sciences, located just east of Tokyo, MODIS data has been periodically acquired and archived since 2000. The archived MODIS data will be used to monitor land use/cover changes in Japan.

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G8-4

Predicting landscape pattern changes induced by highway constructs using landscape metrics and empirical land-use model in central Taiwan

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Taiwan is a mountain island which 88% area belong sloping field. Puli town, a basin area, located in the central Taiwan. Inconvenient transportation influence its' developed before 2008. After that, national highway No.6 is open to traffic to Puli town in 2009. Purposes of this research is to predict land use and landscape pattern change after national highway open to traffic by logistic regression model, CLUEs (Conversion of Land Use and its Effects) empirical land use model and landscape metrics. In this study, driving factors of land use change before and after highway open were collected by interview 33 heads of neighborhood. Data and digital maps of driving factors inputted to logistic regression model to set up land use change predictive model, then CLUEs model to predict land use change from 2010 to 2020, landscape metric to analyze landscape pattern change in this period.

The findings reveal that highway open is one of the major impact factors for land use change in Puli town. Others included terrain conditions and socio-economic factors. Results of CLUEs simulation modelling find that the most frequently changed areas from 2010 to 2020 are located in near highway interchange and around downtown areas. Forest and cultivated lands almost will be changed to built-up lands. We also find that highway open will increase forest patch isolation and fragmentation, reduce cultivated and grass land area, and increase landscape mosaic and fragmentation in landscape level. We strongly suggest that landscape ecological master plan must be made in recent years in Puli town.

G8-5

Asian ecological planning using Humantope index: land use duration pattern, cultural lands use pattern, land ownership pattern

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F. Steiner (1983) compared the three environment-assessment methods and pointed out the problems: the US soil conservation service capability classification, McHarg method, Dutch approaches. Two problems were abstracted there. One is the necessity for the simplification of data. Another is that following on multi layering of data do not bear fruit considering time and money. However, this paper does not proposed simplified method. Now, in McHarg's method uses not only index of Biotope, Phisiotope but also artificial environments evaluation (McHarg, 1969). The landscape planning method based on ecological evaluation (*LPME*) method was proposed as simple environment-assessment with only a few environmental indexes (potential natural vegetation and land use (Takeuchi, 1976). The purpose of my study is to propose a shortening planning process which incorporates the advantages of the above two methods by using a small number of *Humantope index (HI: environmental division by people or society)* for environmental management guidelines. This guideline assumes that present land use will continue. My proposed environmental classification method superimposes two index layers: the *HI* and present land use. This *HI* could be choice from three kinds of index as follows: patterns of past serial land use, traditional land use, and land ownership. The proposed method using both *HI pattern* and present land-use pattern are easier than those of McHarg and *LPME*. Indeed, in the McHarg method, every future land-use proposal must be checked against the interpretation of multiple evaluations of separate ecological factors. The *LPME* method requires an estimation of the potential vegetation through a specific investigation of flora. Also, these data are of little use until they are interpreted and evaluated against land-use proposals. On the other hand, suggested method can be called a determination index, i.e., a guideline for both utilizing and conservation of nature for regional planning in light of continuing land use. Through the proposed method, both sustainable land utilization and nature conservation can be achieved using only two indices. This method does not require geographical data (Phisiotope), which is necessary in both McHarg and *LPME*. With *HI*, the environmental division which cannot be proposed only with an aerial photo is realizable. Yet, the main *HI* can make from old aerial photo.

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Abstracts for Poster – English

P–1

A habitat model of Magpie in the urban area of Beijing, China using a 3-D GIS map

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To evaluate the effects of tall buildings in urbanized area on the distribution of urban birds, we studied the habitat preference of Black-billed Magpie *Pica pica* in the urban area of Beijing, China. We surveyed the distribution of Magpie's nest, and observed the Magpie's breeding behavior in two different urban areas in Beijing.

Magpie is a Corvidae bird and breeds in widely from urban to suburban in Asia and Europe. A pair of Magpie protects their own breeding territory around their nest, especially top of the trees in their territory. Therefore, we measured the area of 1) trees, 2) buildings taller than the nest tree, and 3) trees which can be seen from the nest, in the three different radii (100 m, 150 m and 200 m) of circles from their nest and trees randomly selected.

The vegetation map was created from an ALOS AVNIR2 satellite image, and trees were classified based on the NDVI value. The digital surface model (DSM) of this area was created from a stereo pair of ALOS PRISM satellite images. We classified trees and buildings using these two maps. The spatial resolution of these maps was 10 m x 10 m, and the vertical resolution of DSM was 1 m.

The result of comparison between these three areas from 33 nest trees of Magpies and 60 trees randomly selected, there were significant differences about the area of trees and the area of tall buildings at radius of 200 m. Magpies prefer areas with many trees and short buildings near their nest.

The results of observations about breeding behaviors at two different habitats in Beijing shows that Magpies can breed in highly urbanized area, but those pairs of Magpies breeding in urbanized area have several good perch points where they can watch many trees in their territory.

P–2

Relationship between the birds and public parks in a northern area of Fukuoka City, Japan

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The city park is utilized for the psychological relaxation and recreation, field of the citizen activity. And the city park is important part good urban environment and activation region. The city park has the role which creates green patch. This space is important as habitat. This shows the important part which creates the inhabiting space of the creatures in the city. It is effective for grasping this space at 2D and 3D, when geographic information system (GIS) is utilized as a tool. It is possible that this GIS data carries out the utilization to which be expansive for research. The northern in Fukuoka City is the region of which the human pressure is high. The biological habitat basic data of this region do not exist very much. This research promoted the bird research of the city park at the coast of which the human pressure is high in northern of Fukuoka City. Then, it was propose that gather bird habitat basic data. The first, this research selects the 7 parks of the field in urban area. This park and around area were constructed by GIS and GPS. This data preparation made the data which could be reflected to future research and position information. Next, the bird research was advanced in the selection park. From data of GIS, GPS and GLONASS, the construction of basic data was advanced. Using GIS, this data made 500 m buffer from the point census spot. Then, from the 500 m buffer, the ratio of green coverage of the inside was extracted. It was possible that the result of bird research showed the data presentation. As a result of the bird species, parks with many species were the 47 species, and parks with small species were the 19 species. In 2 parks with much green and pond, the following were confirmed *Nycticorax nycticorax* of the heron family and *Ardea cinerea*, *Anas crecca* of the duck family and *Aythya ferina* etc. These two sites seem to be because the Fukuoka castle moat and water front is close each other. In one park with much green, the following was confirmed *Accipiter gularis* of the hawk family and *Butastur indicus*, *Falco peregrinus* of the falcon family, *Garrulus glandarius* of the crow family and *Pica pica*. The 4 parks with small green confirmed the urban birds. The value of bird diversity index (Shannon-Wiener, Simpson) was high for the research park where deciduous tree and evergreen tree mixed. The bird diversity value was low for the research park with small trees. For the contrariety, the research park with small the ratio of green coverage was a result with small bird species and population numbers. The research park with many the ratio of green coverage in the 500 m buffer was a result with many bird species and population numbers. It became clear that the urban area has the green space for bird habitat and bird fling in Fukuoka central city area. This was able to grasp the ratio of green coverage and situation of the bird species in city parks. It was added, and the difference between size of the green landscape space and around situation, the difference of the bird species became clear. There are yet small data of the bird research in urban area. The bird basic data is little for this city. Then, it was possible to accumulate the bird basic data. On these green land spaces, it was able to be reconfirmed that the green patch was maintained. From present research result, it can be clear result that city park provides the green landscape space for birds. The city park is an element as the green landscape space and green patch with the important existence. The habitat research and investigations is necessary all season research. These are necessary in order to know the seasonal variation of the birds in the region. This research is one of the results on passing through near investigation period about 4 years. Therefore, it seems to be the necessity to advance continued investigation in future too.

P–3

Conservation of wild Japanese squirrels in the forests of Nagoya City

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Concept - To conserve endangered species, a commonly used method is to capture the species, breed and release them to their habitats. However, it requires a huge amount of money to set up breeding facilities and labour cost for professional researchers. In addition, this method may make them to suffer from high stresses and various diseases, and to lose their defensive attitude against predators during breeding. For these reasons, we decided to establish our method in which squirrels are fed and bred in their natural forests. Our method seems to be the most appropriate for NPOs and volunteer groups like us although this plan will take 50 years or more to finalise.

Activities and Method - Moriyama Wild Japanese Squirrel Conservation Society was established as a volunteer group in 1990 to conserve the Japanese squirrels at Mt. Togoku (150 ha in area, 198 m in height) in the east of Nagoya City. We started the conservation activity of the squirrel with initial support from Higashiyama Zoo, Tokyo Inokashira Zoo and Nagoya University. Our main activities are (1) feeding squirrels with Japanese walnuts at 8 feeding stations in the forests once every week and counting the number of walnuts consumed by a squirrel a week, since almost 98 % of the Japanese red pine which can provide the squirrel with the major diet seeds were killed by the pinewood nematode transmitted from the US, and (2) recovering and restoring the habitats by planting red pine immune against the nematode, Japanese walnut and other trees for the squirrel diet in collaboration with Owaribe Shinto Shrine ,and (3) studying the behavior of the squirrels by using the radio-telemetry method in which we captured squirrels in traps, put micro-tips or transmitters on their necks, and traced their movements. Education of children is also an important activity to teach them the significance of conserving the mammals of Mt. Togoku. The children's activities are (1) measuring the amount of water from the spring at Mt Togoku, (2) recording the diameter at breast height (DBH) of the selected 24 trees growing on the slope of Mt. Togoku by the dendro-meter with the precision of the hundredth part of millimeter to measure the growth rate of these trees and to know the species that overgrow other species, (3) counting the remaining walnuts at the feeding stations and resupplying with new walnuts, (4) fabricating the feeding stations and nest boxes, (5)studying the soil and the soil animals in different tree floors, (6) learning how to use the slide calliper and how to measure the diameters of the nuts every year, and registering the squirrel activity by setting automatic heat sensing digital cameras, and (8) observing the timing and amount of gnawing for the bone fixed at the feeding stations.

Results and Conclusion - Through our conservation activities, 10 to 20 squirrels have constantly been maintained in the area of Mt. Togoku all the year around. We found that the squirrels 1 to 2 years old moved to other territories to give over their places to the newly born babies after the stage of weaning and fledging. We also found that they have migrated to the golf field of the neighboring forest park (281 ha) and the forest park itself (107 ha). It is expected that 30 to 60 squirrels in total could inhabit without extinction for more than 20 years. Measurement of the diameter of the selected trees at breast height (DBH) by the dendro-meter clearly showed that *Castanopsis cuspidata* will dominate over other species for the next 100 years. This indicates that all mammals and insects may become extinct if other trees are not planted because *C.cuspidata* is the evergreen wide leaf tree and it does not produce an amount of detritus enough to support the operation of food chain nor give enough sunshine onto the forest floor.

Future Plan - Regarding feeding activity, we are planning to discontinue feeding squirrels gradually after the newly planted trees grow to bear the number of cones and nuts sufficient to support the population of the squirrels, which will take about 30years.A municipal road between Mt. Togoku and the golf field is planned to be widened from 6 m to 16 m. This widening may impede the migration or the movement of the squirrels to neighboring forests due to the crossing of longer distance and possible traffic accident. We proposed the municipal government to construct animal path including squirrel bridges over the road and tunnels under the road for animals and insects. Although the animal path has been planned in the construction diagram, we will put more efforts to realize our proposal. The forests around golf field are a suitable place to conserve various endangered species. We have been collaborating with Nagoya University and the golf company to create ecologically rich area in planting pine trees (1000), walnut trees (500) as well as to relocate, keep or breed the endangered species such as the Japanese magnolia, sundew, water scorpion, Japanese dogtooth violets (for Gifu butterflies), Japanese mount lilies, squirrels and giant flying squirrels to conserve. We will continue this collaboration, and are targeting its completion after 50 years.

P–4

Landscape-scale distribution of Japanese hare in the surroundings of Tokyo based on pellet census in urban and suburban parks

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The habitat of Japanese hare should be existed once widely in the current range of Tokyo metropolitan area (Tokyo metropolis and the surroundings with densely populated area). During that time, natural lands as well as traditional man-related fields such as paddies, croplands, and managed tree lands were available for this herbivore species. Urbanization has changed dramatically the landscape with buildings and road networks, and the habitat has been fragmented and disappeared.

In order to understand the distribution of remained population of Japanese hare in Tokyo metropolitan area, we focused "parks" as survey sites. Although accessibility of most lands is highly limited in this big city, parks are open to public. Another advantage using parks as survey sites is relatively high efficiency of finding and collecting pellet. In preliminary surveys, we found that finding pellet of hare on grass fields of parks was fairly easy.

Parks include grass fields and tree stands, and parks are distributed in the surroundings of various land types (e.g. among buildings, in paddy fields, in forest). Thus, parks themselves can be habitat for Japanese hare and also be influenced by the surroundings as well as large scale habitat conditions such as habitat connectivity.

We chose 80 parks in the eastern side of Tokyo metropolitan area (north western part of Chiba prefecture). Prior to the field survey, we delineated accessible zone to census pellet for each park by using GIS and aerial photos (Google Earth). In the winter of 2007, census was conducted by walking systematically within the zone for each park with an aid of handheld GPS. Locations of pellet found were saved in GPS, and the data were all transferred to GIS for analysis.

We analyzed the data to assess landscape requirements of Japanese hare under urbanized environment. In this presentation, we will present and discuss positive and negative factors for Japanese hare persistence in Tokyo metropolitan area in relation to implementation of better conservation strategies for urban wildlife in Japan.

P–5

Effect of cutting management of kudzu vine on recovery of the nest site of Harvest mouse in Katura River, Kyoto, Japan

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The Harvest mouse *Micromys minutus*, a small rodent, is endangered by the loss of grassland habitat. The mice build their nests on tall grasses such as Amur silvergrass (*Miscanthus sacchariflorus*). In Japan, floodplains are important habitats for the Harvest mouse. However, the kudzu vine *Pueraria lobata* has recently spread on floodplains to a great extent. This vine often covers the tall grasses and poses a threat to the nests of these mice. In 2005, we examined the effect of cutting the kudzu vine on the recovery of the nest site in a floodplain along Katsura River in Kyoto prefecture, Japan. The experimental area (approximately 0.5 ha) was dominated by the kudzu vine, and only a small colony of Amur silvergrass was observed in that area. During winter and spring seasons, we removed the kudzu vine on the ground surface by cutting. The number of nests of the Harvest mouse, growth of the nesting plants, and vegetation structure were recorded between April and November in 2005. In September, the maximum percentage of plant cover for the kudzu vine was recorded, and this percentage in the area in which the vine was cut (removal division) was 67.6%, which is lower than that recorded in the areas in which the vine was not cut (non-removal division) (97.8%). Further, during the study period, the plant cover for Amur silvergrass was constantly noted in the removal division (18.9% [6.5%]), however in the non-removal division it was hardly noted (0.2% [0.2%]). In the removal division, we observed 4 nests made of foxtail grass (*Setaria* sp.). Young harvest mice were only observed in the division in which the Amur silvergrass colony was observed; in this division, the breeding nests were made of Amur silvergrass. Further, Amur silvergrass with a height of 140.7 [22.3] cm was used for building nests. Amur silvergrass in the removal division was shorter (119.0 [22.4] cm) than that in the division with the Amur silvergrass colony (145 [22.3] cm). The results of the experiment in which the kudzu vine was cut confirmed that cutting management has positive effects on recovery of the nest site of the Harvest mouse. However, there was a possibility that the grasses in such areas that were recovered for a short period did not effectively function as the breeding site. This management was considered to be effective for securing a temporary small-scale habitat for the mice as a shelter.

P–6

Conflicting issues in conserving an endangered tiger beetle in an urban area - a case study in a compensatory created sandy shore

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In recent years, an increasing number of artificial beaches have been created across the coast of Japan. Some cases had clear goals of creation, such as the restoration of coastal ecosystems for human uses (fishery, shellfish-gathering) and/or conservation of fauna and flora, or the construction of sandy beach for recreation activities. However, conflicting relationships are likely to arise between human uses and biological conservations (Furota, 2003).

An artificial shore was created on the coast of Okinosu, Tokushima Prefecture, in 2007, which had the following three purposes: 1) disaster prevention, 2) provision of amenity space and 3) compensation of the habitat for an endangered tiger beetle. The government of Tokushima Prefecture has judged that the shore can be thrown open for public uses from March 2010 on the basis of that a whole life cycle of the tiger beetles was kept in a new habitat on the shore during the previous years. However, Kouzuki et al. (2009) suggested that it is difficult to make a win/win situation between positions with different purposes, particularly for human uses and biological conservations, with serious possibilities of coming into a conflicting situation. In this study, we reported the results of a workshop for considering the rules of shore use and its management systems.

The participants in the workshop consist of the locals, some members of a group for nature conservation and some researchers on terrestrial insects or marine benthos. They reached an agreement about the right of coexistence of the tiger beetle with human activities. Therefore, they agreed on making the rules that restricts human activities to harmless level for tiger beetle activities. However, no consideration to the management systems was done due to unclear policy of Tokushima Prefecture to the practical management.

Because the created shore is a newly occurring environment, the locals have had no friendly feeling to it yet. Therefore, there is no local rule which can self-control disordered uses of the shore. In such cases, an executive management by the local government should be needed. Furthermore, a steady cultivation of the wise use thinking to users through the environmental education program will result in the conservation of coastal biodiversity including the endangered species on the created shores.

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P–7

Conservation of Daruma Pond frogs

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Declines in amphibian species are reported around the world, and habitat loss is considered as a major threat on the amphibian populations. As wetland, which is a crucial habitat for amphibian, is decreasing globally, paddy field is recognized as a substitute habitat of wetland, especially in Monsoon Asia. In Japan, 19 out of 42 frog species/subspecies utilize paddy fields. However, since the environments surrounding paddy fields also changed dramatically, the frog populations at paddy fields are decreasing. Around 1950's, agriculture is modernized and new techniques including chemicals and heavy machineries were introduced to the paddy fields; the structure of paddy fields were converted and water management regime was changed. Modernization of agriculture led to the alternation of paddy field ecosystem.

Daruma pond frog (*Rana porosa brevipoda*) was a common species at paddy field but it is now listed on Japanese red data book. *R. porosa brevipoda* stays paddy field through the year, and its habitat is now limited within the paddy field, so the specie is influenced by the any alternation of paddy field directly. The habitat loss and fragmentation are considered main reasons of the specie's declination, but in details, habitat-environment relationship at each life stage is not clear. In addition, in genetic level, *R. porosa brevipoda* is hybridized with close species, Black-spotted pond frog (*Rana nigromaculata*). Although genetic conservation is urgent issue, even the degree of penetrance of hybridization has not investigated well yet. In order to conserve *R. porosa brevipoda*, we need information on (1) the environmental factors of paddy field influencing the habitat use, (2) habitat use at each life stage, the seasonal use of habitat and dispersal ability, and (3) genetic variation within and among populations.

For this study, first, we identified the frog species in the research fields and examined how environmental factors of paddy fields (in each paddy field level and in landscape level) affect the frog use of paddy fields and the larvae population. The research fields are 11 paddy fields managed in different ways from 4 sites located at Takashima city in Shiga prefecture, Japan. The paddy field use of *R. porosa brevipoda* was influenced by the size of paddy field at field level and the ratio of paddy field at landscape level, and the larvae population was influenced by dissolved oxygen and water management regime.

Secondly, we conducted telemetry survey to investigate habitat use of three life stages; reproductive stages, non-reproductive stage in summer and in fall, at ponds (abandoned paddy field filled with water from March through September) at one of the study sites. During the survey, none of the individuals left the pond. We also conducted marked-recapture survey to follow the movement of individual frog. No marked frog released at the pond was recaptured at surrounding paddy field.

Lastly, in genetic level, we collected DNA samples from three of the study sites and extracted DNA to identify species and estimate gene flow among populations. Hybridization between *R. porosa brevipoda* and *R.nigromaculata* was observed. For further study, we need more samples from wider area to investigate gene flow or population structure.

Based on the survey, so far, *R. porosa brevipod* uses paddy fields at all life history, and if the water level is kept high enough for larvae to survive and the soil is humid, the farming paddy field can possibly support its population. More study is needed to invest the dispersal ability of the specie and mechanisms of hybridization between *R. porosa brevipoda* and *R.nigromaculata* to conserve *R. porosa brevipoda* at genetic level.

P–8

Installation of micro transmitter in Siberian Salamander (*Salamandrella keyserlingii* Dybowski)

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Siberian Salamander possesses the widest geographical range of all amphibian species of the world. It distributes in Russia, the north Kazakhstan, Mongolia, China, Korea and Japan, and is considered an indicator species of global environmental changes. In Japan, this species only inhabits Kushiro Marsh, Kunashir and Shikotan in Hokkaido, northern Japan.

On the other hand, recent decrease in habitat of Siberian Salamander has been remarkable in Japan due to human activities, e.g. road development, land development and river improvement. Therefore, Siberian Salamander has been designated as a near threatened species (NT) by Environment Agency of Japan. Life cycle of Siberian Salamander, however, is quite complex and unclear because this species uses aquatic and terrestrial sites alternately.

The aim of this study was to clear the terrestrial environmental factors of Siberian Salamander. In such study, the radio telemetry using a micro transmitter with antenna attached to the tail of Siberian Salamander has often been done. But the authors have frequently observed fall of the transmitter or tangle of the antenna with plants. To obtain a method of the transmitter installation in Siberian Salamander, therefore, various installations were verified in this study; positions of the transmitter (back, waist and tail), shapes of the antenna (straight and spiral types), antenna size (normal and half length) and bonding materials (adhesive tape, adhesive agent and fishing line) were tried, respectively. For above trial, a small dose of narcotic (MS-222) was also used to prevent pain and consumption in Siberian Salamander.

As the results, most effective method of micro transmitter installation in Siberian Salamander was to use the spiral antenna cut in half, and attach the transmitter on the back of this species with fishing line. This method could contribute to survey Siberian Salamander for one week without a problem such as fall of the transmitter and tangle of the antenna with plants although some problems often occurred in other methods within several hours.

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P–9

Distribution and recruitment patterns of an endangered mud snail on an ‘unexpectedly’ created tidal flat

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Understanding distribution and recruitment patterns of endangered species on a created tidal flat could contribute to successful creation of tidal flats with higher biodiversity including some endangered species and/or rich ecological functions.

Ohgata tidal flat located on the east of Shikoku Island, southwestern Japan, was unexpectedly created with dredged materials (distributed on northern 1/3 part of the Ohgata tidal flat) from nearby shallow bottom and with mountain soils (distributed on southern 2/3 part) in the course of a land reclamation for the Ohgata fishing port enlarging project. At present, after about 10 years from the last reclamation, many animals including 15 endangered species are found in the artificial tidal flat. In particular, two endangered species, a fiddler crab *Uca arcuata* and a mud snail *Cerithidea rhizophorarum* are abundant from a mid to upper intertidal zone.

This study aimed to examine distribution and recruitment patterns of the mud snail in an artificial tidal flat comparing with two nearby natural tidal flats. We investigated their density at 3 study sites (an artificial tidal flat and two natural tidal flats) and conducted a sediment manipulation experiment in an artificial tidal flat.

A small (<45 mm) mud snail *Cerithidea rhizophorarum* mainly distributes on upper intertidal of muddy to sandy tidal flats in the southern part of Japan. In the Ohgata artificial tidal flat, the density of snails in the coarse mountain soils area was about 2.5 times higher than that in the dredged materials area. In order to clarify the recruitment pattern of the snail on a newly created habitat, a sediment manipulation experiment was conducted. New habitats with two sediment types were experimentally created in the coarse mountain soils area in the Ohgata artificial tidal flat. In April 2007, 10 ditches (2 m width x 16 m length x 0.5 m depth) were dug perpendicular to the shore line in the coarse mountain soils area at 3 m intervals by heavy equipments. Five ditches were filled with newly dredged materials and the others were filled with the disturbed coarse mountain soils which were dug up from the identical places. We investigated the density of the mud snail within the two types of filled ditches and non-disturbed coarse mountain soils area as a control for three years.

The density of snails was always higher in the non-disturbed coarse mountain soils treatment (control) and the order (non-disturbed coarse mountain soils > disturbed coarse mountain soils > dredged fine sediments) was kept stable for three years. In two nearby natural tidal flats, snail density was 3-5 times higher at also sandy habitats than adjacent muddy habitats, suggesting that the snail prefers coarse sandy sediments to fine muddy sediments. Furthermore, the density of snails in the disturbed coarse mountain soils treatment gradually increased from less than 5 snails (/0.25 m^2) in 2007 to 5~10 snails (/0.25m^2) in 2008, and reached 10~20 individuals (/0.25 m^2) in 2009, being nearly the same of the two natural tidal flats. This suggests that the situation in the experimental area has become similar to the nearby natural habitats finally after three years from the start of experiment.

This study was partly supported by Fisheries Agency, Japan.

P–10

Distribution and recruitment patterns of an endangered fiddler crab on an 'unexpectedly' created tidal flat

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Understanding distribution and recruitment patterns of endangered species on a created tidal flat could contribute to successful creation of tidal flats with higher biodiversity including some endangered species and/or rich ecological functions.

Ohgata tidal flat located on the east of Shikoku Island, southwestern Japan, was unexpectedly created with dredged materials (distributed on northern 1/3 part of the Ohgata tidal flat) from nearby shallow bottom and with mountain soils (distributed on southern 2/3 part) in the course of a land reclamation for the Ohgata fishing port enlarging project. At present, after about 10 years from the last reclamation, many animals including 15 endangered species are found in the artificial tidal flat. In particular, two endangered species, a fiddler crab *Uca arcuata* and a mud snail *Cerithidea rhizophorarum* are abundant from a mid to upper intertidal zone.

This study aimed to examine distribution and recruitment patterns of the fiddler crab in an artificial tidal flat comparing with two nearby natural tidal flats. We investigated their density at 3 study sites (an artificial tidal flat and two natural tidal flats) and conducted a sediment manipulation experiment in an artificial tidal flat.

In the Ohgata artificial tidal flat, the fiddler crab was abundant only in the dredged materials area. In contrast, they did not occur in the coarse mountain soils area. In order to clarify recruitment pattern of the crab on a newly created habitat, a sediment manipulation experiment was conducted. New habitats with two sediment types were experimentally created in the coarse mountain soils area in the Ohgata artificial tidal flat. In April 2007, 10 ditches (2 m width x 16 m length x 0.5 m depth) were dug perpendicular to the shore line in the coarse mountain soils area at 3m intervals by heavy equipments. Five ditches were filled with newly dredged materials and the others were filled with the disturbed coarse mountain soils which were dug up from the identical places. We investigated the density of the crab within the two types of filled ditches and non-disturbed coarse mountain soils area as a control for three years.

The crab appeared only in the dredged sediments area just 4 months after the start of the experiment. In contrast, only a few individuals occurred in the coarse mountain soils area. In 2007 (the first year from the start of the experiment), the density of the crab remarkably increased in the dredged material area, but it did not increased any more in the following years except for some seasonal fluctuations. These results suggest that the fiddler crab actively selects muddy sediments and this is a main reason of their inhabiting only in the dredged material part of the Ohgata artificial tidal flat.

In September 2009, the total density of the crab in the experimental dredged material area (Ohgata experiment) was less than 1/3 as compared with a nearby intact dredged material area (Ohgata aged) where created more than 10 years before. Furthermore, only a few recruits (<10 mm in shell length) occurred in the experimental area, and even in the intact aged dredged area, the recruitment was significantly lower (less than 1/3) than that of the muddy habitats of two natural tidal flats. These results also suggested that physical requirements of the juvenile crab seems to differ from the adult's one and unknown factors may negatively affect the process of recruitment and/or post-recruitment survival of juvenile in the artificial tidal flat, particularly in the experimental area.

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P–11

Red Claws crab *Chiromantes haematocheir*, as an indicator for evaluating urban green space

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Preserving the biodiversity is important for people to receive ecosystem service sustainably. However, the loss of biodiversity is a global phenomenon. Especially, it is serious in highly urbanized areas.

There are parks and green spaces created by humans in urbanized areas, and many species live there. However, there are few attempts that evaluate these surroundings through the biological view. In this study, we evaluate the urban green space “Shiroyama” and the urban park around it located in Tokushima city, by using Red Claws crab (*Chiromantes haematocheir*) which uses many habitats as an indicator.

There are still the forest and stone walls left at Shiroyama. And a river is located adjacent to there, Red Claws crabs use there when they release zooeae. The park attracts many people, and there is the artificial stream which man made.

As a result, it is revealed that the forests, the stone walls of castle and the artificial stream are important habitats for Red Claws crab. In addition, Red Claws crab which release zooeae prefers old-type bank protection to new-type bank protection. At old-type bank protection built of stones, the hole is deep, and riverbed is gently-inclined. On the other hand, at new-type concrete bank protection which stones are pasted, the hole is shallow, and riverbed is flat.

Whereas constructions such as stone walls, the old-type bank protection and the artificial stream are useful for Red Claws crab, the new-type bank protection unfavourable as a habitat. These results show that environments created by humans have both good and bad effects on lifestyle of Red Claws crab.

P–12

Study of soil animal communities for conservation of the regional ecosystem on endemic spring-fed wetland and Kaisho Forest of Aichi in Japan

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Across the road from Kaisho Forest in Aichi, where Expo 2005 was held, lies a spring-fed wetland commonly called ‘Dragonfly Pond’. In the Tokai region’s oligotrophic hill marsh, the sand and gravel beds as well as springs show weak acidity. Indigenous plants grow in this ‘Tokai Hilly Element’, as it is called. Dragonfly Pond, also a site of silica mining from the sand and gravel soil, springs flow and plants such as *Drosera tokaiensis*, the endangered *Eriocaulon nudicuspe* or wetland insects such as the Tiny Dragonfly, *Nannophya pygmaea RAMBUR* inhabit the Tokai Hilly Element, where a wetland ecosystem has formed.

In this study, with a goal of developing preservation methods for this wetland ecosystem typical of the region, the communities of soil animals as well as the soil and water quality were investigated in the oligotrophic wetlands where the carnivorous plant *Drosera tokaiensis* grows, in order to clarify the relationship of the soil and biological characteristics.

The sampling method of soil animals was as follows: in Dragonfly Pond and comparable target locations in Kaisho Forest, a layer of soil A was collected and extraction was performed using Tullgren equipment at 3 points (in 50 cm × 50 cm quadrats) in each location.

The soil animals were fixed using 75% ethanol. Then, the genera were identified and populations were investigated using a stereoscopic microscope. On-site measurement and analysis was performed for the following: soil pH (H_2O), TC, TN, soil moisture content and soil surface hardness; the following were measured and analyzed for the spring water: pH (H_2O), TOC, TN and nutrient content.

The following 3 categories of soil animals were established: mites, collembolans and soil macrofauna. The genera of the wetlands in these categories were 10, 7 and 20, respectively; the genera of the forest in these categories were 16, 9 and 33, respectively. The mites and soil macrofauna were more numerous in the forest, but many types of soil macrofauna were also found in the wetlands.

With regard to the 3 frames of population totals and their relation to the genus, the genus of collembolans was the same as that in the wetlands; however, the forest population was 2.1 times greater than the wetlands. The wetlands’ soil macrofauna population for this 1 type was small.

The wetland soil had weak acidity, but the spring water was neutral with lots of added calcium. The cause of this is believed to be that when the groundwater supply to Kaisho Forest passes under the road, the embankments load it with high-alkali solidification materials.

The on-site measurement values for soil moisture content were as follows: 23% for the wetlands and 30% for the forest. With regard to TC, the forest measurement was 130 g kg^{-1}, and the wetlands’ measurement was 10 g kg^{-1}. As such, the effect of the difference in vegetation on the population and genus of soil animals is large.

The smaller the size of the wetlands, the faster is the vegetation succession. Naturalized plants prefer dry soil containing alkali. With changes in the soil quality and vegetation, our challenge hereafter is to learn more about the symbiotic relationship between soil animals.

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P–13

Seasonal dynamics of fruiting of macrofungi in the EXPO '70 Commemorative Park

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After the Expo '70, its place was redeveloped as The Natural and Cultural Gardens of the EXPO '70 Commemorative Park. The Natural and Cultural Gardens has 98.5 ha which includes large forest and locates in northern west area of Osaka prefecture. At the present time, trees have been growing up much bigger than 40 years ago, and forest have become very thick. Therefore we have to manage the park for increasing of biodiversity in The Natural and Cultural Gardens. There are already some researches for increasing of biodiversity in The Natural and Cultural Gardens, for example, researches about shrubs and herbaceous plants (Nakamura, 2002; Shiota, 2003), butterflies (Chikamatsu, 2002), and pteridophyta (Matsui, 2003). This research had investigated seasonal dynamics of fruiting of macrofungi in the EXPO '70 Commemorative Park. We have started survey since June 2008, and we have surveyed every month species and ecological characteristics of appearing macrofungi. In addition, we have surveyed soil moisture and soil temperature by DIK-360B at 3 sites in the Natural and Cultural Gardens. As a result, 51 species (40 species were fungi which grew up at the ground) appeared from June 2008, to March 2009. And, 68 species (50 species were macrofungi which grew up at the ground) appeared from April 2009, to February 2010. The seasonal dynamics of macrofungi showed a tendency to rise at June and October. On the other hand, appearing macrofungi had decreased in midsummer and winter. In conclusion, we inferred that seasonal temperature and precipitation cause such seasonal dynamics of macrofungi.

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P–14

Small remnant habitats in urban public properties: the potential role for conservation of grassland plant species

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Semi-natural grassland was one of the main components of the traditional *satoyama* landscapes in Japan (Takeuchi et al., 2003). For centuries, semi-natural grasslands had been maintained by seasonal mowing or burning to produce such as organic fertilizer, livestock feed and materials for thatched roof in the traditional agricultural systems. However, particularly during the last 100 years, the system has changed drastically, and large tracts of semi-natural grasslands have converted to crop fields or urban land use in almost all of the rural agricultural regions in Japan. Semi-natural grassland especially in upland and lowland rural *satoyama* landscapes has almost disappeared during the last 50 years by agricultural intensification and rapid urbanization, which has led many grassland species to be rare both at the regional and the national levels. There are no more habitats with high conservation value remaining as “hotspots” in *satoyama* landscapes that are adjacent to cities. However, out of conservation point of view, it is important to focus not only on “hotspots” but also on remaining habitat fragments, since these common fragments will have a relatively high importance for species diversity in everyday rural landscapes (Cousins, 2006; Cousins & Eriksson, 2008). In this study, we aimed to reveal whether the vegetation of small habitats (semi-natural grassland and open secondary woodland) remaining in the urban public properties in Tsukuba Science City could be comparable to that of the past semi-natural grassland. We conducted vegetation survey on 29 grassland sites and 15 pine woodland sites, and gathered the past vegetation data of 40 grassland sites from regional flora. Although the average grassland species richness of the present vegetation of the small remnant habitats was significantly lower than that of the past semi-natural grassland vegetation, these vegetation still have actual pools of grassland plant species in the present highly fragmented landscapes. The small habitats remaining in the public properties might have functioned as habitats for grassland species under the condition of regular public management. Grassland species diversity in these small remnant habitats could be enhanced by more suitable mowing regime, and contribute to conservation of semi-natural grassland communities in the highly fragmented urbanized *satoyama* landscape.

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P–15

Plant biodiversity assessment in urban historical sites: a case study in Trabzon city, Turkey

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The urban historical sites vegetation features in urban landscapes play an important role as indicators regarding urban biodiversity potential and traditional values. They also include ornamental resources in the context to landscape appreciation for environment. This study provides quantitative information on the distribution and diversity of plant species in “Ortahisar” as an urban historical site of Trabzon city (Turkey). The aim of the study is to find answers for these three questions: What is the plant diversity in study area? What is the usage rate of plant species in the study area? and Where were these plants used?

As for the main results of the study, the plant species were basically used in three spatial types (atrium, street and edge) all over the research area. Non-native taxa frequency among all the species in the research area is much and it dominantly represents urban landscape structure. Additionally, in this study, it will be debated whether the species richness and diversity have relation to urban historical sites in positive or negative ways. Consequently, it can be evidence that the historical vegetation type is one of the ornamental plant resources to urban biodiversity and that the distribution of the species in urban landscapes follows necessities of city and human quality.

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P–16

Railway edges plant diversity along an urbanization gradient in the Parisian region (France)

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Railway edges represent important green areas in urban spaces where plant communities are highly affected by human activities. Despite that in this context they should play a role as refuge for native flora, no studies deal with that question. Moreover the influence of the urban landscape, and particularly the intensity of urbanization, can affect this potential refuge role. More attention is given by ecologists to invasive species along railways edges but not often in urban landscape. We studied the urbanization effects on plant richness and functional diversity on railway edges and focused on the invasive species *Senecio inaequidens*.

In order to examine this question, a plant survey was conducted on 71 sites located along two railway lines. For each site, we inventoried all vascular plants in five quadrats regularly distributed in the middle of the site over a 40 m transect parallel to the rails.

We found 187 species, 148 of them were indigenous or archaeophytes. Plant richness was found to strongly decrease in high urbanized landscapes so as functional diversity. On the contrary, the invasive *S. inaequidens*, and more generally non native species, were found to be positively related to urbanized areas. Plant specialisation - estimated with the Species Specialisation Index (Julliard et al., 2006) - followed the same tendency: we found some specialists of rural landscapes in high urbanized areas.

In urban landscapes, railway edges play a role as refuge for native species. When landscape is highly urbanized, plant richness and functional richness are lower, the abundance of non native and invasive *S. inaequidens* are higher but the habitat is favourable for some rural specialists.

These results show the importance of low managed spaces in the urban context. But management remains essential to prevent the spread of invasive species.

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P–17

Habitat of threatened species, *Rumex nipponicus* Franch. et Savat., fragmented in urban area

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Despite increasing awareness of the importance of protecting threatened species, many species are endangered due to urbanization and changes of landscape.

In mid-April 2009, corresponding author recorded some *Rumex nipponicus* Franch. et Savat. from a paddy field fragmented in urban area, Fukuoka City, western Japan. It has been designated as a threatened species, Grade II (VU), by Environment Agency of Japan.

R. nipponicus is widely distributed in lowland fields westward from the Kanto District of Honshu and Kyushu in Japan (Kitagawa, 1982). It is often confused with *Rumex obtusifolius* L., but both are identified by their tubercles in valves, inner perianthes. *R. nipponicus* was once a common weed of cultivated fields but is now becoming rare because of human activities (Yonekura, 2007). Incidentally, a theory that *R. nipponicus* is one of the subspecies of *Rumex dentatus* L. described from Egypt has also been published (Rechinger, 1949).

Investigating the above paddy field where *R. nipponicus* inhabits, around 1,000 individual *R. nipponicus* (seed setting in early May) were confirmed, with *Geranium carolinianum* L., *Alopecurus pratensis* L. and *Persicaria scabra* (Moench) Mold. representative of paddy weeds. The number of *R. nipponicus* individuals indicates that the paddy field is one of the largest habitats of it in Japan, according to the latest report of Environment Agency of Japan.

In this region, paddy fields are usually tilled twice a year, namely, in late March and late May. The former tillage is done before seed setting of paddy weeds, and prevents the seeds dispersing. The latter is preparatory work for planting seedlings of rice in early June. Contrary to such land use, the paddy field where *R. nipponicus* inhabits has not been tilled in late March during the past several decades. Seed setting of *R. nipponicus* is confirmed in early May as mentioned above. Therefore, it turns out that this paddy field is tilled after seed setting of *R. nipponicus* once a year. As the life cycle of *R. nipponicus* conforms well to the land use, it could have been endured thick in this paddy field.

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P–18

Ecological traits and invasion patterns of curbside species invading the curbsides in Kyushu, southern Japan

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To clarify ecological traits and invasion patterns of curbside species invading the curbsides, we studied species composition and life-form patterns of curbside vegetation among difference land-use types in Kyushu, southern Japan. The species composition of curbside vegetation in Kyushu (Route 3) was surveyed and recorded by vegetation survey (Braun-Blanquet, 1964), based on the presence / absence data of species in each study plots. The curbside was defined as the linear space (under 20 mm width) between the asphalt pavement and curbstone (Suto et al., 2006). The number of study plots on Route 3 was 40 ranging in length from 30 to 50 m, and taken about every 10 km. Dominant land-use types within a radius of 100 m from each study plots based on aerial photographs and field observation, were classified as follows: (1) urban land; (2) dry fields; (3) developed and waste land; (4) paddy fields; (5) forest and (6) coast. Curbside vegetation of different land-use types was classified by cluster analysis based on the Sørensen distance. The occurrence frequency patterns of species among land-use types were analyzed by a Kolmogorov-Smirnov test. Differences in life-form composition patterns of curbside vegetation among land-use types were analyzed by using a Friedman test. Curbside vegetation composition was separated into four groups. Except for the rate of invasive alien species, however, significant differences were not found in vegetational characteristics of curbsides among land-use types. Of the 51 species above 10% occurrence in all plots, only 2 had differences in occurrence tendency in different land-use types. Similar life-form composition patterns of curbside vegetation were found regardless of surrounding land-use types. We suggest that small differences in vegetational characteristics in curbsides regardless of surrounding land-use types can be found due to continuity and connectivity of paved-road networks. Whereas, we suggest that invasive alien species may have an advanced adaptability and high initial invasion ability to artificial disturbances including urban land. We conclude that typical ecological traits of curbside species in Kyushu are ephemeral monophytes with anemochory, hydrochory and barochory regardless of surrounding land-use types for invading curbsides. Additionally, of the 122 species, 32 were graminoids and 23 were Asteraceae. We suggest that graminoids and Asteraceae may have an advanced adaptability and high initial invasion ability to curbside environments. Therefore, we conclude that curbsides play an important role as habitats and safe sites of curbside species including invasive alien species.

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P–19

Managed vegetation under power lines

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Introduction - Since the late 1950s, *satoyama* secondary forest resources in Japan have come to be less used due to the popularization of fossil fuel and the increased availability of chemical fertilizers. As a result of the diminished human disturbance, species composition and biodiversity in satoyama secondary forests have changed. On the other hand, disturbance under power lines in and close to *satoyama* woodlands has continued during the same period as a result of regular cutting to prevent trees from touching power lines. As seen in studies from North America, power line corridors have the potential to provide unique habitats to wildlife that is decreasing in number and depends on early-successional habitats (Askins, 1998). The present study was conducted to grasp the condition of vegetation under power lines in Hachiyado, Otsu City, Shiga Prefecture, Japan.

Power line corridor at Hachiyado

Methods - Two power line corridors (20 m wide) were identified using GIS (ESRI): the Takashima-line (362.8 km) and the Takashimakatata-line (25.2 km). These two power lines pass through Hachiyado. A vegetation map produced between 1995 and 1999 during the Ministry of Environment's 5th National Survey on the Natural Environment was used. Maximum height (<1 m) and percentage of cover were recorded for each species with <1 m height, both in power line corridors, and in not fully managed satoyama secondary forests.

Results and discussion - According to GIS analysis, substitutional vegetation of the Fagetea-crenatae region and the Camellietea-japonicae region occupied 40.5% of the entire power line corridor of the Takashima-line, while substitutional vegetation of the Camellietea-japonicae region occupied 67.5% of the Takashimakatata-line corridor. As substitutional vegetation consists mostly of *satoyama* vegetation, these data show that power lines under which trees are regularly cut pass through vast areas of *satoyama*. Power line corridors in our study had more herbaceous plants, were more abundant in pioneer species such as *Rubus microphyllus* and *Rosa multiflora*, and had a higher percentage of vegetation cover than secondary forests. This indicates that power line corridors are sunnier than secondary forests due to the cutting of trees. Species composition within power line corridors was diverse, while that of the secondary forests was rather homogeneous, and there was varied vegetation under power lines ranging from vegetation from secondary forests such as seedlings of woody plants, to vegetation typical of other areas consisting of herbaceous plants and pioneer species. The results suggest that management of power line corridors passing through vast areas of satoyama greatly contributes to sustaining the plant species diversity in satoyama woodlands.

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P–20

The possibility of natural regeneration of native vegetation on the Kirigamine Heights

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Sub-alpine semi-natural grasslands have been established on the Kirigamine Heights (about 1600 m to 1800 m asl), Nagano Prefecture, central Japan. This area naturally belongs to the evergreen coniferous forest zone, but semi-natural grasslands have been established by human activity over the past about 700 to 800 years and severe environmental conditions.

Generally the semi-natural grasslands of Japan are a very important native plant habitat. Apart from man-made grasslands, most grassland vegetation is semi-natural grasslands, and has been managed by mowing, grazing and burning. Recently, as a result of changes in the land use of semi-natural grasslands, plant succession has been proceeding, and native plant habitats have been decreasing rapidly. The primary reason for this loss of native plant habitats is thought to be the decrease in the area of semi-natural grasslands. For instance, *Pulsatilla crenua* and *Patrinia scabiosaefolia*, herbaceous native plants of semi-natural grasslands, were not uncommon in the past, but they are now in danger of extinction (Murata, 1988; Okubo & Maenaka, 1994).

The Kirigamine Heights are an example of semi-natural grassland suffering from a decline in native plants. Further, in this area, alien plant species have been invading and establishing, and wild deer (*Cervus nippon*) have been eating native plants of the semi-natural grasslands (Tsuchida, 2002; Okubo, 2002).

Therefore, the purpose of our study was to determine whether natural regeneration of native vegetation in this area could be enhanced by controlling alien plant species. The distribution and habitat conditions of the most common alien plant species were investigated at eight areas in the heights. Vegetation, and soil water and light condition of the grassland communities were surveyed at only the Kowashimizu area in the west of the Kirigamine Heights. The alien plant species *Erigeron strigosus* and *Oenother* spp. were shown to be the most common and widely established species of the semi-natural grasslands in the height. The number of both alien species and species of established semi-natural communities were higher than in the nearby native communities (Mori & Okubo, 2005). Moreover, it is suggested that the succession process differs according to habitat conditions.

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P–21

Restoration of grassland biodiversity from dwarf bamboo by reactivating seed bank

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Secondary grassland has existed in the northern part of Chiba Prefecture until Edo period. Dwarf bamboo (*Pleioblastus chino*) grows thickly now because of the change in land use, and flora of grassland has been lost. To restore secondary grassland from dwarf bamboo, seed bank composition was investigated and the effect of mowing was experimented.

The study area is grassland around Konbukuro pond at Kashiwa-city in Chiba, Japan. Previous study showed that there are dormant seeds of characteristic species of secondary grassland in soil.

To examine the past grassland vegetation by reactivating seed bank, dwarf bamboo was mowed experimentally. After mowing, the change of flora was investigated at intervals of one month in each stand. In addition, to investigate the effect of mowing on wildflower phenology, *Eupatorium makinoi* was mowed in summer.

There had been 75 plant species in mowing area while 21 species in control area for 28 months. 19 species of characteristic species which grows in secondary grassland had germinated in mowing area. As species abundance and coverage increased only in mowing stand, it was proved that to restoration of secondary grassland is possible by mowing. In order to maintain the grassland flora, dwarf bamboo should be controlled by mowing in summer. But the result of summer mowing showed that *E. makinoi* did not flower in mowing area.

According to these results, the treatment that allows the control of the growth of dwarf bamboo and has wildflower bloom is needed. The results of this study recommend a rotation management. In the rotation management, whole area is divided into several patches and summer-mowing will be employed in each patch due to the schedule of rotation. The rotation of management is as follows. Dwarf bamboo and grassland species are mowed in summer in the first year, and consequently the growth of both of them are suppressed. Since two years of vegetative period is satisfactory for flowering of all grassland species, all the grassland species blooms and disperse seeds in the third year. Grassland will be mowed in summer of the fourth year in order to control dwarf bamboo. As a result, biodiversity as grassland is maintained.

P–22

Conservation and management of coastal pine forest

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Coastal forest, which is located between sea and human settlement, is one of the representative cultural landscapes in East Asia. Especially in Japan, plenty of coastal forests are distributed along coast lines of the Japanese archipelago (Kawai, 1992). The main component of coastal forests is Japanese black pine (*Pinus thunbergii* Parl.). The coastal pine forests have established and have been maintained by local residential people for a long time (Oda, 1992). The coastal pine forests have multi functions, for example prevention from wind, sand and natural disasters, providing food and materials for fuels and compost, habitat for animals and plants etc. In addition, some of these forests have been conserved as a scenic beauty. Coastal pine forests are closely related to daily life of residential people and maintained as a cultural landscape (Tanaka, 1992). However, these functions of coastal pine forests have been changed after 1960s. Recently, the fallen leaves and the deadwood in the coastal forests are not used, because the energy resource changed from the wood fuel to the fossil fuel and the resource for agriculture changed from the compost to the chemical fertilizer (Taoda, 1988). The management of forest is indispensable to sustain the proper function (Fujihara & Iwasaki, 2006). On the other hand, coastal pine forests have been established on sand vegetation, which was unique natural vegetation. In the present study, we try to describe the relationship between management practice of coastal pine forest and biodiversity of coastal sand vegetation. The study site is located in the southern part of Awaji Island, Hyogo Prefecture, Japan. Both coastal pine forest and sand dune were closely related each other from the view point of function and structure. The vehicles have been used to collect fallen leaves and branches for maintenance of the coastal forest. Moreover, the machines such as the beach cleaners have been used in the coast for the garbage cleaning. The management works by such heavy equipment exerted a severe influence as artificial disturbances to the coastal forest floor and vegetation. The red data species of Hyogo Prefecture, such as *Linaria japonica* Miq. was found on the sand dune and pine forest.

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P–23

Effects of irrigation network on the invasion process of alligator weed in the drainage basin of Lake Teganuma, Japan

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Alligator weed (*Alternanthera philoxeroides*), which has been designated an Invasive Alien Species by the Japanese Ministry of Environment, was first observed in the drainage of Lake Teganuma in Chiba Prefecture in 1998, and is now in the process of spreading around the entire drainage basin (Hayashi et al., 2009). Hayashi et al. (2009) have identified one factor in this spread as the network of irrigation canals that were dug as part of agricultural land improvement works since the 1960s. In this research, direction of flow in the canals and all rivers is used to trace the route of expansion, and changes in spatial distribution of this plant over the past 10 years are analyzed using by a spatial statistical method.

ArcGIS was employed to attach positional data to records of alligator weed distribution for the entire watershed (163.4 km^2) for the years 1997 to 2007. Locations of all rivers (105.8 km), canals (589.6 km) and pumps were digitized from maps (1/25,000 and 1/3,000) obtained from the Agricultural Land Improvement District. To extract the route of expansion, minimum distances between observed points were calculated. To analyze changes in the distribution pattern, the K-function and cross K-function, which is a K-function (Ripley, 1976) expanded to network scale (Okabe & Yamada, 2001), were calculated using SANET Version4.0.

The results showed that after being first confirmed in 1998, the total number of distribution points for alligator weed increased from two to 27 by 2004. The increase accelerated after that, reaching 154 points by 2007. From 1998 through 2001 the distribution of the plant waxed and waned in the canals in the eastern part of the watershed. In 2002, however, the plant entered the main rivers, and by 2005 had spread over the entire watershed. The maximum distance between observed points increased over three times, from 8 km in 2004 to 25 km in 2005. Analyzing the spatial distribution by year using the K-function showed that before 2004 clustering was within a limited area at distances of 1 to 5 km. After 2004, however, clustering was at distances from 1 to 8 km, with random distribution over 8 km. Using the cross K-function to analyze distribution over consecutive years showed an attraction distribution from 1 to 5 km based on the 1999 - 2000 data. This pattern was repeated until 2003 - 2004. From 2004 - 2005 onwards, the attraction was from 1 km to 8 km. Combined with the digitized network of rivers and canals, these results show that the alligator weed is able to spread in an upstream direction, and that even further increases in the distribution can be expected.

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P–24

Differences in aquatic plant diversity and vegetation cover among watersheds in a heavily urbanized drainage basin, Lake Teganuma, Japan

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Wetlands such as shallow lakes and marshes provide important ecosystem services to human society, such as fishery resources, maintenance of water quality, climate regulation, flood prevention and recreation. These valuable biodiversity and ecosystem services, however, are severely endangered in many regions, due to land use changes and consequent increases in nutrient levels in the watersheds. Particularly, in heavily populated areas, habitat destruction and fragmentation are seen as important causes of local extinction.

Freshwater ecosystems are also vulnerable to disruption caused by the introduction of invasive alien species. An assessment of the current status of local communities and habitats is thus important for developing strategies for conservation of native species and prevention and eradication of invasive alien species.

In this study, the relationships among vegetation cover, watershed area and native and alien aquatic plant diversity is studied for a drainage basin of Lake Teganuma, shallow water located just east of Tokyo, Japan, that has been highly impacted by human activities. Satellite images are employed to map the distribution of aquatic plant species in six watersheds belonging to the drainage basin of Lake Teganuma. In addition, the images are used to assess vegetation cover as an indication of land reclamation, and a hierarchical model of the watersheds is employed to assess species diversity by species-area curve and to analyze the relationship between species richness and vegetation cover in each watershed.

To analyze these relationships, the drainage basin of Lake Teganuma was divided into six watersheds, namely, Kamenarigawa Watershed (KAM), Chokusetsuryunyuiki Watershed (CHO), Otsugawa Watershed (OTS), Ohorigawa Watershed (OHO), Kanayamaotoshi Watershed (KAN) and Someiiriotoshi Watershed (SOM). The diversity of aquatic plants for each watershed was determined by field collecting and the distribution of 21 species was digitized using ArcInfo. The mapped species were divided into native and exotic species. Vegetation cover (Normalized Difference of Vegetation Index, NDVI over 0.4 defined as vegetated) and subwatershed structure were derived from DEM (10 m resolution) images were employed for the analyses.

The total number of species recorded in the study area was 21, of which invasive alien species and uncategorized alien species comprised 9.5% (two species) and 19.0% (four species), respectively. Alien species were found in all watersheds except for SOM. Emergent plants were found in all watersheds, but other life forms, such as submerged and floating-leaved plants, were found mainly in KAM and CHO. Vegetation coverage ranged from 2.0% to 23.0% and was greatest in KAM, where the area of watershed was the second smallest, and lowest in OHO. As a general trend, vegetation cover was higher in the eastern part of the study area. The results of species-area curve showed a positive correlation between species richness and both vegetation cover and subwatershed area for native species. In particular, aquatic plant species with life-forms other than emergent plant were found primarily in the watershed with the highest vegetation cover. Alien species were found in all the watersheds, regardless of vegetation cover. The results of this research will hopefully provide base data for restoration of habitats in Lake Teganuma, and also provide insights useful for preventing and eliminating invasion by alien species.

P–25

Relationship between aquatic plant distributions and environmental conditions in the drainage basin in Kamiina District, Nagano Prefecture

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Recently, the loss of diversity of aquatic plants has become a major issue in paddy fields, reservoirs, and canals. In this study, conservation of aquatic plants was considered based on the relationship between distribution of aquatic plants and environmental conditions and management types.

The study plots were set up in six types of water area (river, reservoir, paddy field, irrigation canal, drainage, and fish-breeding pond) in Ina district (Nagano prefecture, the central part of Japan). According to the size of the water area surveyed; several quadrats (2 m × 2 m) were established to reveal the species richness and cover of the aquatic plants. The flora of aquatic plants in these study sites were completely surveyed in the summer and in the fall of 2009, respectively. The environmental conditions measured or recorded were as follows; water temperature, pH, EC, types of the bottom sediment, neighboring land use, agricultural management and dredging management.

The survey of the aquatic plants revealed the presence of 51 species in the summer, and 24 species in the fall. The highest species richness was found in the rice field without mid-summer drainage, followed by the rice field with it. The irrigation canal and drainage connected directly with the rice field had relatively higher species richness. Notably, the flora of aquatic plants in the irrigation canal maintained by dredging was different from other water area. There results indicate that maintenance such as paddy field farming without mid-summer drainage and dredging in irrigation canal can increase the species richness of aquatic plants. Furthermore, paddy fields may play a role as the source of aquatic plants in the neighboring water area.

P–26

Evaluating plants species diversity across multiple spatial scales in the urban isolated wetland

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Biodiversity of urban wetlands are in a critical situation. To conserve biodiversity in such wetlands effectively, applying ecological survey to the management planning is important. Previous studies dealt with endangered/indicator species distribution or changes in species composition due to habitat conditions. However, there are few studies which deal with species diversity across multiple spatial scales. The multiple spatial scale approach allows us to use additive partitioning of species diversity which could evaluate patterns of species diversity and develop conservation strategies (Gering et al., 2003). The purpose of this study is to evaluate the plant species diversity of an urban isolated wetland using the spatial hierarchical approach.

Negiuchi Historical Park located in Matsudo City of Chiba Prefecture in Japan, has about 1 ha wetland which is a remnant flood plain in an urban area. The wetland was divided into 222 grids (5 m x 5 m). And in each grid, species names and coverage were recorded in a quadrat (1 m x 1 m) located at the center. Quadrats were grouped into 14 blocks based on environmental and management condition.

In the concept of additive partitioning, the sum of the average diversity within the community (α-diversity) and the diversity among the communities (β-diversity) give the total species diversity (γ-diversity). According to this concept, we defined the spatial diversities as follows: α_{quad}-diversity, is defined as the diversity within each quadrat. α_{block}-diversity, is defined as the diversity within each block. β_{quad}-diversity, is defined as the diversity among quadrats. β_{block}-diversity, is defined as the diversity among blocks. Each analysis used two indicators of species diversity such as species richness and Simpson index. Simpson index reflects both species richness and equivalence of abundance, and strongly emphasizes the impact of the dominant species (Lande, 1996).

As a result, species richness about β_{block}-diversity mostly contributed to total species diversity of the wetland area. It indicated that environmental difference among blocks should be kept to restore the species richness in this wetland. However, the result from Simpson index shows that the condition of α_{quad}-diversity was the largest. This result indicated that the equivalence of each species abundance at quadrat level is important to keep the total diversity in this wetland. Therefore, the dominant species which excludes the other species at a small scale should be removed to increase the entire wetland species diversity.

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P–27

Sedimentation of the sand and mud over the seagrass meadow of *Zostera japonica* Aschers

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Introduction - It is often seen the seagrass meadows grow on the mound at the seabed. We investigated the reason and the mechanism of the formation of seagrass meadows on the mound.

Methods - We measured three belts of micro-topography on the seabed with seagrass meadows of *Zostera japonica Aschers* growing set in the investigation site in Tanabe Bay located in the western part of Kii Peninsula, Japan (Fig. 1), and set ten quadrats of 30 cm on those belts. After measurement of the micro-topography, we dug up all of shoots, leaves, roots and rhizome from the quadrats, and measured the size and dry weight of every organ.

Results - The depth of the rhizome growing under seabed became deeper according to the stem age older. And except those newest tips, they grew under reduced layer (Fig. 2).

In addition, it was found the positive correlation (r=0.63) between maximum leaves length and sheath length (Fig. 3). And sheath length were larger according to the location of basal axillary under seabed becoming deeper.

In general, seeds of seagrass species cannot germinate under reduced condition. Consequently, it was suggested that the reason of older rhizome growing under reduced layer were buried with sand and mud. Thus, the mechanism of the formation of seagrass meadows on the mound at the seabed may be caused by catching and dropping down the drifting sand and mud by leaves and stems on the surface of seabed.

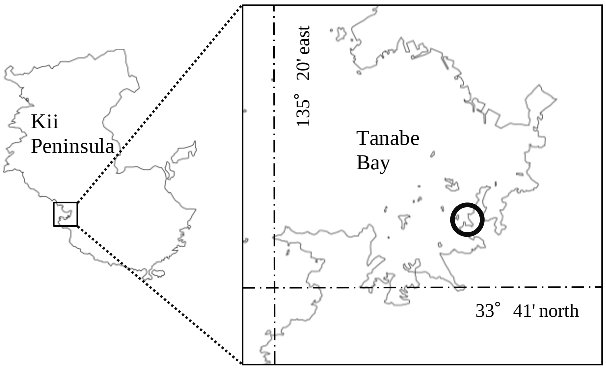

Fig.1 Location of Tanabe bay and investigation site

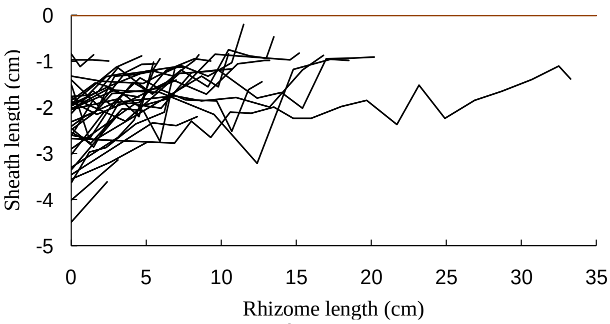

Fig.2 Appearance of rhizome under seabed

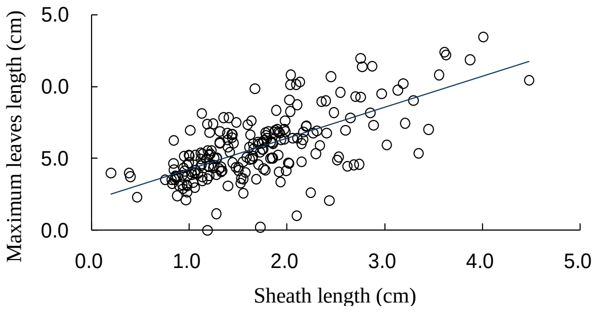

Fig.3 Relations between maximum leaves length and sheath length

P–28

Comparison of levels of genetic variation of *Zostera marina* L. among different patches in small bay

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We investigated the influence of the genetic characters by the phenomena of decline of the seagrass meadows of *Zostera marina L.* in Tanabe Bay located in the western part of Kii Peninsula, Japan (Fig. 1).

We gathered samples of the seagrasses form five sites in Tanabe Bay, and one site in Hashikui located the point of Kii Peninsula, 60km south from Tanabe Bay. Genetic variations among each seagrass meadows in the bay were analyzed by the microsatellite method.The samples of the seagrasses were gathered from each seagrass meadows on and around the center of every 3 m intervals (n=8 to 30). The samples were brought to the laboratory promptly. They were washed clearly and kept in -80°C until the analysis. The samples were analyzed and separated genotypes by five microsatellite loci (Table 1).

The genetic variations of seagrass meadows in Tanabe Bay had closely different genotypes compare with among each seagrass meadows in other areas in Japan, even they grow in the small bay (Fig. 2). Thus, it is suggested that the genotypes are not close among each seagrass meadows in the same Tanabe Bay. And, it is suggested that the same phenomena appeared in the other small bays. But it was not clear the reason.

There are three possibility of such as phenomenon; 1) there is usually large difference among the every habitats, 2) they are characteristics in the bay of small bay, or 3) the area character limited only to Tanabe Bay.

We expect the results will be used to study the genetic variation of seagrass meadows in other areas.

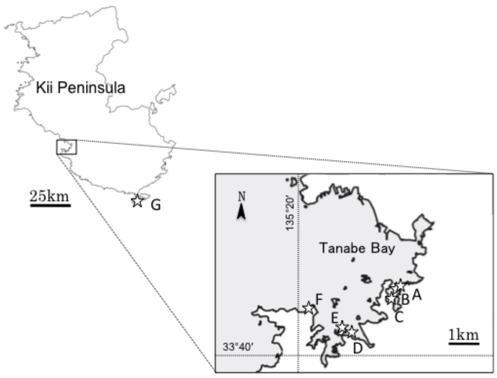

Fig.1 Seagrass meadows of Zostra marina

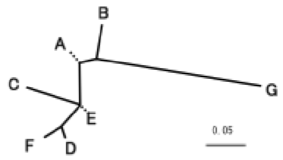

Fig.2 Tree diagram of genetic variation

Table 1 Arrangement of primers

	Primer	Arrangement (5'-3')
Zosmar	GA-3-f	CGACGATAATCCATTGTTGC
	GA-3-r	GCTTTTCATTTATCCAATAGTTTGC
Zosmar	CT-19-f	CCCAAGAAATATAAAATCGGGG
	CT-19-r	CTTCTCCTTCCGCCGCTAC
Zosmar	GA-4-f	GCGTGGATTCTGGTTTTCG
	GA-4-r	GCATATCCTCTTCTTTTGCCC
Zosmar	CT-3-f	TGAAGAAATCCCAGAAATCCC
	CT-3-r	AGACCCGTAAAGATACCACCG
Zosmar	GA-1-f	TAGTGGTGGTTGTTGGAGTGC
	GA-1-r	GCCTCTTCCTTCAGACTTCCC

P–29

Evaluation of beach vegetation for conservation/rehabilitation in Tottori Prefecture, Southwest Japan

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Beaches represent ecologically valuable ecotones between sea and land. However, they are often changed by human activities, not only through development of farmland and roads, but also by construction of coastal structures. For these reasons, beach areas are decreasing. Needless to say, beach vegetation has also been impacted by these human activities. There are many beaches in Tottori, but there is insufficient emphasis on conservation of beach vegetation. The goal of the present study was to evaluate the current status of beach vegetation for conservation/rehabilitation purposes.

We examined all 17 beaches in Tottori except for the Tottori Sand Dune. We conducted a floristic survey and a beach vegetation region survey, and calculated variables to indicate vegetation health status. We also analyzed the beach environment using aerial photographs and GIS. Beach vegetation health status was evaluated by principle component analysis (PCA) using beach vegetation and environment variables. PCA using beach vegetation variables, where axis 1 indicated beach vegetation scale and axis 2 indicated beach vegetation quality, resulted in four classifications: Group A was superior in both quality and scale to the other groups; Group B was had a large scale but a deteriorated quality; Group C had deteriorated quality and scale; and Group D had deteriorated quality and a small scale. PCA using beach environment variables, with axis 1 indicating the synthetic component of grain/area/extension and axis 2 indicating beach width, also resulted in four classifications: Group E-a had a large grain/area/extension and a wide beach width; Group E-b had a large grain/area/extension and a narrow beach width; Group E-c had a small grain/area/extension and narrow beach width; and Group E-d had a small grain/area/extension and a wide beach width. Based on the PCA results derived from beach vegetation data, we recommend conservation and rehabilitation.

A floristic beach vegetation list was determined from a floristic survey and three conclusions were made based on the list. We first determined the priority rank of beach plant conservation. By focusing on the occurrence of beach plants, we distributed beach plants into 4 types, which allowed determination of the priority rank for beach plant conservation. Then by focusing on the occurrence of beach plants listed in red data book for Tottori, we re-examined the validity of the extinction risk category. Our conclusion was that the category of extinction risk needs changing. Finally, we compared the number of beach plant species at Tottori Sand Dune with that of the survey area beaches. We found that only 7 beaches equalled or surpassed Tottori Sand Dune in terms of number of plant species. We concluded that beaches other than Tottori Sand Dune should be conserved.

In addition, only 7 beaches are located in designated protection zones. In future, more Conservation/Rehabilitation studies should be conducted on beach vegetation to increase protection zones.

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P–30

The factors affecting plant distribution in a fallow paddy field under consideration of nature restoration in Oguraike drained land

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Oguraike drained land in Kyoto prefecture, Japan, had rich aquatic plant diversity before drainage completed in 1941. Recently, nature restoration in this area has been discussed. The germination ability of diaspores in the soil from ground surface to 50 cm-depth in this area was studied and 6 endangered plant species were germinated (Matsumoto et al., 2009). Fallow paddy fields are potential candidates for restoration in Oguraike drained land. The aim of this study was to obtain basic information to restore aquatic plant vegetation by water-covering over a fallow paddy field in Oguraike drained land.

This study was conducted at a fallow paddy field, of which area is 1,400 m^2, in Oguraike drained land from June to September 2009. This study site was used as a paddy field until 2001, an upland cropping field from 2002 to 2007 and a paddy field in 2008. The soil of the study site was roughly harrowed to the depth of 25 cm without water twice in April and the soil surface was finely harrowed with water once in May, which is a usual manner for paddy cultivation in Oguraike drained land. The water was fitfully supplied by irrigation and precipitation to water-cover or keep wet the study site and the water level and temperatures of soil and water were continuously recorded from June to September. No plants were removed from the study site during the examination. Seven-hundred quadrats (50 x 50 cm) were set within the study site. Plant species, plant coverage (%) for each species and coordinate of the center point of each quadrat were recorded in September. The coordinates were measured by a total station. The Generalized Additive Models (GAMs) were used to reveal the relationships between occurrence of each species and environmental variables (relative altitude and plant coverage of the other species).

The duration covered by water differed among the points in the study site due to the 10 cm-difference in altitude. Twenty-one plant species including 2 unidentified species were recorded. An endangered species, *Rotala pusilla*, was recorded. The GAMs gave the following results: 1) *Lindernia* sp. and *Elatine triandra* preferred shallow water level to germinate. 2) *Leptochloa chinensis*, *Ludwigia decurrens* and *Cyperus glomeratus* did not prefer water coverage to germinate. 3) The occurrence of some species was influenced by the cover of *Ludwigia decurrens*.

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P–31

Restoration of yatsu landscapes and its effect on conservation of biodiversity

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Yatsu is a local term for narrow valleys that cut complicated branching patterns into the surrounding uplands. These valleys form the representative geological feature over much of the southern Kanto Region, central Japan. In the traditional land use pattern the bottom of the yatsu valleys are planted in irrigated rice paddies. Upstream, however, the valleys grow even narrower as they branch, and near their source are only wide enough for a few very small paddies. These paddies are inefficient in terms of agricultural production, and are frequently abandoned. The area around the head of a yatsu valley, however, often supports a rich mosaic of wetland and forest habitats, including natural water seeps, dirt irrigation ponds and canals, small marshes, and various forests growing along the valley slope. In recent years, these areas have been recognized as vital cultural assets and important biodiversity reserves, especially in rapidly suburbanizing countryside regions.

Azeta Yatsu is a typical yatsu valley landscape located in western Sakura City, Chiba Prefecture, in the eastern suburbs of Tokyo. Parts of the valley and surrounding uplands have been purchased by the city, and the land is now designated as a municipal park. Conservation and restoration work in the park, targeting both marshland habitat and traditionally maintained rice paddies, is being implemented under cooperative participation of the local administration, NPOs and citizens. Abandonment of rice paddies in the Azeta Valley began in the 1970s, but from 1992 a local NPO leased and continued to maintain some paddies. In 2000 this area was converted into a biotope (bio-reserve). In addition, a comprehensive management and restoration program, funded as a Strategic Habitat Restoration Program by the Chiba Nature Restoration Fund, has been implemented since the city acquired the land in 2006. This program, cooperatively managed under the active participation of various stake-holders, includes restoration and management of marsh and paddy habitat, monitoring of the local flora and fauna, and various information dissemination and exchange forums. Under this management program, native aquatic plant species have revived from seeds that had remained viable in the mud. In addition, populations of several species of amphibian, including the Japanese brown frog (*Rana japonica*), listed as A-rank (most vulnerable) in the prefecture RDB, have increased dramatically. The grey-faced buzzard-eagle (*Butastur indicus*), raptors which had previously disappeared from the area, have returned.

The experience gained in this program shows that restoration of yatsu landscapes should be approached with the following considerations in mind:

1) Management plans formulated and implemented at the landscape scale,
2) Strict attention paid to the spatial pattern of landscape elements, especially the connectivity among neighboring elements,
3) Historic land use patterns always taken into consideration,
4) Habitat management based on environmental needs of local native species,
5) Management considers seasonal movements and cycles of native species,
6) Decision making with input from a wide variety of stake-holders, including government, academic, landowners, NPOs and citizen,
7) All work closely coordinated with responsible municipal department,
8) Management implemented on PDCA cycle, with timely monitoring,
9) Stability and continuity of program management ensured,
10) Funding mechanism is secure and reliable.

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The flora and fauna in suburban paddy fields in Shizuoka City

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In Japan, 27% of the agricultural land is distributed in suburban areas. These suburban agricultural lands are scattered between residential and industrial areas, mainly because of rapid urbanization. However, agricultural lands in the suburban areas play various roles in not only food production but also in the provision of green space and places of refuge and relaxation amidst an urban heat island. Agricultural land in the suburban areas tends to be managed as self-sustenance farming or organic agriculture for consumers in the neighborhood. Therefore, it is reasonable to expect that many organisms live in the agricultural land in suburban areas. In this study, we investigated the flora and fauna in suburban paddy fields in Shizuoka City and a neighboring city.

Materials and methods - Field studies were conducted at 5 fields in suburban areas and near rural areas in Shizuoka City, Yaizu City, and Fujieda City for 10 days of mid-July and the last 10 days of August. Plant species were investigated using the quadrat method, and buried seeds from a seed bank were investigated using the pot emergence experiment. Insects, spiders, and small organisms on rice plants were investigated using the sweeping and beating methods. Aquatic organisms were investigated using the quadrat method.

Results and discussion - There was no difference between suburban and rural paddies with respect to the number of plant species in paddy fields and ridges. The composition of plant species on the ridges in the suburban paddies was similar to that found on the roadside. However, *Chara braunii* and *Rotala pusilla*, which are red data species, emerged from the soil in suburban paddies.

The number of organisms observed on rice plants in suburban rice paddies was more than that in rural paddies. Furthermore, the composition of organisms in suburban paddies was characterized by the presence of more neutral species, which are neither pests nor natural enemies, than those observed in rural paddies (Fig. 1). Moreover, the number of organisms that were natural enemies to a number of pest insects was more in suburban paddies than in rural paddies.

Further, with regard to the characterization of aquatic organisms in suburban paddies, indicator species of nutrient-rich water, such as *Baetis sahoensis*, *Austropeplea ollula*, and *Physa acuta*, were observed in suburban paddies.

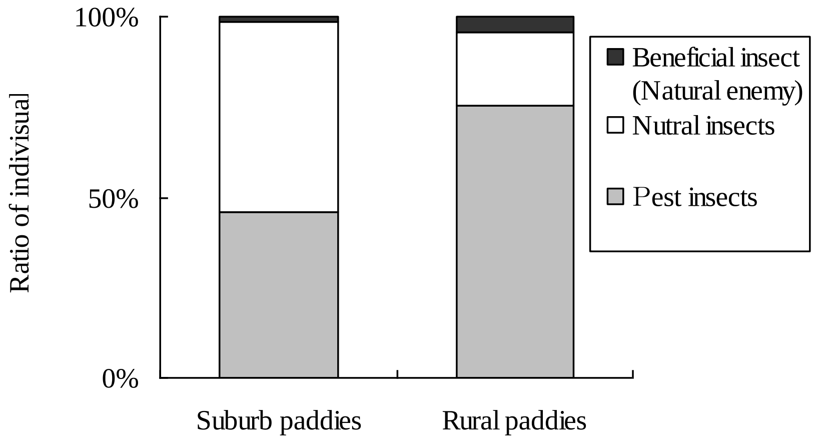

Fig.1 The composition of organisms found on rice plants.

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Effects of small reservoir pond on improvement of Satoyama biodiversity and ecosystem services

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The Shioda plain where Nagano University is located is in a suburban city of the central Japan. In the plain, there are many artificial reservoir ponds for agriculture because annual precipitation of the plain is little. Some reservoir ponds are constructed in Satoyama forest to use the function of rainwater storage in its forest. These reservoir ponds in Satoyama forest create habitat diversity in its forest, and will increase its biodiversity.

In order to assay effects of reservoir ponds on improvement of Satoyama biodiversity and ecosystem services, we constructed a small reservoir pond with traditional techniques in a small Satoyama forest within the property of Nagano University with our students and local residents in the Shioda plain, and investigated aquatic and terrestrial biota in and around the pond. During the 2-year period since the reservoir pond was constructed, 12 aquatic animal species were observed in the pond. Aquatic biota in the pond gradually shifted from Chironomidae larvae and isopods to backswimmers, larvae of dragonflies and adults and larvae of frogs. Because most of these aquatic animals have the life-histories that use both aquatic and terrestrial habitats, the pond will contribute to improve the biodiversities in not only the pond but also the forest. Furthermore, in the summer season when water resources in the forest were insufficient, footprints of 3 mammal species (raccoon dogs, deer and wild boar) were often found around the pond, suggesting that the pond attracts various mammals to our forest. The present results indicate that reservoir ponds in Satoyama forest cause the increase of biodiversity of its forest. Such increment of biodiversity will improve Satoyama ecosystem services. In fact, the reservoir pond of Nagano University is used for some lectures and field practical in the university curriculum of environmental education called “Creator of Forest Ecosystem services Course” as educational resources (i.e. cultural ecosystem services).

In the present construction of the reservoir pond, we are positively supported by local residents in the Shioda plain. During from the planning to actual construction of the pond, the local residents enthusiastically initiated us into traditional techniques for construction of reservoir ponds. The reason of this positive support by local residents may be explained by the cultural background of this region. Local residents in the Shioda plain are traditionally strongly interested in reservoir ponds and managements of water resources because of this region with little annual precipitation. This study suggests that methods for managements of Satoyama ecosystem with traditional cultural characteristics of respective local regions play an important role in advancing community-based managements of its ecosystems.

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Evaluation of species diversity and potential habitats of the Satoyama indicator species in Toki-Shonai river basin

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For the landscape management to conserve the heterogeneity of the ecosystems in the river basin, it would be effective to grasp the key environmental factors and their relationships which generate the diversity and the indignity of the ecosystems. In this collaborative research project on the evaluation of potential biodiversity in Toki-Shonai river basin, we aim to evaluate the heterogeneity of the watersheds composing the river basin from the aspect of the relationship between the species diversity and habitat indigenity. At landscape scale, we clarify the spatial relationships between the species diversity and the potential habitat of the indigenous index species, and extract the ecological zoning of the watersheds as the environment basis for the river basin management. At habitat scale in the watershed, we extract the environmental factors and their thresholds for the habitat suitability, focusing on some indicator species representing Satoyama ecosystem with secondary vegetations and marshes in hills.

In this poster, we introduce the framework of the project with the relationships among the outputs on 1) the ecological zoning of the watersheds by their environmental heterogeneity in the river basin, 2) the mapping of the matching and the gap between the potential species biodiversity and the potential habitat for the indigenous species, and 3) the habitat suitability modelling for the species using SI and HSI models in HEP (Habitat Evaluation Procedure).

Focusing on *Nepa hoffmanni*, a water scorpion indigenous to the marsh habitat in Tokai hills, we predicted the possibility of the establishment of its habitat by modelling the relationship between the presence data and the environmental factors in the watersheds, by using 10 m grid DEM and other environment data. On the other hand, the potential diversity of the general birds, butterflies and dragonflies was mapped by modelling the relationship between the diversity of the species groups and the environmental factors, using the national survey data on species diversity in 1 km grids covering the whole river basin. The outstanding environmental factor which generated the gap between the diversity and the indigenity of the habitat was the geological age of the watershed, which was also the key for the classification of the watersheds into four types of ecological zones.

At the local habitat scale, we extract the habitat requirements for the Satoyama index species by the habitat surveys, adding *Gentiana thunbergii* and *Apodemus speciosus* as the indices for the integrity of the grasslands and the forests in Satoyama environment. As the habitat requirements of *Nepa hoffmanni*, local environmental factors such as the depth of the litter and the water in marshes were extracted, together with the geological factor which was common in the model for the potential habitat in landscape scale. The geological factors were thought to be dominant for the establishment of the habitat of *Nepa hoffmanni* with the conditions of the groundwater, in relation to the vegetation and the ground covers which were chosen to explain the habitat suitability for *Gentiana thunbergii* and *Apodemus speciosus* in the watershed.

The methodology to extract the environmental heterogeneity among and inside the watersheds both at landscape scale and at habitat scale could be applied to the allocation of the management policies and to the restoration measures of Satoyama environment in the river basin. With this framework, the practical restoration experiment is also proceeding in the campus forest of Chubu University, which concept will be reported in another poster presentation.

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Growth characteristics of woody seedlings emerged and established in a restored natural habitat for wildlife in an urban area

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Urban development attaches great importance to convenience for human activities. Therefore, in urban area there are few places for animals and plants and remaining wildlife habitats exist isolated from each other. Urban environment is very inappropriate for wildlife, for instance polluted air, contaminated water and soil degradation. Consequently biodiversity in urban area is poorer than that in natural area. In order to enhance biodiversity in cities again, restoration of natural forests that have roles of wildlife habitat is very effective. But there are few cases that large-scale natural forest has been restored in urban area. One of these rare examples is “Inochi-No-Mori Forest”. Inochi-No-Mori Forest is located in Kyoto city, Japan. In former days, this site used to be a freight depot. Original vegetation had been once disappeared there. In 1996, Inochi-No-Mori Forest has been constructed, heaping up soils and planting some trees. After that, human disturbance has been restricted as much as possible in this site. Vegetation succession has been permitted to take it course to develop forest structure. One of restoration goals of this forest is vegetation of Tadasu-No-Mori Forest in Kyoto city. This forest has been dominated by *Ulmaceae Aphananthe aspera, Celtis sinensis* and *Zelkova serrata*, deciduous broadleaved species. It was said that *Ulmaceae* forests had covered most parts of Kyoto plain in ancient times, therefore *Ulmaceae* forests might be the native vegetation of this area.

In forest dynamics, emergence and establishment of woody seedlings are very important stage. Although regeneration process of trees in artificial urban forest must be very different from that in natural forest, there is little information about this process on the ground that there are few natural forests restored in cities. So we censused woody seedlings naturally germinated in Inochi-No-Mori Forest ten times at one-year intervals from 1998 to 2007. We numbered and recorded species, heights, stem base diameters and locations of all woody seedlings taller than or equal to 50 cm in the whole area (0.6 ha) of Inochi-No-Mori Forest. We examined the population dynamics and growth characteristics of each species.

In 2007, 11 years after construction, a total of 70 species were identified in 3979 stems observed and the population density was 65.8 / 100 m^2. In 1998, 2 years after construction, the population density was 4.6 / 100 m^2 and it had increased 14.4 times during the 9 years. The proportion of deciduous broadleaved species in the total population was higher than that of evergreen broadleaved species. *C. sinensis* comprised 27.3% of the total population and was the most dominant species, followed by *A. aspera* and these two *Ulmaceae* species accounted for 38.4%. Recruitment rate was the highest in *C. sinensis*. The 5-year mortality rate from 2002 to 2007 was 0% in *Q. glauca*, 4.0% in *Lingstrum lucidum* and 6.6% in *A. aspera*. By contrast, *Mallotus japonicus* had relatively high mortality rate (30.8%). Height growth rate of *M. japonicus* was the highest. These results suggested that in Inochi-No-Mori, *Ulmaceae* deciduous broadleaved species, *C. sinensis* and *A. aspera* would be the most dominant position in the canopy layer in the future.

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Decreasing five deciduous broad-leaved tree species in abandoned urban forest reserve

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Coppice woodland called Satoyama, which used to be managed as coal and timber forests, are widely distributed throughout plains and hills in Japan. However, now that these coppice woodlands are not commercially productive anymore, many of them have been abandoned and natural succession has been going on. Especially in warm areas as Chugoku and Shikoku, Kyushu, they have been quickly changing into evergreen forests. In this study, we researched how 5 different sorts of deciduous broad-leaved trees (*Prunus jamasakura, Quercus acutissima, Castanea crenata, Kalopanax pictus, Magnolia obovata*) which are especially endangered had grown in such a coppice woodland in north part of Kyushu area, analyzed the factors of the results and considered how conservational managements should be in the future.

In the site “Kohnosu-Yama Forest Reserve”, they had conducted the research since 1999 till 2000. So in this study, we had done additional research since 2008 till 2009.The headings are tree height, diameter breast height, and flowering condition ranks and growing condition ranks. We followed the classifications of Nakamura and others in flowering condition ranks and the ones of Maehara and others in growing condition ranks, and defined 5 different ranks (5-the best, 1-the worst). In addition, we recorded the factors of death, disappearance, and changes of the ranks through field observations.

As a result, comparing to the previous research conducted since 1999 till 2000, we found samples which were dead or disappeared and ones whose ranks had changed or not changed. Out of all the samples, the dead and disappeared ones are thought to have been in areas which had not been suitable for them, so it can be said it is difficult to conserve deciduous broad-leaved trees in such environments. On the other hand, samples which had got better ranks and ones whose flowering and growing conditions had been good (rank 4 and 5) are thought to have been in suitable environments, so we are pretty sure they will survive for the time being without any conservational managements. And ones which remained in the same rank (3 or lower) though their flowering and growing conditions had not been good and ones which got lower ranks could be improved in their conditions depending on conservational managements in the future.

Next, if I mention the factors of ups and downs, the factors were in most cases of bad conditions are covering pressures of neighboring trees. Meanwhile, the factors of ones which got better ranks and ones which were in good ranks (rank 4 and 5) had differences according to the sorts. *Prunus jamasakura, Castanea crenata, Magnolia obovata* were disappearing on the southern side of the hill where evergreen trees grow remarkably, but on the northern side, there were many samples in good conditions of those. It can be said it was because they had been in proper lighting conditions to grow without too many neighboring trees or by being on the ridges of the hill. On the western side, *Quercus acutissima* on the ridges and *Kalopanax pictus* on gaps and collapsed lands had got better in the lighting conditions because of their locations.

Considering these, we found each sort of deciduous broad-leaved trees has its own suitable environment to grow in coppice woodland endangered by evergreen trees. By considering this, we will be able to conduct conservational managements more efficiently.

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Study on the prevention of mass Japanese oak mortality in EXPO 2005 Commemorative Park

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Mass Japanese oak mortality is an epidemic caused by *Raffaelea quercivora* Kubono *et* Shin. Ito, sp. nov for *Platypus quercivorus* MURAYAMA into Japanese oak wilt (Kansai Research Center, 2007; Kuroda, 2001). A lot of *R. quercivora* are captured in the place where the *Quercus* sp. tree trunk of height is 0.5-1.5 m. There are a lot of attack borings by *R. quercivora* to near the ground side (Kamata, 2002). Moreover, *P. quercivorus* is shown positive phototaxis, a lot of imagos gather to the relative light intensity about 20% (Kamata, 2008). In the Aichi Prefecture, the damage of mass Japanese oak mortality was confirmed in 2005 first and also spread in EXPO 2005 Commemorative Park until 2007 (Department of Agriculture, Forestry and Fisheries, 2008). 51 dead woods are confirmed in 2007, 119 in 2008, about 250 until middle of August in 2009. In this study, the damage of mass Japanese oak mortality in this park was investigated and calculated the cost of prevent their behavior at the whole area of the park. *Q. serrata* Murray subsp. *mongolicoides* H.Ohba. is important in the point of growing at the hill ground in the warm temperate zone region (Department of the Environment, 2009). In the opening area of this park, there are two secondary forests which were called SINRINRAKUEN and RINSYOKAEN. We set A plot (0.2 ha) in the former and B plot (0.1 ha) in the latter.

As the result, the mortality of *Q. serrata* was 23.5% in A plot, and 14.3% in B plot. However, the number of dying trees was 5/ha in A plot, and 10/ha in B plot, the ratio of attack boring was 5/ha, and 17/ha. Accordingly, it was suggested that the density of *Q. serrata* is key point and relate to the occurrence of mass Japanese oak mortality. It was calculated that 3,394,400Yen for the pharmaceutical expense at the first year and 3,000,000Yen for dispose of cutting in the *Q.* sp dominant forest. The expansion can be prevented by executing a prior medicine injection to young trees which does the sprout natural regeneration easily and to *Q. serrata* Murray subsp. *mongolicoides* H.Ohba. that encounters the mass attack easily and preservation value is high in this region.

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Forest dynamics in an artificial evergreen-broadleaved forest

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The analyzing forest dynamics in an artificial evergreen broad-leaved forest is required recently because the restoration of natural forest in degraded area is urgent subject nowadays for restoration of biodiversity, ecosystems etc. for an independent ecosystem that can regenerate naturally (Shibata, 2006). There are few studies that stand dynamics in environmental protection forests restored by plantation of native species saplings. It represents one method for restoration of natural forests with native species saplings and plantation densely with 1.2-2 individuals per square meters randomly. It is promoted in Japan since the 1970s. This method is intended to shorten the time span for regenerating quasi-natural forests in barren or non-wooded land to 1/10 the normal period of succession, that can take ca 200 to 500 years (Miyawaki et al., 1993). Some of these planted results became 15 to 18 m tall forests in Japan.

The study was conducted in the artificial evergreen broad-leaved forest with 30 years old (after transplantation) on reclaimed area at Oita Prefecture, Kyushu, Japan. The permanent quadrat area with 0.11 ha was established and DBH and height of all trees in PQ were measured in 2005 and 2008. The litter fall was also measured during the same period. The new comer species were also surveyed.

The stand is comprised of 27 tree evergreen species (*Cinnamomum camphora*, *Machilus thunbergii*, *Castanopsis sieboldii*, *Viburnum odoratissimum* var. *awabuki*, *Quercus glauca*, *Lithocarpus edulis*, *Distylium racemosum* etc.) with total basal area of ca. 69.7 m^2/ha. Maximum DBH and height are 75.1 cm, 23.5 m with *C. camphora*. From the annual total litter fall averaged 7.05 t/ha, we estimated the net primary production is 18.8t/ha/yr. Tree mortality and recruitment is a little high and litter fall is bigger than the average of natural evergreen broad-leaved forests in Japan.

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New trend in forest management in Higashiyama, Kyoto by Council for Kyoto Traditional Forest Culture

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Higashiyama's forest landscape is the background and part of many temple's and shrine's garden in Kyoto. Okuribi, Kyoto's traditional event for the dead, takes place on the hills including Higashiyama. The forest of Higashiyama is important for the landscape and culture of Kyoto.

Recently, forest landscape of Higashiyama has been changing, caused by the expanding distribution of *Castanopsis* and decrease of *Pinus*. Higashiyama's forest landscape in Edo era have been become clear by analyzing old drawings (Ogura, 1992), and its transition after 1960s have been become clear by analyzing aerial photographs (Okuda, 2007). According to their research, it is revealed that Higashiyama's forest landscape have changed a lot during about recent 100 years. The cause of this changing is thought that due to some of laws about forestry and decreasing of utilization of fuelwood after 1950s and spreading of Pine wilt disease after 1970s. The persons concerned temples around Higashiyama started proposal administrations to cut *Castanopsis*. On the other hand, oak trees have been attacked by Platypus quercivorus since 2003.

In November 2007, Council for Traditional Forest Culture was started so that the scholars of acknowledged erudition and experience and groups of private and administrative organs can decide about management of Higashiyama. Industry and Tourism Bureau of Kyoto City and Forestry Agency manage it. The subject fields are national forest around Higashiyama.

Now, the council cope with problems using three points of view. The views are Zoning of forest, Investigation methods of keeping forest in good condition, Enlightenment citizen about forest. The council intend to finish the working of zoning until the end of 2010. *Castanopsis* have been cut down experimentally. The council and the party of concerned temples and shrines decide about cutting place. The tendency after the cutting is monitored by Laboratory of Silviculture, Kyoto University. The citizen use fuelwood for making a fire in the stove so that citizen can study about fuelwood.

To estimate the effect of trial by Council for Kyoto Traditional Forest Culture is difficult now. It needs to spend more years. But, it has values because the council provide a place for debating about Higashiyama's destination. Council for Kyoto Traditional Forest Culture should keep coping with problems and monitoring trend the forest of Higashiyama.

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Urban forestry in Turkey

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The area of Turkeys is 77,056,192 hectares and 26.9% of this area that is an area of 20,703,122 hectares are forests. A total of 54.4% of the forests in Turkey are of needled (coniferous) trees and 45.6% of broad-leaved trees. Because of the increased urbanization faced in the 20th century, forests and other wooded lands in and nearby urban areas attract a lot of attention, and the expectations of the human from the nature vary and differentiate. Urbanization is one of the most evident global changes in the world. Large parts of the world have become highly urbanized and the majority of the world's population live in cities and towns. In developed nations, 80-90% of the people live in cities, whereas in the poorest nations only 20% live in the cities.

In Turkey, immigration of many rural people to big cities, especially during recent years caused the demographic structure to change considerably. According to the year 1927 census, 84% of the population live in rural whereas 16% of populations live in cities. The year census 65% of the population lives in cities. This percentage is estimated to reach 89% in 2025. 103 urban forests have been established since 2003 until the end of 2009 by this project and 63 of them in 54 cities and 9 towns are fully constituted for local amenities.

The urban forest concept in the world emerged from the rapidly growing urban areas where people inevitably need large areas of woodland. This concept gradually gains more importance since the urban forests provide social functions to the community. In a research carried out by the World Trade Organization, it is recommended that the woodland be at least 9 m^2 per person for a healthy community.

Urbanites establish various expectations such as socio-cultural and environmental values of forests, apart from economic values. This study aims at the assessing urban forests in Turkey. Forests and other wooded lands have drawn the special attention of urban people in parallel to rapid urbanization recently. Thus, Urban Forest project has been put into practice to meet a great demand of the people by the General Directorate of Forestry. By this study, it is objected that forests and other wooded lands in or nearby urban areas are shifted to the urban forests where people enjoy and admire the nature.

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Green new deal through the use of woody biomass - smart urban forestry

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Background - Trees and other plants are recognized as carbon sinks because they absorb and sequester carbon dioxide (CO_2) in the atmosphere. As urban greening progresses, the amount of absorbed and sequestered CO_2 increases. Meanwhile, the thinnings, prunings, and leaf litter derived from tree maintenance and management has generally been thrown away as a negative resource.

Overview of Smart Urban Forestry - To address global environmental issues such as climate change and biodiversity, it is important to widen the circle of action beyond the cities. We have technology that provides a key to solving difficult problems, and have succeeded in converting biomass to non-combustible raw materials (lignin, carbon, and ethanol, for example) for industrial products.

We propose a form of "smart urban forestry", based on melding this cutting-edge technology with conventional technology, to conserve, create, and utilize urban green space in a sustainable manner. By means of this technology, local industrial structures and social systems could potentially change significantly, from oil dependence to biomaterial utilization, and toward zero-waste, low-carbon urban structures.

Social experiment - A social experiment is being conducted as a collaborative experiment in which JUON Co. Ltd. produces ethanol and bioplastic raw materials from biomass such as forest thinnings, weeds such as reeds, *Miscanthus sinensis* and lawn clippings, and bamboo, and a leading chemical manufacturer and other partners produce finished goods from the raw materials. In addition, Urban Green Tech., Japan is performing various tests, such as measuring the reduction in CO_2 emissions and verifying traceability. This presentation outlines the methodology and discusses some of the results.

Potential 25% reduction in CO_2 emissions

- Petroleum resin in pellet form 100t
  - CO_2 emissions during manufacture: 138t
  - CO_2 emissions during incineration: 280t — Total: 418t (1)
- Lignin additives 100t
  - CO_2 emissions during manufacture: 10t
  - CO_2 emissions during incineration: 0t — Total: 10t
- Lignin resin in pellet form 100t (Lignin content: 25%)
  - CO_2 emissions during manufacture: 138t x 75% + 10t x 25% = 106t
  - CO_2 emissions during incineration: 280t x 75% + 0t x 25% = 210t

  Total: 316t (2)

Reduction in CO_2 emissions by conversion to lignin resin — (1) - (2) = 102t

Percentage CO_2 reduction ▼24.4%

P–42

The role of biodiversity conservation in maintaining ecosystem services: case of Omerli watershed, Istanbul

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Today, most experiments and scientific studies have shown that biodiversity promotes ecosystem functioning in direct and in-direct ways. However biodiversity loss can be identified as one of the major threats weakening the ability of the Worlds' ecosystems to provide key natural services such as climate regulation, air and water purification, provision of medicines and protection from natural disasters. Therefore any efforts for sustainable management of ecosystem services production areas and biodiversity conservation strategies have similar purposes.

As well as in other developing countries, biodiversity loss accelerated by various factors such as habitat degradation, uncontrolled urban development, pollution and over exploitation of natural resources urges sustainable management strategies for both biodiversity conservation and socio-economic development in Istanbul too. In this context, Omerli watershed, the largest drinking water source and one of the biodiversity hot spots of the Megacity Istanbul, is a unique case for addressing the potentials and difficulties for the application of an ecosystem services based water resource management in order to biodiversity conservation.

This presentation aims to identify the role of national and local level biodiversity conservation strategies in maintaining the Omerli's watershed services. The national biodiversity action plan, the time series of 1/100,000 scaled environmental master plans and the Landsat satellite images of Istanbul will be used to evaluate the opportunities of biodiversity and ecosystem services conservation in the Omerli watershed.

P–43

Urban biodiversity identification and tracking system

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This poster introduces a participatory mobile application for urban biodiversity identification, tracking, and habitat creation, UBITS (Urban Biodiversity Identification and Tracking System). School children, bird watchers, gardeners, hobbyists, and amateur naturalists use their mobile phones to capture images, sounds and locations of birds, butterflies, bees, insects, trees, and other plant life; query multiple databases to identify wildlife and plant species; participate in collaborative mapping of urban species by location, frequency and time of year; and increase habitat for urban biodiversity.

UBITS users identify wildlife and plant species by color, shape, and sound using mobile telephones' built-in audio recorder, camera, video, date-and-time function, geo-location, and search engine dialogues (see Fig.1). User data generates freely accessible online maps of urban biodiversity. The participatory network enables beginners and hobbyists to learn from scientists, and to correct and expand existing biodiversity databases by location and season. UBITS identifies, tracks, and increases beneficial wildlife, while also monitoring and controlling species known to be invasive or harmful.

By connecting existing mobile phone technology and scientific databases, UBITS supports popular participation in observing, protecting, and promoting urban biodiversity. UBITS builds online and real world social networks within cities and across the globe. Learning about urban wildlife and the landscapes that support them promotes both individual action for habitat creation and also informed dialogue with policy makers, property developers, land-owners, and corporations.

UBITS impacts are scientific, social, and environmental. Increased system usage promotes the planting of new urban gardens in yards, balconies, roofs, walls, and public spaces for habitat creation.

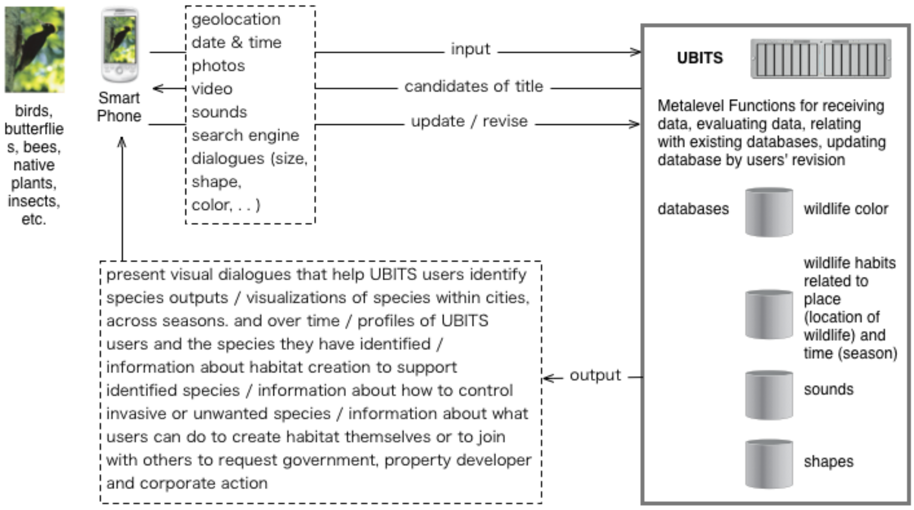

Fig 1: System Architecture of UBITS

The authors will perform experiments and evaluate the feasibility and scalability of UBITS by developing a prototype application on the iPhone and Google Android platforms. For the prototype application, we will focus on several wildlife species, including birds and butterflies.

P–44

Estimating vertical structure of heterogeneous forest using LiDAR

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Providing spatial information on ecosystem is particularly necessary for regional management of biodiversity and forest condition. The vertical structure of forest plays an important role in assessing habitat quality for wild animals such as birds, small mammals and insects (Tews et al., 2004). Airborne Light Detection and Ranging (LiDAR) provides a means of measuring vegetation structure, which is difficult and time consuming with traditional field-based methods. This study investigated the use of data acquired by newly-developed full waveform lidar for determining vertical vegetation structure in two different heterogeneous forests in western Japan.

Field data were collected in the Expo'70 Commemorative Park in Osaka, and the mountain area of Shugakuin Imperial Villa in Kyoto. Both of the sites consisted of different types of forests, containing coniferous, broad-leaved, and mixed trees with diverse vegetation structure. Vegetation distribution was estimated by visual assessment for 6 strata (above 12 m, 8-12 m, 4-8 m, 2-4 m, 1-2 m, 0-1 m). Lidar data for the both areas were acquired by Riegl LMS-Q560, small footprint full waveform lidar device, and vegetation cover index model was calculated from the proportion of pulse attributes for each stratum.

The proposed model was applied for coniferous, broad-leaved, and mixed forest, and then compared. The results suggested that lidar-derived vegetation distribution index could be useful for assessing the vertical structure in the different forest types with acceptable accuracies. However, the estimation was found to be dependent on the density of vegetation layers.

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P–45

Assessing tree vigor condition by optical and Lidar-derived indices

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Understanding vigor condition of trees is an important stage for managing a forested area. Comparing with traditional ground work, remote sensing is expected to be more efficient in broad-scale survey. Although the previous studies proposed a variety of vegetation indices, their performance with tree vigor condition was not directly assessed. Thus we attempted to develop a remotely sensed index which could link with the on-ground assessment.

Sixty-six cherry trees, i.e. 43 *Cerasus* × *yedoensis* ‘Somei-yoshino’ and 23 *Cerasus jamasakura* (Siebold ex Koidz.) H. Ohba var. *jamasakura*, were assessed by experts for ground reference data. Airborne remote sensing imagery were acquired with Lidar (light detection and ranging) and optical sensors of narrow bandwidths from visible to near-infrared region. After tree pixels were calibrated to contain only the information of tree vigor condition, they were evaluated by 23 published indices and 66 other potential spectral combinations. The results were assessed by Spearman’s rank correlation (r_s), and accuracy of classification (rank A to E) in discriminant analysis.

The best index was the ratio or the normalized difference computation of reflectance at red-edge (700 nm) and green (541 nm) spectra (r_s=0.659). R750R550, the ratio of 750 nm to 550 nm, was the highest among the published ones. These results indicated the green spectral region closely related to chlorophyll content was an important indicator of tree vigor condition. The Lidar-derived indices were poorly correlated because the footprint (38 cm) seemed to be large to sense foliage density. By the discriminant model using the best index of red-edge and green, tree vigor condition was classified into five ranks with 84.5% fuzzy accuracy. Accordingly the index would be useful to associate with field diagnosis, thereby applicable to broad-scale survey.

P–46

Biodiversity inventory in urban Satoyama: efforts of the Satoyama Research Center of Ryukoku University

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"Satoyama" was historically an agricultural ecosystem in which farmers gathered fallen leaves as fertilizer and firewood. However, in the past 50 years, the use of chemical fertilizers and the shift from firewood and charcoal to fossil fuels as energy sources have decreased the economic value of Satoyama and caused urban sprawl, particularly in urban Satoyama. The exploitation of urban Satoyama has not only led to loss of biodiversity but also to a loss of knowledge on how to best use local biodiversity. To conserve biodiversity in urban Satoyama, we must create novel contemporary uses of this ecosystem as well as learn from past approaches. To this end, the Satoyama Research Center of Ryukoku University initiated research in 2004 on the contemporary uses of Satoyama in the "Ryukoku Forest" (previous firewood forest, 38 ha), Seta Hills, Otsu, Shiga Prefecture.

Here, we outline our efforts to provide environmental education programs that incorporate both past and present Satoyama land use and biodiversity. First, we collected information about past land use and vegetation from aerial photographs over the past 50 years and from interviews with local residents in Otsu. We discovered that pine forests (*Pinus densiflora*) dominated in the 1940s through 1960s, as local residents had primarily harvested other tree species as firewood. Second, we examined the current biodiversity of plants, fungi, mammals, birds, spiders, and insects. We found that 67% of the woody plant species are dispersed by animals, indicating that the present, uncontrolled (by humans) Satoyama vegetation can be maintained by birds and mammals. Based on our results, we currently provide environmental educations programs for undergraduate students, elementary school students, and local residents.

We conclude that Satoyama is one of the most suitable systems for environmental education, particularly for observing anthropogenic effects on ecosystems and subsequent recovery through interactions between plants and animals.

P–47

Horikawa Sen-nin Chosatai (HSC) - Horikawa River Thousand-Citizen Survey Network 2010

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The Horikawa River, a first-grade river approximately 16 km in length, flows north to south through the central part of Nagoya City. A test of transmitting water from the Kiso River to the Horikawa River at a rate of 0.4 m^3/s commenced in March 2007, gaining the understanding of stakeholders, including people in the Kiso basin area. At the same time, the "Horikawa Sen-nin Chosatai" 2010 (HSC 2010) began its activities. Clarification of the Horikawa River has been a long-sought goal of, and a tough challenge for, the citizens of Nagoya. However, the resident-administration partnership of the HSC has precisely met the challenge. The network's activities suggest the possibility of revitalizing the limpid flow of the Horikawa, and offer hope and assurance to citizens.

P–48

Environmental monitoring using a sensor network system in an attempt of regenerating Satoyama ecosystem services

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Humanity in provincial cities of Japan had depended on the Satoyama ecosystem services. Recently Satoyama ecosystems degraded its services and biodiversity due to underused and reduced management of the forest. That is because the provisioning services such as food, firewood, fertilizer, and architectural material, lose the economic value under the influence of modern trends in Japan. In order to regenerate the values of Satoyama, ecosystem and services, we have to create of diverse modes of resource use and rebuild a relationship between humanity and Satoyama ecosystems.

Due to the recent development of information communication technology (ICT), many information sources can be digitalized and published to the web easily, and it has a potential to provide new cultural services of Satoyama ecosystem. This study builds an infrastructure to monitor forest environment. It is available to access by Internet. We intend to make a model of relation-building between humanity and Satoyama ecosystem services utilizing the ICT infrastructure.

Our study site is 6.3 ha university forest in Ueda city. We design Sensor network by wireless local area network (LAN) to be usable in a forest. Nine FieldServers (“e-lab experience products.) were set up at the 50 m intervals in the forest. FieldServer as a distributed sensing device consists of web-server, wired and wireless LAN module, web-camera with functions of pan/tilt and zoom-in, sensor of temperature, humidity, and light intensity. In addition, we build night-vision cameras and weather indicator (wind, rainfall, soil moisture, and CO2 concentration) into the network. By linking university LAN, Sensor network in forest become available to transmission of information via Internet and monitoring of PC at university network.

To regenerate ecosystem services, it is absolutely essential that human resource to be able to plan and practice of effective activities to take advantage of Satoyama ecosystem services utilizing ICT. These infrastructures are coordinated in the university curriculum of environmental education called “Creator of Forest Ecosystem services Course” consists of a series of lectures and field practices. We practice environment education utilizing sensor network systems into this curriculum.

P–49

An ecological gift from social contracts to urban areas: graveyards - a sample of Trabzon city, Turkey

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Because of many "postmodern" problems such as rapid urbanization and population growth in cities all over the world, the amount of livable spaces has seriously decreased and some important environmental problems, of which the solutions are not that easy, have been created by humanity. In spite of the fact that many claim that life standards were improved owing to especially technological innovations, there is no doubt that the relationship between nature and those who live in cities was literally damaged at the same time. In addition, open green spaces have been turned into urban areas particularly in big cities in many parts of the world.

In urban areas, there are many land use types and vegetation on these areas was naturally effected by the activities happening on them. Residential, industrial, business, public, archeological, militarily areas and graveyards are some basic land use types in cities. In this study, graveyards were evaluated in a different way, as open green areas, which are naturally conserved by social and cultural constructs. Plus, their importance on urban ecosystems as green areas was defined depending on their surfaces and native and exotic woody plant diversities. Several huge and historical graveyards in Trabzon city were chosen as the research areas and they were analyzed by using GIS techniques. Apart from their main characteristics such as size, topography, altitude and neighborhoods, their woody plant diversity was determined by field surveys to be able to identify what species were used mostly and what the main functions of graveyards are to make a contribution to urban ecosystems. Finally, apart from their ecological importance, a questionnaire was used to determine what people think about graveyards regarding ecology and sociology.

P–50

Environmental management of a natural park by citizen volunteers, restored in an urban reclaimed land - an experience of the Tokyo Port Wild Bird Park

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Tokyo Port Wild Bird Park was built on a reclaimed land at a port district of Tokyo Port in 1989 by the request from the citizen. The place was a grassy plain and swamp land which occurred naturally on this reclaimed land. The Tokyo Port Wild Bird Park is managed by the consortium of the Tokyo Port Terminal Co. and the Wild Bird Society of Japan, and 2 volunteer organizations are active. The “Green Volunteers by Tokyo Port” has its origin in the active people who have requested the conservation of wetlands on this ground in 1970’s. In 1990 they have got the permission of doing activities in this park from Tokyo Metropolitan Government, and had been attested as a non-profit organization in 2004. Another volunteer organization is “Volunteer Guides”, organized by the municipality, mainly taking charge in bird-watching assistance every day, including weekdays.

One of the purposes of this park is for the regeneration of its original landscape before the drastic economic growth era of Tokyo. To introduce the original vegetation, many native species had been transplanted on the bare reclaimed land. Based upon the theory at 1980, especially evergreen plants had been transplanted in high density. Also rice paddies, irrigation brooks, wetlands, and tidal flats had been recreated. To secure biodiversity, many environmental elements were packed in 2 ha. At present after 20 years have passed, a luxuriant evergreen broadleaf forest is formed. However invasion of foreign species as Glossy Privet and Locust tree are striking. In aquatic fauna, alien species as Topminnow, Bluegill, Black Bass, Common slider and Red swamp crawfish are dominant species.

These species were transplanted into this park after constructed. On the other hand, in tidal flat, natural species recruited from surrounding canals, especially rich in crabs, mud shrimps and worms are good feeding ground for shore birds. It is remarkable that the mudskipper, one of the endangered species is staying since the 1990’s. The forest in this park can hardly be regenerated because of high density planting and less disturbance by outer natural forces. Scrub and grassland is remarkable for the exotic species and pioneer species such as arrowroot. Also micro topography of tidal flat is hardly creatable for lack of wave and flood. Therefore a big amount of artificial environmental management is strictly required to maintain biodiversity.

These environmental management activities are authorized through the discussion by the monthly meeting composed of ranger, park manager, and volunteers. Some environmental management activities are carried out as events by attendance of visitors.

In September every year during the International Work Camp, heavy environmental management work such as dredging the reservoir pond and the irrigation brooks are executed for 2 weeks, an event in which Japanese and foreign students participate in. This event is promoted by volunteers too.

In addition, environmental education is one of the most important purposes of this park. Park rangers and volunteers design and carry out interpretation guide for visitors, e.g. workshops on farming experience in paddy and vegetable fields, observing insects in the park, benthos in tidal flat, seasonal birds and attend classes of handicraft made with natural materials. Recently, the number of environmental education events of which the volunteer promote exceeds of the park ranger’s. In other activities, the Green Volunteers of Tokyo Port supports some companies’ activities for their Corporate Social Responsibility programmes.

P–51

Practices of local science for regeneration of ecosystem services in networks of experts and stakeholders

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Introduction - For regeneration of ecosystem services in urban area, interactions between ecological systems and human behaviors are expected to be transformed. This transformation process requires adaptive co-management of social-ecological systems which are based on complexities of ecosystems (Olsson et al., 2004). Adaptive co-management requires resources such as local and scientific knowledge, dynamic social network, and effective leadership. We try to get the idea of the appropriate styles of local sciences through analysis of social network of local residents and various types of experts with a case study of regeneration of ecosystem services in Japan, focusing on production and application of local and scientific knowledge.

Case study - Shiraho community, located in the Ryukyu Islands in the south-westernmost part of Japan, has coral reefs in front of their inhabited area. Local people have routinely used ecosystem services of coral reef in various ways while at least a part of the Shiraho reefs retain their amazing health, sustaining rich biodiversity. However, recently the coral reef is damaged by multiple factors including accumulation of inflowing red soil, coral bleaching, overuse of snorkelling tourism, physical damages caused by typhoons and so on. In 2006, Shiraho Community Organization (Shiraho Koumin-kan) has formally acknowledged the value of the coral reef in their community charter. Local stakeholders started various activities including fisheries resource management or red soil inflow prevention. They also organized the association for conservation of bountiful coral reefs, leading to facilitate social-ecological interactions for regeneration of valuable ecosystem services. These activities are coordinated and supported by local residential experts of community development and coral reef ecology in a branch office of WWF Japan, Coral Reef Conservation and Research Centre. Researchers in the local government and the visiting researchers from the research organizations outside the community are also deeply involved in this process.

In this research, local residents including members of the stakeholders association and the residential experts were interviewed with a focus on their mutual relationships and interactions, as well as on the knowledge production processes in their activities aiming to bring transformation of ecological and social environments.

Conclusions - We will describe characteristics of local sciences, with discussions on several key issues based on the case study. Communicative knowledge production, roles of residential experts for integration of local and scientific knowledge, mobilization processes of social or cultural memory for reappraisal of the values of ecosystem services are analyzed in detail to understand the characteristics of the social networks allowing effective collaboration among experts and stakeholders.

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P–52

The history and management of Yamazakura (*Cerasus jamazakura*) landscape in Yoshinoyama

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In this presentation, we introduce management activities on Yamazakura landscape in Yoshinoyama located in the center of Kinki region. Yoshinoyama has spectacular Yamazakura forested landscape which stretches along undulating topography from 200 m to 750 m above sea level with 5 km far distance. The unique landscape, enveloped in enormous flowers in spring season, was registered as a World Heritage site in 2004: "Sacred Sites and Pilgrimage Routes in the Kii Mountain Range". The most noticeable characteristic is that the landscape has been maintained for more than 1,300 years.

The history and landscape in Yoshinoyama - Yoshinoyama has been recorded and depicted in Japanese history, animistic religion and literature under deep relation with Heijo-kyo (present Nara) and Heian-kyo (present Kyoto) both of which were ancient capitals of Japan. In an atmosphere of mountainous religious city, Yamazakura landscape has attracted vigorous politicians and famous poets from ancient ages, and also the general public from the 18th century. After the late 19th century economical modernization and globalization triggered a rapid change of local society and the landscape itself. In the history of Yoshinoyama, though there were several recorded risks of degradation of the landscape, Yamazakura has been sustained by local initiative management cooperating with outside supporters occasionally.

Management activities for next generations - In the moment the local society and conservation authorities have enthusiastic discussion and make efforts to reasonably implement sustainable management of the landscape, which should be handed to future generations as the same way as the former one had done. We are facing to some social issues on declining and aging population and also tree health problems such as epidemic disease, disturbance in genetic diversity of local population and declination of habitat quality. However, the people of Yoshinoyama have already taken actions from two aspects. One is scientific approach mixed with original wisdom and skills of the local hand-in-hand cooperating with experienced scientists and professionals of tree health. The other is local initiative on landscape management to nurse and return sound Yamazakura saplings to the mountain with proper care. We are also trying to set up 'Sakura no Gakko' (research and education center).

Participation for Green Wave - An activity on utilization of bamboo for sapling pots nurtured in Yoshinoyama will be introduced to outside and inside of the country through 'Green Wave' (held on the 22nd of May) as a worldwide planting event. This activity is expected to open the way to keep the unique landscape and to effectively use bamboo materials for adequate management of bamboo forest. We have a confidence that the actions firmly rooted under the community let us keep knowhow on sustainable management of the Yamazakura mountain.

P–53

Sense of value and the protective technology for the cherry tree of the Japanese

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In this presentation, we introduce the sense of value for the cherry trees of the Japanese, and the protection technology for cherry trees.

The sense of value for the cherry tree of the Japanese

Japan is a country rich in biological diversity. Since ancient times, Japanese people have values that are part of nature, has made it important to live close with nature. In the typical ones, there is a spiritual culture which has the sense of reverence towards the life which in the typical ones resides in the trees and shrubs of longevity. In addition, the spiritual characteristic, produced big effect on the Japanese religion became the foundation of the Japanese garden culture.The cherry tree, the Japanese national flower, is one of those typical trees. Not only, as the view wood with the garden of the temple and the shrine, it is many planted even now as an object of belief of the people. In addition, the cherry tree is many picked up even to the Japanese poetry and the fine arts, so that it is special existence for the Japanese.

Protective technology of cherry tree

Sun Act Co. Ltd., that speaker belongs, have been paid attention to the anti-bacterial action of allyl isothiocyanate, that is included in the horseradish, and developed the protection method of pruning the trees, the several methods that prevent withering and the atrophy with the deterioration of the tree body. These methods as a means of protecting trees and their agents, the U.S. and Japan, South Korea, EU have been patented.

The background of these methods, there is a Japanese spirit of nature, and developed to meet the needs that are protected by using natural materials and ingredients for cherry trees that the subject of faith in religious institution.

Furthermore, these methods are adopted even with the cherry trees that are appointed to the natural monument, the Japanese garden above 1000 continues, 80% of the tree bodies the trees and shrubs which decay with deterioration and protection of trees and shrubs of several hundred years in tree's age.

Finally, these methods are effective for the protection of the trees other than the cherry tree, and helpful for Japan and other regions of the world as a tree protection technology.

P–54

The activities of practical leadership training for conservation volunteer and interpreter

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This research aims to enhance practical conservation volunteer activities of which is inevitably needs maintain, hands on works "Te-ire", Japanese semi-natural countryside farmland and secondary forest. In these years, environmental practical volunteer activities have been increased in Japan. Forestry Agency (2004) reported forest volunteer group number increased from 277 to 1,863 groups between 1997 and 2006. Asahiro et al. (2006) reported International Conservation Working Holidays (ICWH), which were carried out in cooperation with the British Trust for Conservation Volunteers (BTCV), were held nine times between 1997 and 2005 in Kurogi-cho, Fukuoka Prefecture, Japan. The number of repeat volunteers increased each year and the capabilities of individual participants were developed. However, relatively few participants chose to do conservation tasks on a regular basis and to participate actively as a local leader. It is essential to overcome this problem, by commencing leadership training, in order to continue the operation of ICWH or start new conservation task in the future. Shortly afterward, BTCV trainers was invited and carried out leadership training for Japanese conservation volunteer, and Project Leader's Guide was handed out to us (2006). On the other hands, Interpretation activities have been developed in national park, local habitat site and school. I assume that reason why, their communication skill for telling environmental value is high rather than practical conservation volunteers. I expect that conservation activities would be vigorously spread if interpreter and conservation volunteer get together.

This time questionnaire results is reported of which carried out Practical environmental conservation volunteer leadership workshop for interpreter in 2009 in Gifu Academy of Forest Science and Culture. This workshop aims to hearing and gets opinion from practical interpreter who act around midland and Kanto area in Japan in terms of BTCV practical conservation volunteer leadership training.

The workshop was held between December 8 and 10 in 2009. Nineteenth participants and three lecturers who had been lectured BTCV training in 2006 were joined these three days. The program shown at Table 1 and effective response questionnaire was sixteenth. As a result of this research, there is statistical trend that Interpreter has few experiments of practical hands on field works (ex. footpath) and tool talk program. On the other hand, risk assessment process, safety management and motivation program is useful for interpreter activities in the future.

Table 1 Workshop program

8th:Theory of Countryside conservation; Introduction of BTCV; What is a leader; Team game; Motivation and Feedback; Tool talk
9th: Project planning and organization; Safety management; Risk assessment process; Practical field works of footpath
10th: Resolving problems; questionnaire

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P–55

Local culture for the co-existence of people and animals - the case with cats in Tashiro Island

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There are many kinds of human-animal conflicts including wild and pet animals in all around human inhabited areas. For example, despoil of garbage dump by wild crows and mice are one of the most serious problems in urban area. Even in pet animals, abandoned or bad-mannered animals cause problems such as barks and excrements (Kato, 2005). To think about these problems, it would be important to study model-case of co-existence of people and animal.

In Tohoku (northern part of Japan), there are over 100 of cats living together with people in an island. Tashiro Island, Ishinomaki city, Miyagi Prefecture is small island (3.14 km^2) where 94 island's residents live. This island became known as "a paradise of cats" in recent years. To reveal how are island's residents and cats living together, this study examined the relationship between island's residents and cats in terms of historical and cultural backgrounds. Firstly, historical changes in population, industry, and life style, and unique traditions and indigenous beliefs of the Tashiro Island were investigated by literature surveys. Then, daily attitude of island's residents toward cats was examined by hearing investigations.

The literature survey suggests that cats have lived in the island and been fed by fishermen since Edo period. Therefore, cats have been familiar animal for the island's residents for a long time. Fishermen had a custom to watch cat's behavior for weather forecast. In addition, there was a religious faith of cat in the island. In relation to the religious faith, there is a small shrine called "Nekogamisama" at the mountain area of the island, which sacred to a cat as a deity of fishery. It was observed that island's residents feed cats when they come back from fishing, suggesting that even now island's residents have the unique attitude about cats. Such persistent unique custom may influence the island's resident's behavior toward cats.

Thus the present study concludes that the local histories, cultures and religions influence on peoples attitude toward animals. Local cultural and historical backgrounds about animals may be a key to understand condition of coexistence between human and animal.

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Sacred spots as a means for enhancing biodiversity and living environment in urban and suburban landscapes

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There is often a strong relationship between spiritual culture and land management practices. Areas that are considered sacred within a particular culture are treated differently that ordinary spots. For example, in Japan large, mature trees are often preserved in the sacred groves surrounding Shinto shrines and Buddhist temples. As urbanization swallows up the countryside landscape, these groves may become the only substantial forests left standing. Sacred ponds, wells and springs, where water deities are revered, also function in a similar manner. These waterside habitats are often preserved in the middle of highly developed and densely populated landscapes. This paper discusses the general characteristics of sacred spots in Japan, with an emphasis on urban and rapidly-developing suburban areas.

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Linking scientists and science educators across the world through global climate change and urban phenology study

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Our project provided an opportunity for scientists and science educators and their students to team up on a study of climate change and leaf phenology. We launched the GLOBE (Global Learning and Observation to Benefit the Environment) Urban Phenology Year (GUPY) project in 2005 in partnership with school teachers in Europe, Asia, Africa and North America. The GUPY project specifically aimed to investigate the effect of the urban environment on the timing of leaf budburst of native deciduous trees across the world. A post survey was conducted among our participants to assess the relevance and effectiveness of this international collaboration. A response rate of 74% was achieved from the survey of science educators from six cities in Finland, Kyrgyzstan, Thailand, Senegal and USA. Only 59% of our teacher-participants have been previously involved in GLOBE projects in their country. Visits to each city were also found effective with 64% of the teachers gave an excellent rating on the delivery of on-site training-workshops. Availability of information materials (video and budburst protocol translations in different languages) on the web that defines the rationale of the research project and explains the role of the teachers and students in field data collection was also given an excellent rating. Our participants (81%) signified interest to integrate phenology research as a classroom activity with majority of them thought that leaf phenology and climate change are important topics in science teaching and that the project was useful in promoting social development (e.g. teamwork) among their students. Success of this international partnership could be attributed to the commitment of our participants to science teaching and their country's previous involvements and familiarities with similar GLOBE projects. Linking an inquiry-based science project that has an international scope with an institutionalized science and education program (i.e. GLOBE) facilitated working with a wide range of educators from different countries that ensures continued global impacts on science education.

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Numerical analysis of changes in indoor and outdoor thermal environment for historical urban district in past decades

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As the result of the decrease the population in center of the rural city in Japan and the increase vacant lot, decline of urban area has become a serious problem. The site which became vacant lot from 1979 till 2009 changed to parking lot with asphalt entirely. And the area of parking lot occupied about 20% of the whole site. In addition, half the number of the buildings are adjacent to parking lot because of the parking lots distribute scatteredly.

The purpose of this study is to analyze the impact of vacant lots on thermal environment and building heat load in the summer in an historical urban district using numerical simulation in Tsuchiura city (about 150 buildings), Japan.

Firstly, the spatial geometry and material data in 1979 and 2009 are collected using GIS data, laser point data, aerial photos, field investigation and reference investigation. And 3D CAD model of the site, to which material data was added, scaled 1:500 is completed.

Secondly, (1) the surface temperature distribution, (2) the Heat Island Potential (HIP) which was proposed by the authors (Iino & Hoyano, 1996), as index of sensible heat load to the atmosphere, (3) the Mean Radiant Temperature (MRT) at the height of 1.5 m, as an index of the thermal radiant environment of outdoor living space in 1979 and 2009 are calculated for the evaluation of outdoor thermal environment using the 3D CAD-based thermal environment simulator (Asawa et al., 2008) on the assumption of a clear sky day in summer.

The result indicated that the difference of HIP of the site that varied from the building to the parking lot from 1979 to 2009 and the difference of HIP of the building where an adjacency site varied from the building to the parking lot from 1979 to 2009 were equivalent or greater. As a result of having compared distribution of mean radiant temperature (MRT) at a height of 1.5 m of 1979 with 2009, the MRT value which scored higher than air temperature increased through diurnal day.

Thirdly, the effect of the vacant lots on the building heat load is analyzed using the simulator. Furthermore, it was evident tendency that the sensible heat load of the building where an adjacency site varied from the building to the parking lot from 1979 to 2009 increased.

In conclusion, the increase of vacant lots from 1979 to 2009 affects not only the outdoor thermal environment within the area but also the heat load of the adjacent buildings.

Acknowledgements - This work was implemented in a part of the research project entitled “Research on effective simulation towards a model city for low carbon society” supported by the Global Environment Research Fund (Hc-088) of the Ministry of the Environment, Japan. The authors are grateful to Ben Nakamura, Director and Research Committee on Low Carbon Society, Architectural Institute of Japan. This work was supported in part by Grants-in-Aid for Young Scientists (B), No.21760466.

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P–59

Analysis of the solar control effect of residential trees (Yashiki-Rin) on the microclimate around dispersed houses in Tonami Plain

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It has long been formed many traditional landscapes made full use of lush greenery and water courses since ancient times in Japan. Many these landscapes have not only visual beauty but also multiple functions such as biodiversity and microclimatic modification, etc. However, the landscapes have been disappearing in recent years. Therefore, to clarify and to make effective use of these multiple functions in the daily life are important for preservation of these landscapes. There is a traditional landscape called "San-Son (dispersed village)" on the Tonami plain in Toyama, Japan. The traditional country houses surrounded with trees (dispersed house) are dispersed among the paddy field on all the plain. This study focuses on the solar shading effect of the residential trees on the microclimate, as one benefit of this traditional landscape because the benefit relates closely with the daily life and hardly is aware because its effect is invisible. Therefore, in order to obtain the basis for utilizing the effect, the relationship between the residential trees' form and outdoor microclimate around dispersed houses on summer sunny days were analyzed by field measurement and numerical simulation.

First, based on previous research (Tachi, 1986) and field surveys six types of residential trees that were different in planting design and number of trees were selected from existent residential trees in Tonami district as analysis objects. And six 3D CAD models of dispersed houses with residential trees were created based on the field surveying results.

In order to understand the actual solar shading effects of residential trees, outdoor surface temperature distributions were measured with the spherical thermograph system (Asano & Hoyano, 1998) around dispersed houses. The measurement result indicated that the surface temperatures of the tree-shaded ground covered with wet soil were 2-3ºC lower than air temperature and the surface temperatures of the south-facing walls were nearly equal to air temperature on the south of the residence site with dense tall trees all around the site at noon.

Diurnal temperature variations of all surfaces at six dispersed houses were simulated by the 3D CAD-based environment simulator (Asawa et al., 2008) and analyzed. And the following indexes were estimated: the MRT distribution at 1.5 m height in outdoor living spaces; HIP (an index to express the sensible heat flux from all external surfaces of a site).

The simulation results in terms of MRT and HIP indicated that dense tall trees on the south and west of the dispersed houses' site have higher solar shading effects to the outdoor living spaces and the site in the daytime. And it was found that a row of trees with small crowns on the west of the dispersed house has a slight solar shading effect to the outdoor living spaces, etc.

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Rooftop gardening of large-scale shopping center

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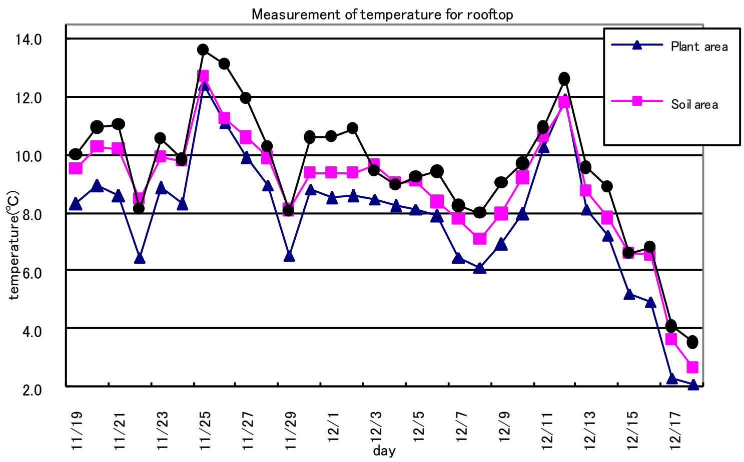
Introduction - Green space in a developed urban region is very narrow. And the rooftop of the building is valuable space for planting trees. The rooftop gardening can reproduce natural environments. The cogongrass that grew in the lakeshore was used for rooftop plant in this study. The temperature reduction with the cogongrass in the rooftop and the cogongrass in the lakeshore was measured. The figure of the cogongrass in the rooftop and the cogongrass in the lakeshore was also investigated in this study.

The experiment method - Experiment spaces were the rooftop of the shopping center of AEON MALL in Kusatsu city and the lakeshore in Omihachiman city. Data logger thermometers were placed in the space of gardening of cogongrass in the rooftop, the space of soil and the space of lakeshore of cogongrass. Temperature was measured for 30 days to investigate temperature reduction by the plant. Moisture content and concentration of nitrogen of the soil was measured. The concentration of nitrogen was measured with carbon / nitrogen autoanalyzer. In addition the cogongrass of each space was divided into the ground part and the underground part to know moisture content and concentration of the nitrogen in the cogongrass. Furthermore, Investigation for vegetation was performed. The number of the stocks per 1 m^2, green coverage ratio, the number of leaf of one stock, the height of the plant, the depth of the root, the width of the leaf, the length of the leaf were measured.

Result - As the result of measured temperature, the same level of temperature reduction at the rooftop and the lakeshore was recognized. The temperature reduction effects by the soil and the plant were also recognized in the rooftop. The moisture content and the concentration of nitrogen of the soil in the rooftop were higher than those of the lakeshore. The fact that the soil of rooftop contains enough nutrients was understood. The moisture content and concentration of nitrogen of the plant in the rooftop were higher that of lakeshore. As the result of investigation for investigation, the plants density of the rooftop was lower than that of lakeshore. The plants of the rooftop were higher and the leaves of the rooftop were longer than those of lakeshore.

Conclusion - The temperature was reduced with the rooftop gardening at the same level of the natural lakeshore. The plants of rooftop gardening were higher than those of lakeshore.



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Stormwater runoff simulation of water retainage green roof systems for sustainable hydrology in urban area

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Objective - Stormwater runoff simulations are done by using the latest research numbers of the traditional green roof system and the green roof drainage layer with water retainage to experiment the hydrological sustainable design in urban environment.

Methods - As urban environment case study area, seventeen city block area around Iidabashi in Chiyoda Ward, Tokyo was selected because of the current occasional flooding. For the simulation purpose, runoff coefficient factors, based on the existing Murayama and Kikuchi's researches, 0.80 for the green roof systems and 0.63 for the drainage layer were used. Additionally, as the runoff delay time, 12 minutes 37 seconds for the green roof system and 1 second for the green roof drainage layer with water retainage were applied (Murayama et al., 1997; Kikuchi et al., 2010). Using the weather statistics of JMA, local two types of rainfall conditions were selected; 76 mm/hr for Tokyo's urban torrential rain and 234.5 mm/day for typhoon. Using GIS, the total area of land use was estimated, and then, the rational method (1) was used to run stormwater simulations.

$$Q = \frac{C \times I \times A}{3600} \qquad (1)$$

Q : the maximum stormwater storage capacity (m^3/s), C : runoff coefficient, I : the average of rainfall intensity in arrival time t, A : land use area (ha).

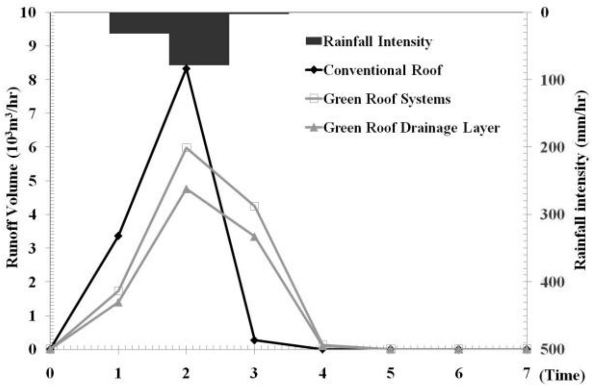

Figure. Runoff Volume at Torrential Rain

Results and Considerations - When the maximum rainfall intensity happens, 8,331 m^3/hr for conventional roof, 5,976m^3/hr for green roof system and 4,761m^3/hr for green roof drainage layer with water retainage were calculated as the stormwater runoff volumes. The results suggested beneficial effects of urban stormwater management by using the green roof drainage layer with water retainage. There is stormwater pooling in green roof, which reduces the runoff volume and delays the discharge to sewage system. Moreover, rather than the traditional green roof systems, the drainage layer with water retainage was suggested as the key for stormwater management. In the end, green roof showed promising benefits not only the ecological function of urban landscape but also the hydrological sustainable design.

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Assessment of open and green areas in Samsun city of Turkey regarding landscape ecology

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Open and green areas are important indicators to prove life quality in urban areas. Population growth and incensement in urbanization have recently affected green patches in urban areas and given rise to degradations on semi natural parts of cities. Because open green areas are known as heritages regarding social, cultural, ecological, functional and aesthetical ways, they should be protected, improved and rehabilitated by both local official decision makers and public. To be able to do this so that next generations can experience a livable environment, Samsun, one of the biggest and the most beautiful city of the Black Sea Region, was selected as the research area.

This paper contains three important topics. The first is on importance, functions and problems of open green areas. The second is on an approach of landscape ecology to open green areas in urban ecosystem while the last one is on ecological parameters of urban landscape and how they can be evaluated now and in the future. As a result, Ecological Performance Analyze (EPA) will be discussed as a method for Samsun in this paper.

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Urban expansion and the change of urban landscape in Trabzon

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Researches on the historical development of urban areas focus on how the birth and expansion of civilizations and urbanization effect civilizations and cultures. In this context it is obvious that cities which are the products of cumulative living experience brought from the past absolutely have their own nostalgia. But cities do not expand their physical space and infrastructure development in the same way as in rapid population growth remain the products of irregular urbanization. Moreover the deformation in the physical structure effects the cultural formation of the city in negative way as well. This situation expands the need of studies on biodiversity and cultural continuity relationship for cities that have to be taken as alive cultural organisms.

The aim of this research is to make a photo analyze of physical and cultural transformation of Trabzon city (It was founded in seventh century B.C. and was ruled by Persians, Greeks, Romans, Ottomans, and Turks in its history) in last century. In this context the structural transformation of Trabzon city beginning from 1900s was evaluated by historical maps and photographs. And physical and functional transformations of urban landscape system in the pressure of dense urbanization process were analyzed. The results can be summarized in two topics. The main re-shaping effect of the coastal line of Trabzon city in a different way from its natural formation is found as the coastal road and the dense urbanization have a breaking effect on green texture continuity.

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A planning method for vegetation management that considers biodiversity in a national park - a case study of Daisen-Oki National Park, Japan

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Development and overuse are controlled by the 'Protection Regulatory Plan' in Japanese Natural Parks. However, several problems arise due to this planning system. Firstly, in many natural parks, plans are not based on actual vegetation. Secondly, no specific zones are set aside to conserve secondary grassland and forest. Thirdly, natural parks are expected to become the 'backbone of biodiversity' (Ministry of the Environment, 2007), but current plans do not take biodiversity into account. Lastly, the current planning scale for natural parks is 1:50,000, but this scale is too broad to be practical for vegetation management.

The authors have implemented a case study in a part of Daisen-Oki National Park, Tottori prefecture, southwest Japan. A vegetation survey and analysis was done to draw up a tentative vegetation management plan for the case study area. The authors prepared three thematic maps: 'a map to evaluate the possible restoration of the plant community', 'a map of the natural plant community' and 'map of safe sites for endangered plants'. These maps were then overlaid and five zones, 'Strict Nature Protection Area', 'Endangered Plant Conservation Area', 'Secondary Forest and Grassland Conservation Area', 'Forestry Coordination Area', and 'Agriculture and Sightseeing Coordination Area' were determined by specific evaluation of axes and grades. Finally, the authors proposed a 'Vegetation Management Plan' that has clear aims and management policies for each area, at a scale of 1:5,000.

The proposed plan was also compared with the current legal plan. Among five proposed areas, the 'Endangered Plants Conservation Area' is a new idea and is expected to conserve endangered plant species, especially those growing in secondary grassland. The 'Strict Nature Protection Area' and 'Forestry Coordination Area' are similar to those in the current legal plan. The 'Agriculture and Sightseeing Coordination Area' constitute almost the same area of the current 'special protection zone III', but it excludes plant communities that have a high degree of naturalness. The authors conclude that the proposed plan could provide better vegetation management for maintaining biodiversity in the study area.

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Satoyama landscape change subject to landform in the fringe area of Japanese regional city from 1884 to 2002 - a case study in Wakayama Prefecture

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Introduction - Satoyama, traditional rural landscape of Japan, was considered as one of the sustainable agricultural ecosystems managed by local farmers. In the past, bioresources were effectively utilized and recycled in Satoyama landscape, which formed resource circulating society coexisted with nature. However, urbanization and fuel energy use have caused decline and abandonment of Satoyama. Recently, Satoyama landscape is being highlighted in terms of its ecosystem functions; hence the maintenance activities by NPO, other groups and individual citizens are emerging. To support these activities, general and site-specific information of Satoyama landscape such as natural land conditions, long-term land-use changes and their interrelationships are of importance. This study aims at examining relationships between topographic conditions and land use changes in the periphery of Wakayama City, Japan.

Study area - Study area is shown in Fig. 1. It is located on the suburbs of Wakayama City, a regional city in the middle part of Japan with a population of 370,000. It is covered with mainly rice and dry fields in a low-lying part, and with orchards in slopes.

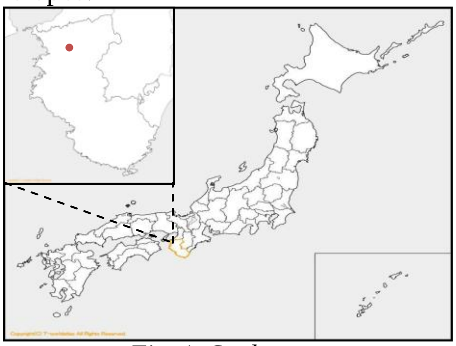

Fig. 1: Study area

Methods - *Preparation of digital land-use maps in three different periods and digital elevation data*

We produced three digital vector land use maps for 1884, 1947 and 2002 by onscreen visual interpretations of scanned raster images of original paper topographic maps. We used digital elevation data at 10m resolution, provided by Geographical Survey Institute of Japan, for landform modelling.

Overlay analysis

We conducted overlay analysis among above four layers (three-period land use maps and landform) and quantified land use change as well as land use-landform relationship.

Results and discussion - Fig. 2 shows land use changes between three periods. Line thickness indicates amounts of changes. According to this figure, the built-up area had increased continuously. The orchard had increased remarkably whereas the rice field had slightly decreased for the three periods. The conifer forest changed into the broadleaf tree forest between 1884 and 1947, and then this broadleaf tree forest went back to the conifer forest between 1947 and 2002. Overlay analysis of land uses with landforms demonstrated that landforms performed as the basic environmental condition restricting possible land use throughout the time.

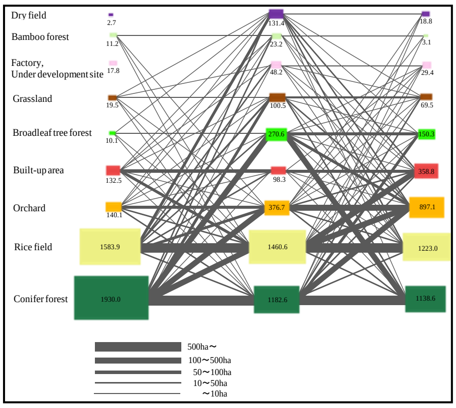

Fig. 2: Pattern of land-use change between three periods

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Distribution of *Satoyama* in Japan and characteristics of the landscape change in urbanizing region

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Satoyama is traditional rural landscape in Japan, comprised of an integral social and ecological network of a village and its surroundings, such as agricultural lands, open forestlands and forests. The *Satoyama* landscape was sustained by activities of local people to obtain various ecosystem services, such as wood for fuel and grass for fertilizer, and the activities have helped to sustain many wildlife. The background makes Japanese government to propose "*Satoyama* Initiative" to the world that represents a vision to realize societies in harmony with nature.

The *Satoyama*, however, is declining by urbanization and abandonment due to fuel revolution and innovation of technology. And thus many species which inhabit at *Satoyama* have become threatened and human-nature relationship becomes disconnecting. Restoration of declined *Satoyama* is urgent concern in Japan, as well as conservation of well preserved *Satoyama*.

In order to make a plan for *Satoyama* conservation/restoration, the map which can represent the distribution of *Satoyama* and evaluate risks of landscape change is necessitated. In this study, we focused on the mosaic of landscape elements, and tried to visualize *Satoyama* area. Moreover characteristics of landscape change are perceived in decreasing region that is selected as *Satoyama* area.

Characteristic of *Satoyama* landscape can be defined as a mosaic of forest, farmland, and residential area. Shannon-Wiener diversity index, *H'*, was calculated by using cover ratios of three land use types in every 1km mesh of entire Japan. The *H'* represents a degree of landscape mosaic, and it can be used as *Satoyama* index.

The value of *H'* relates to population density; the value increases with the population density and reaches highest at around 1,000 persons/km^2, and then it decreases with population density. At the areas with scarce and dense population, monotonous landscapes are established; scarce areas are dominated by forests, conifer plantations in southwest Japan and natural forests in northeast Japan.

The Ministry of Environment of Japan started "Monitoring Site 1000", which is the work for monitoring ecosystem change, and 191 *Satoyama* areas were set according to nomination by local people. The selected areas tend to have high value of *H'*, and it suggests that people recognize the areas with diverse landscape as *Satoyama*.

The areas with high value of *H'* are situated around urban areas with dense population. Around areas with highest density, expansion of urban area is observed. Comparing the landscape structure around Osaka between 1980s and 2000s, it can be found that half of paddy fields have been replaced to residences. *Satoyama* remained around urbanized area is providing ecosystem service to urban dwellers who want to work in nature as voluntary activities.

In conclusion, the *Satoyama* index, *H'*, is useful to monitor situation of *Satoyama* area and to make a plan for conservation and restoration.

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Comprehensive landscape mapping using GIS - a tool for green conservation and public involvement

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Tokai village is located in the north area of Ibaraki Prefecture in Japan and is famous for a lot of nuclear power facilities location. At the same time, this village has a good natural environment, green space and regional culture like a long history. In this village, a Master Plan for Park and Green was established in 2009, is now being formulated Execution Plan in collaboration with the Environmental Design Laboratory of the University of Tsukuba. In order to carry out these plans under public involvement, it is necessary to understand the current regional environment and should be shared between local residents. Geographic Information Systems (GIS) is a powerful tool for that.

In this research we collected a variety of geospatial data concerned with regional environment such as vegetation, landform, altitude, roads, water surface, housing, legislation and various regional resources. These data were compiled as a database for GIS analysis on a computer. First, we examined how to visualize these geospatial data effectively, resulted in creating various interesting maps.

Then the main landform of the Tokai village is composed of a plateau, lowlands and slope zone connecting them. Green space area on the plateau has a tendency to be decrease and has been divided into small green patches with the expansion of the urban area. Most of the lowland has been used as paddy fields. And in the slope zone located between plateau and lowland, is still a lot of green space because of the area unsuitable for urban development. These three landform types have provided a lot of information to obtain spatial description and landscape characteristics. Yet, the classification of such landform types does not fulfil the needs of a detailed landscape evaluation in the research area. According to the GIS and multivariate analysis as a data of vegetation, land use, landform and altitude, the three landform area could be subdivided into a variety of smaller landscape units, each of them having an individual landscape character.

The dominant vegetation types on the plateau is a planted vegetation of cedar and cypress, there are also a few thicket composed of oak, quercus and forest around a farmhouse. On the other hand, thicket and planted red pine are dominant vegetation on the slope zone. Unfortunately, these vegetations are rapidly being abandoned by the lack of management. So, there is an urgent need to halt this abandonment of green space. Then the distribution map of green spaces was created by the research using vegetation map, satellite image data and field survey. To conserve green spaces, they were evaluated from a view point of landslide prevention, scenery conservation, culture, recreation, living environment protection and ecosystem conservation.

Next, the continuity of the green space was evaluated on GIS and we found characteristics of green patches distribution, to be divided on the plateau and relatively continuous on the slope zone. In consequence, to maintain green space network, we created green space conservation plan and various maps using GIS.

As further research, we will hold workshops related to green conservation to promote public involvement, which will improve the conservation plan taking account of the opinions of local residents.

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Watershed environmental capacity looking at future sustainability in Japan - GIS quantitative analysis of accumulative human activities in relation to the capacity of the supporting ecosystem services

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Background and Motivation - There is an increasing awareness of global environmental issues such as global warming and other problems concerning water supply, food, forest resources as well as regional issues such as the heat island effect created in urban areas. These problems are thought to be caused by increased activities of human beings and their interactions with natural ecosystem. In order to stop or slow these negative trends, it is first essential to create a methodology that can grasp the various functions of the living environment. This research aims to analyze the Human-Nature Interaction quantitatively based on the objective measuring of accumulative affects of human activities in relation to the capacities of ecosystem services.

Approach - In this quantitative analysis, a concept of Watershed Environmental Capacity (WEC) has been established. For modelling of the pluralistic Human-Nature Interactive System, five indices of WEC have been established including: WEC CO2 Fixation, WEC Cooling, WEC Food Resources, WEC Water Resource, and WEC Wood Resources. The analysis unit, based on the watershed as an ecosystem, includes contrasting scales to establish the hierarchical watershed management model: the Watershed Unit, and the Community Unit. To do the modelling efficiently a quantitative analysis database system based on numerical modelling and Geographic Information System (GIS) have been developed. To grasp temporal conditions in Japan, analysis has been conducted in all regions in Japan.

Significance and Objective - Establishing these quantitative relationships between humans and the natural environment within the urban context is in its formative stages. This study is intended to help in our understanding of the complex interrelationships between our urbanized activities and elements of the supporting ecosystems. Desired research outcomes are: environmental protection improvements for areas within and around our cities, and through broader global implications, applicability beyond Japan as so much of the world is undergoing similar processes of urbanization. This study is also a representation of an environmental system. However, as it is only a composite of specific environmental processes and functions, there is a yet a greater challenge to quantify and represent an absolute or complete ecological system as so many of its functions and features are invisible. In this system, we have integrated scientific knowledge and accumulated environmental data through the application of GIS technologies while rendering finding for easy conveyance and comprehension. Our target is to promote recognition regarding the raison d'être of nature - human actions and attributes, thereby resulting in the development of more effective environmental planning strategies, and perhaps leading to changes in lifestyles or living patterns, and finally, contributing to the body of knowledge and information regarding people and planning for the subject areas of urbanism and natural systems.

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P–69

Study on the ecological base map for the landscape planning in Tokyo Bay area

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During the last century, metropolitan bay areas were reclaimed and developed as artificial space with economical theories. Much of natural shorelines and habitats were lost under the development. The restoration of the biodiversity in bay areas is one of the issues that address global environmental problems today. To enhance the biodiversity and develop ecological networks, spatial information for evaluating the ecosystem and environment is necessary. However, we currently do not have such information for metropolitan bay areas. Through a case study of Tokyo Bay area, this study presents a basic method of landscape planning that can create environmental databases and ecological base maps for metropolitan bay areas.

We first reviewed available existing spatial databases on natural environment and green spaces produced by national authorities and 19 municipalities adjoining to Tokyo Bay. From this review, we found that the maps differ greatly in classification schemes and resolution depending on the municipalities, which could be a barrier for us to assume as well as lateral connections between municipalities.

To solve this problem, we created two ecological base maps. One is an ecological base map created from available existing databases. For the creation, we used various maps that include the Basic Survey for Urban Planning, Vegetation map, Port planning map, map of Park and Open Spaces. Based on our field survey and bibliographical survey on Tokyo Bay area, we newly devised ecological classifications in a municipality scale taking existing databases into account. The other is a base map made from satellite images in a landscape scale. We used the satellite images compiled by ALOS AVNIR. The images have been classified into three categories: evergreen forest, deciduous forest and grass field, using maximum-likelihood method. Using these two base maps, we analyzed the distribution of ecological facilities in Tokyo bay area hierarchically. The analysis confirmed the importance of existing cores and corridors, such as tidal flat, river, large-sized reforested area and grass land, from the viewpoint of landscape ecology. We also found that the base maps enable us to evaluate the potential of the bay area for creating eco-tones and combinations of biotope types. From these results, we conclude that the maps which we created in this study contain effective information for landscape planning towards the enhancement of the biodiversity in metropolitan bay areas.

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P–70

Instruments of integrative urban biosystems management - case study Bratislava

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Slovak planning system represents a comprehensive planning system typical for Central European planning culture. In addition, long tradition of landscape ecology in Slovakia and strong position of green movements in societal transformation processes after 1989 led to his transformation towards comprehensive system of spatial development management integrating the comprehensive management of urban landscapes and regulating the changes induced by economic, social and environmental requirements of dynamic societal development. This system is created by a set of principles, planning, programming and executive activities and measures focused on achieving and sustain biodiversity and ecological stability in spatial systems, based on the development of territorial systems of ecological stability, renewal and careful use of natural resources, protection of natural and cultural heritage and on improvement the quality of environment according to defined standards at the sub-local, municipal, regional and national levels.

The poster demonstrates the core of this system at urban level, created by the set of analytical and prospective instruments - landscape-planning database, environmental sectoral programs (e.g. green spaces, waste, energy, water, air), plan of territorial systems of ecological stability, landscape study for areas requiring special landscape treatment and most important integrative planning documents - landscape-ecological plan and land use plan. These instruments are shown at the poster, applied at the example of the capital of Slovak Republic Bratislava in the context of Central European agglomeration and twin-cities Bratislava - Vienna.

The poster presents representative examples of the instruments typical for Central European planning culture which can be inspiration for cross-border cooperation and integration in the management systems across different planning cultures. It was elaborated as a part of the project implementation: SPECTRA Centre of Excellence for the Settlement Infrastructure Development of the Knowledge Based Society supported by the Research & Development Operational Program funded by the ERDF.

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P–71

An adaptation of the focal species approach for conserving forest-floor fern species diversity in fragmented shrine forests in the middle Kinki District, Japan

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Aim - Within the city environment, a selection of umbrella species for preserving the diversity of fern species was tested. We assessed Lambeck's (1997) 'focal species approach' for its ability to identify minimum patch size, micro-habitat diversity (number of micro-landform types) and landscape connectivity (distance from non-fragmented forest), which are required to conserve existing forest-floor fern species.

Location - Seventy fragmented forest patches of sacred shrines within the city environment of northern Osaka Prefecture and southern Kyoto Prefecture, central Kinki district, Japan.

Methods - A presence/absence data set was gathered for 70 forest patches that varied in size, isolation or structural complexity of habitat. The data set for forest-floor ferns was also modelled statistically to determine relationships between occurrence of each species and patch size, number of micro-landform types and distance from non-fragmented forest. We modelled a binomial distribution with a logit-link function in a stepwise fashion. Regression models were then used to generate probability-of-occurrence functions for a range of patch sizes, number of micro-landform types and distance from non-fragmented forest.

Results - Patch size explained a significant portion of the deviance of presence/absence for 36 of the 50 fern species. The number of micro-landform types of each patch explained a significant portion of the deviance of presence/absence for nine species. The distance from non-fragmented forest explained a significant portion of the deviance of presence/absence for 13 species. Therefore, presence/absence thresholds for patch size, micro-landform types and isolation were assessed. *Coniogramme intermedia*, *Leptorumohra fargesii* and *Thelypteris torresiana* were identified as the most threatened species of the area because they had the most demanding spatial requirements (2.94 ha). Similarly, *Blechnum nipponicum*, *Dicranopteris linearis*, *Gleichenia japonica*, *Plagiogyria euphlebia* and *P. japonica* were the species most threatened by the reduction in micro-landform diversity (three micro-landform types). *P. japonica* was also identified as the species most threatened by isolation (710 m). Conservation planning guidelines that we formulated from these eight focal species were (1) conserve forest patches of sacred shrines of at least 2.94 ha in size, (2) conserve the diversity of micro-landform types (a minimum of three micro-landform types) and (3) conserve patches that are within 710 m of neighboring mountain forest. When patches that fulfilled at least one of these three conditions were preserved, it was calculated that all 78 species grown in this area could be preserved. Although patches that fulfilled at least one of these three conditions numbered 43 out of 70 (i.e. 61.4%), it was not considered an efficient method because it was calculated that many patches would require to be preserved. The number of patches that fulfilled only patch size condition (≥2.94 ha) was 16 (22.9%), and these patches contain 97.6% of the total number of species.

Main conclusions - The focal species approach was effective for conserving the high diversity of forest-floor fern species. Although this approach did not succeed in enabling efficient selection of patches that should be preserved, this can be substituted by selecting only patch size condition, which was the most effective factor.

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P–72

The effectiveness of seed sowing *in situ* to create low maintenance ornamental meadows for hostile urban environments

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Research at the Department of Landscape has been highly successful in developing the method of *in situ* seed sowing for the creation of economical prairie meadows. There can be greater confidence that they will establish reliably and can be maintained with a minimum of labour. This experience was built upon to test a range of mixtures of herbaceous perennial species, with specific requirements for urban environments, where there is a possibility of establishing new vegetation over degraded, semi-permeable or impermeable surfaces.

A trial was set up to establish a range of mixtures of perennial species which would have the characteristics of a defined height, a diverse vertical structure and a long flowering period. Species were selected from steppe or prairie habitats in central Europe and North America, including such genera as *Campanula, Cerastium, Penstemon* and *Anthyllis*. The depth of growing medium and access to the lower soil profile were strictly limited to simulate the conditions of growing over hard landscape surfaces.

Initial results showed a wide range in the rate of germination of seeds from different geographical regions, the rate of establishment and ground coverage. It was speculated that this would have implications for the eventual establishment of the mixed community. Population surveys after one year of growth showed distinct trends in establishment of particular species. Those species with rapid germination were not necessarily successful in dominating the community, but frequently succeeded in establishing large individual plants, which could later become a distinctive feature of the population, even in low numbers. It was noted which species could be useful as alternative ground cover plants for ornamental schemes, to create greater diversity in urban vegetation, with consequent benefits in faunal biodiversity. A benefit of a vegetation system suited to very low maintenance was the absence of significant grass colonisation or dominance of the scheme. With low inputs of water and fertiliser, only a limited number of species reached their full height potential, with consequences for the overall visual impact of the mixture. Low-growing species were found to be more successful in colonisation. It was noted that there was miniaturisation of some species, however with survival of high frequencies of individuals and distinctive vegetative growth form in clumps. It is proposed that manipulation of mixtures with greater frequencies of these could be useful for well-defined landscape schemes.

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P–73

Eco-mixed seeding and planting method for revegetation of diverse woodlands in towns and cities

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Eco-mixed seeding and planting method are used to restore woodlands to a condition approximating their natural state, by taking advantage of the mechanism whereby woodlands regenerate places where trees have been uprooted by wind. When trees are uprooted, areas where root systems had spread become denuded. The seeds of many tree species that naturally spread into the denuded areas at about the same time germinate and start growing. The trees that grow there form a woodland of pioneer trees, which later undergoes a transition to that of climax trees. The eco-mixed seeding and planting method aims to reproduce this process.

In this method, no artificial measures are taken after artificial dispersal of seeds and the planting of small seedlings, in anticipation of the restoration of semi-natural woodlands. This method encourages involvement by local residents in collecting native seeds and growing small seedlings, which can raise awareness of environmental conservation.

Implementation of the eco-mixed seeding and planting method has revealed the feasibility and necessity of resident participation. Resident participation is very meaningful in terms of the supply of seeds and nursery trees and in terms of awareness raising among residents. At present, it is extremely difficult to procure seeds and seedlings through conventional distribution channels, if their regional properties are to be ensured on the genetic level as well as on the species level.

When residents join in implementing this method, it is possible to acquire various native seeds and small seedlings that have the required genetic properties suited to the region without a large nursery or special technology. The experience of collecting seeds in the surrounding natural woodlands and of growing them to small seedlings at home is a good opportunity for residents to understand the natural conditions of their community. Additionally, it is expected that residents will take an active part in the maintenance of seeds and small seedlings after having collected the seeds and grown the small seedlings by themselves.

This method was initially developed in 1991 to regenerate riparian trees, and the present method was established in 1995. For the last fifteen years, it has been undergoing trials. The method involves a comprehensive system that covers the setting of objectives, seed collecting, seedling cultivation and planting, record tracking, follow-up survey, and evaluation. During those fifteen years in Hokkaido, 200,000 trees of 70 species have been planted at about 200 sites including parks, riverbanks, embankments, dams, and road slopes in no only rural sight but also in towns and cities. Data are continuously gathered on these trees. These data show that, as initially aimed, there has been rapid restoration of woodland by pioneer trees and gradual transition from such woodland to that of long-lifespan tree species.

In 1999, Gentle slopes appeared by levee enhancement work of the Toyohira River in the center part of Sapporo City. It was a good chance to organize the system to make an agreement of the plan among general public. We discussed about the design of the levee slopes for two years, and the greenery plan had concluded as “Woodland and grassland” by eco-mixed seeding and planting method. We will introduce this method through the greenery plan.

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P–74

Study on urban moss habitat patterns on artificial exterior material

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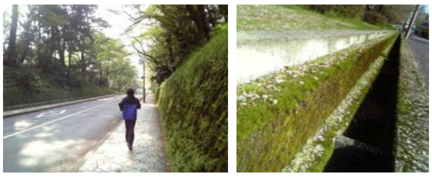
You can see many mosses in Japanese garden, shrines and temples (Fig. 1-a). Moss appears in lyrics of the national anthem of Japan and some of old waka poetry. Moss has been familiar to Japanese people since early times. Today city is coated with artificial material which has a less water retaining capacity. It becomes difficult for plants to live in city. Even so, some mosses are living on artificial exterior materials in city modestly and tough, for example, on building roots, tile joints or block fences (Fig. 1-b).

(a) Traditional space



(b) Urban space

Fig. 1 Moss in Japan

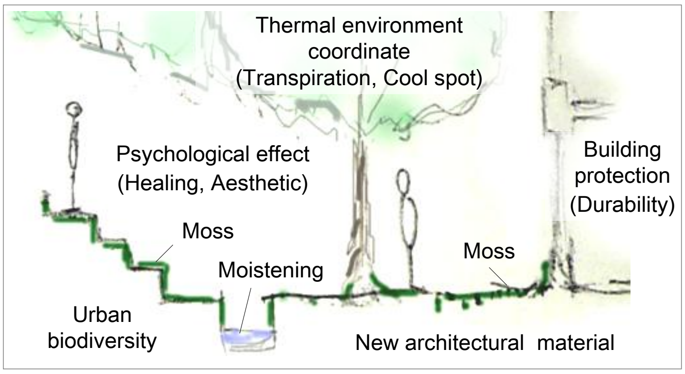


Fig. 2 Urban moss's prospective effects of environmental coordination

We have been studying moss as one of architectural materials. We focus attention on moss's effect of thermal environment coordinate, building durability (by moss cover), artistic design and urban biodiversity (Fig. 2). This report shows a survey result of urban moss habitat patterns on artificial exterior materials in a college campus (Kanazawa, Ishikawa Pref.).

About 20 characteristic habitat patterns and 10 representative patterns were extracted with consideration of moss living space form and environment condition (Fig. 3). As a result, material's and space form's condition which enable urban moss to grow on artificial exterior materials were broken down into patterns.

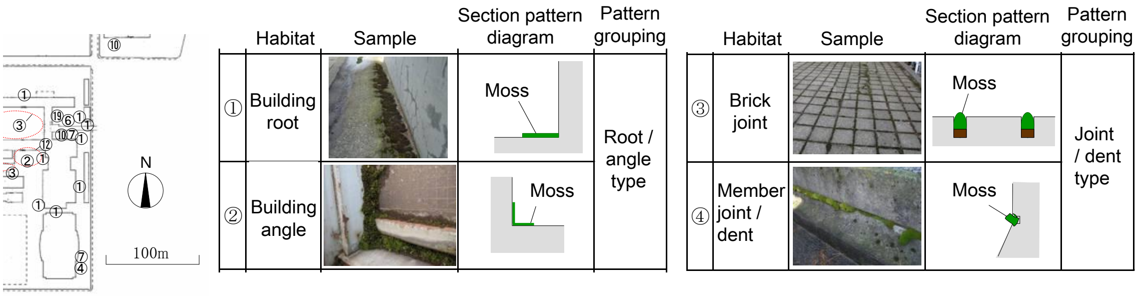


Fig. 3 Grouping result sample of urban moss habitat patterns on artificial exterior material (on the campus of Kanazawa Institute of Technology, Ishikawa Pref.)

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Consideration on suitable microclimate of moss garden based on turf surface moisture dynamics of *Polytrichum commune* Hedw.

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Polytrichum commune Hedw. in moss gardens - *Polytrichum commune* Hedw. is one of the most important mosses used in Japanese traditional gardens of Kyoto. Turf surface moisture (TSM) of *Polytrichum commune* Hedw. would be affected by urban climatic conditions. In this presentation, we introduce a result of measurement of TSM and a concept of suitable microclimate of moss gardens related to micrometeorological process of TSM.

Turf surface moisture dynamics - TSM was manually measured for a total number of 33 days with microclimate observation in naturally cultivated habitat in Kitashirakawa experimental site of Kyoto University (shown in Fig.1). The mean TSM was 13.2 g m^{-2} among 28 no-rainfall days while there was only 5 days when it exceeded over 21.1 g m^{-2}, which value is the total that standard deviation (7.9 g m^{-2}) added to the mean value in the dry period.

Rainfall-Distillation Process and turf structure - Relatively higher TSM for the dry period can occur due to water droplet (shown in Fig.2) formation process on leaves by nocturnal radiation after increases of turf humidity and soil moisture by rainfall, named as Rainfall-Distillation Process (RDP), in these 5 days. Positive photosynthesis condition may appear on account of simultaneous presence of both higher TSM and bright sunlight at clear morning with RDP.

Suitable microclimate and its maintenance in moss gardens - We concluded that it is more necessary to preserve and maintain moss-suited microclimate condition related to RDP. The control method of horizontal wind and vertical space, neither to blend inner and outside air nor to disturb accumulation of calm cool air mass, should be recognized to develop for moss gardens surrounded with urban changing climate.

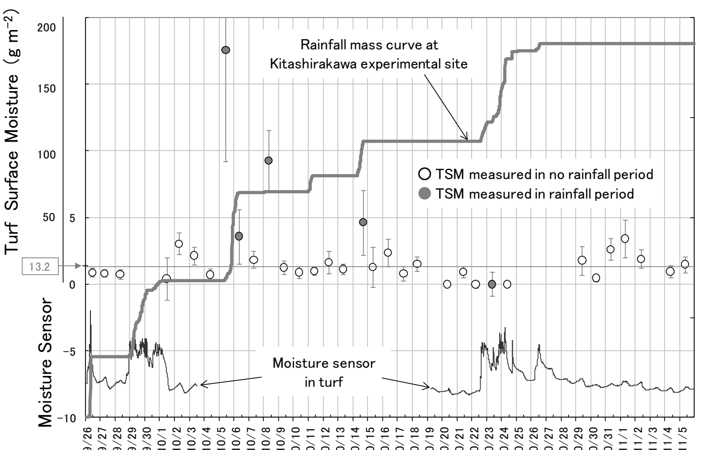

Fig.1 Turf surface moisture and rainfall periods

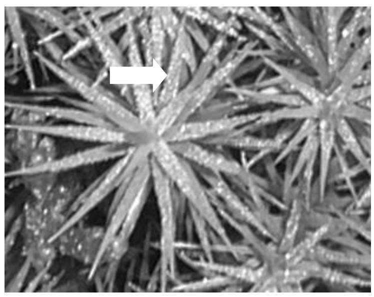

Fig.2 Water droplets on leaves (October 16, 2008)

P–76

Issues of delay in land development process by obtaining building permit in Malaysia and Ghana

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Building permissions serve as a green light in any land development. In Ghana, issuing of building permit has been characterized as time consuming, overriding and overshadowing. Accra Metropolitan Assembly (AMA) for instance, has more than 50 bureaucratic procedures that a developer/applicant has to follow before permits are issued. To end all matter without going through all the hassle many build without permit ignoring the planning and zoning schemes. This has resulted to unplanned human settlement in many slums and other customary settlements in the rural and urban centers. The paper discussed the substantive laws and the influence they have in the applicability's of the planning permission acts by identifying the gaps, loopholes at the enforcement level especially in the side of Ghana. By analyzing the causes of the delay, 6 main functions and variables were identified as factors that contribute to the issues of delay. Using Malaysians system as a model this suggests alternative to the building permission process in Ghana. Unlike the old traditional system, the OSC serves as one stop kiosks where applicants submit their application without going to all the respective agencies and departments involved in person. It serves as a liaison between an applicant and the agencies and department with a special mandate. The system saves an applicant time and money not only during getting permission but also after completion of construction, where the Certificate of Fitness for Occupation (CFO) has been replaced by Certificate of Completion and Compliance (CCC). The study finally proposed a similar system to be adopted and implemented in Ghana base on the research conducted both in Ghana and Malaysia with a relative approach.

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Forestation for landslide defence on civil engineering work in school district in Tokushima Japan

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In Shikoku district, many cities have housing area which are surrounded by mountains. These areas are called landslide hazard area because of occurrence of landslides is expected. There is a need for disaster prevention. These areas have disaster works of civil works that made by the government. Disaster preventions in construction are such as building retaining walls, and creating erosion control dams. These disaster works are to force the removal of groundwater. Constructions result in tree cuts and sediment movements take place. After construction, some alien species are planted.

Tsurugi-cho, Handa area in Tokushima prefecture is located near the mountain. Disaster work is required and are made by the government for civil works. After the destruction of nature by the disaster works, it was required to restore back the nature. The residents of the area, the residential middle school students as well as us, thought of a way to restore nature. As a result, we chose and surveyed some old forests in this area to copy, after civil works. The solution, the model of the old forest figured out how to copy. We investigated the old forest as possible for the copy model. Using aerial photographs, we found some old forest for this forestation.

We thought that the model of forest is a forest that was seeking close to nature as possible. And this forest was decided to aim at creating a lot of forest wildlife habitat in the region. The middle school wanted to use the forest for teaching and lerning of regional ecology. For this forestation for the landslide defence on civil engineering work in the school district of Handa Junior High School, 4 steps were taken: 1) literature survey to make the model forest (Miyawaki, 1982; Abe, 1990); 2) surveys of several areas where the vegetation in the region consist of old types; 3) survey of several areas of forest vegetation around the construction site; 4) after making the model forest plan in 2004, the residents and junior high school students planted the model forest species.

This forest was named “Kenji no Mori Forest”. This forest has been managed by the residents of the area and has been used by the residents of the nature feelings. The construction consulting firm was in charge of design of these works.

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P–78

Practice and effects of ecological programs utilizing educational resources of Satoyama

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Satoyama is a traditional agricultural landscape in Japan. It consists of several landscape elements, such as paddy fields, secondary forests, secondary grasslands, ponds, and streams. It contains many kinds of living things.

Moreover, satoyama has educational resources for conservation biology. In this research, we define conservation education as the education to conserve biodiversity. And we report the practice and effects of ecological programs based on conservation education utilizing educational resources of satoyama.

Our laboratory uses several field sites for research purposes; one of these is Kurokawa, which is located in the northwestern area of Tama Hills. Although Kurokawa is surrounded by urban areas, the region is characterized by a satoyama landscape, with large areas of farmland and *yato*, or valley bottoms. The local biodiversity is richer than areas in the city, and holds substantial academic research value. But the students who belonged to our laboratory did not once express much interest in the satoyama in the Kurokawa area. To encourage the students to recognize the worth of the Kurokawa area, we have conducted a monthly activity named “the Kurokawa Yato-Project in the region since June 2007. This program has included research into Kurokawa’s natural resources: firefly research, bird watching, excursions to study the plant community, and workshops with farmers from Kurokawa on traditional agricultural practices, such as rice planting, harvesting, and threshing. In this program the students play central roles in conducting these activities as the coordinators. And they conduct these activities with the intention of later practicing these skills in the field in order to examine both seasonal and yearly changes in the area. In terms of agricultural practices, the students are taught about the traditional management of secondary forests and paddy fields by the local farmers.

Through the participation in this program, the students express more interest in the satoyama in the Kurokawa area than before. Moreover they are better able to understand the biodiversity of satoyama and to recognize the natural resources in the Kurokawa area. By researching the local biota the students learn the biodiversity-evaluation techniques, and the students’ volunteer efforts allow themselves to experience the traditional management practices that contribute to the overall biodiversity of satoyama.

Consequently, the Kurokawa Yato-Project allows us to utilize on the educational resources of satoyama. And this program offers a variety of research-oriented, volunteer activities that enable students to recognize the importance of the biodiversity of satoyama in urban areas.

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Environmental education curriculum for regeneration and use of Satoyama ecosystem services

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Satoyama ecosystems have historically provided a wide range of ecosystem services to humans in each of local communities of Japan. However, firewood forests and farm forests of main components of Satoyama ecosystems were abandoned along with lifestyle modification, and thus it leads to loss of ecosystem services of forests which cover about 67% of the country. Recent problem of Satoyama ecosystems in Japan is that human cannot neatly use the ecosystem services for local communities. Therefore, local communities and whole society of Japan require human resources to use forest ecosystem services in various citizen activities and corporate social responsibility (CSR) activities of social sectors such as non-profit organization (NPO), local government, and companies.

To nurture students as human resources who contribute to regeneration and use of forest ecosystem services for sustainable development of local communities, the training curriculum of environmental education called "Creator of Forest Ecosystem Services Course" for all students of the three faculties of Nagano University, the Faculty of Social Welfare, the Faculty of Tourism and Environmental Studies, and the Faculty of Business Information was developed in December 2008. The curriculum consisted of a series of lectures and field practices, and the classes were designed by using educational resources of the three faculties. The compulsory 3 lectures and 2 field practices of introduction of ecosystem services, and the optional 31 lectures and 41 field practices in four domains of environment, tourism, welfare, and information was newly offered in the curriculum in fiscal year 2009. After completing the required classes and passing the final examinations, the students with knowledge and skills necessary for using forest ecosystem services are qualified as the "Creator of Forest Ecosystem Services".

The policies of the curriculum are: (1) to enhance global views and practice abilities of students; (2) to promote their autonomies; (3) to broaden interests, concerns, and horizons of students; and (4) to improve their knowledge and skills. To achieve the policies, a variety of the optional lectures and field practices was introduced into existing subjects of the three faculties and special subjects. The registered students of the "Creator of Forest Ecosystem Services Course" freely selected interesting classes across existent subjects of the three faculties. Also, the situation of selected classes and change of interests and concerns of each of the students was monitored by teachers and a researcher of the course. The monitoring data was used for instruction abilities of short thesis and practical test of the final examinations of individual students. The individualized instruction would be a key process to nurture students who can establish relation to forests and can utilize forest ecosystem services for sustainable societies in various social roles after graduation.

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P–80

The research of designing about children’s space for playing and learning nature - the comparison of primary school designing in China and Japan

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As the main site in the daily life, primary school plays an important place. The morality of children with a wealth of nature experience would be affected positively. Another one which the children playing or being touch with nature in is the stadium that has great significance in the studying of natural environment, so the playground of primary school has been taken more seriously.

There are some differences in the study-style and life-style of the pupil that have influence with the design of school’s playground. According to the time cost in the extra-curricular activities, the form, the incubation target, the understanding and the inexpensive type of nature education and so on. In addition, the playgrounds in China and in Japan are also different. In the elementary school of Japan, as a wealth of emotional education, to make children get in touch with nature frequently has been an education of the environment in the future. However, the time children cost in school is more and more, and the chances used to play outside have been less and less. Because of this, the elementary school is not only the place for studying, but also the place to branch out into nature education. So that the primary schools would both have the space for collective activities and more space for the pupils’ freedom of action. So in the design of Japan, the water environment, the arbor, the topography, living things and so on would be considered to make pupils play in nature. On the other hand, in China, to branch out into group activities and the physical education, so many schools construct the standard plastic runway and the gymnasium, and for the pupils’ studying and exchanging, the quiet outdoor lounge was set up too.

This study takes the Ikiminami primary school on Fukuoka city of Fukuoka and Emperor Academy on Kitakyushu of Fukuoka as the respondents in Japan, while takes five primary schools, such as North Division Primary, QingLai Elementary, Shanghai Instituted-of-Teacher-Education Primary, as the respondents in China. Then take two points to analysis the design of school’s playground synthetically. The one is the design location and the available space used to constitute the elements and the surrounding environments in both of China and Japan, and the other is the differences in the grasp of operating requirements to the design of school’s playground.

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Contribution of urban biodiversity to children's play

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Along with population increase in Turkey as well as whole of world, green areas offering biodiversity (in terms of species diversity especially) have been turned to different buildings in several functions, primarily to residential and business centers in cities. In this condition, it is difficult for people to experience natural areas which include plant and animal species.

This condition expose negative results in terms of children whom constitute the important majority of occupant in urban. Playing is most important element for children. Children learn, develop ability and find their environment while playing. Along with developed technology and decreased playground especially in city centre, children anymore play indoors and houses with artificial toys or outdoor playgrounds arrange playground equipments. However researches indicated that to play in outdoor - especially natural areas and natural elements important for children development. Hence, areas that enable to get into touch children with nature and have biodiversity contribute of children's healthy development.

Consequently, this paper will emphasize that importance of the playing areas which contribute healthy development for children and enable biological species diversity in urban areas. How children use these areas for playing is another important issue of this paper.

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Perception of forest function by local people in TNGP West Java, Indonesia

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Taman National Gunung Gede Pangrango (TNGP) is one of sixth biospheres protection sites in Indonesia, which was designated by UNESCO in 1977. TNGP is the closest national park to Jakarta, Indonesia. Thus developing, extending infrastructures and population has lead to a variety of high pressures around it (Dianto & Anton, 2001). Because of the large population, local government has been establishing a policy to protect the national park with the local community empowerment program. It is hoped this policy would change the local communities' perceptions in order to enhance their social environment. The objective of our study is to measure the forest function perception of communities in TNGP. The study was conducted in six selected villages such as; Pasir Buncir, Cibeling, Tangsel, Lembur Pasir, Gunung Putri and Sarongge. Where they locate in the transition zone of TNGP and have high dependency on forest product.

Detail demographic and economic household was collected using stratified random sampling method from household interviews. The interviews were conduct in August 2009. We divided forest functions into seven categorizes, each respondent could select more than one categorize. In the total there were 210 head of household who responded, 74% were male, while 26% were female. The results of the interview in Fig.1, 201 respondents have opinion that, the national park has main function as water resources. This is common perception, because around 35 percent of the respondents are using clean water from the river directly, 35% from wells and 30% use water supplied by the government.

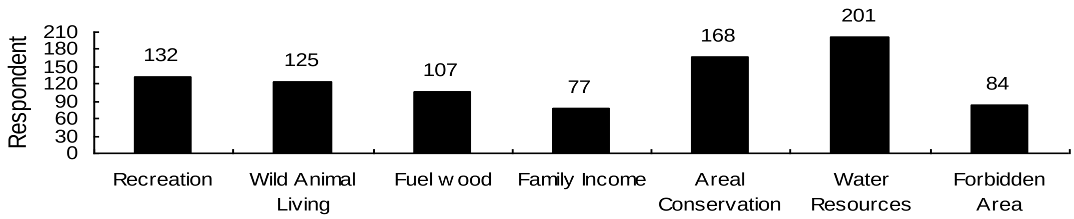

Fig.1 Forest function base on local community perception

The result shows, that 168 respondents agree that the national park has a function as conservation area. According to gender perception, most female respondents answered that forest has a main function as conservation area, contrary with male respondents who percepted that forest function as a clean water resource. Generally, local people in the transition zone of TNGP have a good perception of the forest function. They agree and realize that TNGP should existed circumstance in order to prevent natural disaster and to maintain clean water resource.

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Can endangered insect change people’s mind on use of beach?

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Use of nature and conservation of wildlife frequently cause a conflict, because people’s demands vary and some of usages lead to overuse and threaten wildlife. One of the reasons of overuse/misuse might be happened by lack of information on the distribution of endangered species, because it is considered that such information increases a chance for the collectors to take endangered rare species and then increases a risk of extinction.

In Tokushima city, Shikoku Island of Japan, artificial beach have constructed as a mitigation of natural beach which is reclaimed by highway construction. The purposes of new beach are uses for people and for a habitat of endangered tiger beetle, and the information has passively distributed to people.

In the study, we compared people’s demands on usage of artificial beach before and after giving information on the situation of endangered tiger beetle and purpose of beach construction. Two cases of questionnaire survey were conducted; one is questionnaire without information and another is with information. In each case questionnaires were distributed to 50 “users” including neighbors who were found near the beach, and 100 “potential users” who were found at central area of Tokushima (50) and in the campus of Tokushima University (50).

As a result, obvious change on demands to beach usages appeared between before and after giving information; Before giving information, both users and potential users tended to evaluate the beach from the safety, while after giving information both changed to evaluate it from naturalness. After giving information, users tended to want to go more frequently to the beach than before. While potential users tended to restrain to go. Before giving information, “for doing barbeque and fireworks” are kinds of most preferable purposes for potential users. These usages by potential users are hated by neighbors and might have a possibility to cause conflict. After giving information these demands tended to be restrained.

In conclusion, active distribution of information can raise people’s awareness on wildlife and may encourage urban dwellers to coexist with endangered insects. In addition, the endangered tiger beetle may act as a device for avoiding conflicts between neighbors and visitors.

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How do people evaluate nature-green space remaining in a city?

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In general, a green space in a city has various social and ecological functions, which are necessitated for human life. Quality and quantity of services which urban dwellers obtain also vary, and they are depended on psychological distance of the person from the nature. In this study, differences of evaluation on current situation and thought to conservation are clarified by analysing answers to questioner, which are given from 3,600 dwellers of Tokushima city, Shikoku, Japan.

A natural forest has been remained on an isolated hill, called "*Shiroyama*", which is situated at a centre of Tokushima City. The forest has been designated as natural monument by the government of Tokushima city. Tokushima Castle used to locate on the hill, and remnant stonewall has been designated as cultural monument by the national government. Decreasing number of trees due to their death and falling stonewall have become problems recently.

The space has been open to public as central park and several artificial items are set for use, in addition to remnant items of natural and cultural heritages. According to results of questionnaire, over 80% of dwellers have visited *Shiroyama*.

People's preference on these items is clustered into 3 groups from answering pattern to questions; Group A is characterized by preference to natural forest, stonewall, moat, and gate for castle and artificial pond, Group B is as preferring lawn garden, rose garden, jogging course, tennis court, historical museum; Group C is as preferring tennis court, locomotive and bronze stature. Group A is the closest to nature and history indigenous to the place, while Group C is the farthest from those. Persons who are included in Group C tend to be living near *Shiroyama*.

There are no differences among the groups on recognition of that the stonewall has been designated as cultural heritage, 40-45% of persons know in each group. Recognition on stonewall collapse, however, differ among the groups; 46% of Group A, 38% of Group B and 26% of Group C know problems, and 82% of Group A, 70% of Group B and 48% of Group C do not think to leave the problems. Thus the knowledge on the current problem and will to conservation is higher in the group who have strong concern on history.

Regarding the natural forest, there are no differences among the groups on recognition of that forest are designated as natural heritage, 24-29% of people know, and recognitions on tress decrease are evenly low in three groups, only 13-16% of people know. While will to conservation of forest is higher in the group who have strong concern on nature; ratios of person who do not think to leave the problem of tree decrease are 84% in Group A, 71% in Group B and 45% in Group C.

It can be concluded that urban dwellers in Tokushima City recognize the historical value on *Shiroyama* rather than nature value. However almost dwellers feel necessity of maintaining values of history and nature, even in the persons who have little concern on history and nature, about 50% think that those values should be conserved. Opportunities to touch nature in *Shiroyama* and to feel it with reality should be increased for urban dwellers to raise awareness on the value of nature in the city.

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Motivation and satisfaction of urban people in volunteer activities for Satoyama management in Hotani, Osaka, Japan

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Satoyama is traditional landscape in Japan, comprised of an integral social and ecological network of a village and its surroundings, such as agricultural lands, open forestlands and forests. The Satoyama landscape was sustained by activities of local people to obtain various ecosystem services, such as wood for fuel and grass for fertilizer, and the activities have helped to sustain many wildlife.

The Satoyama, however, is declining by urbanization and abandonment due to fuel revolution and innovation of technology, and is no longer managed by local people alone. And thus many species which inhabit at Satoyama have become threatened and human-nature relationship has disconnected. Restoration of declined Satoyama, therefore, is urgent concern in Japan. In the situation, some of urban dwellers have started to manage Satoyama as volunteers.

Aim of the study is to clarify motivation, satisfaction, vision for the future activities and their relationships, by distributing questionnaires to voluntary groups at Hotani where situated adjacent to mega-city Osaka. Three groups are making activities at Hotani, but connections among groups and between groups and local people are weak. The results will help to find ways for networking them and building social capital, and for encouraging volunteer activities at other places.

From analysis of scores answering to each question, motivations for the activities could classified into four of those oriented from preference to nature, activity itself, friendship and attractiveness of Hotani. Persons who have high motivation in “nature” and “activity” tend to gain high satisfaction from the activities, and become to be more attracted to Hotani. Many participants have satisfied in increasing friends through the activities, and it suggests importance of friendship to keep continuity of voluntary work.

Persons who have obtained high satisfaction are willing to participate in events such as talking about history and folklore of Hotani and nature observation. However they are not interested in farm work collaborative with local people, in spite of its necessity for Satoyama management. The result shows that making opportunities for volunteers to hear talks on Hotani from local people is the next step to extend networks and building social capital.

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Horticultural therapy in Japan -towards Nature & Humans Total Care

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Mother Nature made me realize how small I am. And same time Mother Nature gave me courage and strength to confront with unendurable pain and destruction Anne Frank

They shall beat their swords into plowshares, and their spears into pruninghooks: nation shall not lift up a sword against nation; neither shall they learn war any more. But they shall sit every man under his vine and under his fig tree; and none shall make them afraid. Micha 4:3-4

"Nature & Humans Total Care" as Future Palladium - "Nature & Humans Total Care" is a provisional title for a movement that seeks a new paradigm and calls for a new voyage to a future full of hope for nature and human beings. While it is not yet a structured concept or academic field, it is a courageous effort to confront our crisis and create a new paradigm by integrating science, culture, and art. Nature & Humans Total Care is an interdisciplinary area in which different areas influence each other by crossing the borders. Nature & Humans Total Care sees the importance of the new practical therapy areas that were born in medical care, social welfare, and education. These are Non-Medicinal therapy areas that connect human life directly with Nature, such as Horticultural Therapy/Therapeutic Horticulture, Horse riding therapy, Animal assisted therapy, Art therapy/ Able Art, Forest therapy, sports by the handicapped, Dance therapy, Holistic Medicine, West-East integrated medicine, psycho-therapy, Universal Design, etc. It is essential that these areas have a high quality of professional ethics and self-critical researches, because these areas are directly responsible for Human Life. These new areas should be proved by trustworthy reason and evidence.

Goal and Vision of Nature & Humans Total Care - First vision: Nature & Humans Total Care will seek a total care approach in accordance with the concept of health as defined by the World Health Organization: *"Health is a dynamic state of complete physical, mental, spiritual and social well-being and not merely the absence of disease or infirmity."*. Second Vision: Nature & Human Total Care advocates the Ottawa Charter for Health Promotion (1986)-WHO which recognizes that health is a function of political, economic, social, cultural, environmental, behavioral and biological factors. Health promotion action aims at making these conditions favorable for the health and well-being of all persons. Prerequisites for Health in Ottawa Charter for Health Promotion (1986). Third Vision: Unite the wisdom of East and West. Fourth Vision: Social Globalization is needed. Fifth Vision: Transitioning from medical care of treating illness to medical care of Human Beings as a whole person. Sixth Vision: Healthy society and self-healing power of community. Seventh Vision: "Nature Deficit" causes human pathology and Human society pathology. Eighth Vision: Nature & Human Total Care is a melting pot wherein academic research and practical research meet each other.

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Horticultural therapy and green care in Taiwan - health promotion & human total care

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At present, there are Horticultural Therapy, Horse Riding Therapy, Music Therapy, Color Therapy, Art Therapy, Animal Therapy, Butterfly & Firefly Therapy, and other green care related organizations in Taiwan. But these therapies are generalized under the Complementary and Alternative Medicine (CAM) therapy and do not attach much weight. Therefore they could not connect and cooperate with other mainstream medical system.

It proceeded within ten years for the development of Horticultural Therapy in Taiwan. Mostly is individual independence development without system rule. For the education, there are only few schools offering Horticultural Therapy classes for graduate student. Beside some civil organizations (such as special education, sanatorium, etc.) will aim at particular group and organize Horticultural Therapy workshop. There are few registered Horticultural Therapists (HTR) who will open classes and award Horticultural Therapy certificate by themselves. These training classes are not like international HTR certificate program which are stricter, because the training classes are not yet that complete.

Within the Taiwan medical police, everyone relates that the treatments or care association must come from professional medical workers. Therefore, horticulture workers cannot organize a therapy association. For this reason, the first association organized by professional horticulture workers is named as “Human Nature Association”. But sadly, only few professional medical workers join it.

The Tzuchi General Hospital is under the Tzuchi Foundation. Their development policy is the improvement of full medical treatment services, and also for the purification of the soul and care of the earth. In view of Horticultural Therapy development, the best situation is to combine professional horticulture workers and professional medical workers in forming an association. Under the APATH director of foundation Yumiko Kan, who provides encouragement and support for the association, three Horticultural Therapy International conferences were held in three years. The Formosa Green Care Association was established on 23 January, 2010, with the following purposes:

a. The association is a communication system. Any medical workers, professional psychology workers, horticulture preserve health workers, horticulture workers, botanist, landscape designer, and other relative HT workers who are interested can join.
b. Hold green care training classes and conferences.
c. Publish green care related books.
d. Communicate with Taiwan and international green care related associations and groups.

Abstracts for Poster – Japanese

PJ–1

Effectiveness and issue of wildlife passage on the road

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Road ecology explores and addresses the relationship between the natural environment and road systems (Forman et al., 2003). Roads have six negative effects on wild mammals: increased mortality due to wildlife-vehicle collisions, modification of animal behavior and the reduction of animal populations due to the buffer effect, modification of habitat by edge effects, habitat loss and reduction of habitat quality, disruption of habitat by noise and vibration, and increased alteration of habitat due to use by humans（Andrews, 1990; Forman, 1995; Forman & Alexander, 1998; Trombulak & Frissell, 2000). In many countries, several mitigation techniques are in use to minimize road-kill, habitat loss, and reduced habitat quality. In Japan, the significance of road ecology is currently uncertain, and no standard procedures are being used to minimize the detrimental effects that road systems can have on wild mammals. Therefore, we studied the ecological effects of roads in this country. We analyzed the biological and physical factors that contribute to the selection of road-crossing structures (RCSs) by wild mammals. Furthermore, the future direction of road-ecology studies and mitigation techniques in Japan are discussed.

First, we investigated the availability of various RCSs (box culvert, pipe culvert, underpass, overpass, eco-bridge, drift fence, planting, other) for focal species of conservation on 86 roads (12 roads in Hokkaido, 31 roads in East Japan, 34 roads in West Japan, and 9 roads in Okinawa and Tsushima). Second, we selected 5 roads (Gotu Road, Higashifuji-Goko Road, Kashi Road, Shari Eco-Road, and Toyotomi Bypass) from these 86 and set up infrared sensor cameras to investigate RCS use by species of wild mammals.

RCSs in Japan are mainly box culverts intended for large (e.g., sika deer *Cervus nippon*) and mid-size (e.g., red fox *Vulpes vulpes*) mammals. There are few RCSs intended for arboreal mammals (e.g., Japanese squirrel *Sciurus lis*, Japanese dormouse *Glirulus japonicus*, Russian flying squirrel *Pteromys volans orii*).

According to the result of camera traps for wild mammals survey, large mammals such as deer, boar (*Sus scrofa leucomystax*), and several other species preferred the underpass RCS. Box culverts were used frequently by foxes and masked palm civets (*Paguma larvata*). Pipe culverts in Hokkaido were favored by sable (*Martes zibellina*) and rodents Apodemus spp (*Apodemus speciosus*, *Apodemus argenteus*). In summer, box culverts in Hokkaido were used by cave-dwelling bats.

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PJ–2

希少昆虫とその生息湿地の保全活動に対する高速道路建設の重要な価値
(Great values of construction of an express highway in conservation of a rare insect and terrestrial-water ecotone as its habitat)

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１．概 要

高速道路などの高規格幹線道路の建設は，道路建設の施工性や経済性から里地・里山など二次的自然が広がる都市空間のフリンジで建設される場合が多い。生物多様性が高く評価される空間での環境改変は，生態的階層を持つ景観や土地自然へのインパクトが大きい。道路建設が環境へ与える負の影響が強調される一方で，並行的になされる様々な環境調査によって，希少な動植物が確認される機会も拡大している。

本事例で対象とする希少昆虫ヒメタイコウチも，2001～2004 年にかけて高速道路建設が契機となり実施された環境調査により奈良県で初めて発見された。2006～2009 年にかけては建設事業の影響に対する保全対策として代償型生息湿地の創出を図り，湿地環境と希少昆虫の保全活動を推進し，市民との協働による活動に結びついた。

２．主要な視点

本事例の視点として，高速道路建設に関連する各セクターの役割の中で行われる保全活動がセクター間でスムーズに受け渡されることが不可欠であり，各セクターが情報的に孤立しないことが重要であると考えた。ここでのセクターは，高速道路建設を行う事業主体（国）と専門家を中心とする保全対策協議会，地域を取り巻く広域および基礎自治体（県と市），ならびに地域住民である。

各セクターの連繋の局面を，１）環境情報の的確な把握と実現可能な保全対策の方針設定，２）環境配慮方針や環境情報の関連機関への発信，３）情報の持続的な共有と発信，４）セクター間の助言・支援など協働の試行，と捉え，この各段階での各セクターの関連性によって保全活動のネットワークの基盤を形成した。それは，1）保全活動体制の確立，2）保全施策の確立，3）保全活動の継続的サポート，の３点である。

３．高速道路建設の重要な価値

本事例での高速道路建設の重要な価値としては，１）学術的に確認されていない分布空白地での生息情報や昆虫分子系統学的情報の補完，２）生息環境の形成や飼育技術の知見蓄積と実践，３）地方公共団体との希少種情報の共有と施策展開，４）地域による希少昆虫の保全活動や環境保全への意識の高揚，等に繋がった事である。結果的に，地域住民が継続的に生態系サービスを維持・享受できる足掛かりとなった。

この事例では，希少昆虫の発見と共に，その保全活動を通じて小学校児童やその他の地域住民も高速道路建設による受益者として考えられ，道路利用者の利便性だけでない幅広い事業効果を得ることができたと考える。

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PJ–3

Distribution of terrestrial reptiles in river open space as the large scale ecological corridor running through Tokyo metropolis, Japan.

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Not only the biotope but also the protection of the immigration route of wild life is needed for conservation and restoration of the biodiversity in the urban area. That is, an ecology corridor where the target species can be moved and be distributed becomes important. Concretely, the wood land in the cliff line, roadside trees and the river etc. correspond to the ecological corridor. Especially, the confirmation of the function as the immigration route of those corridors is requested for small animals that do not have the flight ability. In the present study, an open space in river reservation where consecutives along the river was discussed. Comparatively large-scale rivers named Tama River, Arakawa River, and Edogawa River run through the Tokyo metropolitan area in Japan. These rivers are consecutive to the mountainous district, the hilly area, and the countryside located in the periphery of the metropolitan area. Therefore, the corridor functions to immigrate from the surrounding area to the urban area is expected. Then, we investigated distribution of terrestrial reptiles in the river open space as the case study of Tama River.

The investigation was conducted in the middle reaches part and the downstream part of Tama River got out from the mountainous district. We set up the investigation site composed of grassland and the woodland in the river open space at about 50 km between Ome City and the mouth of a river part by seven places. The visual encounter surveys were conducted two times about June and September in 2008 by field personnel/surveyors who surveyed the field and recorded the individual reptiles encountered on each investigation site (4 surveyors x 1 hour /site). As a result, the following 6 species of terrestrial reptiles were observed; *Takydromus tachydromoides*, *Plestiodon japonicas*, *Elaphe climacophora*, *Elaphe quadrivirgata*, *Amphiesma vibakari*, and *Rhabdophis tigrinus*. There were remarkably a lot of numbers of individuals of *Takydromus tachydromoides*, because it was counted by 111 individuals in total. Other species were below two individuals though added up all sites. It was clarified that *Takydromus tachydromoides* inhabited commonly in each site excluding the site in the mouth of a river. The site where the number of species was the richest was middle reaches part that approached the Tama hills. In contrast, there was poor fauna of reptiles on other sites. Because protected lowlands are the urban land use in each sites (Kuroda et al., 2009), these species maintain the population only in river open space. From the aspect of an ecological corridor, when the section where inhabitation of reptiles is difficult exists, i.e. sports turf and sports ground, it becomes the trouble of the immigration according to the river open space.

Because the investigation of reptiles is controlled by chance, the analysis of the relation between the habitat factor and distribution is difficult. *Takydromus tachydromoides* was the only species that was able to be analyzed as quantitative data in this study. However, the examination of the relation between lizards and the vegetation structure is still little (i.e. Tsuchikane & Osawa, 2008), and the accumulation of the research is requested.

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PJ–4

Research and development on revegetation for biodiversity conservation in Field Museum Karasawayama

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In Japan, the revegetation of artificial slopes created by construction work is often promoted to prevent soil erosion and conserve natural landscapes. Revegetation methods such as the erection of special nets and spraying plant growth bases are generally used to improve the hydric surface environment and fertility and thereby promote plant growth. The results of revegetation techniques on artificial slopes become evident only as plants mature. Therefore, to improve current methods it is necessary to investigate the outcomes achieved and verify the long-term effects of revegetation techniques. At the Tokyo University of Agriculture and Technology's Field Museum Karasawayama (FM Karasawayama), located in Tochigi Prefecture, examination of slope revegetation techniques has been ongoing since 1998, to spearhead development of revegetation techniques for biodiversity conservation. Various slope-revegetation methods have been implemented on slopes alongside forestry roads, and the plant communities sown are continuously investigated to verify the performance of each method. Conditions related to both the slope and the plant community are investigated to verify the relationship between environmental conditions and appropriate selection methods for actual construction sites. FM Karasawayama comprises 162 ha at an altitude of 90-290 m in the North Temperate Zone, with warm index of 104 and 1223 mm annual rainfall. The revegetation techniques for biodiversity conservation, principally the use of forest topsoil and the promotion of natural invasion, have been examined, in addition to commonly used rapid revegetation techniques such as spraying growth material and the use of revegetation mats with commercial seeds. Because the research site is on a large scale and encompasses a wide area, it is suitable for comparative studies of various revegetation methods in the same environment. Study sites that have been researched as continuously as this site are rare in Japan. Furthermore, the site's low levels of precipitation and ridge areas that dry out easily mean that any revegetation methods that prove successful in such a severe location will have strong potential for universal application. This presentation introduces the results of the research and development of revegetation techniques for biodiversity conservation at the FM Karasawayama artificial-slope revegetation research site.

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PJ–5

A biodiversity-oriented re-vegetation case of a factory in a cool temperate zone: the case of the Suntory Oku-Daisen Bunanomiri Natural Mineral Water Factory, Tottori Prefecture, Japan

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Biodiversity-oriented revegetation has been recommended since the 2000s to conserve biodiversity in Japan. However, its feasibility is not great, because appropriate planting materials are often unavailable. The authors planned a completely biodiversity-oriented revegetation for the Suntory Oku-Daisen Bunanomiri Natural Mineral Water Factory, located close to Daisen Oki National Park, Tottori Prefecture, southwest Japan. The factory is located at an elevation of about 750 m above sea level in a cool temperate zone. Japanese beech (*Fagus crenata*) natural forest and substitutional vegetation such as *Quercus -Fagus* mixed secondary forest and *Miscansas* secondary grassland exist near the factory. Therefore, *Quercus -Fagus* mixed secondary forest and *Miscansas* secondary grassland were targeted for the 44, 000 m^2 planting site. Black soil was moved from just next to the planting site and a 2 m depth planting bed was created. In total, 30 species (290 individuals) of tall trees and 10 species (59 individuals) of pollard trees were planted in autumn of 2007 and April of 2008. All were transplanted from the secondary forest very close to the factory. The majority of transplants were *Quercus serrata* and *Quercus crispula* . Before transplantation, in March to April 2007, all main roots were cut and balled to initiate sprouting of new rootlets. In addition, 4 species (809 individuals) of 3-4-year-old seedlings were planted in April 2008. These were cultivated from seeds collected in the Daisen area. The main species were *Quercus crispula*, *Fagus crenata* and *Aesculus turbinata*. Monitoring was initiated in 2008. When evaluated in autumn 2008, 95% of the tall trees, 90% of the pollard trees, and 75% of the seedlings were alive. Pioneer species such as *Rhus javanica* showed a lower survival rate, at 63%. Other evaluation factors, such as growth rate, visual vitality, and SPAD were also recorded. Among all species, *Quercus crispula* showed the best performance. Pollard methods showed good performance for *Quercus crispula*, but were not as effective lower for *Quercus serrata*.

PJ–6

海岸砂丘地での企業研究施設周りの修景技術－植生管理を中心として－
(Landscaping technique surroundings of the training facilities in the costal sand dune- focusing on the vegetation management)

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はじめに -

本稿は、鳥取県の海岸砂丘に位置し，自然植生が残存する保安林指定地で企業研修施設の建設周りで導入した植生管理による修景技術に関する実践事例の報告である。

我が国では、砂浜の自然植生は全国的にも減少を続け、植物群落レッドデータブックによれば保護の必要性が高い植生タイプに区分されるなど保全要請が高いエリアである。その中で計画地は比較的小規模な砂丘であり、植物の生育制限要因である飛砂や潮風の影響が強く、それらの強弱の変化が狭い範囲で起こっていると考えられることから、立地条件をきめ細かく把握して評価し、それに対応した土地利用と植生管理を実施していくことが求められた。

立地評価の方法と結果 -

立地条件については、地形・地質などの基盤条件と植生条件との対応関係（表－１）を、広域的な視点と計画地周辺の視点からとらえ、植物生育の制限要因の種類や制限要因の強さを評価した。これらの基礎調査と解析の結果を総合し、建物玄関周りのシンボル的景観や前庭の庭園的景観などと調和する修景イメージからの要請ならびに保安林の土地利用規制条件を重ねて、海岸砂丘植物の生育環境に適した植生管理方針を示した。

表- 1　主要な立地区分と植物指標

<table>
<tr><th>砂丘地形区分</th><th colspan="2">植生区分</th><th>希少種</th><th>主な外来種</th><th>保安林</th></tr>
<tr><td rowspan="2">第一砂丘列の海側斜面</td><td colspan="2">砂丘の無植生地</td><td>2種</td><td>－</td><td>指定外</td></tr>
<tr><td colspan="2">砂丘の多年草群落</td><td>2種</td><td>コマツヨイグサ</td><td rowspan="4">指定地</td></tr>
<tr><td>第一砂丘列の陸側斜面</td><td colspan="2">砂丘の低木群落</td><td>－</td><td>メマツヨイグサ</td></tr>
<tr><td>第一砂丘列の陸側平坦面</td><td rowspan="3">砂丘後背地の高木群落</td><td rowspan="2">砂丘後背地の低木・草本群落</td><td>－</td><td rowspan="2">コバンソウ
セイタカアワダチソウ
ニセアカシア
シンジュ</td></tr>
<tr><td rowspan="2">第二砂丘列の海側斜面</td><td>１種</td></tr>
<tr><td>造成地
建築物</td><td>－</td><td>－</td><td>解除地</td></tr>
</table>

土地利用ゾーニングと植栽区分 -

上記の解析評価を基に、「代償度 1)」の区分を行った。代償度は管理圧区分を示しており，動態的に捉えることができる。本計画では，代償度を 6 段階に区分（表－２）した。区分１のほとんど整備や管理の手間がかからない自然植生を保全する区域から区分６の初期の整備において造園樹木を新たに導入し，日常的・庭園的管理が必要となる区域まで、自然植生から建物周りの植栽地まで連続した植生景観が創出できた。

表- 2　代償度区分と初期整備内容

<table>
<tr><th colspan="2">代償度区分</th><th>初期の整備内容</th></tr>
<tr><td>1</td><td>低い</td><td>現存植生の保全と外来種の除去</td></tr>
<tr><td>2</td><td>↑</td><td>砂丘植生の再生</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2"></td><td>既存高木群落の保全・再生</td></tr>
<tr><td>既存草本群落の保全・再生</td></tr>
<tr><td>4</td><td></td><td>既存草本群落の保全及び在来種による修景補強植栽※</td></tr>
<tr><td>5</td><td>↓</td><td>前庭の修景植栽（既存植生一部保全）</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">高い</td><td>側面修景植栽</td></tr>
<tr><td>玄関側修景植栽</td></tr>
</table>

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PJ–7

集合住宅の屋上ビオトープの整備から維持管理の一連の取組み
(The approach to creation, maintenance of biotope at roof in apartment complex)

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ビオトープの管理は、生きものの生育・生息状況を経年的に把握し、環境の変化に対応した順応的管理を行うことが重要である。これらの管理を適切に実施していくには、事業者、設計者、管理者などの様々な職能を持つ関係者による協働が重要となり、竣工後は、空間理念を継承するために、管理者を中心とした協働体制の構築と、管理を最適に推進するツールが必要となる。

本報告は、神奈川県川崎市に位置する（独）都市再生機構が整備した賃貸の集合住宅であるアーベインビオ川崎の屋上ビオトープを対象に整備および竣工後に実施した動植物の調査結果の概要を報告し、その結果をもとに作成した管理マニュアルの運用状況の調査から、その役割および、課題を明らかにすることで、今後のマンションなどの居住環境に隣接した屋上ビオトープなどの管理に役立てることを目的としている。

対象地は、ＪＲ川崎駅西口に位置しており、周辺市街地は緑がきわめて少ない都心地区となっている。対象地の整備では、都市部の生態系の回復やエコアップを主眼に、屋上ビオトープとして整備を行い、2001 年に 1 号棟が竣工した。竣工後の約 3 年間は、ビオトープの整備後の状態を評価し、管理計画に反映することを目的に、植物、鳥類、昆虫類のモニタリング調査を行っている。

管理マニュアルは、空間理念、年間スケジュール、管理作業特記仕様書などから構成して、竣工後約 3 年間実施した生物および環境調査と並行して作成した。

管理マニュアルを作成した 2004 年 11 月以降の 2006 年と 2010 年に管理者へ現地において管理マニュアルの運用状況や課題などに関してヒアリングを行った。その結果、管理マニュアルは、管理の方向性を定める上での資料として継承されていた。一方、目標空間を伝達するためには、図や文言、部分的な写真だけではなく、目標空間を示す造園空間としての風景写真が必要であることが課題として明らかになった。風景写真を示すことにより、管理施工者が造園空間としての質感を理解し、草地の除草や樹木剪定の程度を判断することが可能になると考えられる。

また、管理マニュアルの作成・継承に加えて、管理方針の伝達・共有化にあたっては、設計者と管理者が現地で２～３時間程度の対話を行うことで、効率的に詳細な空間意図などを共有化することが可能になると考えられる。

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PJ–8

練馬区におけるエコロジカルネットワーク ～いきものつながり (Urban ecological network of Nerima City in Tokyo, Japan)

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近年、都市環境における生物多様性の機能維持・向上を図るため、エコロジカルネットワークの重要性が指摘されている。全国各地でその検討が行われているが、生物の生息空間の質に注目し、具体的な検討を行った事例は少ないのが現状である。そこで本発表では、東京都練馬区において、昆虫類や鳥類の生息空間としての機能を持つエコロジカルネットワークを検討した調査事例「いきものつながり」を紹介する。

練馬区は、東京都の北東部、埼玉県との境界に位置し、面積は約 4,800ha である。区内には、数～数十 ha 規模の都市公園が点在するほか、北西部を中心に屋敷林や農地が広がっている。また、国の天然記念物に指定されている三宝寺池沼沢植物群落などの池沼や石神井川・白子川という 2 本の都市河川が流れている。

本事例では、既存の土地被覆データを用いたが、生物の生息空間としての機能の違いを考慮し、樹林地と草地の 2 系列に分類した。そして、この 2 系列について、既存の土地被覆凡例の中から、樹林地については「果樹畑」「苗木畑」を除外した「樹木地」に注目した。同じく、草地については、「普通畑」「芝畑」を除外した「雑草地」に注目し、ポリゴンの規模や分布、相互関係などを抽出・考察した。

規模および分布傾向は、「樹木地」は、規模の大きな、いわゆる「コア」と位置づけられる部分が都市公園内に分布しているほか、「憩いの森」や屋敷林などの中～小規模のものが区内全域に分布していた。また、区内を東西に流れる石神井川沿いには「コア」と位置づけられた「樹木地」が点在し、樹林性鳥類にとってのコリドーとして機能していることが示唆された。一方、「雑草地」は、規模の大きな「コア」は、都市公園内の草地や野外運動場として分布するほかは、数千㎡前後の中～小規模のものは非常に少なく、分布も限定的であった。

以上の結果から、練馬区におけるエコロジカルネットワークを考える際には、特に草地に注目することが重要であると考えられた。しかも、そのためには、面積減少の緩和、相互の連結性の確保、新たな草地の創出など、総合的かつ早急な対策が必要と考えられた。また、現在、区内の生物生息状況についての調査が実施中であるが、東京区部の RDB 種が生息している草地も確認されており、保護・保全エリアの設定や管理手法の検討も望まれる。

なお、同様の傾向は、近隣自治体でも起こっていると予想される。今後は周辺自治体の傾向を把握するとともに、その現状を周知させ、東京区部全体、あるいはより広域エリアでの草地保全戦略の必要性なども検討されるべきと考えられる。

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PJ–9

Development of efficient planning systems as a communication tool for intensive forest management and consensus building in Miyoshi City, Hiroshima

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Introduction - Rural forests called "satoyama" are largely fragmented by private or community-based ownership, especially in western Japan. The heterogeneity or diversity of the rural forest landscape can be attributed to differences in property and management (Kamada & Nakagoshi, 1997). However, this structure is also an obstacle to building a consensus on the integral planning of forest management in a certain region. In particular, it is very difficult to design and plan forest roads through thinned disjointed artificial forests. Our ultimate goal is the development of efficient planning systems for intensive forest management that can be communicated to all concerned parties such as forestry cooperatives or administrative organizations as well as private owners or general inhabitants; for this, we used leading-edge geographic information system (GIS) technologies, including global positioning system (GPS), a laser-assisted survey airplane, and remote sensing images.

Study area and methods - Our study area was Miyoshi City, the provincial capital of northern Hiroshima Prefecture in western Japan. Miyoshi City has an area of 778 km^2 and a population of about 60,000. The Miyoshi district forestry cooperative, one of the most progressive with respect to intensive forest management, has suggested that union members consign the planning of forest roads and their maintenance in "low-cost forestry consolidations" of several hundred hectares that were highly promoted by the prefectural government. We used the Takataniyama consolidation as a test case, wherein we developed 2 types of reference layers in GIS to streamline the process of planning and operation: a hazard distribution map and a forest resource distribution map. To create these maps, the following technical methods were used: (1) evaluation of the relationships between the construction of forest roads and the topographic indices calculated using the 10-m mesh digital elevation model (DEM) provided by the Geographical Survey Institute and (2) extraction of distribution to forecast the cost-benefit balance by analyzing the satellite images as follows-(a) object-based classification of Japanese cypress (*Chamaecyparis obtusa*) forests by using medium resolution images (ALOS/AVNIR-2), (b) calculation of the tops of trees by using high resolution images (QuickBird/IKONOS), and (c) conversion of stand density to volume by surveying sample plots belonging to different stand ages.

Results and discussion - Slope classification and flow accumulation were adopted as the topographic indices for the hazard distribution maps, because they correlated with factors associated with the structure of roads and the bearing capacity of roadbeds. However, for the forest resource distribution maps, conversion only to mean diameter breast height (DBH) was possible; grid-based distribution maps with the same resolution and format (Shape file, GeoTIFF, etc.) as the hazard distribution maps were available. These maps could be loaded onto a GIS application and used for the planning of the case study area by the Miyoshi district forestry cooperative. We intend to compile our methods in a technical manual.

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PJ–10

An evaluation of threatened ecological land units and landscapes in Tokyo Prefecture

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Many years have passed since threatened species were registered as red-lists by the national and local governments in Japan. The lists have been used mostly in environmental assessments. However, the assessment procedure using the lists is being questioned in overemphasis of the species conservation and neglect of the landscape.

Since the assessment law was enforced, the estimation and the evaluation of the impacts on the ecosystem and the proposal of mitigation and conservation have been required for development planning. In practice, species considered important in the evaluation of ecosystems are listed, and conservation plans of populations are proposed based on the listed species while conservation of land units or landscape is not taken into account.

Meanwhile, in 2008 the fundamental low of biodiversity was enacted, and sustainable uses of the land for conservation of biodiversity are now required of citizens and the administrations. Considerations of land uses are very important for conservation of vulnerable ecosystems and hot spots of habitats of threatened species to keep the biodiversity. In such considerations, geographical information of the biodiversities of lands (landscapes) and evaluation of them in quality and quantity is crucial as the fundamentals for planning and conservation.

We studied the area of Tokyo prefecture, listed threatened ecological land units, and prepared geographical information, for further studies and conservations of land units and landscapes.

The ecological red-data map is prepared by the following procedures.

- The vegetation map of Tokyo Prefecture was used as the base map.
- The area is classified into three regions: mountain region, satoyama region, and urban region.
- For the evaluation of the land unit or landscape, three criterions are considered: origins, landscape patterns, and vulnerabilities.
- In the process of listing, the standards of evaluation are differed from region to region depending on the landscape characteristics. For example, small gardens with a restored nature are listed in the city region.
- The ecological red-data map is made by the overlay of the topographical map, the vegetation map, species distribution maps, etc. by GIS.

The map prepared in this procedure shows the important land units and landscapes, and will be the basic information of the SEA (Strategic Environmental Assessment) and mitigation banking system, in future.

PJ–11

里山指標種ハルリンドウの遺伝的多様性保全のための環境要因評価
(Evaluation of environmental factors for the conservation of genetic diversity in *Gentiana thunbergii*, the SATOYAMA indicator species)

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土岐川・庄内川流域圏の上流域の岐阜県東濃地方から中流域の愛知県東部丘陵地域の中山間地域は，本流域圏内だけでなく周伊勢湾地域の「生物多様性ホットスポット」となっている．しかし，近年の里山管理の低下や市街地化の拡大に伴い，生物多様性保全に向けた評価が必要な地域となっている．生物種の保全には，個体数及び遺伝的多様性保全が必須である．さらに，現在の分布状況や生育地環境の把握に加え，現在の生育地に分布拡大するまでの分布規定要因（過去の地質形成環境などの地史的要因）と定着，生育を左右するハビタット規定要因（気候・植生・ハビタット環境条件）を突き止める必要がある．本研究では本流域圏を含む周伊勢湾地域に生育する里山指標種ハルリンドウ（*Gentiana thunbergii*）の現在の分布とハビタットを規定した要因の解明，さらには本種の遺伝的に異なる系統間の分布を規定した要因についても各採集地点の表層地質に注目し，考察を行った．

周伊勢湾地域 67 箇所（内，本流域圏 32 箇所）の各地点から採集したハルリンドウの葉緑体 DNA 遺伝子間領域 *trn*S~*rps*4 の DNA 多型を用いてハプロタイプネットワークを構築した結果，東濃型ハプロタイプ（13 ハプロタイプ）及び周伊勢湾型ハプロタイプ（5 ハプロタイプ）の 2 つの異なるハプロタイプに大別できた．特に東濃型ハプロタイプは本流域圏内全域から多数（29 箇所）確認された．そこで，GIS を用い，まず本種の採集地点の表層地質を解析した結果，中期更新世（～15 万年前）以前の表層地質で採集地点の 93％が確認され，さらにハビタット近隣の表層地質を見ると，周伊勢湾型ハプロタイプは後期更新世（15 万年前～）以降の表層地質との境界付近にハビタットが限定していた．一方，東濃型ハプロタイプは中期更新世（～15 万年前）以前の表層地質に広く分布していた．本種は大陸系遺存種であることから，両ハプロタイプの周伊勢湾地域への移入期，分布拡大期は異なることが示唆された．また，両ハプロタイプの採集地点の気候条件を解析した結果，年間降水量 1400～1800mm に採集地点の 78％，また年間日照時間 1700～2100 時間に採集地点の 98％が一致した．しかし，植生条件を比較した結果，周伊勢湾型ハプロタイプは樹林（落葉広葉樹林 11％，針葉樹林 22％，植林地 56％）の林縁をハビタットとしているのに対し，東濃型ハプロタイプは落葉広葉樹林（29％）及び水田・畑地雑草群落（15％）など里地・里山を構成する生態系を主なハビタットとしていた．

以上より，土岐川・庄内川流域圏を含む周伊勢湾地域のハルリンドウ分布は中期更新世（～15 万年前）以前の表層地質上の里地・里山を構成する生態系であった．しかし，各ハプロタイプで分布域が異なったのは，この地域に移入してきた際の地史的要因によって規定されたためと推測された．

PJ–12

Genetic heterogeneity among fragmented populations of *Viola grypoceras* in urban areas

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Habitat fragmentation is a worldwide phenomenon and has many important ecological and genetic implications in plant populations. Isolated plant populations may generally experience changes in population size, as well as disturbances in pollinator service and seed dispersal. Over time, this can lead to decreased genetic variation and increased population differentiation. In the long term, decreased genetic variation may limit the evolutionary potential of plants to respond and adapt to changing environments. In fact, the consequences of habitat fragmentation for plants vary depending on the population density or reproductive abilities of the species.

To analyze the response of reproductive systems to habitat fragmentation, we studied the genetic structure of *Viola grypoceras* in Kyoto city, Central Japan. *V. grypoceras* is a common perennial herb that produces 2 types of flowers: showy chasmogamous flowers that are visited by insect pollinators and are potentially cross-pollinated and cleistogamous flowers that are like small buds and are self-pollinated.

In order to compare the within-population genetic diversity for the *V. grypoceras* populations located in fragmented habitats and those located in continuous habitats, we selected 7 populations in the isolated habitats of Kyoto city (urban populations) and 3 populations from the countryside (countryside populations). We developed 7 microsatellite markers for *V. grypoceras* and used them for genetic analysis.

Comparison between the 2 distinct population groups (countryside and urban populations) showed that the within-population genetic diversity of the countryside populations was significantly higher than that of the urban populations. However, some urban populations exhibited high genetic diversity equivalent to that of the countryside population, whereas some others had extremely low genetic diversity. Our results suggested that not only habitat fragmentation but also other factors influence the within-population genetic diversity of *V. grypoceras*. Availability of limiting light may possibly change resource allocation of this species to product less costly cleistogamous flowers, and self-pollination in cleistogamous flowers may cause decreased genetic variation of the population with low light intensity. This indicates that not only habitat fragmentation but also resource availability may cause genetic heterogeneity among *V. grypoceras* populations in urban areas.

PJ–13

東京都におけるチョウ類の衰退と再生
(On transition and restoration of butterflies in Tokyo, Japan)

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都市化にともない土地利用が進み、樹林地・草地・湿地・農地などが消えた。また、池沼は埋め立てられ、河川や水路には覆蓋された所もある。東京の区部と呼ばれる 23 区は、オフィス街を都心とした建物が密集する、広さ約 622ｋ㎡の市街地である。緑被率が 20%台の区がほとんどで、10%以下が 3 区ある。人口密度が高まると共に、著しく緑地が減少して、僅かに公園・河川敷・農地・宅地内の庭などに残されている。東京都内に「公園」と呼ばれる場所が約 4,000 カ所ある。この数の中には、全く無生物的な、単なる憩いの場所、あるいは子供の遊び場も含まれる。動物の生息が維持できる、まとまった植生が存在する公園は、国立（環境省）、都立、区立公園の一部に限られる。23 区内に都立公園（庭園を含む）は 48 カ所あり、これに準ずる規模の区立公園は少数である。東京都区部における公園を調査地としてチョウ類群集を調べ、都市化が影響したチョウ類の衰退を考察し、再生へのロードマップを検討した。

山地（多摩地区）をふくむ東京都から 127 種のチョウが記録されている。23 区内で比較的継続して調査されている世田谷区のチョウ類を見ると、随所に雑木林が見られた 1930 年代には 74 種、農地が減り宅地が増えた 1950 年代には 72 種、1960 年代前半には 64 種、1960 年代後半には 54 種、1970 年代前半に 49 種、1977 年～1980 年に 45 種と減少している（福田、1981）。2009 年には 41 種が見出された（立川、未発表）。この過程を見ると、年を経るに従い種が漸次減少しているが、日本の高度経済成長期の 60 年代に、大きな落差を見る事が出来る。東京オリンピック前後を境に交通網が整備され、施設や宅地が急増して、自然の破壊が進んだ時代であった。チョウ類の減少の傾向を見ると、幾らかのパターンに分ける事が出来る。①急減型：初期に姿を消した、ミヤマカラスアゲハ・ミヤマセセリ・コツバメなど。②漸減型：多くの種が含まれ、コチャバネセセリ・ミドリヒョウモン・ミズイロオナガシジミなど。③復活型：激減した後に少数で推移する、カラスアゲハ・ダイミョウセセリ・ツマキチョウなど。④停滞型：ある程度で個体数を維持する、モンシロチョウ・イチモンジセセリ・ヤマトシジミなど。⑤侵入型：新たに分布を果たした種で、一時的に個体数が多い、ナガサキアゲハ・アカホシゴマダラ・ツマグロヒョウモンなど。

都市における既存の公園の多くは、憩いと遊びを楽しむ場として、住民に公開された場所で、生物の生息に配慮されることは少ない。現在の東京 23 区内に、新たに質の高い緑地環境である自然生態公園（urban ecology park）を設置することは、かなりの困難をともなう。しかし、既存の公園内にビオトープ造成を実施して、順応管理をすることにより、里山環境を再生することは可能であろう。ビルの屋上緑化や住宅庭園によって緑を拡大し、河川、水路、緑道を環境整備して、緑のコリドーとして公園を結ぶ「命のネットワーク」をつくる。公園の孤島化を防ぐ仕組みをつくり、生物のために公園を砂漠のオアシスとするならば、都会に再び生物を呼び戻せるのではないか。

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PJ–14

多摩川中流域における猛禽類の分布と季節的消長
(The distribution and the seasonal changes of Raptors inhabiting the Tama River in Tokyo)

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近年の急激な都市化による緑地の減少や分断化により、都市域の生物多様性の低下が問題視されている。そのような中、河川は市街地化が進行する中にありながら、連続した緑地帯が確保された貴重な空間である。河川は都市域に生息する動植物のレフュージアとしての機能だけでなく、生態的回廊としての機能も併せ持つことから、都市域の生物多様性保全の役割を果たしていると言える。猛禽類は河川空間の食物連鎖の頂点に位置しているものの、これまで猛禽類のハビタットとして河川が注目されることは少なかった。そこで本研究では、多摩川中流域における猛禽類の生息について着目した。多摩川中流域は東京都と神奈川県の県境を流れ、関東山地から東京湾に注ぐ典型的な都市河川である。多摩川中流域に生息する猛禽類の視点から、都市の中の河川の意義とその役割について考察することを目的とした。

本研究ではまず、多摩川中流域(河口より 21 km～50 km) における猛禽類の分布と季節的消長を把握するため、2009 年 1 月から 12 月の各月に猛禽類の生息調査を行った。調査の結果、2 科 8 種 382 個体の猛禽類が確認され、トビが優占種となっていたほか、オオタカ、ノスリ、チョウゲンボウが次いで多く確認された。そのほかにも、確認個体数は少ないものの、ハヤブサやミサゴといった RDB に記載される種も確認されるなど、多摩川中流域が都市域における猛禽類の種多様性の維持に貢献していることが示唆された。月ごとの確認個体数は、本調査地で繁殖が確認されたトビを除き、概ねほとんどの種が繁殖期において減少した。多摩川中流域における猛禽類の季節的消長は、種ごとの繁殖ステージの移行に伴う行動圏の変化が一因であると思われる。分布を見ると、オオタカやノスリの確認がある地域に偏っていたほか、トビやチョウゲンボウは全域を通して確認されるなど、それぞれの種で異なる傾向を示していた。

次に多摩川中流域の環境を把握するとともに、猛禽類の分布に影響を与える環境要因を明らかにするため、調査地内の土地利用調査、利用人数調査と調査地周辺 2km 圏内の土地利用調査を行った。調査の結果、多摩川中流域は川幅平均 370m、最大 500m 前後の規模を有する大規模なコリドーであり、河川内の土地利用や植生構造は区域ごとに特徴が見られた。猛禽類の分布は、利用人数や周辺の市街地の面積といった“人の利用圧”に関わる環境に加え、高茎草地や低木林といった“河川内の餌資源量”に関わる環境に影響される傾向が見られた。しかし、環境の順応性が高いとされるチョウゲンボウやトビにそのような傾向は見られなかった。

本研究において、多摩川中流域は多様な猛禽類の生息環境として機能していることが明らかとなった。猛禽類はそれぞれの環境選好性に応じて異なった分布を示していたことから、多様な植生構造が存在する河川の特性が多種の猛禽類の生息を可能にしていると思われる。河川は都市域の生物多様性を保全する上での役割を担っているが、猛禽類にとっても重要な生息環境として機能していた。周囲の市街地化が進行する中、広域なハビタットを必要とする猛禽類にとって、多摩川の価値は今後さらに大きくなるものと考えられる。

PJ–15

京都大覚寺大沢池におけるソウギョのコントロールと風景の復元
（The population control of *Ctenopharyngodon idellus* in Daikaku-ji Temple Osawa-Pond and the restoration of the scenery）

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大覚寺は，京都の西部，嵯峨野に位置する名刹であり，その庭園には，周囲約 1 ㎞の大沢池がある．大沢池は日本に現存する最古の林泉のひとつで，奈良時代に北嵯峨地域の水田への水供給を目的として造成されたため池であり，平安時代には嵯峨天皇が離宮嵯峨院の造営にあたって，中国の洞庭湖を模して造られたものである．

1989 年（平成元年）ころ，大沢池に繁茂する水草の除去のため，外来種であるソウギョを多数放流したところ，数年を待たずに，水中の植物はほとんど摂食され，水草のない風景の池となった．同じころから，水質が悪化し，夏には腐敗臭がするようになり，魚が浮くようにもなった．1992 年以降は毎年アオコの発生が確認されるようになった．また，餌が枯渇したソウギョは，池の杭や水際に生育していたササや樹木の根を食害し，池の漏水や，植栽された樹木や草本類の生育不良を引き起こし，良好な庭園としての風景が失われていた．こうした状況から，寺関係者や周辺住民らの間には，水草が生育していたころの大沢池に復元したいという希望が高まっていた．

このプロジェクトは，ソウギョを放流する以前の大沢池の風景を復元することを目的として設置されたものである．プロジェクトでは，単に，原因となったソウギョをコントロールするのではなく，大沢池の利用や成り立ちといった社会環境の調査とともに，風景を復元するために必要な自然環境についての調査をおこなった．具体的には，ソウギョの生息状況調査，水質調査，樹木分布・活力度調査，土壌調査などであった．自然環境調査の結果をもとに，別途に実施されていた社会環境調査等から得られた復元目標をもとに，適切なソウギョの生息個体数コントロール，土壌改良，水質改善，風景復元のための水草植栽などについて検討を行い，必要な作業を行った．

こうした調査・作業の結果，現在では，ハスやスイレン・ヒシなどの水草が再び生育する風景が復元されている．

このプロジェクトは，現場の状況をみながら順応的に調査・対策・検証を行ったこと，対策の検討では，外来種の投入によって貧化した環境を，地域の生物多様性の復元を行うことによって風景を復元させたことが特徴である．

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PJ–16

流水による攪乱と河川植生の関係
(Effect of frequency of overwash on river vegetation)

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河川植生は流水や流砂による攪乱で持続している。ダム等による流況の平滑化、河道の複断面化等により攪乱を受けにくくなった立地が増え、河川植生に変化をもたらしている。変化は河川に特有の種の減少や外来種の進入等、河川植生にとって好ましくないものであることが多い。そのため、河川植生と攪乱の関係を定量的に把握し、河川植生を健全な状態に管理することが必要であるが、例えば、河川植生と流水による攪乱の関係は、“年に数回の冠水”など定性的に考察されることが多い。しかし、河川植生の質を水位や流量と関連づけて考察しなければ、河川管理に反映することが困難である。

国土交通省が主導する河川水辺の国勢調査などにより、おもに河川の下流域では連続した現存植生図が整備されていることが多い。また、河川管理のために等間隔に設定した横断線で断面の測量が行われていることが多い。これらの既存資料を活用すれば、あらたな現地調査を実施しなくても、定量的に河川植生と水位との関係を把握することができる資料になると考えた。

兵庫県の瀬戸内海に流入する二級水系である市川における、ひょうごの川・自然環境調査で作成された現存植生図（2004 年）と河川管理者が実施した横断測量の成果（2005 年）を用いた。横断測量は 100 m 間隔で設定された 102 測線のデータを用い、各測点（7089 点）の測量時の水面からの比高を算出した。GIS 上で測点データを公共座標系に投影し、各測点の群落を現存植生図から抽出した。また、測量時の水位の位置づけを把握するために、調査区間内にある水位観測所の流量観測データを収集した。測量時（2005 年 7 月）の平均水位と 2000 年から 2005 年の年水位年表から水面比高と流況の関係を推定した。

群落ごとに平均水面比高を算出し昇順に並べた。その順序は群落の分布特性とよく一致していた。さらに、流量観測データから推定した水位を重ねることで、定量的な冠水頻度と群落の関係が推測できた。この成果は、河川整備において目標植生に誘導するための断面形状の設計や、河川で蔓延して問題となる外来種優占群落の繁茂を制御するための地盤高の設計などで活用できると考えられる。

今後、同様の知見を他の河川でも蓄積していけば、定量的な河川植生と攪乱の関係や河川による差異が明らかになり、河川植生に配慮した河川管理が進展することが期待される。

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「海辺の緑地マニュアル」に基づく産官学の技術者による自然再生への提案
(Nature restoration and revegetation methods around the coastal zone or urban harbor district)

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自然再生推進法（2002 年）、環境教育推進法（2003 年）、景観法（平成 2004 年）等、自然再生に関心が高まり、海辺の緑地空間においても、陸域や人工構造物に加え、陸域と海域を連続した空間ととらえた「移行帯」の概念が重要になってきた。そのため、海浜、干潟、藻場など沿岸域の自然再生に実績のあるマリコン（海洋や港湾の建設を得意とする建設会社）と陸域の緑化の技術を持つ造園会社および緑地整備の事業計画や設計に携わるコンサルタント会社の技術者が「海辺の緑地フォーラム」を構成し、海辺の緑地整備について現状、計画時の配慮事項、陸域・人工構造物・移行帯の緑化技術を取りまとめた。このフォーラムでは、「事例調査部会」「計画部会」「技術部会」をつくって検討作業を進めた。事例調査部会は、港湾の緑地整備と保全に関し、自然環境の再生、地域文化の重視、都市再生等の視点から、最近の実施事例、関連する事例を収集し整理した。計画部会は、港湾における自然環境の重視や緑地の役割の多様化等、時代の要請の変化に対応するため、海辺の緑地に求められる機能や計画推進のための手法等を取りまとめた。技術部会は、港湾空間における植栽技術や、移行帯を中心とした自然再生技術を体系的にとりまとめた。これらを、学識経験者と港湾行政関係者から構成される「マニュアル検討会」で議論し、「海辺の緑地マニュアル」として取りまとめた。その特徴は次の 3 点に集約できる。① 計画、設計、施工、維持管理の一連の事業段階を網羅している。② 良好な先行事例を収録した。③ 港湾における陸域や人工構造物の緑化に加え、自然再生の視点から「移行帯の緑化」について記述した。

海辺の自然再生では、利用面でも大きな役割を期待されることが多く、多様な意見を調和・共存させるべく住民参加・合意形成を図る必要がある。この緑地整備事業の円滑な進捗のためにワークショップや協議会等の手法が採用される。また移行帯の緑化には、潮風、波浪、地盤高などの生育環境と、植物の生育の関係を定量的に把握する必要があり、研究課題も残されている。海辺の自然再生のためには、自然植生の生育環境を参考としたり、整備後にも順応的管理を取り入れながら海辺の緑地についての知見を増やすことが求められる。これらの成果は、(財)港湾空間高度化環境研究センター（2009）海辺の緑地マニュアル,「海辺の緑地フォーラム」報告書として取りまとめられた。

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強度間伐地で伐り残した樹木が鳥類による種子散布に及ぼす影響
(Influence of remained trees at strong-thinned Satoyama on seed dispersal by birds)

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京都市街地北郊に位置する京都大学フィールド科学教育研究センター里域フィールド上賀茂試験地の二次林の斜面上部(0.09 ha)，中部(0.06 ha)，下部(0.06 ha)において強度間伐を行い，間伐前後における鳥類の脱糞量を調査した。強度間伐を行った二次林は，かつて高層木をアカマツが優先する森林であったが，マツ枯れ被害によって大半のアカマツが失われ，亜高木層を占めていたヒノキが高木層を占めつつある。

鳥類の脱糞量の調査は，各間伐区とその周辺に設置したシードトラップに付着している鳥糞を，ほぼ1週間おきに採取することにより行った。調査期間は，間伐前の1999年6月から1999年12月までの7ヵ月間と，間伐後の2000年4月から2001年4月までの13ヵ月間である。間伐前後を通じて採取した鳥糞の合計は96糞，乾重量は2.2227gであった。

採取した鳥糞の個数および乾重量から鳥糞量と種子供給の関係を考察した。その結果，間伐前では広葉樹の割合が多い斜面下部で脱糞数が多く，しかもその糞中に種子が含まれている可能性が高いことが推察された。間伐後には，脱糞数は間伐前と同じ傾向であったが，平均乾重量は斜面上部，中部においても増加する傾向があり，いずれの場所でも糞中に種子が含まれている可能性が高いと考えられた。

間伐後の鳥糞の散布形態はランダムでなく林縁部や伐り残した樹木の直下に集中し，開空地で採取された鳥糞はわずかであった。このことは，伐採の度合いにより，鳥類による種子供給が大きく変化することを示唆している。すなわち，皆伐を行えば，鳥類による種子供給は林縁部のみとなるが，適度に残存木を配置した間伐を行うと，鳥散布種子は林縁部と残存木周辺にパッチ状に供給される。したがって，里山再生のための管理伐採において，鳥類による種子散布を期待する場合には，適度に樹木を伐り残すことが有効であると考えられる。

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万博記念公園の森づくり－生物多様性豊かな森を目指して (The Expo'70 Commemorative Park Forest Regeneration Project-aiming at rich biodiversity of forest)

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万国博覧会記念公園は、1970 年に大阪で開催された日本万国博覧会の跡地を再造成されてつくられた文化施設、運動施設等を併せ持つ面積約 260 ha の公園である。

自然文化園は、その中心に位置し、自然再生の核として計画されたもので、基本計画には「今日、緑に求められているのは単に慰めでなく、人間の生活環境を維持することである。人間の活動と自然の緑の環境には互いに調和した共存関係が必要であり、われわれの活動が瀕死に陥れられた自然生態のいくつかを人間の知恵と技術によって復活させ維持する方法が緊急に追求されるべきである。」と書かれており、今ほど環境問題が議論されていなかった時代にあってこうした考えに沿ってつくられた自然文化園は「自然と人間の共生」を念頭に置いて整備された先駆的な公園といえる。

森の構成は、外側から内側へ植栽密度別に「密生林」「疎生林」「散開林」と 3 つのタイプの森が計画され、植栽は園路沿いのみ成木を、その内側には多くの種の苗木を密植させ、ある程度自然淘汰させるエコロジー緑化の手法を用いて緑化された。そして 2000 年の自立した森（内外の都市化に抗しても生き生きとしている森であり、また多様な動植物と共存し安定している森）を完成させることを目指した。

しかし、1990 年代後半に、森の状態を調査したところ、緑の量としては目標を達成したように思われたが、森の質としては、多くの問題を抱えていることが分かった。

例えば①植栽時は多くの種の苗木を植栽したが、アラカシ等のある一定の種のみ残ってしまい生物多様性の乏しい森となってしまっていること。②樹林に低木層がなく、階層構造がない樹林となってしまっていること。③ある程度の自然淘汰を期待して多くの苗木を植栽したが、意外に枯れるものが少なくもやし林となっていること。など数多くの問題が明らかとなった。

これらの問題を解決するため、当機構では 2000 年より京都大学や大阪府立大学等と共同で、生物多様性に富んだ森を目指し、間伐を行い森にギャップをつくる等のさまざまな取り組みを行ない、モニタリング調査を行なっている。

本発表では、これらの取り組みおよび調査の途中経過について紹介する。

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万博記念公園におけるオオタカの繁殖と生息環境保全について
(Northern Goshawks in Expo'70 Commemorative Park for breeding and the living environmental preservation)

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人工的に植栽され約 40 年を経た万博記念公園の森に、環境省のレッドリストで準絶滅危惧種に指定されているオオタカが 2007 年から 3 年連続で繁殖に成功している。里山生態系の頂点であるオオタカが人の手でつくられた公園環境で繁殖したことは、オオタカの生態を理解し、また公園の森の現状を評価する上で画期的な事例である。そのため繁殖が確認された 3 年間、吹田野鳥の会の協力を得てその繁殖状況を調査した。

調査は、オオタカの営巣の兆候が確認されてから巣立ちまでほぼ毎日行い、繁殖時期、営巣環境、巣立ち雛数、餌内容、親鳥及び巣立ち雛の行動圏を調べた。その結果、オオタカは公園内外でスズメなどの小鳥類からカラス類、ハト類を多く採餌し、2007 年は 1 羽、2008 年は 2 羽、2009 年は 1 羽の雛が巣立っており、公園内に多数生息しているカラスを狩る能力があれば、餌条件は良好であることが示唆された。

オオタカが繁殖に至った背景として、都市化による周囲の営巣環境の減少と、公園の植栽樹木の生長が挙げられる。過去 20 年の公園での探鳥会の結果から、植栽当初は多く見られたキジやコジュケイ、モズなどの草原性鳥類が樹林の成長にともない生息環境を失ったため減少し、一方でヤマガラやアトリなどの森林性鳥類が増加したことがわかっており、オオタカの繁殖もそうした変化の延長線上にあると考えられる。

今後の課題として、オオタカが今後も継続して繁殖できるような生息環境の保全と、減少した草原性鳥類も含めた様々な種が生息できる多様な環境の創出がある。また、オオタカ繁殖の際の懸念事項としては、雛鳥の密猟やカメラマンの過度の撮影行為による営巣放棄といった人為的影響が挙げられる。

本報告では、3 年間のオオタカの繁殖状況、植栽当初から現在までに観察された野鳥種の変遷、オオタカの生息環境保全および様々な野鳥種のための生息環境の創出に向けた今後の取り組みについて紹介する。

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中部大学「あいち森と緑づくりモデル事業地」概要と活用法
(Outline and use of the experimental urban SATOYAMA forest at Chubu University, Aichi Prefecture, Japan)

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かつて愛知県は、日本の三大はげ山地域に数えられるほど、森林がなくなった時期があった。特に尾張藩のお膝元ということからの農業生産の拡大や焼き物が盛んだったため、森林から繰り返し薪や枝葉・下草が採取され、明治期にはほとんどの森林が消失した。そのため、現在「里山林」と呼ばれるような尾張地域の都市近郊林は、明治以降のはげ山復旧工事によって回復した森林である。

愛知県では、先人の努力によって回復した森や緑を県民共有の財産として将来にわたって守り育てていくため、平成 21 年 4 月から「あいち森と緑づくり税」を導入し、「人工林」、「里山林」、「都市の緑」を整備・保全するための「あいち森と緑づくり事業」を開始した。これに先立ち平成 20 年度より、本事業での森林整備の進め方及び活用法を検討するために「あいち森と緑づくりモデル事業」を、中部大学キャンパス（愛知県春日井市松本町）で実施している。

中部大学モデル事業地は、開学（昭和 37 年 12 月）以降も校舎建設に不向きな傾斜地であったため放置され続け、現在はヒサカキ群落、コナラ群落、アカマツ群落の二次林へと遷移し「春日井市の典型的な代償植生」となっている。里山林を、立地している周囲の社会システムと結びつけ定義づけると、農林業的自然との共生の場である「中山間型里山林」と、開発等によって市街地、都市近郊でパッチ状に孤立した「市街地型里山林」の 2 種類がある。これらの「里山林の健全性評価、管理、活用法」は、立地条件、使用目的、コミュニティの潜在能力に応じて異なるはずである。特に、本学モデル事業地のような「市街地型里山林」の場合は「農業復興」を称えても、管理・活用法を立案、推進するための潜在能力も期待できない。そこで、本学モデル事業地では、地域コミュニティーで放置されている「市街地型里山林」を既存ストックと捉え、「環境学習」、「教育研究」の場として機能させることを目標とした。そのための持続可能な管理、活用法のモデルケースとするために、以下の 2 つのモデル事業を展開している。

<u>持続可能な管理活用のためのシナリオ</u>：生物多様性を念頭においた「市街地型里山林」の管理、活用法のための「モニタリング項目の選定及びその評価」を行い、持続可能な管理活用のためのシナリオを作製する。

<u>キャンパス・エコ・ミュージアム</u>：思い切った選択的伐採をすることによって「伐採林見本園」としての機能を持たせ、本事業伐採計画立案の見本、ESD（持続可能な発展のための教育）プログラムとして活用していく。

以上、モデル事業地の概要と生態学的見地からのモニタリング項目選定とその評価結果（間伐木萌芽再生能、林床植生回復状況及び林内微気象等）について報告する。

PJ–22

赤沢自然休養林における利用者の散策路の選択とその評価に関する研究
(The choice and evaluation of forest path by visitor: a case study in Akasawa Restforest Base)

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近年、レクリエーション活動への期待が高まり、森林が持つ保健休養の機能が重視されてきている。心身の健康を維持するために、ハイキングや森林浴などの森林での散策は盛んになってきているといえる。既往研究において、散策路の形態とその評価との関係性の研究が進められているが、実際に来訪者がリアルタイムで、どのような散策路の選択を行い、評価をしたかに関しては調査・分析が少ない。そこで、本研究では、複数の散策路を有する森林公園を対象に、利用者は森林公園での散策経路とその評価を分析した。アンケートの結果、利用者の利用は主にに渓流沿いで散策し短時間滞在するⅠ型と、多くのコースを利用し長時間滞在するⅢ型に利用が大別された。また、実態調査から、利用者は散策という連続的な過程において、前半に良い評価が多い。また、起伏変化が多様なコースでは、頂上において良い評価をする傾向が見られた。そこで、散策路の途中にある見所の配置や、利用者の体験順序を考えた上で、散策路は空間の組み合わせを活用することが重要だといえる。

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PJ–23

里山における竹林拡大の影響とその抑制に関する研究
-隣接するスギ人工林とモウソウチク林における下層植生と表土流出量の比較
(A study about the influence and management of bamboo expansion in satoyama -difference of vegetation and soil loss between bamboo forest and Japanease cedar forest)

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はじめに - 近年西日本の里山地域において,竹林自体の管理放棄および竹林隣接地の土地利用放棄といった二つの側面から竹林が分布を広げている[1)]. 竹林の拡大は森林の公益的機能に影響を与えると推察されているにもかかわらず,実態は十分に把握できていない.そこで,本研究では隣接するスギ人工林とモウソウチク林において林床植生の調査を行うとともに,侵食土砂量および流亡リター量を測定し,モウソウチクのスギ人工林への侵入が表面侵食に及ぼす影響についての評価を行った.

調査方法および解析方法 - 調査地の竹林内,木竹混交林内,スギ人工林内において特徴的な林分を選定し,Braun－Blanquet の植生調査を実施した.解析方法はそれぞれの方形区で Shanon-Wiener の多様度指数を算出した.さらに,相対光量子密度、含水比、傾斜角を説明変数,多様度指数,種数,植被率を目的変数として,それぞれ重回帰分析を実施した.さらに,各方形区内に木製枠を埋設し,土砂受け取り部に流入した土砂とリターを回収し,乾燥重量を測定した.さらに,木製枠内の地表の傾斜角,植被率,裸地率(木製枠内の面積に対するリターと葉が覆っていない面積の割合)の 3 変数を説明変数として重回帰分析を行い,林分ごとの侵食土砂量,流亡リター量の予測式を算出した.

結果と考察 - 多様度指数はスギ林が他の林分よりも高く(10.03±2.02),次いで混交林(7.59±0.78),モウソウチク林(4.08±0.83)の順となった.また重回帰分析の結果,いずれを目的変数とした場合も含水比の標準化係数が最も高い値を示した.以上のことより,スギ人工林へのモウソウチクの侵入は多様度,植被率,種数を低下させており,その主な原因は含水比の低下によるものであると推察された.

侵食土砂量は混交林で 0.16～0.32(t/ha)となったのに対し,モウソウチク林は 0.019～0.067(t/ha),スギ林は 0.038～0.077(t/ha)であり,混交林において他の林分を大きく上回った.また重回帰分析の結果,標準化係数は裸地率と高木層の胸高断面積合計が高い値を示した.以上より,混交林においてはモウソウチク林に比べ裸地率,高木層の胸高断面積合計が増加するため,侵食土砂量が増加することが推察された.

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PJ–24

放置竹林における種の多様性
(Diversity of species in a neglected bamboo forest)

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緒言　静岡市街地の中心部に位置する谷津山は、面積が約 91ha で標高は 108m の孤立した丘陵である。ここでは、1985 年頃までチャやミカンなどが栽培されてきたが、就農者の高齢化や減少などによって人手が入らなくなり、現在では管理されない竹林（放置竹林）が広がっている。このような状況は静岡県ばかりでなく西日本でも同様である。放置竹林内は薄暗く、林床にはわずかな種の植物しか生育していない。このまま竹林を放置しておけば種の多様性の減少化が懸念される。私たちは市民で構成する団体により、放置竹林の谷津山を植物相の豊かな丘陵地にするための活動を行なっているが、今後の活動に参考となる放置竹林内の植生や実態を調査した資料は少ない。
そこで、市街地に孤立した丘陵を再生する際の手法や活動方法を考えるための基礎資料を得る目的で、タケを伐採した跡地において継続した植生調査と、放置竹林内の環境、土壌栄養、埋土種子数などを調査したので報告する。

材料及び方法　2006 年に放置竹林内のコドラート（2 m×2 m）５箇所において植生調査を開始した。その後、タケを伐採した同地において同様の方法で 2009 年まで植生調査を継続し、積算優占度および情報量指数（Shannon-Wiener）を求めた。また、2008 年には放置竹林内の光強度（光合成光量子束密度）、気温、地温、土壌の EC、pH、硝酸態窒素濃度を調査し、さらに同年、放置竹林内とタケの伐採地における埋土種子数を、それぞれ 10 箇所ずつのコドラート（0.3 m×0.3 m）において調査した。

結果と考察　出現種数は、2006 年の放置竹林内では 15 種であったが、タケを伐採した同地での 2007 年には 45 種に増加し、その後は 2008 年に 44 種、2009 年に 41 種とやや減少傾向を示した。種の多様性について、各調査年で情報量指数を求めたところ、2006 年は 0.54 と低い値であったが、その後高まり 2007 年は 3.23、2008 年は 3.91、2009 年は 3.49 となった。各調査年で出現種の積算優占度を求め優占種の変化をみると、タケ伐採後の優占種は１年草のベニバナボロギクで、その後は先駆的木本植物のアカメガシワ、籐本植物のクズへと移行した。なお、モウソウチクは伐採 1 年後に急激に低下したが、２年後から増加し３年後にはアカメガシワをしのぐ値を示した。
竹林内の気温、地温および光強度は、竹林外と比べて低く、夏季でさえ暗い環境条件であった。竹林内の土壌中の硝酸態窒素濃度および EC 値は、竹林外の土壌と比べて低かった。埋土種子数は、竹林内で 222 個、竹林外では 316 個確認できた。竹林内の埋土種子は約 91%が鳥類で、竹林外では約 30%が鳥類、約 26%が風散布、約 44%が重力・流水によることが種子の種類から判別された。
以上より、市街地の丘陵を植物相豊かな環境とするには竹林整備が急務であり、治山治水の面でも多様な植物相である必要性を感じた。また、本研究では放置竹林内の各種調査資料を始め、タケは伐採２年後には繁殖し始めること、タケ伐採後には先駆的木本植物が発育してくることなど多くの有用資料が得られたことで、今後はこうした資料を活動に活かすと共に、他団体にも周知し各々の活動の発展に寄与したい。

PJ–25

Wild bamboo forest mapping and the growth estimation in "SATOYAMA" using satellite image

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Wild bamboo forests have been expanded into "SATOYAMA" coppice forests in Japan. The uncontrolled expansion of bamboo forests is concerned of its impact to ecology in "SATOYAMA" coppice forests and increased risks of landslide. In order to prevent the uncontrolled expansion, it is not sufficient to investigate present distributions of bamboo forests. The past distribution and future potential distribution are essential. Previous research was using topographical maps and aerial photographs for monitoring of uncontrolled expansion of bamboo forests. However, uncontrolled expansion of bamboo forests is broad-based problem, satellite image is expected on tools for efficient monitoring of bamboo forests. This study was carried out for the purpose of developing a monitoring method to prevent the uncontrolled expansion of bamboo forests using satellite images.

Bamboo forests have distinctive spectral pattern from spring to summer. In this study, using ASTER surface reflectance (level 2B05 product) observed on 1st June 2002 was applied to investigate spectral property of bamboo forests, and extract of existing bamboo forests, and Landsat/TM observed on 15th May 1987 was extract of past bamboo forests. DEM (Digital Elevation Model) developed by the airborne laser scanner is used for factor analysis of land condition. Surface reflectances of ASTER VNIR to SWIR in these training samples were measured so as to investigate spectral property of bamboo forests. Based on this spectral property, Maximum Likelihood Classifier and Decision Tree Classifier were evaluated. The factor analysis with the application of quantification method II was conducted for the land condition factor which specifies the bamboo forests expansion as slope direction, slope angle, the distance from valley, and surrounding land use.

The results showed that a Decision Tree Classifier, whose thresholds were determined using ASTER band3 (near infrared) and band4 (short wavelength infrared), could estimate the bamboo forests at the accuracy of over 70%, provided that the bamboo forest area is over 4,500 square meters. It was possible to estimate the expansion between present and past at the accuracy of over 60%. The land condition factor of the bamboo forests expansion part was analyzed with Quantification method II. The result suggested that distinction of the bamboo forests expansion region and non-expanding region is possible by the combination of land use, the distance from valley, slope direction, and slope angle. Ultimately, a prediction map of bamboo forest expansion was successfully generated based on the land conditions desirable for the expansion.

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PJ–26

Small scale landscape of bamboos created by their specific utilization: a case study in Yungui Highlands

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It is a major interest how green landscapes are organized with reflection of natural resources in an area under human activities. For illustration of the pattern of bamboo landscape in relation to the specific utilization of bamboos by the dwellers in surrounded communities, specific arrangements in an array of bamboos were surveyed in four villages Yunnan and Guizhou province, China, in 2008－2009. One to seven bamboo forests per village standing at riverside and field hedges were selected by utilizing Quick Bird satellite photos, and arrangement of bamboo species was examined by run test. There were 8 bamboo species: *Bambusa lapidea*, *Dendrocalamus yunnanicus*, *Bambusa vulgaris*, *Bambusa tulda*, *Dendrocalamus hamiltonii* etc. in a total of 663 clumps at 18 arrays. Of them 7 species were clump and tropical bamboos especially in south-western part of Yunnan, the other, one *Pleioblastus* species, was the diffuse and temperate bamboo in Guangxi and Guizhou. *B. lapidea* was commonly found in the area examined. Specific arrangement was mostly random in an array of bamboo plants, except for a few riverside populations. Specific composition in an array was for edible, farming tools, fence, building timber, miscellaneous daily goods in the randomly arranged populations in the dwelling sites nearby waterlines, and bamboo arrays for public enterprise for riverside protection were not randomly distributed. A close similar bamboo landscapes in dwelling villages in the area investigated although specific composition among villages was different. Biodiversity of bamboo species is well illustrated in the conventional dwelling sites, but in recently created green which was artificially selected. We will discuss the cultural aspect on the pattern of bamboo landscape in detail.

PJ–27

都市緑地のエコロジカルネットワーク評価による社寺林の保全管理に関する研究-北九州市の都市緑地における鳥類の出現状況
(Management of the temple and shrine forests by evaluating ecological network-appearance of birds at urban green spaces in Kitakyushu city)

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はじめに – 近年の都市化に伴い、農地、林地といった農林業的土地利用から宅地、工場など都市的土地利用へと転換していった結果、その地域の緑地に存在した生物の生息空間の孤立化・分断化を引き起こし、生物多様性の低下などの問題の原因となっている。一方近年では、如何にして新たな緑を生み出すかに注目が集まっているが、新規に緑地を創出する際には新たな土地の確保の必要性など、大きな問題が伴う。そこで、生物多様性の回復・保全対策として、現存する都市緑地同士をネットワークで繋ぐという方法があり、その候補として社寺林が挙げられる。社寺林は自然の原形を残す都市緑地であるが、本来、宗教的空間としての性質が強くこれまで緑地空間として評価されていなかったが、社寺林を都市緑地として評価することにより、エコロジカルネットワークの拠点として都市緑地の効率的な保全が可能になると考えられる。さらに、社寺林の植生や生物の生息地としての生態学的評価に加えて、社寺林の分布特性や面積の把握を広域スケールで行うことにより、都市緑地保全に対する総合かつ計画的な施策の際、重要になると考えられる[1)]。そこで本研究では、社寺林及び都市公園における鳥類の出現状況を明らかにするとともに、それに影響を及ぼす要因についての検討を行うことで、鳥類に着目した都市緑地の生態学的評価を行い都市緑地における社寺林の位置付けを検討する事を目的とした。

対象地及び解析方法 – 対象地は北九州市中央部をケーススタディエリアとして設定した。そのエリア内に含まれる社寺林（13 社）及び都市公園（30 ヶ所） の都市緑地を選定し、鳥類の越冬期である 2010 年 2 月から 4 月の間にそれぞれの都市緑地において鳥類出現調査を 2 回ずつ行った。その際、対象地点を中心とした半径 25m 以内に出現する鳥類を記録するポイントセンサス法にて行った。一方、Arc GIS8.3 を用いて敷地内の植被率及び都市緑地周辺 250 m 以内に含まれる樹林地を把握し、加えて都市緑地内における植生調査を実施し、種数及び樹高の多様度を算出した。次に、各都市緑地で記録された鳥類出現調査結果に基き、多変量解析である TWINSPAN を用いて鳥類の種組成による都市緑地の分類を行った。次に、タイプに分類された都市緑地と関係ある要因を明らかにするために、都市緑地周辺 250m 以内に含まれる樹林地の割合、植被率、樹高の多様度、種数においてタイプ間でのそれぞれの分布の違い及び、鳥類の種組成と関連の強い要因について検討を行った。

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リモートセンシングデータを用いた都市近郊における里地の連続性の評価
(Network between paddy and forest in Stoyama Landscape analysing by remote sensing data)

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モンスーン・アジアに位置し，温暖で湿潤な気候の日本では，古くから水田稲作が人々の生活を支えてきた。水田は，その周辺に広がる畑地，河川，二次林，草地などと里地を形成し，生物のハビタットとして重要な役割を果たしてきた。絶滅や絶滅の危機に直面しているトキやコウノトリも里地をハビタットとする生物であり，里地の保全・再生・創出に対して関心が高まっている。しかし，近年，市街地の拡大などにより，里地の土地利用や地形の改変が進み，生物のハビタットの消失が起きているのも事実である。失われたハビタットをできるかぎり回復させるためには，里地の各属性を個々に検討するだけでなく，ハビタットとして確保された空間を連結して生態的な機能を高め，地域の生物多様性の向上を図ろうとするエコロジカルネットワークの観点が大変重要である。

そこで，本研究では，ハビタットとして重要な役割を果たす里地属性の連続性について，「水みち」を軸にネットワークの現況を明らかにし，その再生について考察することを目的とした。

解析対象地は名古屋市近郊に位置し，里地景観が残る愛知県長久手町およびその周辺とした。解析の中心となる長久手町は，面積約 2000ha で，その約 20%が森林である。長久手町では 21 世紀に向けた第４次総合計画において，「魅力向上・創造のまちづくり」の実現をするための主要プロジェクトの１つとして，「長久手田園バレー構想」に取り組んでいる。「長久手田園バレー構想」とは，市街化された都市と自然豊かな田園の両面をあわせもつ長久手町の中でも，水系が豊かで農村としての原風景を残している上郷地区を，農的な営み，農的な暮らしを維持・保全しながら，住民が交流し，憩い，ふれあい，楽しめる場として様々に活用し，「農業」「自然」「緑」「人」が「共生」する田園地域を実現しようとするものである。

解析には，ALOS 画像，航空写真，数値地図 50m メッシュ（標高）を使用した。オブジェクトベースの画像解析によって ALOS 画像と航空写真から土地被覆属性を分類した。また，数値地図から，仮想の流水線を算出し，「水みち」として抽出した。これらのデータを GIS のよって重ね合わせ，集水域ごとに水みちを軸とした里地属性の連続性を分析した。

解析の結果，解析対象地では，市街地のスプロール化が進み，森林が分断化されていることがわかった。また，水みちの流水方向に対する森林や田畑からなる里地の連続性を評価した結果，多くの個所でその連続性が失われていることがわかった。

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“ケヤキだいすき！ 探けん隊”： 地域自然と和合する都市の構築をめざしたESDプログラムの創出
(“We love *keyaki*-tree!”-expedition: an ESD program towards the nature-harmonizing urban life and environment)

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わが国では、総人口の 66％を上回る人々が、人口密度 4000 人/km^2 以上で、建造物が連続する都市を生活の場としている（2005 年時点；総務省統計局、2006）。地球上でも、人類の半数以上が都市に居住しているとされる（古田、2009）。高度な社会・経済機能が重層的に集積する現代都市は、資源やエネルギーが大量に移入・消費・廃棄され、植被や野生動植物の量・種類が極めて貧弱な特異な生態系でもある。それゆえ、「持続可能な未来」の実現をめざす環境教育（ESD）を推進する上で、都市住民をターゲットとすることの意義・効果は大きい。

本研究では、都市の緑地を代表する「街路や公園、学校、社寺などに植栽されてきた郷土樹種」に着目して、学習者自らが(1)それらの樹木が撫育・活用されてきた歴史的経過や生態的意義を探求し、(2)地域の自然と和合する生活様式・環境の重要性に気づき、改善に取り組み始めるような ESD プログラムの創出を試みた。いま ESD にとって何より大切なことは、学習者に対して、良質の体験的な学習を通じて達成感と感動を与え、身近な環境と真摯に向き合う「きっかけ」を提供することであろう。

今回事例としてとりあげた地域は仙台都市圏（市街地と近郊の里山）で、対象樹木はケヤキである。およそ 400 年前の藩政時代に端を発する杜の都・仙台には、屋敷林や社寺林、里山二次林にケヤキ大木が散在し、また街路や公園には数多くの若木が認められる。防風や防暑、建材・家具材・緑肥の供給、格式の象徴、大気浄化、土砂流出防止、水源涵養、動植物のハビタット形成などの緒機能を併せ持つ有用樹として、ケヤキは住民の暮らしや生態系を豊かなものとしてきた。

本研究では、(1)こうした地域・樹種特性を、既存文献と現地調査によってきちんと把握した上で、(2)小学生と保護者が一体となって活動する体験型 ESD プログラムを、試行的な実践を経て作成した。その流れは以下のとおりである：(1)郵送されたワークシートの手順に沿って、親子で居住域を散策しながらケヤキを見つけ出し、形態や生育場所、由来などを調査・記録する「事前学習」、(2)里山探検を行う直前に、参加者全員で事前学習の成果をわかちあい、ケヤキや都市環境に関する認識の共有、および探検活動に対する意欲の高揚を図る「事前学習の発表会」、(3)里山で、自生のケヤキを探して二次林内を踏査したり、農家屋敷でケヤキの利用実態をヒアリングする「探検活動」（あわせて、里山の動植物、里山と都市の環境の相違、里山の人々が保有する自然観や伝統的な知恵・技法も認識する）、(4)参加者全員で一連の活動を総括し、自らの日常生活や都市環境をとらえ直す「まとめ・わかちあい・ふりかえり」。
スダジイやタブノキ、シラカシ、モミ、スギ、トチノキなど、日本各地にはケヤキに代わる樹種がいくつも存在する。本プログラムを「それぞれの地域に固有な自然、伝統的な暮らし、文化に適合したESDプログラム」にアレンジすることは容易である。そしておそらく、「みどりの恩恵」にあずかる世界各地にも適用しうるに違いない。

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子どもの遊びと環境学習を目的とした都市緑地のデザインと活用に関する研究 – 子どもの遊びプロセスと空間の関係性把握

(A study on design and using through play and environmental education in urban green park-relationship between process of children's play and landscape)

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子どもにとって「遊び」は成長発達上不可欠であり，特に自然の中での「遊び」は，自然の形や色，その仕組みと変化などを豊かに感じる感性を身につける重要な体験である[1,2)]．本来，子どもの遊びは,子ども達により自主的かつ自然発生的に始められ展開されていくべきものであるが,移住環境の高密度化に伴う遊び空間の減少,少子化,子どもの生活時間におけるゆとりの減少,地域における近隣関係の希薄化などの様々な要因により,今日では地域における子どもの自発的な遊びは失われつつある.また今日的な環境問題に対応するため，1993 年に環境基本法が制定され，新たな施策のひとつとして環境教育・環境学習が位置付けられた．特に子どもに対しては，人間と環境との関わりについての関心と理解を深めるための自然体験や生活体験などの積み重ねが重要と言われている．これまでに子どもの遊びと物理的環境の関係性[3)]や，遊びの実態とまち環境の変遷について[4)]の既往研究はあるが，遊びの発展する過程における子どもと環境の関係性については十分に捉えられていない.

そこで，本研究では福岡県北九州市戸畑区に位置し、近隣には国指定文化財である旧松本邸（日本鉱業倶楽部），戸畑高校，天籟寺小学校，明治学園があり，住宅地に囲まれた面積 10.3ha の総合公園である夜宮公園を対象に，(1)キャプション評価法による子どもの興味把握，(2)植物社会学的調査及び毎木調査による生態学的特性の把握，(3)詩や感想文による夜宮公園に対する空間認知及び環境学習を通じたイメージ変化の把握，以上 3 点から遊びへと発展する過程を通して，子ども達が空間をどのように認知しているかを把握し，子どもの遊びと自然体験を目的とした環境デザインについて考察を行った.

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子どもの遊びと環境学習を目的とした環境デザインに関する研究
−小学校ビオトープにおける自然再生とその活用について−
(A study on the biotope planning for children’s play and ecological education- changes of the children’s recognition of spaces by experience in a primary school biotope in Fukuoka city, Japan)

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図1　壱岐南小学校ビオトープ

はじめに － 宅地開発等により身近な自然環境が減少している中，学校では環境学習と地域の自然環境保全を目的とした小学校ビオトープが整備されてきている．しかし，活用方法や維持管理に問題を抱えており，『自然再生』と『人間の利用』の両立を図るためには，利活用による植生および人間への影響を把握する必要がある．そこで本研究では，子どもとワークショップを行い設計・施工が行われた(伊東ら，2010)，福岡県福岡市壱岐南小学校ビオトープ(図 1)を対象として，利活用を通した人と植生の変化の関係把握を行い，子どもの遊びと環境学習を目的とした環境デザインについての考察を行うことを目的とした．

調査方法 － ①植生調査による 7 年代の植生把握，②2-4 年生を対象とした，学校ビオトープの平面図を用いた自由記述形式のアンケート調査による子どもの意識把握，③先生を対象としたアンケート調査による学校ビオトープの活用内容の把握を行った．

結果および考察 － 植生把握より，造成後 3 年間で，種数，緑被面積および多様度指数は増加し，その後安定が示され，利活用による影響が確認された．②子どもの意識把握より，各学年の学習で取り上げた内容において大きな差異が確認されたことから，学校ビオトープの活用が，子どもに大きな影響を与えていると考えられた．また，学級においても差異が確認された点からも，活用方法の重要性が挙げられる．③活用内容の把握より，動植物の観察・採集などが多くを占め，活用における動植物の重要性が挙げられる．また，子どもの癒し効果など，学習外効果に対する認識が確認された．

以上より，学校ビオトープの体験的な活用は，子どもと植生に大きく影響を受けていると考えられ，「子どもの学習」，「植生の変化」に応じた活用の継続により，学校ビオトープ環境の質が向上する仕組みづくりが重要である．

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校内緑地をゲートウェイとして、里山で総合的に学ぶ: TGU/IC-フォレストと里山をむすぶ教育プログラムの創出 (Isolated university forest as the gateway to *Satoyama*-studies: field activities in the TGU/IC forest and rural sites)

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都市に残存する緑地、とりわけ大規模開発時に保全緑地として残された二次林は、相応の面積と地域本来の生物種を内包するレフュージとして、都市生態系にとって極めて貴重な自然要素とみなされる（沼田、1987；亀山、1996）。一方、都市近郊には「里山」と総称される農林業地域が広がるが、そこには(1)水田や畑地，溜め池，薪炭林、植林、屋敷地などがモザイク状に配置する景観と、(2)暮らしに必要な資源・エネルギーの自給や循環的利用を追求し続けてきた持続的な生活様式、そして(3)両者が生み出すさまざまな変動環境に適応した多様な生物種が存在する（守山、1997；犬井、2002；（財)日本自然保護協会、2005）。

本研究では、都市居住者の多い大学生を対象に、都市残存林（キャンパス内の二次林）と近郊の里山（丘陵地と平野の農村）をフィールドとして、「人（自己）と自然のよりよい関係」を考える体験的な環境教育（ESD）プログラムの創出をめざした。1年次にキャンパス二次林（TGU/IC-フォレストと呼称）を用いて、森林や都市、里山に関する景観生態学的な講義・実習を受講し、その後に丘陵地（仙台市堂所地区など）や平野（亘理町逢隈地区など）の里山にも出向いて、水辺環境や生業、伝統的な暮らしを含む総合的な内容について探求的な学習を深める、という展開である。

そのために先ず、3エリアそれぞれに関して、既存文献を整理・解析するとともに、現地で植物相と植生の調査、屋敷地の見取り図作成、居住者へのヒアリングなどを実施し、基礎データを収集した。次に、系統的な学習の流れを構築し、教案や画像集・ワークシートなどの教材を作成した。

TGU/IC-フォレスト（面積4.34 ha）では、コナラ林（占有面積70.8%）とスギ植林（占有面積10.0%）が微地形に応じて分布し、両者の種組成の違いも反映して461種の維管束植物が確認された。一方、里山の谷津や背戸山、屋敷林には、長年の綿密な観察に基づく微地形や微気候、水流、植物に対する知識と、そうした自然環境や資源を巧みに制御、あるいは永続的に利活用しようとする創意工夫が存在していた（平吹ほか、2009）。

次代を担う大学生が、キャンパス内の緑地を入り口として、里山が本来内包する「人と自然のよりよい関係」を体験的に学ぶことは、都市の日常生活や「持続可能な未来」のあり方を自己の課題としてとらえる糸口となる。キャンパスに付随する「大学の森」を活用した取り組みは（丸山ほか、2007、2009；金沢大学｢角間の里山自然学校｣事務局、2003）、今後ますます活発になるであろう。

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生物多様性教育の 10 年/自然発見館の環境教育プログラム
(Our ten years of biodiversity education in Nature-discovery Museum)

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はじめに － 東海地方で有数の集客数（2008 年度 4 位、年間 376 万人）がある環境共生型テーマパーク「河川環境楽園」。自然発見館は、その「河川環境楽園」の中にある。平成 11 年 7 月にオープンし、都市公園として身近な動植物に直接触れあう中で、専門の知識を持った指導員と遊びながら学ぶことができるプログラムが多数用意されている。特徴として、都市公園でありながら河川を中心とした多様なフィールドを持ち、木曽川や新境川の自然河川だけではなく、木曽川の上流から下流までの風景や自然を再現した人工河川を備え、生物の生息環境の多様性を創り出している。オープン以来、公園利用者累計として 3,484 万人、プログラム参加者の累計として 24 万人を越えた。

自然発見館では、毎週土日を中心に、これらの多様なフィールドを活用したクラフトや観察のプログラムだけではなく、環境教育ボランティア活動、指導者養成講座なども幅広く実施おり、それらの取り組みについてフィールドとともに紹介したいと考える。

多様なフィールドを活用した取り組みの紹介 －

・団体プログラム

学校団体（小中学校）や一般団体（子ども会や PTA など）向けに「楽しみながら自ら考え学ぶ」ことを目的として、専門の指導員により環境教育プログラムを通年実施している。木曽川などの自然河川や、公園内を流れる人工河川など、水辺に囲まれた公園の立地条件を活かし「川」に焦点をあてたプログラムを用意する。

・ネイチャーイベントプログラム

主に家族連れを対象とした一般来館者向けに「観察する・工作する・遊ぶ・食べる・調べる・感じる」などの実体験を通して身近な自然や環境を楽しむことを目的としている。自然資源調査の結果を踏まえ、旬の素材を利用して、失われつつある季節感を盛り込んだ内容のプログラムを実施している。

・環境教育指導者養成講座

教育現場や地域社会などで環境教育を実践する指導者を育成することを目的として、自然発見館周辺のフィールドを活用しながら、「資格」「教育技術」が得られる指導者養成講座を実施している。

・ボランティア活動

自然発見館では、環境教育普及施設としての自然発見館の活性化と、より多くの近隣の指導者あるいはこれから指導者になりたい方に環境教育活動を体験する機会の提供、指導者養成を目的として、自然発見館環境教育活動ボランティア組織「EE ネット発見館」（Environmental Education Network）を設立、会員を募集し「サポーター」として登録、運営している。

PJ–34

大橋“グリーン”ジャンクションの環境配慮手法について
(Environmental concerns relating to Ohashi Green Junction Project)

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近年、首都圏の高速道路建設に際しては、大気、騒音対策などの沿道対策のみならず、地球温暖化防止やヒートアイランド対策などの必要性が高まっている。

大橋ジャンクション整備においても持続可能な開発を目指し、立体道路制度や立体都市公園制度により立体的な土地の有効活用を行ないジャンクションのコンパクト化を図ると同時に、周辺環境を配慮し地域住民と共生出来るようにジャンクションの覆蓋（覆うこと）及び屋上の公園化、換気所屋上の緑化、壁面・広場周辺の緑化等の対策を行なっている。

換気所屋上は、「かつての目黒川周辺の原風景」をモデルとした自然再生空間を創出し、地域の緑や目黒川の自然と連係するエコロジカルネットワークへの拠点として、地域の環境改善にも寄与できる生物多様性空間の整備を行なっている。

ジャンクション屋上は、全国初の試みで、面積約 7,000 ㎡、高低差 24m、園路勾配５％程度の公園整備を目黒区と連携して行っている。公園へのアクセスは、国道２４６号にかかるペデストリアンデッキ、２つの再開発ビルからのアクセスデッキと合計３箇所となっている。公園のコンセプトは「目黒天空の庭」とし、人と自然が共生でき地域の人々だけでなく日本全国や世界にも日本文化を発信できるよう、四季折々の自然や和の文化が楽しめる回遊式の公園となっている。

ループ壁面は、ジャンクションの景観（コロッセオ風デザイン）や周辺環境との調和を考え、オオイタビ（直接登はん型のつる性植物）による地表面からの緑化を行なっている。地域環境の改善に貢献するとともに、時間の経過とともに地域景観と調和して人の心を和ませ、緑豊かでジャンクションに風格をもたらす緑化を考えている。

本論文では、地域社会との共生、持続可能型コミュニティ創造のために大橋ジャンクション建設で用いた環境配慮手法を幅広く紹介する。

PJ–35

高速道路における生物多様性の保全
(Conservation of biodiversity in the expressway)

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・緑と高速道路(Green and expressway)

日本の高速道路緑化は、名神高速道路の建設とともに幕を開けました。その歩みはインターチェンジなどの道路空間を中心とした緑化の取り組みであり、生活環境の保全、自然環境の保全・復元、良好な道路景観の形成、快適性・安全性の向上を図ってきました。

高速道路のり面の樹林化などの取り組みは、生物多様性の保全、地球温暖化の防止に役立ちます。道路緑化は、単に道路空間だけでなく地球規模での環境に対応する役割を持っています。

・エコロード(Eco-road)

エコロードとは、自然環境に配慮した道路、生き物に優しい道づくりのことをいいます。当社は道路整備において、現在および将来にわたり良好な自然環境を保全するため、地域の自然や貴重な動植物の保全に配慮した事業を進めています。

エコロード整備の考え方は、自然環境に対するマイナス要因の軽減・保全(未ティゲーション)と、自然環境に対するプラス要因の付加・創出です。

具体的な内容は、自然環境への影響の少ない道路構造の採用、動植物の生育・生息場所の確保、ビオトープの整備、地域性苗木の植栽、野生動物の道路内侵入防止対策の実施などです。

・生態系保全(Conservation of eco-system)

帯状に連続する高速道路のり面などの樹林化は、沿道に散在する孤立した緑地をネットワーク化する効果があり、まとまった面積の緑地は多様な生物の生息空間の創出に役立ちます。

・ポスター発表内容 (Content of poster announcement)

今回のポスター発表では、中日本高速道路㈱(NEXCO 中日本)が行っているエコロード整備の「自然緑地を残す道路構造の採用」「地域性苗木によるのり面の樹林化」「野生動物侵入対策の立入防止柵などの設置」「ビオトープ整備」などの具体的な内容を紹介するとともに、対策実施箇所の追跡調査などから得られた自然環境復元状況を説明いたします。

PJ–36

自然にやさしい道作り（エコロード）
(Environmentally friendly roads - "Eco-roads")

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東日本高速道路株式会社（NEXCO 東日本）では、地域の生物多様性の保全と生態系の維持に配慮した「自然にやさしい道作り（エコロード）」を進めている。

エコロードの進め方として、道路による自然環境への影響を緩和する「マイナスの軽減」、道路空間を利用して自然環境を創出する「プラスの付加」という２つの考え方がある。

「マイナスの軽減」は、道路の線形を変更して自然性の高い場所を避ける「回避」、トンネル構造や橋梁構造により地形の改変を最小化する「低減」、両生類などの産卵池が消失する場合に近隣に同等の環境を整備する「代償」といった方法をいい、「プラスの付加」は道路のり面や環境施設帯、SA・PA・IC 等の空間を利用して新たに樹林や水辺などの新たな生物･生息空間を創出することにより、地域の生物多様性の保全や生態系の質的な向上を図る方法である。

エコロードの取り組みは、道路が完成したら終わりではなく、その後の環境の推移を把握・観察する事が重要であり、得られた知見は新たな取り組みに反映させることとしているが、特に横浜横須賀道路では実施からモニタリングまで様々な取り組みを行っており、その概要を紹介するものである。

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PJ–37

住居の外部構造の違いが室内環境に与える影響
(The influence for indoor condition by difference of exterior-structural on housing - comparing with Green roofs, Green walls, Glass walls and Plaster walls)

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近年，ガラスを多く使用した建築物が増えている．建築物の外装材に要求される性能は，断熱性・遮音性・安全性・意匠性などであるが，最近では地球の温暖化，環境への配慮から，建物の省エネルギー化への配慮も多く要求されるようになっている（和久井ら，2005）．また，都市に残された緑化可能空間として特殊空間緑化が注目されており，屋上緑化や壁面緑化などにより建物の冷暖房負荷を減らす取り組みも増えてきている．しかしこれらの効果や冷暖房負荷を定量的に計測し，比較を行った研究は少ない．

そこで，本研究では住居の外部構造の違いが室内環境に与える影響を調査することを目的とし，外部構造を変化させることができる住居モデルを用い比較実験を行った．

実験は九州工業大学戸畑キャンパス内にある，屋外実験施設 Green Cube を用いて行った．Green Cube は，底面 2.5m×2.5m，高さ 2.6m の全面ガラス張りの建築物であり，同容積のものが 9 棟並立している．ただし，屋上面には断熱材，鋼板が敷設してあり，屋上面からは直接日光を取り入れないようになっている．また，内部にはエアコンが設置してあり，それぞれの Cube の外部構造を変化させることにより，温室度の差や，エネルギー消費量等を定量的に評価することが出来る施設である．

写真：Green Cube（九州工業大学）

今回の実験では，（１）夏期(2009/08/10ー2009/10/05)に，壁面緑化，屋上緑化（土のみの簡易的なもの），太陽熱反射塗量の塗布（屋上面），そして変化させていない状態のままであるコントロール Cube の組み合わせで，室内温湿度の推移と，エアコンを動作時の消費電力量を測定した．さらに，（２）冬期（2009/12/01ー2010/02/28）では，屋上緑化（土のみの簡易的なもの），壁面の遮光，竹小舞漆喰壁，モルタル＋漆喰壁，サイディング工法壁，そしてコントロール Cube の組み合わせでの室内温湿度の推移と，エアコン動作時の消費電力量を測定した．また（３）冬期には，外部構造の違いだけでなく，内部にも違いを持たせ，それぞれが持つ揮発性有機化合物（VOC）であるホルムアルデヒドの除去効果を調査した．比較内容は，観葉植物（３種），壁面の遮光，漆喰パネルの敷設（床面），竹小舞漆喰壁，モルタル＋漆喰壁，サイディング工法壁，そしてコントロール Cube の組み合わせである．

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PJ–38

自然体験を目的とした河川空間デザインに関する研究 ―遠賀川 4 地区における来訪者の行動と空間特性の比較

(A study on the riverfront space design for nature experience - considerations on users' behavior related to spatial characteristics in Onga river)

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自然体験は心身の健康や憩いの場として有用であるが、近年の都市化に伴い自然体験可能な場所は減少している。そんな中、広さと環境機能を併せ持つ河川空間が見直され始めているが、画一的な計画が見られるなど自然体験の場としては十分とは言い難い。そこで本研究では、河川空間における来訪者の意識・行動と空間特性の関係から自然体験可能な河川空間デザインを行う為の知見を得ることを目的とした。

調査対象地は、福岡県北部を流れる遠賀川とした。また、河口部から遠賀川河口堰左岸南・北の 2 地区、中流部から直方河川敷運動公園右岸・左岸の 2 地区を選定し、計 4 地区の河川空間を調査対象地区とした。

調査は、まず空間特性の把握を目的とした現地調査を行い、護岸や高水敷、通路の整備形態や設置物を明らかにした。続いて、来訪者の行動を把握するため、10－11 時と 14－15 時の二時間を対象として、2010 年 1 月にビデオカメラによる定点観測を行った。更に、来訪者の自然に対する意識を把握するため、各調査対象地区で有効回答数者数が 30 人に達するまで、来訪者に対してアンケート調査を行った。アンケートの調査項目は被験者属性の選択回答に加え、「自然を感じる対象」及び「不満に思う対象」を用紙内の概略平面図に書き込んでもらう形式とし、それぞれ複数回答可能とした。また、それぞれについて回答の理由・場所も同時に尋ねた。

調査の結果、高水敷がコンクリートで覆われた地区は他地区と比べ、水を自然の対象と感じる被験者が多くなっていたが、自然を感じる対象の全指摘数は全対象地区で最少となり、高水敷に芝生などの植生が少ない地区では水に自然を感じる来訪者が多くなることが分かった。また、この地区では、高水敷のコンクリートに見られる凹凸に対して複数の被験者が歩行時の不満を挙げており、通路以外の高水敷での移動は釣りを目的とした来訪者による護岸へのアクセスに限られていた。一方、高水敷が芝生で整備された中流部 2 地区については、通路から僅かに外れた芝生や高水敷での移動が見られ、歩行時の快適性や季節を感じるなどの理由から、芝生に自然を感じるというアンケートの回答が見られた。次に、自然再生を目的とした親水護岸が整備され、沈下橋が設けられている地区水際線では、橋の利用者を中心とした通行や「川を眺める」などによる停止が多く見られ、水辺について植物や生物を自然の対象とした回答が他地区に比べ多くなっていた。この地区における自然の指摘理由は景観・生物・季節・利用に関するものなど、多様なカテゴリーに指摘数が分布していた。これより、自然再生を目的とした水際が整備された地区は水辺での行動が活発となると共に、来訪者の自然を感じる理由は多様となり、意識が河川に向いた際は水そのものよりも生物や植生を自然の対象として意識することが分かった。

PJ–39

生物多様性保全のための「庭の生きもの調査」
(Garden Wildlife Watch for conservation of biodiversity in Japan)

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［目　標］

1．生物多様性・貢献度評価のための、持続可能なモニタリング・システムを確立する。
　1－1．庭における普通種の生息数変動など、長期間継続可能な調査計画を策定する。
　1－2．生物多様性への貢献度評価のためのモニタリング・システムを開発する。
2．市民による生物多様性保全への参加システムを確立する。
　2－1．１万世帯以上の参加による、継続的なデータ収集と情報提供の方法を開発する。
　2－2．庭づくりを通して生物多様性を高める知恵や技術を蓄積し、その成果を還元する。
3．全国の庭から始まる生物多様性に配慮したまちづくりを推進する。
　3－1．生物多様性に配慮した庭づくりの及ぼす地域生態系への貢献度を、定量的に評価する。
　3－2．全国の自治体における「生物多様性地域戦略」の策定と具体化に貢献する。

［活動の実施方法／2009 年度］

１．当ＮＰＯの役員・顧問、練馬まちづくりセンター、シェアリングアース協会などの専門家の協力のもとに検討会を設置し、先進的成功事例研究と、調査目的の明確化、モニタリング対象種の選定などを含む、市民からのデータ収集を前提にした調査計画書を作成する。
２．実現可能、持続可能な生物多様性貢献度評価のためのモニタリング手法を開発する。
（市民参加型モニタリングでは、30 年以上の実績ある英国 BTO などへ協力を依頼）
インターネットを活用した情報提供方法、結果のフィードバック、情報共有化などを検討する。
３．主に５本の樹計画参加者を対象に、モニタリング希望者を募集する。（１万世帯以上を目標）　　　　＊積水ハウスの広報誌／60 万部で参加者を募集。
２％の参加率＝約１万人を想定。
４．秋季に、１、２で検討したモニタリング手法をモデル的に実施する。
課題、問題点の洗い出し、修正点の抽出と手法の改善をはかる。
５．全国展開可能な、自宅の庭でできる生物多様性への貢献度評価のための「モニタリング・ガイド／参加の手引き」を作成する。
６．情報拠点となる専用ウェブサイトを、当ＮＰＯのサイト内に設置する。
７．参加希望者へ、ガイドを配布する／ウェブ上が中心、紙媒体は 5%程度を想定。

［今後の活動予定／2010 年度］

・第１回モニタリングの実施（春ー夏）
・各地域における生物多様性の貢献度評価手法の開発、収集データの解析
・第２期参加者の募集
・第１回「生物多様性に配慮した庭づくりコンテスト」の実施／８月
・ＣＯＰ１０におけるモニタリング結果・コンテスト結果の発表
・報告書の作成による市民へのフィードバック

＊本調査は、平成 21 年度地球環境基金の助成を受けて行われています。

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里山公園のデザインと運営
(Design and management of Satoyama Park)

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はじめに - 近年、里山の消失や質の低下が顕在化しており、能美市辰口町においても土地開発等により、里山が失われつつある。このような背景を受け、里山の良好な自然環境を保全し、新たな交流拠点の場として活用することを目的に、「辰口里山公園」（A=30.9ha）は都市公園として計画され、平成 4 年度の事業着手から、平成 17 年度の部分開園を経て、平成 21 年度に全面開園した。開園後は、近接する和気小学校や国造コミュニティセンター等との連携を図りながら自然とふれあう活動が展開されており、小学校の児童による清掃活動等も行われているが、公園の適正な管理運営を行う地元の運営主体が明確になっていないことが現状の課題となっている。

本発表では、都市における生物多様性の場である里山を舞台とした行政・市民・コンサルタントの協働による公園のデザインと、公園の運営に繋がる市民の活動の発展について報告する。

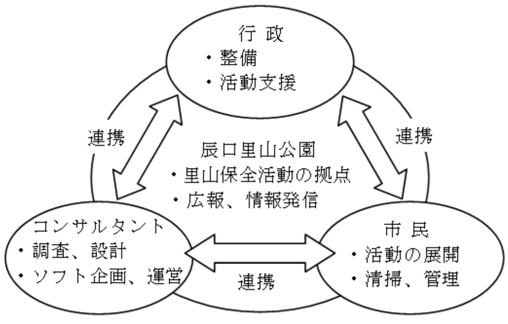
市民との協働によるデザイン － 公園内にはミクリ等の希少植物をはじめ、豊かな自然環境が残されており、平成 14 年度に行った園路設計では、市民ワークショップを開催し、自然環境の保全に最大限配慮した園路のルートや構造形式について、市民・行政・コンサルタントが協働してデザインを行った。

また、平成 20 年度のエントランス広場の設計においては、地元で里山保全活動を行っている市民団体（能美の里山ファン倶楽部）と行政、コンサルタントが話し合い、里山保全の拠点として活動しやすい広場となるよう、三位一体となってデザインを行った。

活動の発展と運営 - 公園では、小学校の授業や地域のクラブによる植物観察等の活動が行われている。また、地元とコンサルタントが主体となって、自然観察会を開催するなど、市民の自然環境の保全に対する意識の普及、啓発に取り組んでいる。

さらに、公園整備により気運が高まって発足した「能美の里山ファン倶楽部」が、今春から本公園を拠点として、様々な活動を計画しており、今後、公園の運営主体となることが期待されるとともに、より多くの市民に保全活動が波及すると思われる。

■市民・行政・コンサルタントの
パートナーシップによる里山公園づくり■



PJ–41

小金井カントリークラブにおける生物多様性保全
(Conservation of biodiversity in Koganei Country Club)

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小金井カントリークラブは、東京都西部の小平市と小金井市にまたがる市街地の中に位置し、約 50ha の面積を有するゴルフ場である。1937 年の開場以来、70 年以上にわたって維持されてきた同ゴルフ場の残置森林やその周辺には、オオタカや 30 種以上のチョウ類をはじめとする多数の動植物が生息（生育）し、市街地に囲まれた貴重な緑地となっている。

このような動植物の生息（生育）環境が保たれてきた背景には、ゴルフ場の植生管理に携わるグリーン委員による地道な植栽等の活動と、できるだけ農薬に依存しないメンテナンスがあった。また、コースが生きものであり、天候等の不確実要素によって著しく左右されるという認識のもとに、現場の状況をみながら管理を行う順応的管理（Adaptive management）が実施されてきた。その結果、今日見るような高い生物多様性と、それらが提供する生態系サービスを享受できるようになったと考えられる。

一方、ゴルフ場のような市街地に残る大面積の緑地は、地震等有事の際の避難場所となることも検討され、社会の安全・安心を支えるものとして今後注目される。そのような場所において生物多様性が確保されることは、地域が持つ社会資本（インフラ）としての価値をも高めることにつながることが期待される。

同ゴルフ場の西には、市街地を隔てて多摩地区の森林が広がり、東には都心の市街地が東京湾まで続いている。そのような中にあって、同ゴルフ場は大都市周辺部における生態系ネットワークの拠点として注目される。

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PJ–42

生物多様性保全を目的とした薄層基盤屋上緑化の研究 －軽量土壌を用いた屋上緑化の有用性評価 (The research on green roofs of a thin layer base for the conservation of urban biodiversity－evaluation of green roofs with lightweight soils)

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近年，都市化の進行により，都市の緑地が減少し，ヒートアイランド現象等の都市環境問題が顕在化してきた．それと同時に，都市の生物は，生息地の減少・分断化により存続の危機にさらされている．この対策として，屋上緑化や壁面緑化など特殊空間緑化が推進されている．しかし，セダムやシバ等の薄層緑化植物による屋上緑化では，植生の温度低減効果は小さく，植生の枯死や維持管理コストなど問題が見られる．そこで本研究では，屋上に軽量土壌のみを用いた緑化手法に注目した．具体的には，軽量土壌パレットの 1）温度低減効果および消費電力量低減効果の基礎評価， 2）侵入した雑草植生と軽量土壌の生態学的特性の把握を行った．

実験は九州工業大学戸畑キャンパス内にある屋外実験施設グリーンキューブを用いて行った．グリーンキューブは，9 棟の同一規格の建築物からなり，内部には，エアコンが設置してある．軽量土壌パレットの温度・消費電力量低減効果の比較，検証として壁面緑化と屋上に太陽熱反射塗料を施した．また，キューブの屋上(設置高さ:2.6m)とは別に，九州工業大学内の 1 号棟屋上(設置高さ:11.7m)にも軽量土壌パレットを設置した． 1 号棟屋上の軽量土壌パレットは，土壌厚の違いと潅水の有無で場合分けをした．

温湿度・消費電力量の基礎評価として，各キューブ室内の温湿度およびエアコンの消費電力量（10:00～18:00）を測定した．また，生態学的特性の把握として，軽量土壌パレット内とその周辺(120 m×120 m)の植生調査を行った．調査結果より，パレット内植生および周辺植生の帰化植物率と Shanon-Wiener の多様度指数を求めた．さらに，土壌動物を，ツルグレン装置を用いて抽出し，種名，個体数を調査した．

軽量土壌のみを使用したパレットでも，室内の温度低減効果が確認された．コントロールキューブの温度が最大になった時刻と比較して，太陽熱反射塗料が 2.8℃，軽量土壌パレットが 3.8℃，壁面緑化が 4.9℃の温度低減効果が確認された．また，壁面緑化と複合的に用いると，さらなる温度低減効果が得られた．コントロールキューブの合計消費電力量と比較して，壁面緑化，軽量土壌パレット，太陽熱反射塗料の順で消費電力量低減効果が確認された．壁面緑化を施し，ガラス面を覆うことで消費電力量を大きく低減できたと考えられる．

キューブ屋上，1 号棟屋上のパレット内植生の種数は，個体数はともに増加傾向が見られた．また結果より，潅水を行い土壌厚が厚いほうが，パレット内植生の種数，個体数はともに多くなると考えられる．パレット内植生は，周辺植生と比較すると，キク科，一年草･越年草，風散布型の植生が高い割合を示した．多様度指数は，周辺植生と比較し，パレット内植生は低い値を示したが，上昇傾向にある．土壌動物は，設置高さが低いパレットから多く抽出された．また，設置高さが高い場合でも長期間設置したパレットでは多く土壌動物が抽出された．このことから，長期間設置することで，パレット内の生物多様性が向上していくと考えられる．

PJ–43

国際宇宙ステーションでの長期滞在に向けた植物ユニット「宇宙庭」の提案
(Plant unit “Uchu-Niwa” for lengthier stay in the International Space Station)

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アメリカ，日本，ロシア，カナダ，欧州等の計15カ国によって運用される国際宇宙ステーション（以下，ISSと表記）では，宇宙飛行士の長期滞在が本格化しつつある．ISSと言う人工的な閉鎖環境が居住者の精神面に与える悪影響は見逃せないものであり，滞在中に精密な作業を要求される宇宙飛行士にとってはことさら深刻な問題となる．こうした問題を緩和するための手段としては，宇宙飛行士との対談の中で「長期の宇宙生活においては生きた自然との感性的交流が人間の精神生活の支えとして極めて重要」と認識されている（松井，2006）．こうした見識に基づき，植物を用いた宇宙飛行士と自然との交流手段として「宇宙庭」プロジェクトが推進されてきた．

一方で，植物との触れ合いは内部環境の汚染源となる危険性も含み持っている．本研究ではISSでの安全な植物育成を可能とするために，ISS安全基準や持ち込みに必要な制限事項等を調査し，これに適合する育成手法を検討した結果，親水性の高分子フィルムを用いた簡易な作庭キットである『宇宙庭ユニット』を提案している．この手法によって，ISS内では危険度が高いと判断される養液部分を隔離したまま，植物と宇宙飛行士との直接的な触れ合いが可能となっている．

また同時にISSで実際に育成が行われる空間の環境条件を調査した．この結果を元にして，最大照度2000Lux，平均気温25℃（恒温），相対湿度40%の条件で親水性の高分子フィルムを用いた地上試験を行い，宇宙庭ユニットに採用する植物種の検討を行った．発芽率や緑被率，成長速度などを元にオニタビラコ，レモンバーム，ピンクケール，ペパーミントを中心とした植物種を選定し，平成21年09月11日の種子島からの打ち上げで，提案したユニットがＩＳＳに無事に搭載されることとなった．平成21年2月現在，ISS内において，野口宇宙飛行士の手により宇宙庭の育成が進められている．

「宇宙庭」は，閉鎖的環境に長期滞在する宇宙飛行士の精神面への悪影響の緩和を発端としている．しかしながら，これに留まらず，微小重力空間である宇宙ステーションでの作庭と，重力の存在が当然である地上での作庭を比較することで，宇宙と言う特殊な環境を通して，「庭」の概念の再定義に繋がることに期待している．

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PJ–44

屋上ビオトープにおける除草管理の経年変化に関する調査
(Investigation into secular change of rooftop biotope vegetation management)

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高密化した都市において生物多様性の回復を図るためには、建築物に動植物の生育・生息環境を創出する屋上ビオトープの整備が重要な方策のひとつとして挙げられる。しかしながら、動植物のことだけを考えた屋上ということでは客先への提案として受け入れられる機会が一般に少ないと考えられ、管理上の問題も含めて建物ユーザーにとって魅力があり、かつトラブルの少ないビオトープが求められる。こうした観点から、2002 年春に「人と自然のふれあい」をテーマとした屋上ビオトープを計画し、茨城県つくば市の会社施設屋上に建設した。

人が自然を楽しめる屋上ビオトープにはガーデンとしての要素が必要であり、そのための管理が必要となる。屋上ビオトープの面積は約 100 m^2 であり、緑地面積もさほど大きくないため、除草管理は動力を用いた器具を利用せずに手作業で行う方針とした。著者らは、こうした規模のビオトープの除草管理を管理者自らが行う場合の目安を得ることを目的とし、草本植物の除草管理の経年変化に着目したモニタリング調査を実施してきた。調査は竣工後 3 年間実施し、さらにその 4 年後の 2009 年春から 1 年間実施した。調査項目は、除草量、除草に要した作業時間、除草植物のほか、飛来、生息する鳥や昆虫、潅水量、降雨量、外気温度も併せて調査した。除草は、ビオトープを 5 つの管理エリアに区分し、それらの植栽目的を考慮して次の 3 つ方法のいずれかで行った。①普通除草：植栽した植物以外の雑草をすべて除去、②選択除草：大きく成長した草本やイネ科、キク科の繁殖力旺盛な植物を中心に除去、③放置管理：基本的に放置するが、特別大きく繁茂した植物や現場の判断で特に気になる植物に限定して除去。

除草量の経年的な傾向としては、竣工年度が最も大きく、2 年目で落ち着く状況ではあるが、指数関数的に徐々に減少する傾向となった。初年度の除草量が大きいのは、人工軽量土壌の表土に用いた畑土と一緒に持ち込まれた雑草の種が発芽したためと考えられるが、2 年目以降は徐々に淘汰されていく状況であった。また、水生植物に関してはこれとは逆に、初年度はさほどでもなかった池のアオミドロが、2 年目以降に増える傾向となった。2009 年の春から 1 年間実施した除草では、初年度に確認されなかったヘクソカズラやムクノキなどの鳥散布由来と考えられる種が含まれていたことが特徴であった。

本調査で得られた調査期間平均の除草作業歩掛は、普通除草管理 0.084h/㎡、選択除草管理 0.063h/㎡、放置管理 0.059h/㎡ であり、経年的には除草量の減少に伴って特に普通除草管理の歩掛が小さくなっていく傾向となった。

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PJ–45

ミツカンよかわビオトープ倶楽部
(Community in cooperation at Mizkan Yokawa Biotope)
—みんなで楽しく自然とつき合う　活動実例—

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■ビオトープ整備の概要

三木工場 ﾋﾞｵﾄｰﾌﾟ全景

ﾐﾂｶﾝよかわﾋﾞｵﾄｰﾌﾟは兵庫県三木市吉川町に位置し、ﾐﾂｶﾝｸﾞﾙｰﾌﾟの三木工場の敷地 28ha 内にあり、2004 年 3 月に完成した。棚田跡や里山林、赤松林から湿地ﾋﾞｵﾄｰﾌﾟなど多様な環境を持ち、地域に開放されたﾋﾞｵﾄｰﾌﾟである。

◆ﾋﾞｵﾄｰﾌﾟ整備の目的

1)多様な生態系を維持・保全し、自然環境と製造環境の調和を図る。2)地域と共に活用し、地域との交流を増進し、地域の自然環境保全と地域社会に貢献する。3)ﾐﾂｶﾝｸﾞﾙｰﾌﾟの環境への取組みとして企業価値向上を図る。

計画段階から「人と自然の博物館」の指導のもと、関係する企業・行政・地元住民・専門ｺﾝｻﾙと協働作業で検討し整備した。整備後 2004 年春に設立した「ﾐﾂｶﾝよかわﾋﾞｵﾄｰﾌﾟ倶楽部」では「皆で育てるﾋﾞｵﾄｰﾌﾟ」を目標に、毎月楽しく活動し継続している。

■ネットワークづくり

ﾋﾞｵﾄｰﾌﾟ倶楽部の活動風景

本事例が順調に継続できたのもネットワークの広がりが重要であった。建設当初に関係者で「研究会」を始め、地域が参加し協働していく「しくみ」を構築した。そこから地域に呼びかけ、様々な世代の様々な立場の人達が集まり、ビオトープを育てるための「倶楽部」がスタートした。その倶楽部メンバーから、さらにネットワークが広がり、学校、公民館、地域のグループへと、様々なビオトープ活動が繋がって来ている。

「子供たちにもビオトープを通して、地域の自然を体験させたい」「学校の教材に使いたい」「いっしょに観察会をやらないか」「しめじづくりを教えてほしい」など。

■環境の保全・再生・育成

ため池整備で再生したﾐｽﾞｵｵﾊﾞｺ

ビオトープでは、植生の遷移による環境の変化を防ぐため維持管理が必要である。広域の除草や下刈りは企業が行い、畦や畑の草刈りなどは、ビオトープ倶楽部の活動の中で維持管理している。この活動で環境は維持され、これまでの調査から約 320 種の植物、約 400 種の陸上昆虫類、約 130 種の水生生物類（トンボの幼生、両生類を含む）、そして 5 種の魚類が確認されている。また、各種のレッドデータブックの指定種も、植物で 11 種、トンボ類で 8 種、そして水生生物、魚類では 10 種が確認されており、地域の生物多様性維持の一助となっている。

PJ–46

都市地域における生物多様性保全に向けたNPOの役割と課題
(Challenges and role of non-profit organization for biodiversity conservation in urban areas)

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内閣府によれば、特定非営利活動促進法に基づくNPO数は2010年1月31日現在、39,217団体に達し、うち「環境の保全を図る活動」（第5号）を定款に記載する団体の割合は28.7%（11,193団体）となっている。NPOは「新たな公」（多様な民間主体を地域づくりの担い手と位置づけ、その協働によって、地域のニーズに応じた社会サービスの提供等を行おうとする考え方）の担い手としてさらなる活躍が期待されている。

NPO活動を推進・活性化する上で、多様な職業・年齢層からなるNPO構成メンバーがいかにビジョン・ミッションを共有するかが課題となっている。また、そのビジョンを実現するため、事業・組織をマネージメントする人材が求められる。本発表では、徳島県の生物多様性保全に取り組む特定非営利活動法人徳島保全生物学研究会（以下、当会）におけるワークショップ形式のビジョン・ミッションづくり、都市地域の住民に向けた生物多様性啓発へのアプローチ方法について事例報告を行う。

都市地域では日常生活において生態系サービスの恩恵を実感することが難しくなっており、生物多様性の理解が進んでいないのが実情である。当会では、都市地域に住む住民に生物多様性への理解を深めてもらうため、人々に身近な食に着目して生態系サービスの重要性を訴える自主事業に着手している。古文書等を通じて、徳島県内の豊かな生態系の恩恵を受けて育まれた食材・食文化を把握し、昔から食されてきた食材を育む生態系の抽出を試みている。

以上の活動内容を通して、都市地域における生物多様性保全に向けたNPOの役割と課題について検討する。

PJ–47

市民と行政の協働によるカヤネズミの生息地復元
－平井川の改修工事における植生回復の事例
(Habitat restoration for the harvest mouse (*Micromys minutus*) in collaboration with citizen and administration: a case of revegetation on river construction in Hirai River, Japan)

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東京都西部を流れる多摩川水系平井川は、全長 17km の 1 級河川である。流域には良好な自然環境が残され、都内では見られなくなった動植物が豊富に生息する。東京都の希少種である小型齧歯類カヤネズミ *Micromys minutus* もその一種である。本種はオギやススキなどの生葉を編んだ巣で子育てをする。そのため、カヤネズミの生息にはオギやススキのまとまった草地が必要であり、平井川の河川敷は貴重な生息場所になっている。　平井川の自然環境を守り、平井川の魅力を地域の子どもたちに伝えるために 2000 年 5 月に発足した市民団体「川原で遊ぼう会」では、2003 年から平井川でカヤネズミの分布調査を行ってきた。その結果、平井川の中下流域にはカヤネズミが広く分布しているものの、外来植物・蔓植物の侵入や河川改修工事の影響で、生息環境の悪化が確認された。そうした中、2007 年度の河川改修工事で、カヤネズミのコアエリアの一つとなっている良好なオギ群落が失われることが分かった。そこで、同会が中心になり東京都に保全対策を講じるよう求め、専門家の協力の下保全方法を立案し、2007 年から 2009 年に市民・専門家・行政が協働で、工事エリアのオギ群落の再生とカヤネズミの生息地復元を目的として、以下の対策を実施した。

1.　工事エリアの上流に位置するオギ・ツルヨシ群落をカヤネズミの避難エリアと位置付け、ツル植物および外来植物を駆除した。（2007 年 7 月～2009 年 9 月）
2.　工事エリアのカヤネズミを避難エリアへ移動させるため、工事エリアの草地を下流側から 1 週間おきに 3 回に分けて刈った。（2007 年 8 月 27 日～9 月 10 日）
3.　工事エリアの表土掘削時にオギの根茎を手作業で掘り出して表土とともに保管し、工事終了後に表土を元の場所に埋め戻して根茎を移植した。（2008 年 4 月）
4.　工事終了後、工事エリアで外来植物およびツル植物の抜き取り作業を行った。

上記の保全対策の結果、下記の成果が確認された

1.　避難エリアにおいてオギ・ツルヨシ群落の面積が拡大し、カヤネズミの営巣数が 2006 年 9 個から 2009 年には 76 個に増加した。
2.　工事エリアにおいて、2008 年は活着したオギの個体サイズは小さいものの面的に広い範囲で生育が確認され、2009 年には個体サイズが大きくなり生育密度も高くなった。
3.　工事後 1 年半（2009 年 11 月）で、工事エリアで 7 個のカヤネズミの営巣が確認された。

以上は、地域における市民の継続的な生物調査が具体的な保全活動に役立ち、成果を上げた事例である。また、市民・専門家・行政が協働で保全活動を進めた事例としても意義深い。

PJ–48

滋賀県営都市公園「びわこ地球市民の森」における市民参加型の森づくりについて
(Creation of a forest in cooperation with the citizens- case study in the Biwako World Citizens’ Forest, the Urban Park of Shiga)

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「びわこ地球市民の森」は、2000 年度に「平成の森づくり事業」（国土交通省所管）の国庫補助事業の採択を受け、都市化の著しい県南部（守山市内）で着手した。地球温暖化対策も視野に入れ、市民との協働により自然再生をめざした新しいスタイルの都市公園事業であることから、かなりの試行錯誤が予想された。以来、10 年間の取組みは、ビオトープ整備面の工夫、県民・企業等の環境問題への認識の高まりもあり、概ね順調に進んできている。その要点を記し、参考に資したい。

（１）事業計画の概要
- 所在地：滋賀県守山市（旧野洲川南流廃川敷地を活用）
- 面　　積：42.5ha、延長 3.2km、幅 100~200m
- 整備方法：県~造成・公園施設、市民~苗木植樹等
- 整備費：2000~2019 年度、約 35 億円

（２）自然再生の進め方
- 「森づくり」は、身近にあった自然林の復元と、原っぱや水辺と連続したビオトープ空間の創出
- 平地化された河川跡地を起伏造成（植樹地は 60cm 厚を土壌改良）、既存水路をワンド・中洲に拡幅
- 植樹樹種は、県南部域の自生種から落葉樹 40 種、常緑樹 10 種余を選択し購入、自家育苗も実施

（３）市民との協働の仕組み
- 市民の取り組みは、森づくりセンター（県設置）と連携し植樹活動から育樹・自然学習へと進展
- 「植樹協力のルール」（図 1）の懸念もなく、植樹活動は予期以上（図 2）、企業参加と継続化が特徴
- 植樹者等による育樹活動も活発化し（図 3）、ボランティアの組織化と拠点施設の整備および未着手区域（ふるさとゾーン）の整備等が今後の課題

図1 植樹協力のルール

図2 年度別苗木植樹の状況

(2009 年度は見込み)

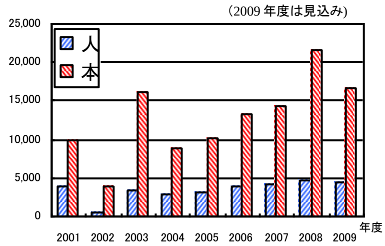

図３　植樹者等による育樹活動

■森づくりサポーター登録
　個人 215 人、団体 5 団体
■森づくりサポーター活動
　つどい行事、育樹、自然学習
　定例 4 回/年、延 3,900 人
■随時ボランティア活動
　除草・間伐 57 回、延 3,800 人

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PJ–49

The possibility of the environmental monitoring by visual disorder person - the case study for integrating of the social welfare and the environmental conservation

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Introduction - The problems concerning environment, social welfare, economy were often handled as the separate problems. However, these problems can be placed as the problem to be related mutually and closely when taking them as “the problem concerning sustainable development of region”. Therefore, the proposal and the establishment of the new method concerning “the sustainable development of region to have made integrate the social welfare and the environmental conservation” are wanted. Also, the practice will contribute consequently to conserve ecosystem in the city area and to conserve biodiversity, too.

Methods - We verified about the hypothesis whether or not it is possible to substitute which the bird listening experience investigation by the visual disorder person for country environmental monitoring investigation. Specifically, we compared the bird investigation data by visual disorder person and the bird researcher.

The bird listening experience investigation was implemented at Kagamiganaru nature trail in Tottori Prefecture Kofu-cho on May 31 in 2009. 16 visual disorder persons, six bird researchers participated in the project in addition to 12 supporters

Results - Through the bird listening experience investigation, in the bird researcher group, it confirmed 24 kinds of birds whereas the visual disorder person group confirmed 14 kinds of birds only.

However, as for the species with high occurring frequency, the great part was confirmed. Also, as for the hearing behind the project, we received the opinion which shows high degree of satisfaction from the visual disorder person, the bird researcher and the supporter. For example,

“We got sense of fulfillment through the project (the bird researcher)”

“We got confidence and relief through the project” (the visual disorder person).

“We got the time of the healing of the heart through the project (the supporter)”

Discussion - Most environmental monitoring investigation which had been done in Japan dealt with the selected specific animals and plant. If preparing beforehand in the enough monitoring investigation design, “the bird listening experience investigation by the visual disorder person” will be able to be utilized as the investigation method to have secured enough investigation precision. Therefore, we concluded that it could be placed as one of the investigation methods of the country environmental monitoring. Also, we supposed that our project made a participant rich mentally and moreover to contribute for the social capital to accumulate, too.

Our subject in the future is the reviewing of the investigation design which included the selection of the monitoring investigation object birds, and they must be sensitive to the change of the environmental condition, the judgment by the listening must be an easy species, too.

PJ–50

モンゴリ森守プロジェクト― 愛・地球博記念公園における県民協働・参加による森づくり―

(Mongori Mori-Mori Project- manufacturing of forest by citizens collaboration and participation in Expo 2005 Aichi Commemorative Park)

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１　目的

愛・地球博記念公園は、愛知万博の理念と成果を継承し、21 世紀にふさわしい公園とするべく整備を進めている。モンゴリ森守プロジェクトは、当公園の整備目的を実現する方策の一つとして、ＮＰＯとの協働により、本公園内の 4,000 ㎡ほどの区域を、将来は自然豊かな森にするべく、４ヵ年(H19～H22)かけて、どんぐりの苗木づくりから植樹までを県民参加で進めているものである。

（どんぐり：フモトミズナラ、コナラ、アベマキ）

２　概要

基本的な内容としては、①本公園においてどんぐりを拾い　②これを発芽させて苗木に育て　③これとどんぐり以外の在来種(苗木)等も加えて県民参加で植樹を行うものである。さらにこれらと併せて、どんぐり授業など参加者の自然への理解、親しみが深まる催事も実施している。

３　当事業の特徴

① 公園の南部から東部に広がる樹林地と公園の北部に点在する樹林地をつなぐ形で森づくりを行い、緑(景観、動植物の生息生育の場)のネットワークに資するものとしていく。

② 本公園の土質は植物の生育には適したものとは言えないことから、これに適合できる樹種により森づくりを行うこととしている。具体的には、本公園内に自生している樹種を中心に構成していくこととし。特にどんぐり系の樹種については、当公園内で採取したどんぐりから育成した苗木を使用する。

③ 植樹予定地は土が悪いこと以外にも、傾斜がある所(土壌が流亡)が多くまた夏の直射日光や冬の季節風など、植物の生育環境としては過酷な状況にある。このような状況への対応として　①木チップの散布　②苗木を高密度に植樹　などにより劣悪な生育環境の改善を図っていく。

④ どんぐり系の落葉広葉樹の森とすることを基本としつつ、在来種の常緑樹も植樹し、多様な自然を育んでいく。また、公園の主要施設をつなぐ動線上にも位置することから、修景に配慮した樹種も植栽していく。

⑤ 県民参加については、小学生を対象に公募し、①どんぐり拾い　②ペットボトル、牛乳パックによる育苗(於：各家庭)　を行ってもらっている。また平成 22 年秋にはこの育ててもらった苗木の植樹を予定している。（NPO が別に育てている苗木や購入苗木(常緑樹)も併せて植樹）特に②の育苗については、ペットボトルの水耕栽培等により発芽、発根、葉の展開などの観察ができるなど、植物への理解、親しみがわくような工夫をしている。

PJ–51

京浜工業地帯におけるトンボネットワークと生物多様性の市民参画
(Citizen participation in monitoring an ecological network and a diversity of dragonflies in the Keihin Industrial Zone)

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京浜臨海部は明治期以降、埋め立てと工場立地により誕生した人工地帯で、各事業所内には一定面積の企業緑地やトンボ池が存在する。私たち「トンボはドコまで飛ぶかフォーラム」は 2003 年、横浜市環境まちづくり協働事業として、多くの市民グループ、事業所、専門家、行政が集まって発足した。今日に至る７年間、夏にこの地域の事業所等 10 ヶ所（キリンビール横浜工場、東京ガスエネルギー館、東京電力横浜火力発電所、日本ビクター本社工場、ＪＦＥエンジニアリング鶴見事業所、マツダＲ＆Ｄ横浜センターの６社と、入船公園、横浜ＳＦ高校、国交省横浜技調、北部第二水再生センター）で、毎年のべ百数十人の市民が参加して、各地点三日間、出現する蜻蛉目（不均翅亜目）昆虫の標識調査を行ってきた。

７年間の調査で捕獲された蜻蛉目は合計 17 種 3535 頭で、調査が８月上中旬となった 2004 年以降ではシオカラトンボ、ショウジョウトンボ、オオシオカラトンボ等が最優占種となっていた。最近では最多のシオカラトンボと他の優占２種との間でトンボの種交代が起きつつある。当初は東京電力の池でしか見られなかったチョウトンボも、現在は個体数を増やし、分布の拡大がおきている。新たに生まれた湿地や池では１～２年で顕著な蜻蛉目群集の形成がなされることもわかった。また、調査した各事業所間や調査地域外の内陸部緑地域へのトンボ個体の移動も直接観察されており、ここでの生物供給のエコロジカルネットワークの存在とその機能が検証されつつある。

こうして各事業所等の環境努力が成果をあげていることがわかるにつれ、参加企業の環境活動は後押しされ、当初はビオトープとしての池を持たなかった３事業所で、新たなトンボ池の設置や池の改良がなされた。すでに地域住民の環境教育と憩いの場となっている所もある。本協働事業への企業の参加にあたってのハードルは低く、調査活動を通じて企業関係者と市民との交流や相互理解も進んだ。環境保全・再生への新たな市民参画のあり方として海外の政府関係者からの視察も受けるようになった。

市民にとっては、自らの活動が企業を動かす形の参画の場となり、一方、企業にとっても機会の少ない生物多様性ＣＳＲとして参加容易な活動となっている。温帯の、しかもこうした生物多様性のあまり高くない地域においても、そこ独自の生物多様性の確保が求められるなか、今日的意義は大きいものと思われる。

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cs-EFA：生物多様性を支えるビジネスに向けての新しいコンセプト
(cs-EFA :new concept for business supporting biodiversity)

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地球規模で急速に生物多様性が失われつつある中、ビジネス業界においても生物多様性保全にどう貢献するかが注目されている。しかし、企業の取り組みは里山保全活動や環境教育等の社会貢献活動として取り組まれることが多く、経済システムの中で生物多様性が保全される仕組みづくりまでには至っていないのが現状である。資本主義経済の中では、できるだけ安価な商品が大量に、安定して市場に供給されることが望まれる。農業についても例外ではなく、生産の現場では効率を重視するため、農薬に頼らざるを得ないところがある。その結果、食の安全や自然環境の劣化、生物多様性の喪失といった問題が引き起こされている。

そこで、経済システムの中に生物多様性保全を組み込むための一つのコンセプトとして、「地域や消費者が、環境-食-農業の健全なつながりを支える」cs-EFA(community and consumer supported Environment , Food and Agriculture)を考案した。これは、地域や消費者が環境や食の安全を守ることのできる有機農産物等の価値を認識した消費を行うことによって、生産者と共に環境共生型農業を支えていく、というネットワークが基本である。本コンセプトを基本とした消費が進むことによって、地域の環境や食、またそれらを支える農業等が保全され、持続可能な社会づくりへとつながることが期待される。本レポートでは、生物多様性保全型の一つのビジネスモデルとして、このコンセプトを柱とした農産物流通ビジネスを紹介する。

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生態系保全に考慮した庭づくり「5 本の樹」計画の効果検証
(Verification of Gohon no ki gardening, garden-planning concept that considers ecosystem protection)

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［背景］
積水ハウス株式会社では 2001 年から、自然生態系保全を考慮した庭づくり「5 本の樹」計画に取り組んでいる。日本各地の気候風土に適合してきた在来樹種を中心に植栽を計画することで、住宅の庭を周辺に生息する鳥や蝶などの利用空間とするものである。規模は小さいが、そのような庭を点在させることで、街の中で人を含んだ生態系ネットワークを構築することができる。また、住宅の庭に鳥や蝶などのいきものを誘致することで、生きものと触れ合う頻度も高くなり、生物多様性と人との関係を実感することで、生態系保全の取り組みが促進されるという副次的効果も期待できる。

［調査目的］
①「5 本の樹」計画実施による生物多様性貢献度評価
②住民参加型調査手法の開発

［調査概要］
調査時期：　冬季（1～3 月）と夏季（6～9 月）の年 2 回
調査対象：　冬季は鳥類を中心とした調査。夏季は鳥類、チョウ・トンボ類・バッタ類等の大型昆虫類を中心とした調査
調査場所：　宮城県仙台市、茨城県牛久市、愛知県瀬戸市、愛媛県松山市、宮崎市
調査方法：　基本は主任研究員クラス 1 名、研究員クラス 1 名により、分譲団地内と周辺地域をライントランセクト法で現地調査。 適宜、住民参加型の調査も実施

［調査結果の概要（抜粋）］
・宮城県仙台市の分譲地における調査では、市街化が進んでいる周辺地域より、緑化された分譲地内で確認できた鳥類・昆虫類の種数の方が多く、敷地内のまとまった植栽による生きものの誘致効果が確認できた。
・愛媛県松山市の 2 分譲地では 2 年連続して夏季の調査を実施した。どちらの分譲地でも観察できた生きものの種数が増加しており、経年による植栽ボリュームの増加が生物相に与える影響を確認することができた。
・調査に参加した住民のアンケートによると、身近な生態系に対する関心が高まったことを示唆するコメントが多く見られた。定性的ではあるが、生態系保全に対する一般生活者の意識向上にも貢献していると考えられる。

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An action of biodiversity conservation of OSAKA GAS Co. Ltd.

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Osaka Gas Group strives to reduce stress on the global environment, particularly by expanding the use of natural gas, with the least environmental impact; offering high-efficiency equipment and systems, and supporting energy conservation and related efforts in environmental businesses, toward realizing a low-carbon society. At the same time, we remain acutely aware of our responsibility to conserve biodiversity as a common heritage of humankind to be handed down for the benefit of each successive generation. To this end, we will work hard to reduce the impact of our business activities on biodiversity to ensure its sustainability.

Osaka Gas Group has made some efforts to conserve biodiversity under the collaboration with stakeholder outside (See the Table1). For example, at Experimental Residential Complex NEXT 21 is that the entire structure features greenery, including the ecological garden. The greenery of NEXT 21 was designed with the request that it be linked with the flora and fauna of the local area. Indeed, since construction was completed in the fall of 1993, more than 22 species of birds have been observed here by the Wild Bird Society of Japan.

At Osaka Gas LNG terminals, we have been conducting afforestation activities that recreate the area's ecosystems and are capable of supporting rich biodiversity. At the Senboku LNG Terminal, we have been trying to restore a network of greenery that brings us closer to the community. On the premises, we are creating forests where diverse creatures can exist; for example, the Senboku Forest of Japanese oak, and grassland of Japanese blood grass. We have another large space that we will use to plant indigenous trees. At the Himeji LNG Terminal, we took part in an experiment by the Museum of Nature and Human Activities, Hyogo in which we introduced into our afforestation 36 species of plants native to Nishi Harima (Hyogo Prefecture), including endangered species , such as Honshu wood mint and calanthe. In April 2009, the threatened plants were surveyed and found to have an 80% rate of survival. This shows that the terminal forest is an effective site to protect threatened plants. Not only did this project help build a habitat for diverse creatures and conserve valuable genetic resources; because indigenous species grow readily in their original area since the climate is ideal for them, it will be more cost-effective to grow such species in afforestation of factories.

In addition, Osaka Gas Group is planning to disclose its own basic policy for biodiversity conservation in April 2009, in order to spread the conservation of biodiversity to the subsidiaries.

Table1. Chronological table of biodiversity and OSAKA GAS.

year	内　容
1965	The main office north building completion, rooftop garden setting (oldest in Osaka city).
1983	Admission to the WWF Japan.
1984	Afforestation with the ecology greening method was introduced in Himeji Terminal.
1992	Osaka Gas environmental action agenda enactment.
1993	NEXT21 completion with green space in the center of a city where wild bird was considered.
1998	Birds and animals were investigated in NEXT21 (Cooperation: Japan Wild-Bird Society).
2001	Afforestation business beginning by Eco Tree Farm Pty. Ltd (Australia).
	Biotope was constructed in the Himeji Terminal.
2004	The endangered plant protection experiment was carried out in the green space in the Himeji Terminal.
2005	Afforestation beginning of sapling grown from local forest acorn in the Senboku Terminal.
	Participation to "Forest of the labor union and the enterprise" in Wakayama Pref.
2006	Osaka Gas group CSR charter enactment.
2008	"Green network connected with local region" plan decision in Senboku Terminal.
2009	"Biodiversity" was referred in an Osaka Gas environmental policy.
	The biodiversity condition was investigated at the main office roof garden (Cooperation: Japan Wild-Bird Society), the Himeji Terminal and the Senboku Terminal.
	Participation to biodiversity declaration partners of the Japan Federation of Economic Organizations.

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里山の植物における生物多様性—日本の園芸，美術，詩歌のゆりかご
(Biodiversity of Satoyama plants-cradle of Japanese horticulture, arts and poems)

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日本のガーデニング愛好家が本家と仰ぐイギリスの植物の種はおよそ 1500 種，顕花植物だけで 3694 種を数える日本に比べると驚くほど少ない．植物の少ないヨーロッパに園芸を開花させたのは，江戸に始まる日本の園芸術であった．この園芸のもととなった植物は得難い植物ではなく，近世に始まる人と自然との新たな関わりの中で人びとの身近な自然環境となった里山の植物である．豊かな里山の植物に美を見出した江戸の市民生活の感性に，自然環境をめぐる現代の課題を解く鍵を探ってみたい．

1695 年刊の江戸染井の園芸家伊藤伊兵衛による「花壇地錦抄」 は中国由来の牡丹，菊は無論であるが，世界の園芸花木になったツバキ，ツツジに加え，今なおヨーロッパの園芸愛好家を魅了するミヤマシキミ，ハマナスなどの木本，草本は世界のユリ園芸の源となったユリに加えて，ホシクサ，テンナンショウ，ヘクソカヅラ，クジャクシダなど，里山の思いがけない草木を園芸の対象として推奨する．加えて江戸寺島村（向島）百花園のように，実際に「雑草」を園芸として楽しむ文化が存在したことは豊かな感性の中で生活していた江戸の市民の姿を浮き彫りにする．里山を切り開きソメイヨシノを全国に植樹しまくる現代のモノカルチュアー園芸とは対極の位置にある．

日本の美術を代表するとされる花蝶画は長い間中国美術の模倣に終始し，日本の自然との関わりはごく希薄であった．17 世紀以降，都市市民の経済力のもと京都，大坂，次いで江戸に広がった出版文化の中で相次いで刊行された大坂の橘盛國・保國父子による「絵本鶯宿梅」，「絵本野山草」などの絵手本，小野蘭山・島田充房による本草書「花彙」の独創的な墨版による植物画の数々は，かびの生えた花蝶画の世界を打ち砕き，橘父子の書物では各々，58 種，165 種，花彙では合計 200 種の植物が描かれている．これらは美しい精密画を通して広く市民に日本の植物知識を伝えた傑作であり，幕末の植物学者飯沼慾斎の日本最初の科学的植物図鑑の先駆けともなった．描かれた植物のほとんどは里山に普通の植物であり，上の園芸書と感性を一にする．

日本人の植物好きの起源を万葉集に求める万葉集信仰は後を絶たないが，万葉集は恋の歌集であり，さらにはその中核を占める宮廷歌人たちの歌の多くが，植物を詠む歌でさえ彼らの中国的教養の誇示の歌であることは今では常識である．詩歌に映る本当の意味での日本人の植物好きの姿は，江戸時代に勃興した俳句とそれに触発され息を吹き返す幕末の和歌に見られる．四季を詠みこむことを約束とする俳句の手引書の俳諧歳時記である 1638 年の「毛吹草」に記される植物はおよそ 360 種を数え，江戸末の「増補俳諧歳時記栞草」になると，顕花植物だけで 490 種，農作物，シダ類を加え 500 種を越す．江戸後期ともなれば多くの外来園芸種が加わるのは無論ではあるが，基本的には身近な環境である里山の植物，農作物を詩歌の対象としたことが分かる．

かくして日本の当たり前の自然を当たり前に文化の中に取り入れるならわしは普通の市民の中に広く受け入れられるようになった．身近な自然環境である里山の多様な植物がそのもとになったといえる．

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地域固有の「伝統的知」からみた生物多様性保全戦略に関する試論
(Local & conventional approach for biodiversity)

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都市における生物多様性における地域固有の「伝統的知」の位置づけ － 日本の都市は、海、農地、ヤマ、川を利用して、産業や生活を営み、文化を蓄積し、人は海、まち、農地、ヤマ、川の資源を相互に循環させることによって、地域固有の生物多様性を保全してきた歴史的経緯を持つ。現在、近代以降の技術開発と経済の発展によって拡大した都市にあって、生物多様性保全につながる生活や生業に関わる技術や地域独自の伝統的知は過去のものではなく、様々な科学的調査研究に基づく知見から現代においても生物多様性保全につながることが実証されている。例えば、河川堤防の一定区間に開口部を設けた「霞堤」は、治水だけでなく、上流から常に肥沃な土壌を供給することによって優良農地をつくりあげ、さらに堤外地の遊水池に湿地性生物などの多様な生物相を維持してきたことが近年の調査から明らかになっている。日本政府が生物多様性条約事務局に提出した「生物多様性条約ポスト 2010 年目標日本提案」では、2050 年までの長期目標に「人類が享受する生態系サービスの恩恵を持続的に拡大していく」ことを提示しており、都市のなかで維持されてきた地域固有の伝統的知は、農林漁業などの生産システム、治山・治水などの生命・財産の保全のための技術、生活文化を含めて、生態系サービスを持続的に享受できる総合的なシステムとして見直される必要がある。

地域固有の「伝統的知」の類型化と意義 － 生物多様性の保全に関わる事例調査の結果、地域固有の「伝統知」は、①自然環境の特性を踏まえた空間活用と景観保全、②自然資源の持続的な管理利用、③自然環境の保護を通じた「地域経営」、の３類型に区分できた。

①については、埼玉県三富新田における屋敷地・農地・屋敷林・平地林からなるモザイク的土地利用の活用によって生態系サービスを持続的に享受できる仕組みの継承と景観保全を図っている例があげられる。②については、愛知県三河湾六条潟における入会漁場の取決めによってアサリ資源の計画的管理と漁場の育成を図り、底生生物の保全と生態系サービスを持続的に享受できる仕組みを継承している例がある。③については、奈良公園における春日山原始林などの自然環境の保護を通じて地域経営を進めることによって都市における生物多様性を維持している例があげられる。こうした事例をみると、生物多様性の基盤となる自然環境の維持管理に関する技術や技法は市場経済と結びついて即効的に地域経営に対応するものではないが、時間軸を勘案すると「伝統的知」による自然環境の利用が将来へのポテンシャルを担保することになり、さらにグローバルな視点からみると、発展途上国における資源管理への示唆を与えるものとなる。

生物多様性保全を進める上での「伝統的知」の継承のための手法と今後の展開 － 地域固有の「伝統的知」を継承するためには、科学的調査研究による「知」の検証や新技術化、「知」の発見・発掘と「知」を担う人材の育成などのハード、ソフトと併せて、システムとしての「知」の継承が必要とされる。わが国では、ハードに関するいわば生物多様性保全に係る要素技術は日々進化しており、ソフトの面では NPO の活躍などである程度担保される時代になってきた。このため、「知」を発見・発掘・データベース化を進め、地域固有の「知」を継承する動きを広げ、これらに多数の市民が参加することなどの一連の「知」の継承のためのシステムを定着させることが必要となる。こうしたシステム構築によって、「伝統的知イニシアティブ」として国内での理解と世界に向けた発信が可能となる。

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里山景観における水田畦畔木
(Free-standing-trees on paddy levees in satoyama landscapes)

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Many rice paddy levees in Japan feature rows of planted, isolated trees. Some trees are used to hang and dry rice plants (so called hasaki-trees). Many trees provide shade for the rice farmers when they rest, and tree roots help to protect the edge of the paddy irrigation canals. Scenery with such free-standing-trees on paddy levees (hereafter called levee trees) was frequent in Japan in the past, but has become limited to only a few regions today. There are two main reasons why there are only few levee trees left today. First, levee trees were cut in the late Meiji era and in the war years of the 20th century when it was believed that their shade and falling leaves caused a smaller crop, and when rice breed improvement measures were implemented in order to increase food production. Second, the advancing mechanization of agriculture and the consolidation of farmland during the high-growth period of the 1970s made levee trees to hang rice and provide shade unnecessary. Today, however, levee trees have been re-discovered as essential elements of scenery, and areas featuring paddies with levee trees have been reconsidered for preservation as cultural landscapes, such as in Niigata Prefecture. Similarly to Japan, scenery with free-standing-trees in paddies is ubiquitous in Asian countries such as in the plains of Thailand and Laos where such trees are mostly used for the production of food. In this survey, we investigated distribution, method of use, management, and time and causes of disappearing of wood species levee trees on paddy levees in the suburbs of urban areas where scenery with levee trees has remained.

Most of the levee trees in Kameoka City (Kyoto Prefecture) were removed during the large-scale farmland consolidation conducted there 20 years ago. Some, however, remained. Among these, the alder was most frequent among the wood species according to field research. Alders were mainly used to dry rice straw after the harvest. Today, some people in Kameoka City attempts to sell rice dried on levee trees as a special commodity with additional value according to hearing investigation. In the Koshihata area of Kyoto City, there used to be seven or eight planted trees on each levee according to the hearing investigation. These, however, have gradually disappeared during the last 40 years. And now there are a lot of levees without the levee tree, also in the remaining levee, there are only four or five on each levee according to field research. Among the remaining trees we found wood species, particularly sawtooth oaks, which were used as hasaki-trees to dry glutinous rice and rice straw. These trees serve also as a biotope for beetles that are popular as pets with children in Japan, in particular the stag beetle. Skimmia evergreen shrubs which are used in Buddhist ceremonies and persimmon trees which provide fruits in early winter were also found. In both investigated areas, levee trees had in the past mainly served as hasaki for the drying of rice and straw. The other tree species differed in the two areas according to local needs and characteristics.

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