

Alain  
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**JSIA**



## **5<sup>th</sup> Japan-Korea EIA Workshop**

### **“Biodiversity and EIA”**

**Date: Sep. 17 (Fri), 2010**

**Venue: Nagoya University (Higashiyama campus), Japan**

**Language: English (no translation)**

**Host Organization: JSIA International Committee**

**Co-Organizer: Nagoya University EcoTopia Science Institute**



# 5th Japan-Korea EIA Workshop Program

## Title: Biodiversity and EIA

Date: Sep. 17 (Fri), 2010  
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Host Organization: JSIA International Committee  
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### Opening Address

13:30: President of JSIA and KSEIA  
- JSIA's President : Shigeru Kashima (Chuo University)  
- KSEIA's President : Myungjin Kim (National Institute of Environmental Research)

### Special Session: Chinese Guest Speakers

13:40: Strategic Environmental Assessment in China  
- SEA Legislation and Administration in China (Dr.Li Tianwei, MEP)  
- SEA Methodology and Practice in China (Dr.Li Wei, Beijing Normal University)

### Session I: Biodiversity Policy and EIA

Chair: Prof. Jong Ho Lee (Cheongju University) and Prof. Akira Tanaka (Tokyo city University)  
14:10: Prof. Kiichiro Hayashi (EcoTopia Science Institute Nagoya University)  
"World Trend of Biodiversity Policy and Environmental Assessment"  
14:30: Prof. Jaeyong Choi and Eunyoung Park (Chungnam National University)  
"CBD and Nature Aspects of EIA"  
14:50: Q and A

### Session II: Impact Assessment for Biodiversity

Chair: Prof. Kiichiro Hayashi (Nagoya University) and Dr. Myungjin Kim (National Institute of Environmental Research)  
15:00: Prof. Sang-Don LEE (Ewha Womans University) and Dr.Paik-ho Roh (Korea Environment Institute)  
"Construction of alternative habitat for endangered species of waterbirds in the western coastal areas of Incheon"  
15:20: Prof. Akira Tanaka (Tokyo City University) and Maiko Yoshizawa (IGES)  
"HEP applications to EIAs in Japan -Its implications for Biodiversity Offsets"  
15:40: Q and A

### Break 15:50-16:00

### Session III: Impact Assessment for Biodiversity: Cases

Chair: Dr.Jong-Gwan Jung (CDI) and Prof. Takehiko Murayama (Waseda University)  
16:00: Ms. Noriko Shimizu (FoE Japan)  
"Sakhalin Oil and Natural Gas Development and Biodiversity Conservation"  
16:20: Prof. Changwan Seo (University of Seoul)  
"Biodiversity Conservation and National Park Management"  
16:40: Q and A

#### Session IV: Panel Discussion

16:50: Chair: Prof. Kiichiro Hayashi (Nagoya University) and Dr. Jong-Gwan Jung (CDI)

Prof. Jaeyong Choi

Prof. Sang-Don LEE (Ewha Womans University)

Prof. Akira Tanaka (Tokyo City University)

Ms. Noriko Shimizu (FoE Japan)

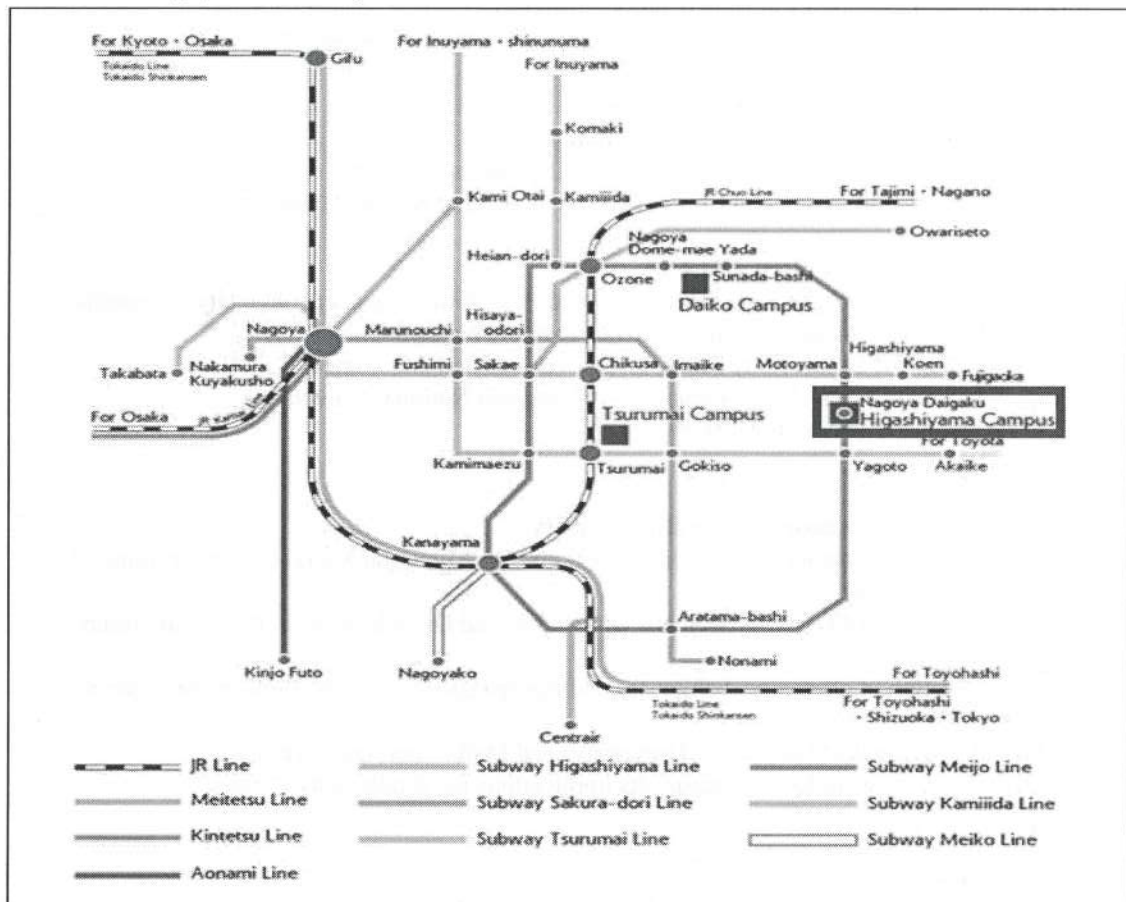
Prof. Changwan Seo (University of Seoul)

#### 17:20: Closing Remark

Prof. Akira Tanaka (Chairman of International Exchange Committee of JSIA)

#### 17:45-19:30: Reception (Nanamitei “七味亭”)

#### Access to Nagoya University



#### To Higashiyama Campus

From Nagoya Station: Take the Subway Higashiyama Line to Motoyama Sta. (15 minutes), then transfer to the Subway Meijo Line to Nagoya Daigaku Sta. (Higashiyama Campus is just off the subway exit).

From Centrair (Central Japan International Airport): Take the Meitetsu Line to Kanayama Sta. (30 min.), then transfer to the Subway Meijyo Line to Nagoya Daigaku Sta. (21 min.).

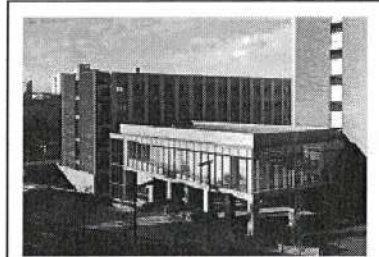
## To Nagoya Station

From Centrair (Central Japan International Airport): Take the Meitetsu Line (30 min.) or the airport bus (60 min.).

### Venue: Integrated Building “IB電子情報館”

2 minutes from the Exit 3 of Nagoya Daigaku Station (Subway Meijo Line).

(Venue of convivial party: Nanamitei “七味亭”)

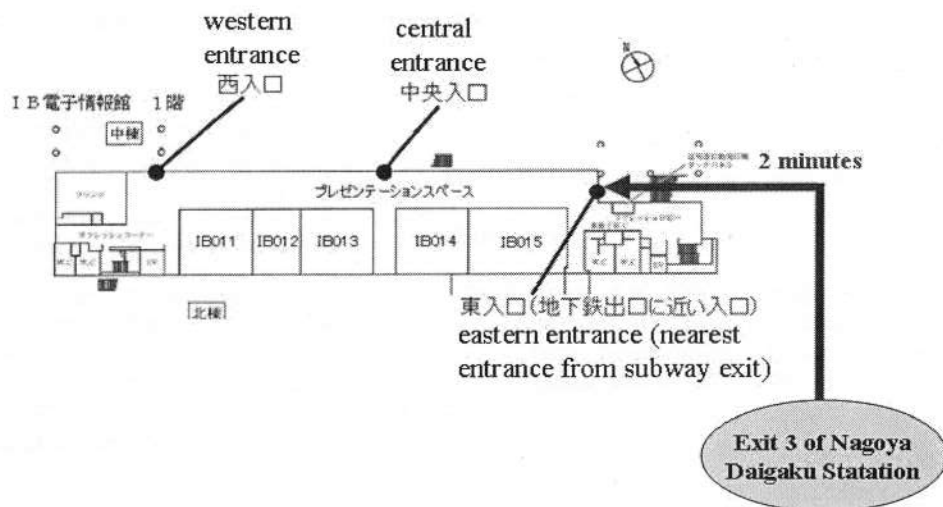


Integrated Building



## Inside Integrated Building

### Integrated Building, 1th floor



# **Special Session: Chinese Guest Speakers**

## **Strategic Environmental Assessment in China**

**“SEA Legislation and Administration in China”**

**Dr.Li Tianwei (Ministry of Environmental Protection)**

**“SEA Methodology and Practice in China”**

**Dr.Li Wei (Beijing Normal University)**

# SEA in China

Li Tianwei

Department of EIA, MEP

Keywords: SEA, China

## 1 Introduction

Strategic Environmental Assessment (SEA), a newly-developed decision-making support tool, has been used in China for decades. This article describes the development of china and the current situation of SEA in China.

## 2 China's SEA

### 2.1 Development of China's SEA

EIA was legislated in China in 1979, China government worked out a series of supporting documents on project EIA. Regional environmental impact assessment is regarded as the earliest form of SEA (Che Xiuzhen, et al, 2002). The Ordinance for Program/Plan EIA became effective on 1st October, 2009 means a new phase of incorporating environmental considerations into development decision-making process.

### 2.2 Framework of China's SEA

Generally, the framework of China's SEA consists of scopes, P-EIA documents, the organizing of P-EIA, Time for P-EIA, Review & approval. Table 1 shows the main elements P-EIA documents shall include.

**Table 1 Elements included in P-EIA documents**

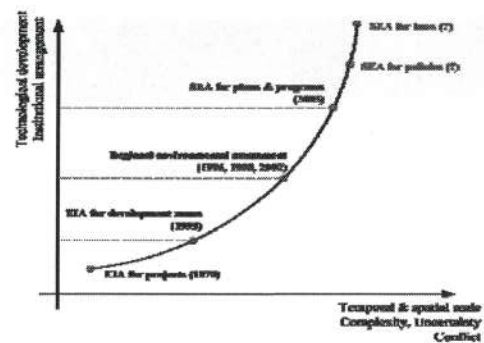
The chapter or statement	EIA report for special plans
<ul style="list-style-type: none"> <li>An analysis, prediction and appraisal of the environmental impacts</li> <li>The counter-measures for preventing or mitigating the unfavorable environmental impacts.</li> </ul>	<ul style="list-style-type: none"> <li>An analysis, prediction and appraisal of the environmental impacts</li> <li>The counter-measures for preventing or mitigating the unfavorable environmental impacts,</li> <li>The conclusion of the P-EIA.</li> </ul>

### 2.3 Progress of China's SEA

China has enacted a set of Supporting regulations and measures, and developed a lot of Pilot projects on P-EIA, meanwhile, invested a lot to capacity building.

### 2.4 Priorities for China' SEA

The current Priorities for China' SEA are Refining the legal framework, deepening P-EIA pilot projects, and enhancing capacity building. The trajectory of SEA in China is showed as figure 1.



**Figure 1 SEA in China: trajectory**

## 3 Conclusion

SEA in China is increasingly regarded as a way to counter limitations of project EIA and as a tool for integrated decision-making, and china did a lot with SEA at the same time, however, there were plenty of difficulties in P-EIA, including technical foundation, financing, information, discretion and support of stakeholders , and public participation.

## References

Che Xiuzhen, et al,(2002) Strategic Environmental Assessment and its development in China ,Environmental Impact Assessment Review, Volume 22, pp. 101-109



# SEA in China

Li Tianwei PhD  
Department of EIA, MEP  
17/09/2010



## Contents

- Development of China's SEA
- Framework of China's SEA
- Progress of China's SEA
- Priorities for China' SEA



## (I) EIA was established in 1979

- Environmental Protection Law (Trial) (1979)
- the following environmental laws on air, water, noise and solid waste
- A series of supporting documents on project EIA



## (II) R-EIA leads the SEA application

- In 1993, Regional EIA (R-EIA) in China primarily took the shape of SEA.
- In 1996, The Decision of the State Council on some Key Issues of Environmental Protection, asks Environmental impact analysis for territorial and resources plans, urban and industrial development plans or making momentous decisions on economic construction or social development
- the Regulations on the Administration of Construction Project Environmental Protection issued in 1998, requires R-EIA



## (II) R-EIA lead the SEA application

- Some important R-EIA: Yang Pu Economic Development Zone in Hainan Province, Daxie Island Development Zone in Zhejiang Province, Xigu Industrial Development Zone in Gansu Province, Taizhou Raw Chemical Material exporting Base in Zhejiang Province, Shanghai Chemical Industry Development Zone
- In 2002, Circular on Strengthening EIA Supervision of Development Zones



## (III) Establishment of SEA system

- EIA Law establishes the Plan & Programs EIA (P-EIA) system The Ordinance for Program/Plan EIA became effective on 1st October, 2010 means a new phase of incorporating environmental considerations into development decision-making process.
- The Decision of the State Council on Implementing the Outlook on Scientific Development and Strengthening Environmental Protection issued in December of 2005 further requires: "Environmental impact analysis shall be carried out on the decision making with significant environmental impacts."



## Contents

- Development of China's SEA
- Framework of China's SEA
- Progress of China's SEA
- Priorities for China' SEA



## (I) Two scopes

- **General Plans:** the land use plan, and the plans for the development & utilization of regions, river basins and sea waters.
- **Special Plans:** including industry, agriculture, animal husbandry, forestry, energy, water conservancy, transportation, urban construction, tourism and natural resources development.
- **The specific scope** was prescribed by SEPA jointly with other relevant departments and submitted to the State Council for ratification.



## (II) Two types of P-EIA documents

- for General plan & the Derective plan in special plans: to present a chapter or statement on environmental impacts.
- for Special plans: to present an EIA report.



## (III) The organizing of P-EIA

- Self-assessment: The department organizing the compilation of the plan is in charge of organizing the compilation of P-EIA document.
- P-EIA document compiled by :
  - EIA team organized by the department organizing the compilation of the plan, or
  - a professional institute entrusted

## (IV) Time for P-EIA

- for General plan & the Derective plan in special plans: EIA shall be carried out during the period of the plan drafting.
- for Special plans: EIA shall be carried out before the submission of the draft plan for approval.



## (V) Elements included in P-EIA documents

- The chapter or statement shall include:
  - An analysis, prediction and appraisal of the environmental impacts that might occur if the plan or program is implemented,
  - The countermeasures for preventing or mitigating the unfavorable environmental impacts.
- EIA report for special plans shall include:
  - An analysis, prediction and appraisal of the environmental impacts that might occur if the plan or program is implemented,
  - The countermeasures for preventing or mitigating the unfavorable environmental impacts,
  - The conclusion of the P-EIA.



### (VI) Review & approval of P-EIA documents

- The chapter or statement on environmental impact:
  - as a part of a draft plan
  - shall be submitted together with the plan to the authority according to law for examination and approval
- EIA report for special plans:
  - submitted together with the plan to the authority for review and approval
  - environmental protection depart. take the responsibility of review
  - to summon the representatives of relevant departments and experts to form a review panel



### (VII) Legal liabilities of related parties

- the department in charge of drawing up plans
- the authority for review and approval of plans



### Contents

- Development of China's SEA
- Framework of China's SEA
- Progress of China's SEA
- Priorities for China' SEA



### (I) Supporting regulations and measures

- MEP
- Regulations on the Review of P-EIA Report for Special Plans in 2003
- Measures on the Management of P-EIA Review Expert Pools in 2003
- Specific Scope of Plans or Programs in Need of the compilation of EIA Report & of the Chapter or Statements for Environmental Impacts (Trial) in July 2004
- Provisional Measures for Public Participation in EIA in February 2006

### (I) Supporting regulations and measures

- The Regulations on P-EIA was submitted to the State Council for review on December, 2006 and is waiting for approval.
- About 13 provinces or municipalities have issued the administrative regulations or government documents on P-EIA.



### (II) Pilot projects on P-EIA

- In 2006, Experimental Works of SEA Nationwide:
  - 10 typical administrative regions
  - 3 key industries
  - 10 major special plans

### (III) P-EIA in key fields

- Rail transport
- Expressway network
- Coal mines
- Port
- Economic development zones



### (IV) Capacity building

- Recommended P-EIA compiling institutes: 4 lists of 317 recommended units
- Advisory Commission of SEA: 39 members in 2007
- Textbook of SEA cases
- Training courses for: 650 officials and 2395 professionals
- P-EIA technical guidances for relevant industries



## (V) Major difficulties in P-EIA

- Technical foundation
- Financing and time
- Information
- Discretion and support of stakeholders
- Public participation



## Contents

- Development of China's SEA
- Framework of China's SEA
- Progress of China's SEA
- Priorities for China' SEA



## (I) Refine the legal framework

- Legislation on the EA at policy level
- SEA template or "cookbook" for planners and decision-makers
- Integration of SEA in the planning and decision-making process
- Public participation and stakeholders' engagement

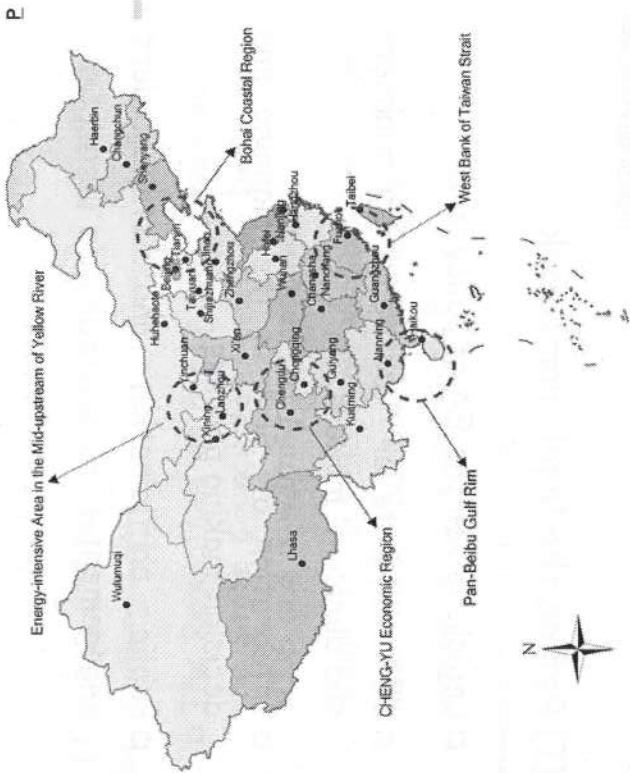


## (II) Deepen P-EIA pilot projects

- Focus on key areas and industries:
- Participate in macro-level decision making:
  - take part in the national productivity arrangement and development plan, such as Nationwide Strategic Plan on Increasing 100 billion Food Throughput(2009-2020)
- Promote SEA on Five Key Development Regions:
  - the Economic Zone Encircling Bohai Bay, the West-bank Economic Zone of Taiwan Strait, Economic Zone of China Northern Gulf, Economic Zone of Chengdu and Chongqing, Energy and Chemical Intensive Zone at the middle and upper reaches of the Yellow River

### (III) Enhance capacity building

- Expedite the development of technical guidance on P-EIA
- Develop simple and flexible approach
- Training of SEA professionals and officials
- Strengthen international cooperation
- Establish several national SEA research centers



# Thanks !

Li Tianwei PhD

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# A Snapshot of the Practice and Methodology of Strategic Environmental Assessment in China

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<sup>2</sup> Department of Environmental Impact Assessment, Ministry of Environmental Protection, China

Keywords: SEA, Environmental Carrying Capacity, Scenario Analysis, Methodology, PEIA

## 1 Introduction

So far, SEA systems have been established in both developing and developed worlds to assess and modify proposed PPPs. More and more SEA cases have been done or studied on a variety of development plans or programs of energy, transport, industry, coastal zone, waste management, water or land use. However, in contrast to the growing demand of SEA capacity, there is still a lack of effective approaches, especially for the macro, large scaled SEAs at policy level and beyond. This paper seeks to provide a rough overview of China's SEA development and methodologies.

## 2 Recent SEA practice in China

In China, the EIA Law came into effect on 1 September 2003. The law adopted a form of SEA only at the levels of plans or planning (PEIA) with an objective of rationalizing the development alternatives based on regional environmental carrying capacity and long term ecological security. From 2005 to 2008, Chinese Ministry of Environmental Protection (MEP) had developed three rounds of PEIA demonstration projects mainly for the typical regions and key sectors and a series of training courses for PEIA managerial staff and technicians. Based on the experience acquired from the pilot works, MEP had consecutively issued a set of technical guidelines on PEIA including the Technical Guideline for PEIA (on trial) (2003), the Provisional Measures for Public Participation in EIA (2006), the Technical Guideline for PEIA on the Master Plan of Coal Mining Area (2009), and as a milestone of

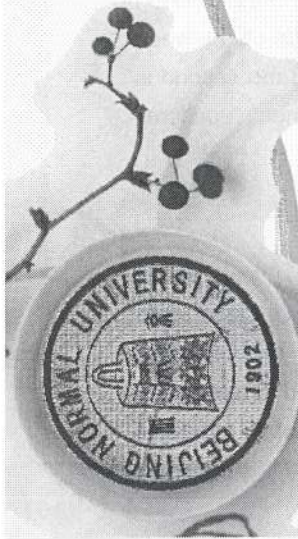
China SEA development the Ordinance for PEIA which has taken effect since October 1st, 2009. All of these measures are attempting to set up a comprehensive management and technique system ensuring the effectiveness of PEIA.

## 3 Summary of China's SEA methodologies

Conceptually, current SEA practice can be divided into two categories including *project EIA based* (SEA is modeled closely on or applied in accordance with the requirements of EIA guidelines) and *policy analysis based* (procedures have some or all of the features or characteristics of SEA). In term of features of the methods and procedures employed, four kinds of SEA methodologies may be concluded as follows: environmental carrying capacity based, sustainability diagnosis oriented, scenario analysis modelled, and lessons learnt driven methodologies. In addition, two kinds of impacts and relations are highlighted in the assessment. The two impacts include the overall impact on ecosystem and the long term impact on environment and human welfare. First relation need to be addressed is the trade-off between short run and long run benefit, and the second is balanced relation among environment, economy and society.

## 4 Conclusion

SEA has been recognised as a useful aid in integrating environmental considerations into strategic planning to improve the environmental performance of policies, plans and programmes making. Despite of the application of its principles



# Mainstreaming SEA Methodology to

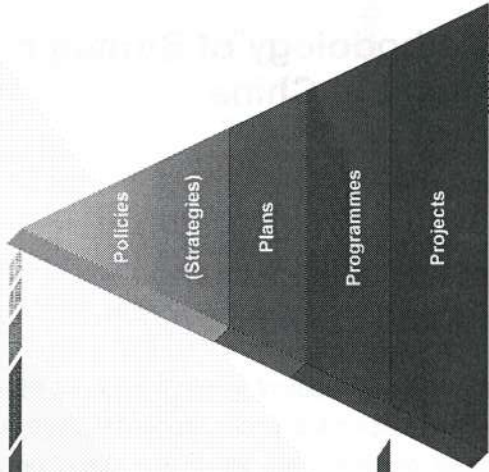
## Fit Decision-making in China

Prof. Li Wei

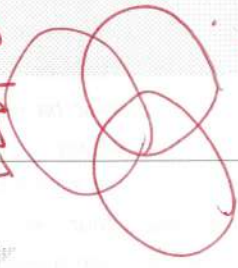
School of Environment, Beijing Normal University

2010.09

# Hierarchy of Proposal and Assessment



*ECBP Component*



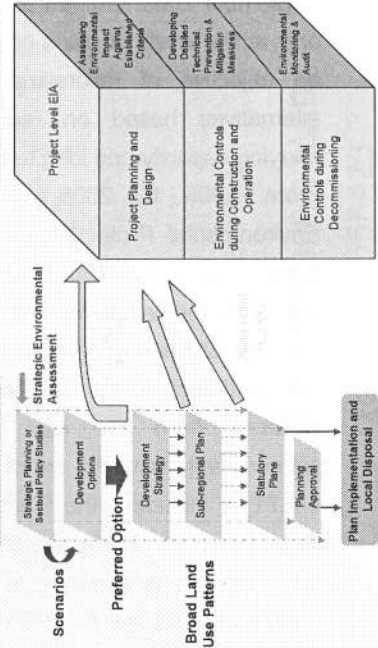
*Ecological Compensation, "nonet loss" watershed compensation.*

Strategic Environmental Assessment

Project EIA

# Common Applications of SEA

Interaction Between Planning, SEA and EIA



# Hierarchy of Governance

Mainstream of Environmental Management

Environment

Prevention

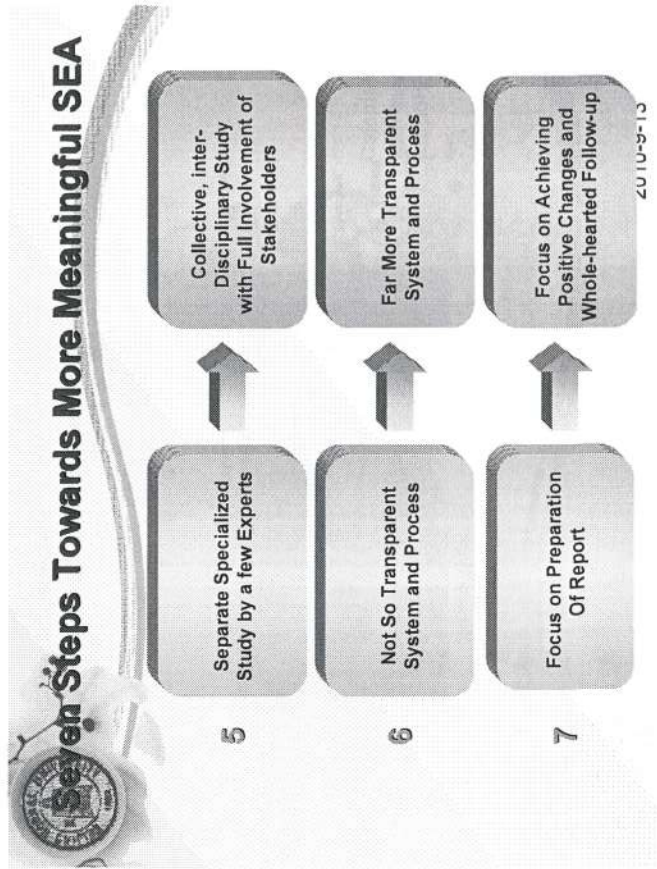
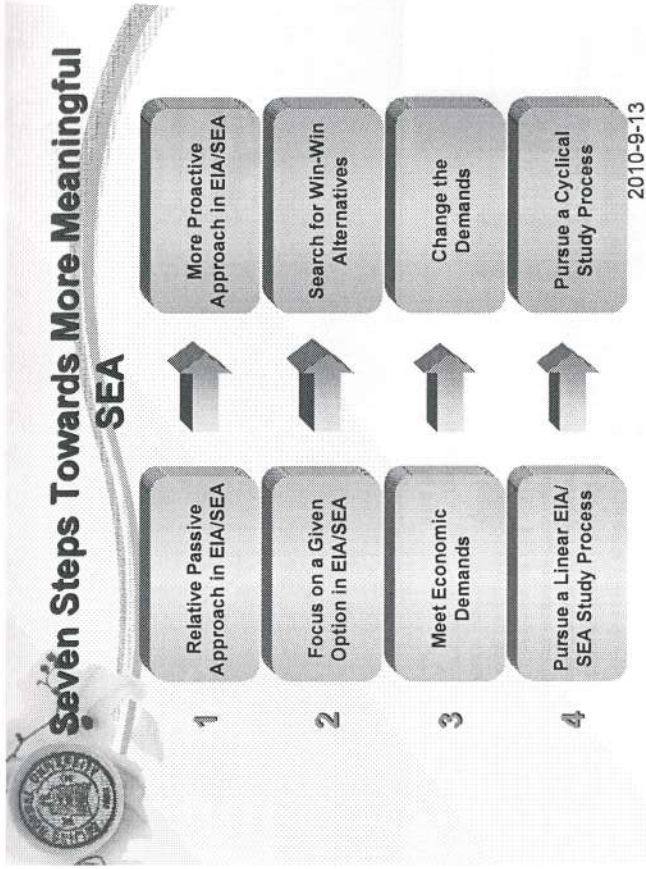
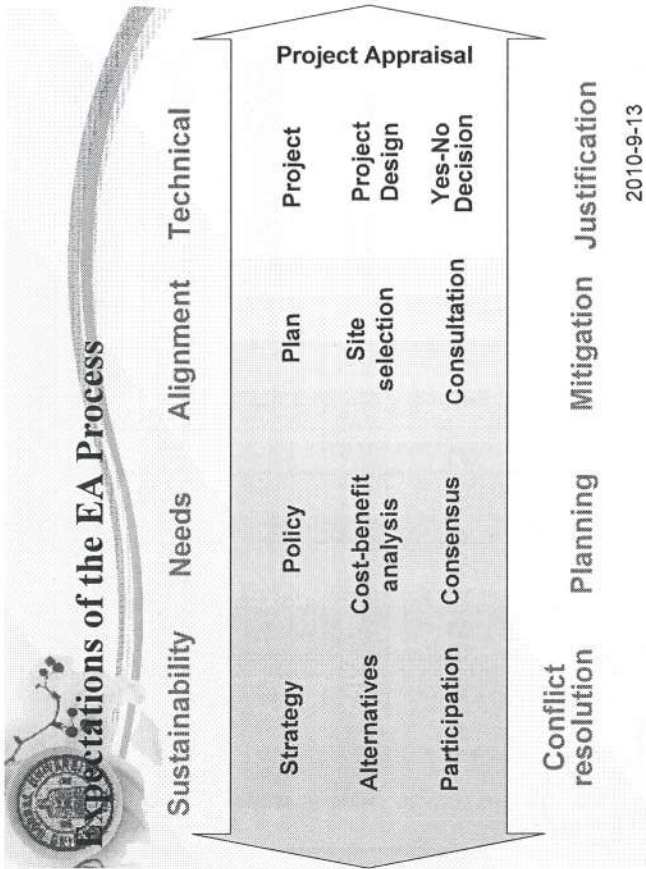
Government

Upstream of Environmental Management

Sustainability

Integrated Planning

Public Participation

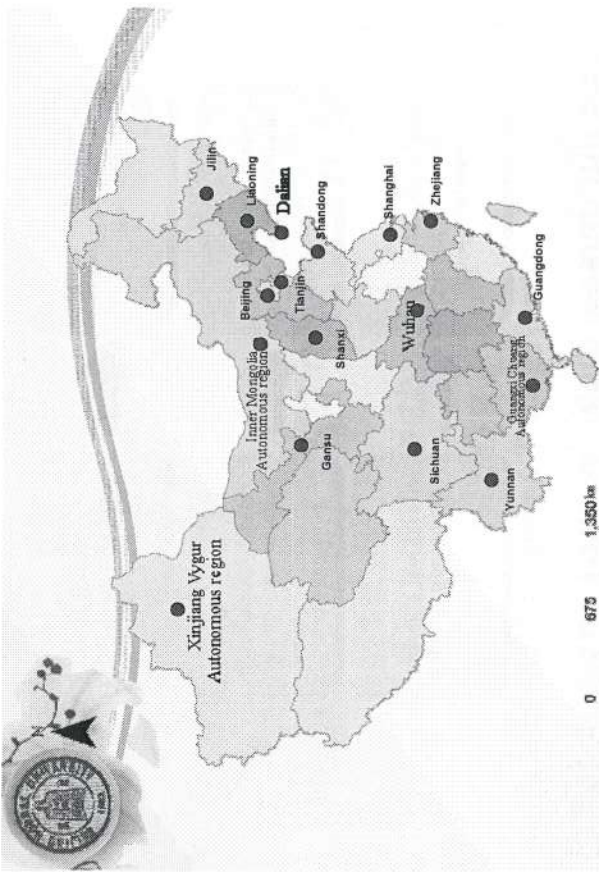


### Officially Experimental Works of SEA in China

- On April 30, 2006, SEPA released the "Notification of Developing the First Experimental Works of SEA at Nationwide" (document No.[2006]-57)
- It is aimed to address the problems in the process of promoting SEA in China to
  - enhance recognition and understanding
  - Improve the working system
  - Enrich the experience
  - building up the technical capacity

2010-9-13





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Officially Experimental Works of SEA in China	
Type	Works
Typical administrative prefectures	Inner Mongolia Autonomous region
	Guangxi Chuang Autonomous region
	Xinjiang Vygur Autonomous region
	City of Dalian City of Wuhan
Key industries	The 11th five-year Development Plan of China Oil Co.
	The 11th five-year Development Plan of China Ocean Oil Co.
	State Railway 11th five-year Development Plan
	The 11th five-year Development Plan of China Petro-chemical Co.

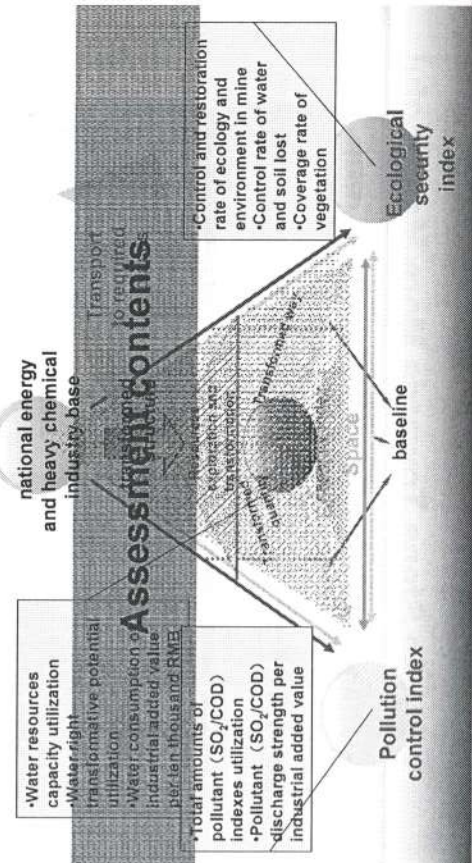
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## Introduction of SEA Methodologies

- Carrying Capacity based Methodology
- Sickness Diagnosis driven Methodology
- Later-comer Appraisal oriented Methodology
- Scenario Analysis supported Methodology

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In the suitable conditions of resources exploration and transformation quantity, method or structure, the projected area of geometric space belongs to the extent of three baseline environmental space, which indicates that key controlled indexes of regional resources and environmental capacity are suitable to balanced development and planning development is capable of making the goal of friendly environment.



## Basic concept of assessment

### Incremental value of carrying capacity

- In the period of assessment, we compare with the plan development of objective and the standard, using economic or industrial added value caused by unit resources and environmental capacity, which indicates the utilization of capacity in planning development, represents the resource-saving and benefits development, therefore, the bigger the figure, the better the result.
- the capacity mainly includes kinds of water resources, atmosphere environment, and water environment. Specifically, the capacity of atmosphere environment contains total amount control of SO<sub>2</sub> and the water environment refers to total control of COD.

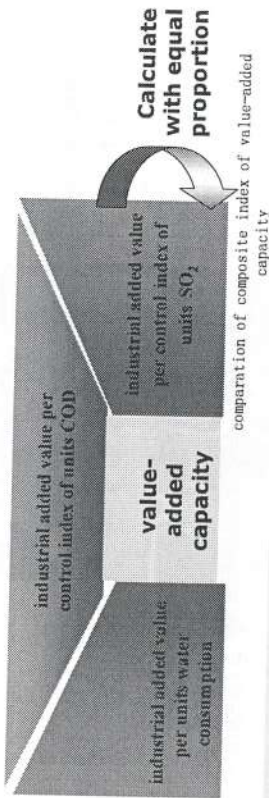
$$\text{Formula: } \square Vc = \frac{ADV}{Cap} - \frac{ADV}{Cap_0}$$

### Occupation rate of environmental space

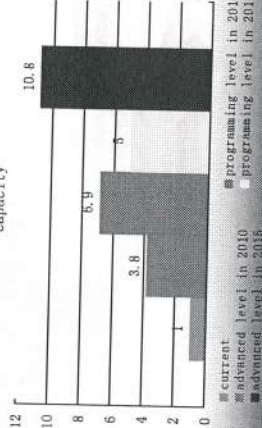
- It means the utilization of environmental space by exploration behavior, the lower the rate, the less effect to the environment, and more friendly to environment, thus the occupation should be as low as possible.
- environmental space mainly consists of: resource capacity, pollution control and ecological security, these parts.
- Resource capacity: resource consumption occupies the utilization of gross resources that can be used;
- Pollution control: pollutant discharge occupies the utilization of total control index;
- Ecological security: changes in objective year to the standard one.

$$\text{Formula: } Re = Wr \cdot Rr + Wc \cdot Rc + Wes \cdot \frac{ES_0}{ES_1}$$

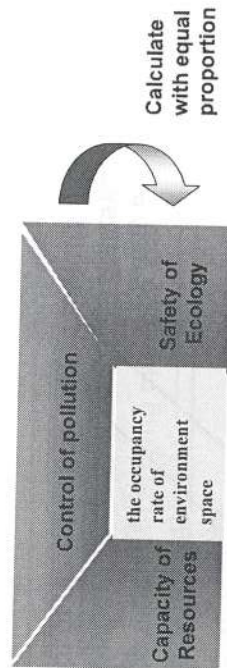
## -The Incremental value of Carrying Capacity



The implement of the planning will put more pressure on the environmental protection. On the other side, as the planned industrial level is higher than current level and the realization of the energy saving measurement, the utilization rate of environmental capacity will be improved to be up to the resources saving development.



## -The Appropriated Proportion of Environmental Space



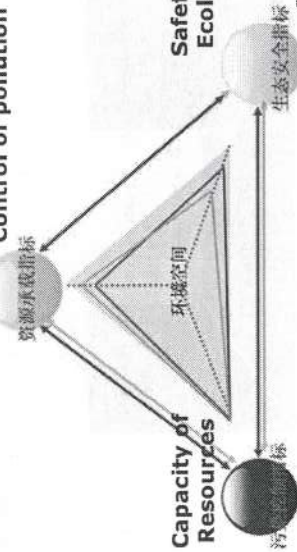
## Control of pollution



Status Quo & Saving energy ; reducing emissions ; eliminating backward production

(Annotate: gray: Total area of environmental space ; yellow: The proportion of environmental space of status quo (93%) ; dark green: the proportion of environmental space after saving energy ; reducing emissions and eliminating backward production (68%))

### Control of pollution



Capacity of Resources

Safety of Ecology

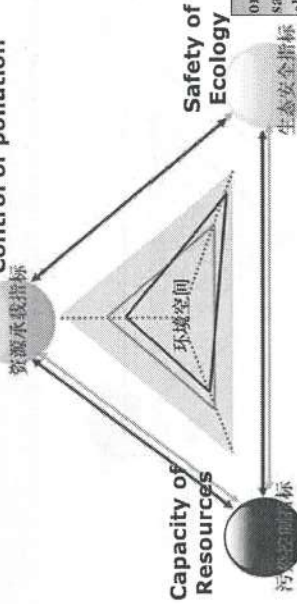
生态安全指标

The proportion of environmental space of near future compared with middle future under the planning level

(Annotate: gray: Total area of environmental space, blue: The proportion of environmental space of near future under the planning level(65%); yellow: The proportion of environmental space of middle future under the planning level(35%))

The index of control of pollution and capacity of resources will increase in the future comparing with it of recent period, and the index of safety of ecology is decreasing because of the continuous improvement of ecology.

### Control of pollution



Capacity of Resources

Safety of Ecology

生态安全指标

The proportion of environmental space of near future compared with middle future under the advanced level

(Annotate: gray: Total area of environmental space, purple: The proportion of environmental space of near future under the advanced level (65%); green: The proportion of environmental space of middle future under the advanced level (35%))

on the premise that energy-saving technologies and eliminating the backward techniques, the implement of the planning (especially under advanced level) will reduce the occupancy rate of environment space, broaden the resource environment bottleneck, and then embody the amicable environment development pattern

## Main Features of the Recommended SEA Methodology in China

## Features of SEA Methodology

Position & Scale

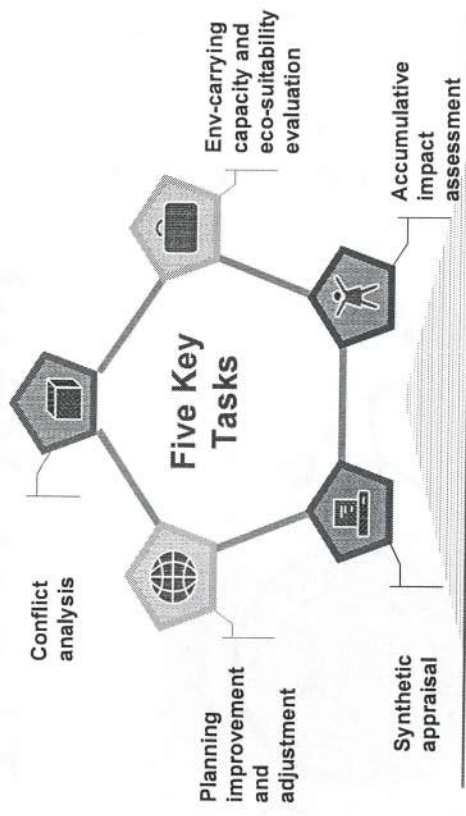
Objective & Aim

Four core elements

Structure & Layout

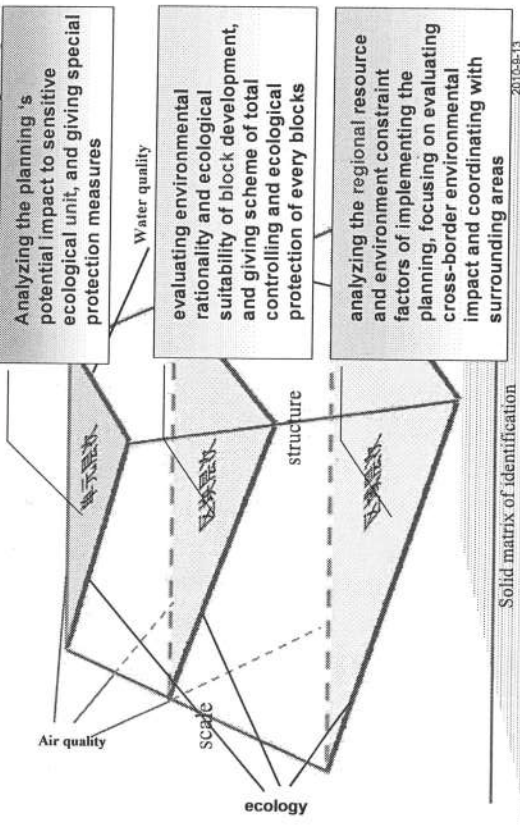
Rate & Order

# Features of SEA Methodology



2010-9-13

# Identifying environment impact of planning — identifying tiering



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# Basic Contents of A SEA Report

1. SEA objective, principle
2. Main points and conformity analysis of the planning
3. Impact identification and assessment indicators
4. Evaluation of carrying capacity and utilization rate
5. Eco-suitability
6. Overview of development of the area in study
7. Impact prediction and assessment

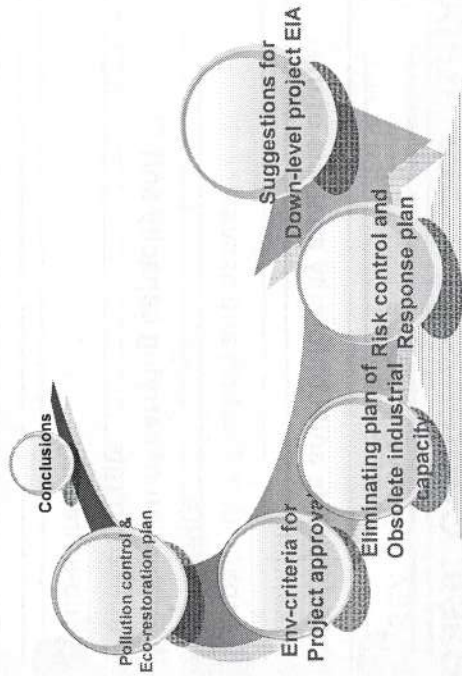
2010-9-13

# 规划环评的主要内容

3. Evaluation of the accumulative impacts
9. Environmental Risk Assessment
10. Analysis of circular economy promotion
11. Comparison and improvement of the planning alternatives
12. Recommending mitigation measures if there is
13. Public engagement and consultation
14. Conclusions and recommendations

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## Conclusions and the by-products of SEA



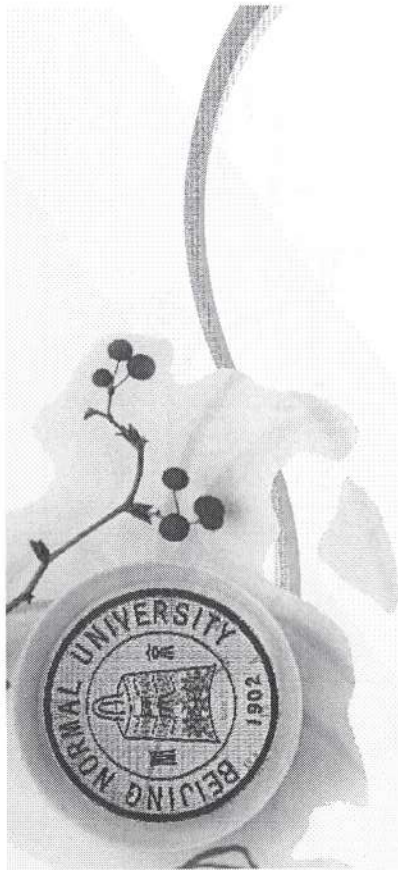
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## Conclusions and recommendations



	Original planning	Improved planning	Reference for improve	Effects of improve
• Scale	- ...	- ...	- ...	- ...
• Structure	- ...	- ...	- ...	- ...
• layout	- ...	- ...	- ...	- ...

2010-8-13



# Thank You!

# **Session I: Biodiversity Policy and EIA**

**Chair: Prof. Jong Ho Lee (Cheongju University)**

**Prof. Akira Tanaka (Tokyo City University)**

**“World Trend of Biodiversity Policy and Environmental Assessment”**

**Prof. Kiichiro Hayashi**

**(EcoTopia Science Institute Nagoya University)**

**“CBD and Nature Aspects of EIA”**

**Prof. Jaeyong Choi and Eunyoung Park**

**(Chungnam National University)**

# World Trend of Biodiversity Policy and Environmental Assessment

Kiichiro HAYASHI

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Keywords: Biodiversity policy, CBD, Strategic Plan, biodiversity offset, PES

## 1 Introduction

Convention on Biological Diversity (CBD) is an international treaty focusing on conservation and sustainable use of biodiversity which entered into force in 1993. In 2010, the 10<sup>th</sup> meeting of the Conference of the Parties to the CBD (COP10) will be held in Aichi-Nagoya in Japan. One of the most important topics of the COP10 will be the development of the "Strategic Plan for the Period 2010 to 2020" which includes various strategic goals and targets for biodiversity. To achieve these goals various environmental policy measures will be utilized and considered.

The loss of Biodiversity currently becomes one of the important issues in the world. Main reason for that loss of biodiversity includes the loss of habitat, the invasion of alien species, climate change issue, the excess utilization of bio-resources, etc. Also biodiversity loss is caused by direct and indirect impacts by economic activities.

This presentation will discuss the current and new biodiversity policy for tackling against the loss of biodiversity.

## 2 Strategic goals and targets

The strategic goals and targets are now being negotiated and finally will be adopted in the COP10. Current draft decision includes draft strategic goals and targets. Some parts of which are closely related to impact assessment issues such as like, target 2, 5, 11, etc.

## 3 New biodiversity policy

There are several environmental policies implemented in the world such as direct regulations and economic instruments, such as, tax, charge and subsidies on biodiversity. However, the trend of degrading biodiversity has not changed yet. In addition to that traditional approach, other new types of instruments have been introduced in some countries, including payments for ecosystem services (PES), biodiversity offsets (BO). These instruments have been implemented in some countries. However, these policy instruments have some issues to be solved in effective implementation from the perspective of the assessment and evaluation of appropriate biodiversity.

## 3 Conclusion

In this presentation, world trend of current and new biodiversity policies are discussed taking into consideration Strategic Plan for the Period 2010 to 2020 and impact assessment. Also, it will touch on the issues on these policy measures.

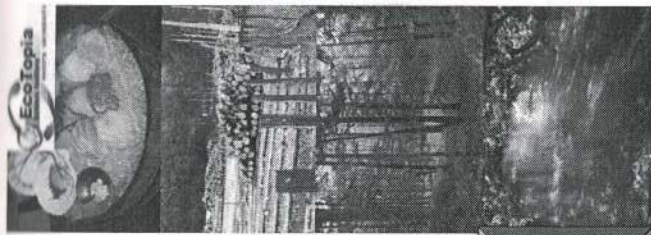
## References

CBD (2010) Report of the Ad Hoc Open-Ended Working Group on Review of Implementation of the Convention on the Work of its Third Meeting, UNEP/CBD/COP/10/4.

# World Trend of Biodiversity Policy and Environmental Assessment

17 September 2010

Nagoya University EcoTopia Science Institute  
Prof. Kiichiro HAYASHI

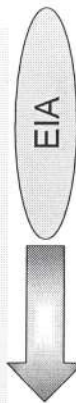


## Biodiversity and Ecosystem Services

- Ecosystem services
  - Food
  - Timber
  - CO2 sequestration
  - Water purification
  - Etc.

Ecosystem services(ESs) are easy words for better understanding the relation between daily life and biodiversity

## Factors of Loss of Species

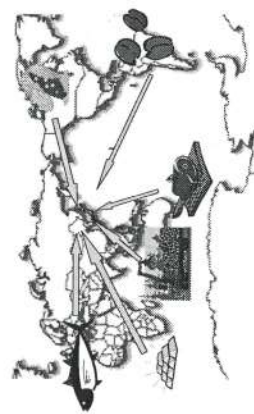


- **Loss of habitat**
  - Decrease of ESs by loss of habitat
  - Most of ESs are public goods
- Climate change
- Invasive alien species
- Excess utilization
- **Environmental impacts**



## Depend on World Ecosystem Services (ESs)

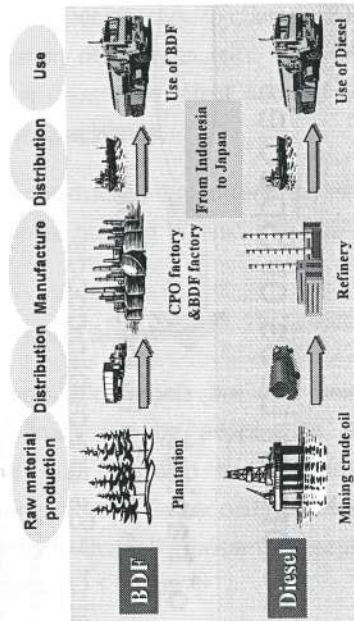
- Import foods from the world
- Namely, import associated ESs from the world
- Loss of world biodiversity means loss of world ESs and it affects world citizens





## Direct and Indirect Impact Life Cycle Perspective

- Direct
- Indirect



5

## Policy Response

6

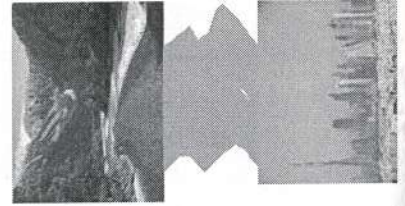
## Need for New Biodiversity Policy

- Limitation of current practices (eg. regulations)
- Recognize the value of biodiversity
- New biodiversity policy
  - Business and market creation
  - Internalization of externality
    - Tax, charge, subsidy, etc.
    - PES (payment for ecosystem service)
    - Biodiversity Offsets

7

## Variety of PES Beneficiary contribute to conserve ecosystem services

- Direct negotiations: with upstream land owners and downstream beneficiaries
  - E.g.: groundwater recharge, tap water fee, protection watershed forest, etc.
- Governmental intervention
  - E.g.: Forest environmental tax, Tap water fee (Toyota city), winter flooded rice field, Direct payment for hilly and mountainous region, etc.



Beneficiary pays



## Targets related EIA and SEA

- *Target 4:* By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.
- *Target 5:* By 2020, the rate of loss and degradation, and fragmentation, of natural habitats, [including forests], is [at least halved][brought close to zero].
- *Target 8:* By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
- *Target 11:* By 2020, at least [15%][20%] of terrestrial, inland- water and [X%] of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through comprehensive, ecologically representative and well-connected systems of effectively managed protected areas and other means, and integrated into the wider land- and seascape.
- *Target 12:* By 2020, the extinction and decline of known threatened species has been prevented and improvement in the conservation status [for at least 10% of them] has been achieved.

13

26

## Targets related to EIA and SEA

- *Target 15:* By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.
- *Target 2:* By 2020, at the latest, the values of biodiversity are integrated into [national accounts], national and local development and poverty reduction strategies and planning processes.

14

## Conclusion

- Biodiversity issues are closely related to human activities directly and indirectly.
- Impact assessments have crucial role for appropriate conservation activities for both direct and indirect impacts on biodiversity.
- Impact assessment are related to new biodiversity polices, PES, PO and strategic plan, etc.

15



Thank you for your attention

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# Convention on Biological Diversity and Nature Aspects of EIA

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Department of Environment & Forest Resources, Chungnam National University, Republic of Korea

Keywords: biodiversity, green space, connectivity, no net loss

## 1 Introduction

The Convention on Biological Diversity (CBD) requires parties to imply impact assessment to projects, programmes, plans and policies with a potential negative impact on biodiversity. In individual countries, Environmental Impact Assessment already deals with many aspects of biodiversity. However, improvements and more consistency with the internationally agreed principles of the convention are needed. The ecosystem approach is a strategy for the integrated management of land, water and living resources. The application of ecosystem approach will help to reach a balance of all three objectives of the Convention: conservation, sustainable use, and the fair and equitable sharing of the benefits from genetic resources. In this stream, the first principles for impact assessment in CBD is 'no net loss' of biodiversity in quantitative as well as qualitative terms, this implies that loss of irreplaceable biodiversity must be avoided, and loss of other biodiversity has to be compensated (in terms of quality and quantity).

The objective of this study, therefore, is to develop measures concerning the values of green space where biodiversity is potentially important.

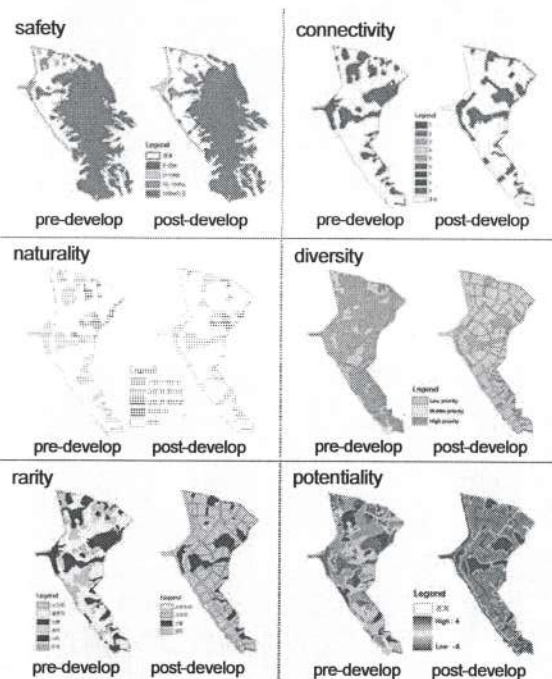
## 2 Methods

Six aspects of rarity, potentiality, safety, connectivity, naturality, and variety with 32 indicators have been selected as the measures of the green space value. Each indicator has been weighted based on AHP statistical analysis. Those quantifiable indicators are applied to large

and small scale development projects of which EIA process has been carried out previously.

## 3. Results

The large scale development project were analysed graphically as below:



## 4 Conclusion

The indicators adopted in this study could be utilised in the process of EIA review as a basis for the nature aspects evaluation at the screening and scoping stage. Through this evaluation, compensation methods such as replacement, restoration, or penalty could be recommended according to the interfered green space size.

# Convention on Biological Diversity and Nature Aspects of Environmental Impact Assessment

2010. 9.

Jaeyong CHOI & Eunyoung PARK

Chungnam National University

## Contents

I. Introduction

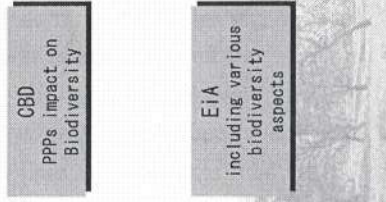
II. methodology

III. results

IV. conclusion

## I. INTRODUCTION

### I. Introduction



**GNU**

## I. Introduction

### Biodiversity Principles for Impact Assessment

- 1. No net loss (quality & quantity)**
  - loss of irreplaceable biodiversity must be avoided
  - loss of other biodiversity has to be compensated
- 2. Precautionary Principle**
  - uncertainty about the prediction and mitigation measures
- 3. Local, traditional & indigenous knowledge**
- 4. Participation**

objective of the study

develop measures on the values of green space implying "no net loss" of biodiversity.

**5**

**GNU**

## I. Introduction

### Operational Definition

→ Undeveloped open space which has potential to be vegetated

*ecosystems*

- Biological Value**
  - Possible restoration
- Ecological Value**
  - Restoration impossible
- Human centered Value**
  - Compensation needed

**6**

## II. METHODOLOGY

**GNU**

## II. Methodology

### Indicator selection

- Indicators are driven from literature review

patch size, diversity, potentiality, connectivity, rarity, frag. richness, usefulness, representativeness

Experts in-depth interview

Academic Criteria

- Usefulness
- Representativeness
- Excepted Vague Criteria
- Objectiveness

safety, connectivity, Naturality, diversity, rarity, potentiality

**8**

## II. Methodology

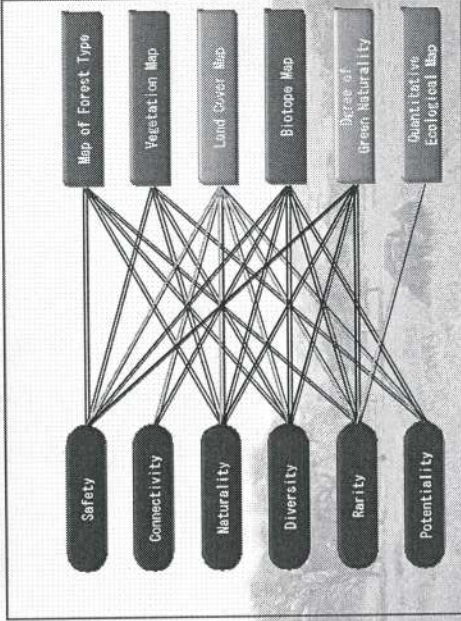
### Contents by indicators

Contents	Assessment Methods
Limits of distribution area, habitats of highest protectable species	degree of protectable habitat value
Size forest / grass / open-space etc. habitats	grade on the patch size
connection with the surrounding green	cell connection degree in GIS method
plant succession to the highest	quality of tree succession
numbers of species and habitability	amphibioadaptable by habitat type
human interference possibility	assessment by location of forest / watershed / urban

9

## II. Methodology

### Indicators and data relationships



10

?  
w/ study  
development

## III. RESULTS

### Site Selection

- ✓ Development site subjected to preliminary environmental assessment OR environmental impact assessment
- ✓ Land Use plan has been Permitted



Value estimation adopted

Test the indicators for the usefulness & adaptability

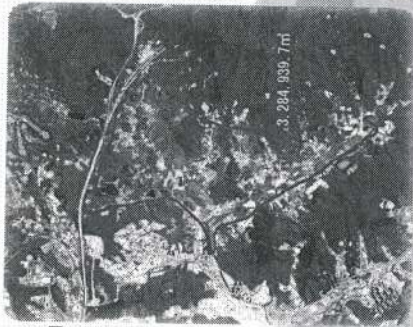
12

### III. Results

#### Large Scale Residential area development

##### Yongin-Dongbaek

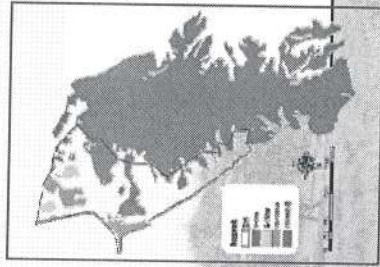
- > Year 1997, designated as residential land development site
- > 1999-2006, project proceed
- > 50% of the development site is residential area
- > Pre-development agricultural & forest land
- > Large forest surrounds the site



### III. Results

#### Large scale development

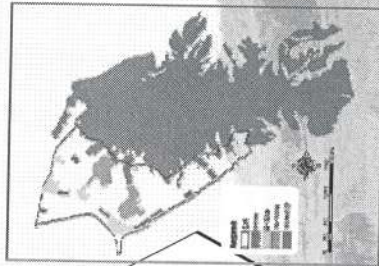
##### Safety



Green space  
25.4%  
decreased

Large patch  
decreased

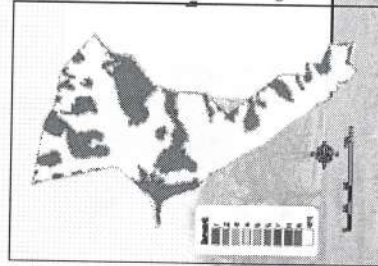
Habitat size  
decreased



### III. Results

#### Large scale development

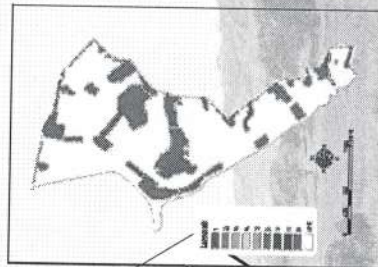
##### Connectivity



low  
connectivity  
area  
increased

high connectivity  
area  
decreased

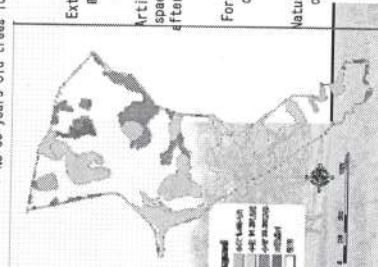
connectivity of  
fauna & flora  
decreased



### III. Results

#### Large scale development

##### Naturalty / Assessment on artificial green space, natural grass, natural grass, trees succession / No. 30 years old trees found

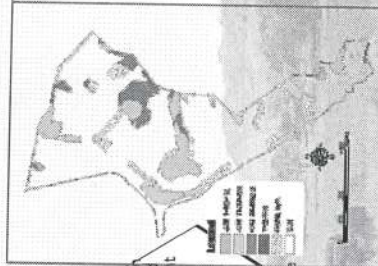


Extinct natural  
grass area

Artificial grass  
space increased  
after development

Forest grass  
decreased

Natural grass  
decreased





### III. Results

**Large scale development**

**Diversity**

- Low priority : impermeability layer & lack of water resources
- Mid priority : artificial green space
- High priority : habitat diversity

Low priority  
1,818,867 m<sup>2</sup>

Mid priority  
69,387 m<sup>2</sup>

High priority  
1,879,502 m<sup>2</sup>

Assessment values decreased

Legend: Impermeability, Artificial green space, Habitat diversity

17

### III. Results

**Large scale development**

**Rarity**

- Endangered and protected species were not found

Urban area increased  
18.3% → 73.1%

51.23% of agricultural area removed

Legend: Very high, High, Medium, Low, Very low

18

### III. Results

**Large scale development**

**Potentiality**

- Potentially human interference area
- A GIS unit cell is assessed with surrounding 8 cells together

Red (grade V)  
Possibly high interference area by

Blue (grade V)  
High nearby area

Legend: Very high, High, Medium, Low, Very low

19

### III. Results

**Large scale development**

**Result**

- Weighting value based on experts in-depth interview were adopted
- Calculates the value of the site by pre- and post-development

Indicator	Pre-dev. t	Post-dev. t	Value comparison
Safety	372.83	215.10	↓ 30.13
Connectivity	473.93	366.46	↓ 15.15
Naturalty	142.61	78.17	↓ 7.93
Diversity	1,994.90	731.93	↓ 98.51
Rarity	184.47	161.26	↓ 5.87
Potentiality	845.49	164.99	↓ 145.63
<b>TOTAL</b>	<b>538.78</b>	<b>235.57</b>	<b>↓ 303.22</b>

20

*In this calculated in need AIAZ*

*Over raw - so far - CAP (2019)*

**III. Results**  
Small scale development using biotope map

Dangjin-Gun 000 factory

- > Project started 2008. 02
- > On going project
- > Adoption of biotope map
- > Subjected to PEA
- > 85.6% of the site is industrial
- > Natural forest

25,000m

21

**III. Results**  
Small scale development using biotope map

Safety

Green space ratio 85% decreased

10 km size area decreased

22

**III. Results**  
Small scale development using biotope map

Connectivity

Connectivity decreased

High connectivity area decreased

10 km

23

**III. Results**  
Small scale development using biotope map

Naturality

Rarity

Potentiality

Diversity

value score 6.24 decreased

Value score 4.08 decreased

Value score 9.25 decreased

Value score 18.86 decreased

24

### III. Results

#### Small scale development using biotope map

#### Result

- Weighting value based on experts in-depth interview were adopted
- Calculate the value of the site by pre- and post-development

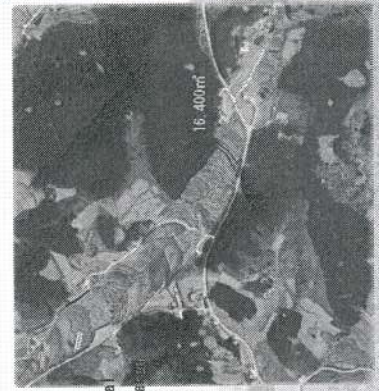
Indicator	Pre-development	Post-development	Value subtraction
Safety	8.84	1.11	↓ 1.48
Connectivity	14.05	1.77	↓ 1.73
Naturality	6.35	0.11	↓ 0.77
Diversity	21.46	2.48	↓ 1.48
Rarity	4.51	0.42	↓ 1.03
Potentiality	12.31	2.62	↓ 1.98
<b>TOTAL</b>	<b>9.81</b>	<b>1.34</b>	<b>↓ 8.47</b>

### III. Results

#### Small scale development

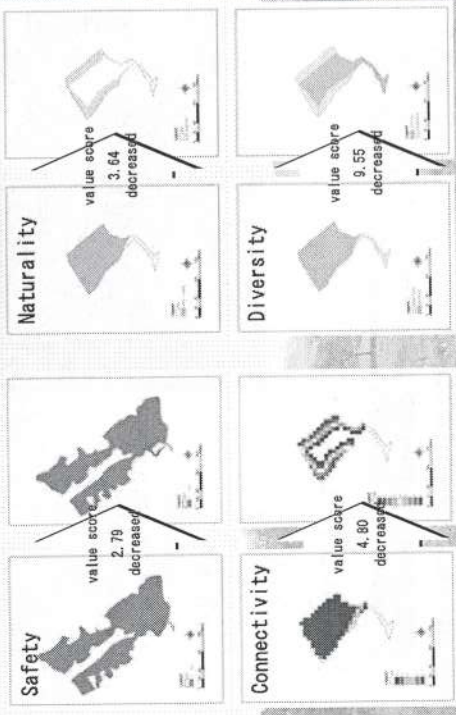
#### Seosan 000 factory

- > Started 2009. 01
- > On going
- > Subjected to PEA
- > 63.8% of the site is industrial
- > Forest land and agricultural



### III. Results

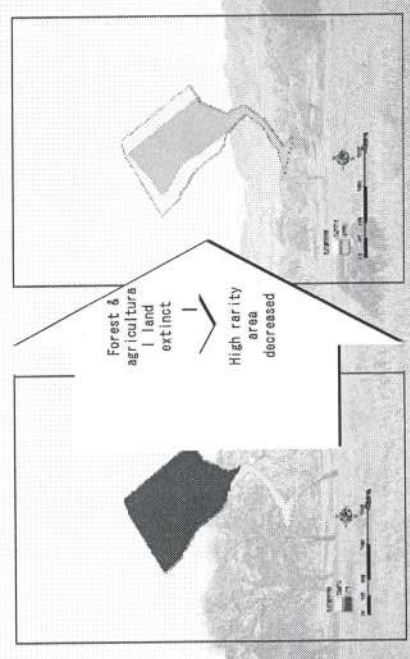
#### Small scale development



### III. Results

#### Small scale development

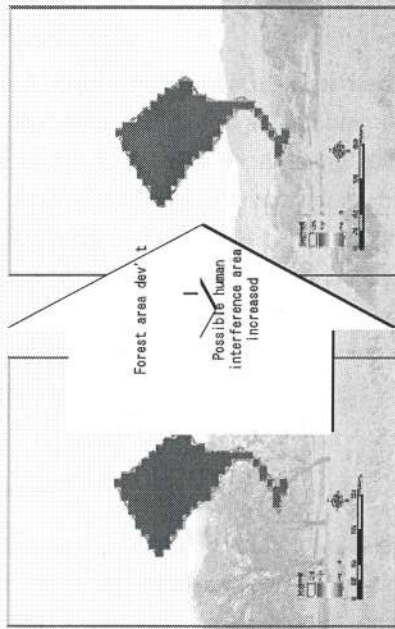
#### Rarity



### III. Results

#### Small scale development

#### Potentiality



29

### III. Results

#### Small scale development

#### Result

Weighting value based on experts in-depth interview were adopted  
Calculate the value of the site by pre- and post- development

Implication	Pre-dev't	Post-dev't	Value comparison
Safety	4.82	1.84	➔ 0.53
Connectivity	7.22	2.42	➔ 0.68
Naturality	3.78	0.15	➔ 0.45
Diversity	11.38	1.83	➔ 0.74
Rarity	2.45	0.36	➔ 0.53
Potentiality	6.33	2.18	➔ 0.89
<b>TOTAL</b>	<b>5.25</b>	<b>1.41</b>	<b>➔ 3.82</b>

30

### IV. CONCLUSION

### VI. Conclusion

#### Compensation methods

##### replacement

- within the development site, the damaged green value should be restored

##### balancing

- other than the site, the damaged green value can be restored
- MOUs between local governments

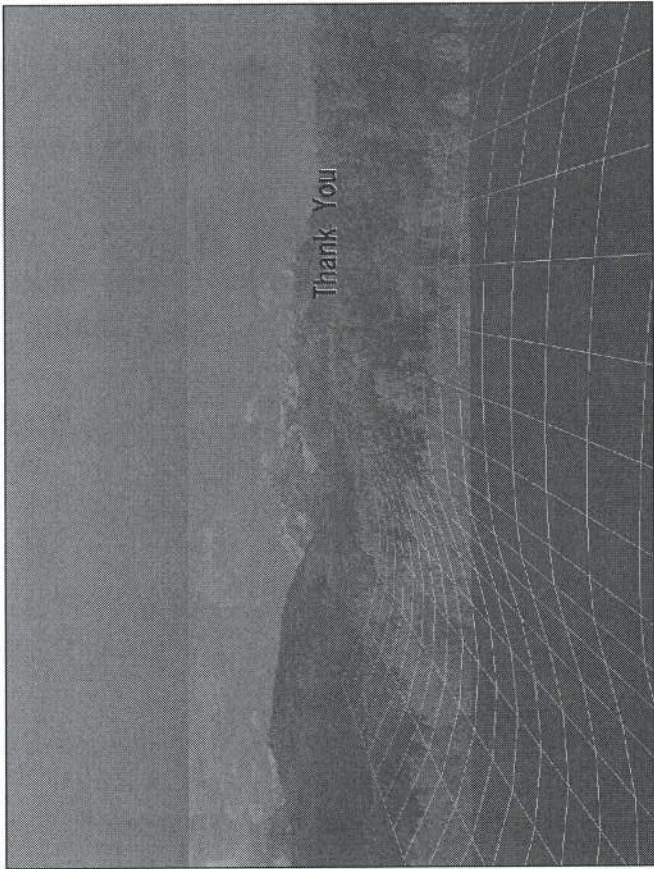
##### restoration

- damaged green value & function should be restored as it was, either in or outside the development site

##### Value compensation

- 20 years period
- Continuous balancing / replacement
- Financial compensation

32



# Construction of Alternative Habitat for Endangered Species of Waterbirds in the Western Coastal Areas of Incheon

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<sup>2</sup>Korea Environment Institute, Seoul 120-750, Korea

Keywords: Biodiversity, Conservation Planning, Saunder's gull, Habitat Replacement

## 1. Introduction

This study aims at habitat replacement for the Internationally protected by IUCN and Korean endangered species of Saunder's gull (*Larus saundersi*) (Fig 1). To create replacement habitat will also help for other related species of waterbirds such as Oystercatcher (*Haematopus ostralegus*), Little tern (*Sterna albifrons*), Long-billed Ringed plover (*Charadrius placidus*).

In the west coast of Incheon the tidal flats are reclaimed areas that are in the process of development and new land use plan for 'Song-do International City' which is located into a suburban area of Incheon city.

## 2. Methods

The habitat replacement studies were based on the literature of EIA, and at the same time field survey of wild birds were done during 2006-2009. Song-Do Project inevitably destroyed the habitat of Saunder's gull and to protect this species we created Habitat Model based on breeding and home range of the species. This idea is applied to the area for post-monitoring and management patterns.

## 3. Results

In securing resting and feeding we calculated a total of 125ha including core and buffer areas (Fig 2). These areas can cover a total of 258 ha considering 1,023 ha for the whole areas

representing 25.24%. This area can support a total of over 200 pairs of gulls.

## 4. Conclusion

The areas considered the distance among nest areas and Minimum Viable Population of gulls.

The protections of tidal flats are important, but in the process of reclamation project it is important to understand and estimate the unpredictability of ecosystem so that we created the transition zone. The gulls need nesting areas and feeding areas for distance

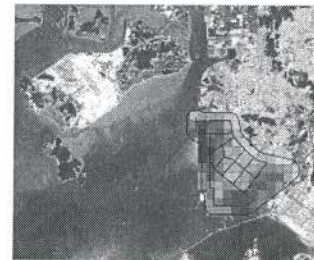


Figure 2: Habitat Replacement

## 5. References

- Korea Environment Institute (2009) Studies on habitat environment of wildbirds in IFEZ
- Ministry of Environment (2005) Protection law of wild plants and animals



Figure 1: Picture of Saunder's gull

# Construction of Alternative Habitat for Endangered Species of Waterbirds in the Western Coastal Areas of Incheon

2010. 9. 17.

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## Contents

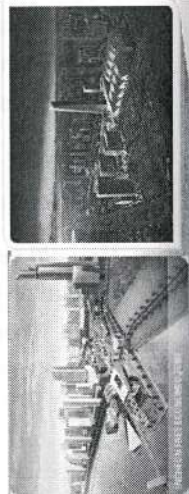
- 1 General Introduction
- 2 Current Status
- 3 Natural Survey of Birds
- 4 Habitat Replacement
- 5 Future Perspectives



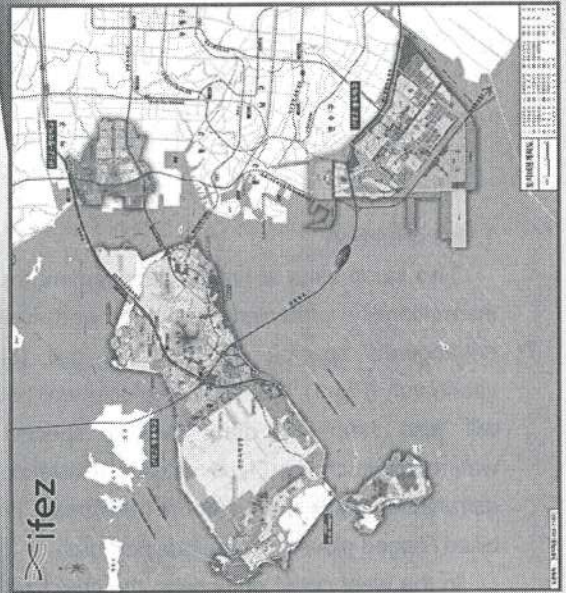
## 1. Introduction

### General Information for the Project

- Title : Studies on Habitat Replacement of the wildbirds in Song-do
- Duration : 2006. 11. 06 - 2009. 02. 05 (27 months)
- Area : IFEZ (Inchon Free Economic Zone) at Song-do (53.4 km<sup>2</sup>)
- Duration : 2003-2020
- Population : 252,000
- Items : Intelligent center, Bio-center, Songdo Landmark, New Incheon Port
- Budget : 104,253 million won

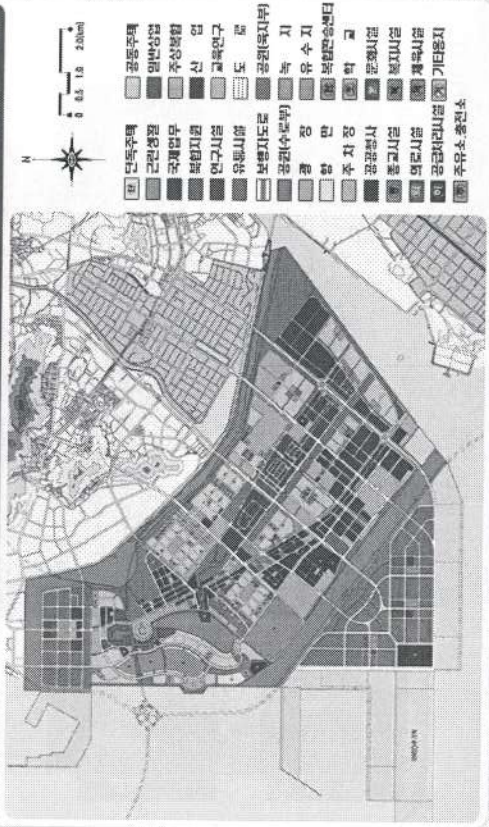


## Inchon Free Economic Zone and the surrounding Areas



# Land Use Plan in IFEZ

인천경제자유구역(송도지구) - 토지이용 계획도(변경)



## Case Study in Japan



Artificial Island City project in Hakata Harbor (Fukuoka). Reclamation is going on the orange areas that used as breeding for Black-faced Spoonbill

# 1. Introduction

## Study Objectives

1. Saunder's gulls (IUCN and Korean Endangered species) for Habitat Replacement from reclamation of tidal flats
2. Estimation of current status of land development for Habitat Replacement
3. Estimation of Location, Size, Formation and Monitoring of Newly constructed Habitat
4. Managing Habitat Replacement for wildbirds in Song-do Area



Eggs and nests Song-do 9th Section (photo : I.Y. Kim)



Photo : D.W. Kim (2007)



## 2. Current Status

### Progress of the Project

- Understanding of wildbirds in the area
- Evaluation of current status and land-use planning
- Habitat Replacement (How and Where)
- Search of literature overseas
- Evaluation of Habitat replacement and how to use it
- Selection of Habitat Replacement
- Evaluation form of possible sites
- Monitoring of Habitat after construction



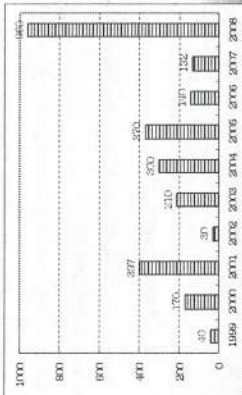
### 3. Survey of Wildbirds

#### Field survey of 2007-2008

1. A total of 57 species (21,203 individuals) around Song-do area
2. Summer 46 species, Density 15,492 (mostly wading birds)
3. Dominants were Dunlin (*Calidris alpina*, 민물도요), black-tailed gull, Spot-billed duck, black-tailed godwit (*Limosa limosa*, 흑꼬리도요) and others

#### Breeding status of Saunder's gull

- Annual population trends since 1999



	2007 (n=66)	2008 (n=480)
Egg hatching success	21.4%	26.2%
Breeding success	0.0%	22.2%

### 4. Habitat Replacement

#### Factors considering Habitat Replacement

- Breeding, resting and feeding areas
- Ecological characteristics based on Habitat Suitability Index
- Location selection for considering development plan, land use pattern etc
- Expert opinion, comparison of alternatives

#### Size of Habitat Replacement

- Distance among nests, Minimum Viable Population, and other ecological factors of Saunder's gull
- Tidal flat ecosystem characteristics for marsh plant habitat
- Formation of transition zone for counting stochasticity of nature
- Movement pattern among nests and feeding areas

### 4. Habitat Replacement : Location

#### Maximum feeding sites : based on food availability



### 4. Habitat Replacement : Location

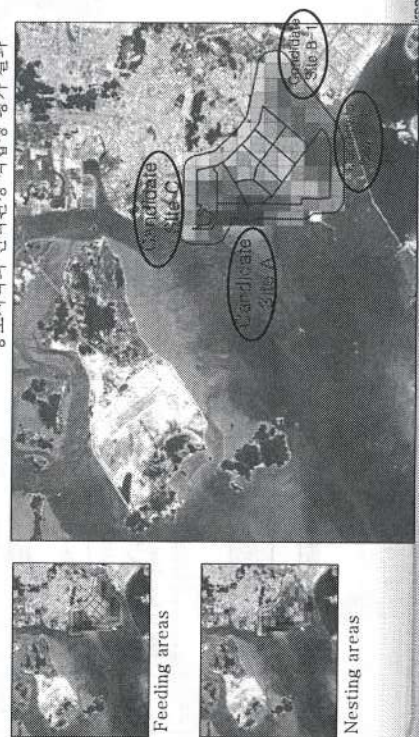
#### Factors for Breeding Sites Availability



## 4. Habitat Replacement : Location

### Potential Sites for Habitat Replacement

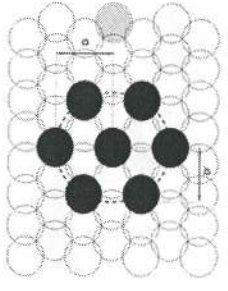
송도지역의 번식환경 적합성 평가 결과



## 4. Habitat Replacement : Size

### Factors Habitat size in tidal flats as breeding site

- Minimum Viable Population : a minimum of 250 breeding pairs
- Distance between nests : 35.45m (D)
- Habitat matrix of core area and transition zone depending on breeding success



### Estimation of Habitat Replacement

No of Hexagon	# Nesting sites	Mean Distance among nests = 35.45m (D)
81	250 (Green circle)	26.4ha
		Including transition zone 64.8ha

\* Distance from the seashore 100-200m

## 4. Habitat Replacement : Size

### Estimation of breeding and feeding areas

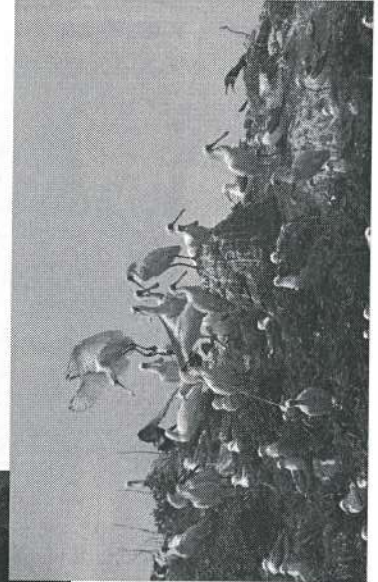
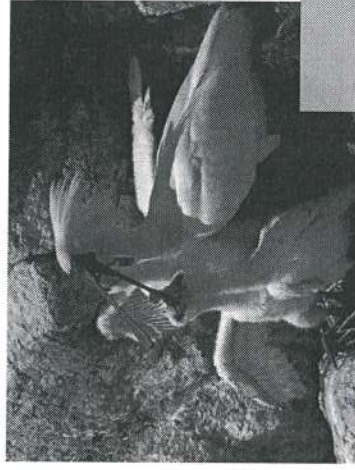
1. Breeding : 65 ha × 1.5 = 97.5 ha (2005, 2006년 - similar size at sector 1 in 2005, 2006)
2. Feeding : 163 ha × 1.5 = 244.5 ha
3. Total Areas : 228 ha × 1.5 = 342 ha

Other birds such as little tern (*Sterna albifrons*) and Kentish Plover which have similar breeding Pattern, Black-faced Spoonbills need a special attention



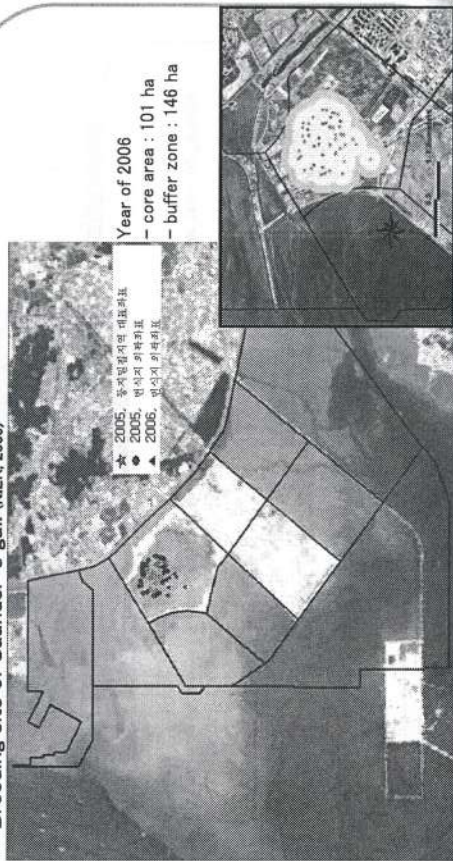
## 4. Habitat Replacement : Size

Black faced spoonbills breed in the west islands of Korea



#### 4. Habitat Replacement : Size

Breeding site of Saunder's gull (NIER, 2008)

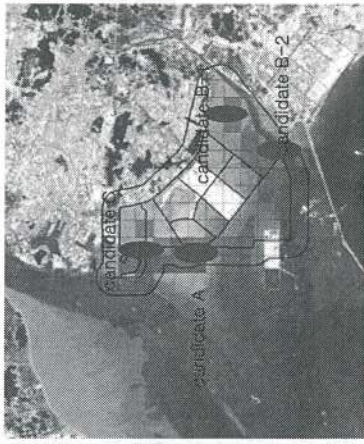


Year of 2006  
 - core area : 101 ha  
 - buffer zone : 146 ha

#### 4. Habitat Replacement : Size

##### Estimation of Candidate Sites

1. Breeding area: 97.5 ha
2. Feeding (Tidal flats) : 244.5 ha
3. 1+2 = 342 ha

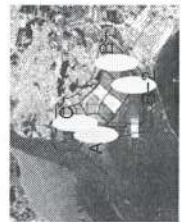


category	Candidate A	Candidate B	Candidate C
Tidal flats	0 ha	4,343 ha	0 ha
Total Area	342 ha	97.5ha	342ha

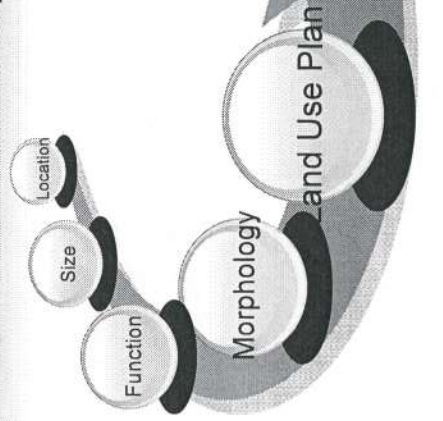
#### 4. Habitat Replacement : Location & Size

##### Comparison among Candidate Sites

category	A	B (Selected)	C
Advantages	-Easy access to ocean -Near to large Tidal flats area of Yong-jong (Airport)	-Sector 5, 7 and filling in parks and green areas -Green belt connection -Near to Gezan, Oido mudflat area	-In year 2008, breeding sites -Gangwha island, Yong-jong airport Tidal flats areas nearby
Disadvantages	-Threats due to Seoul outskirts highway -Reclamation areas resulting in destruction of Tidal flats and surrounding areas	-Reclamation sites -New Port construction projects	-Lacking in breeding sites (terminal)
Remarks	No change of land use plan (foreign investment)	Threats due to sector 11	Consultation with MCT



#### 4. Habitat Replacement : Diagram



Habitat Replacement for Wildbirds of SongDo Area



### 4. Habitat Replacement : Function as

- Conservation**
- Creation of habitat for Endangered species
  - Habitat in Tidal flats for feeding sites
  - Creation of Salt Plants for Saunder's gull breeding
  - Marsh plant along the stream channel

- Observatory**
- Observatory tower for wildbirds and Eco-corridor
  - Reservoir for dabbling ducks
  - Brackish water for both salt and freshwater plants

- Education**
- Habitat management office
  - Waterbird protection activities for school children
  - Eco-Leadership program and Habitat monitoring

- etc**
- stream channel, watergate for water control
  - Tidal flat ecosystem and Salt plant monitoring

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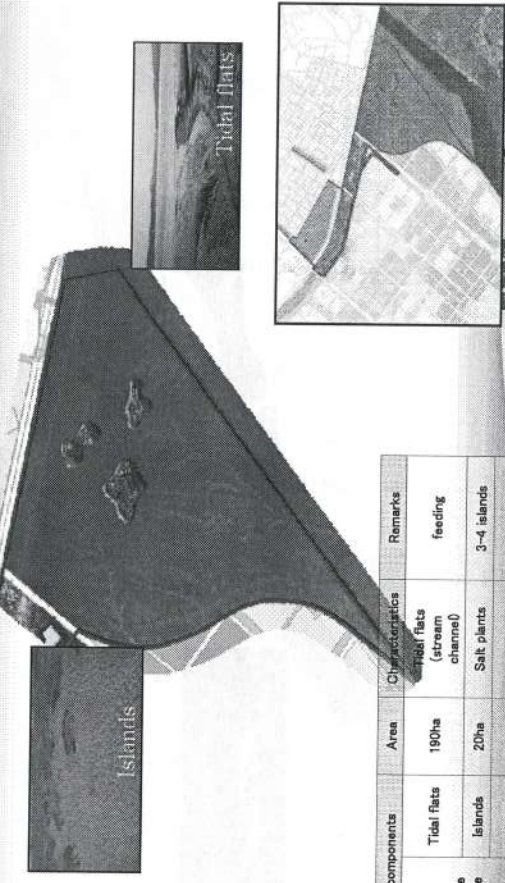
### 4. Habitat Replacement : Morphology



Function	Area	면적
Core Zone	Tidal flats	190ha
	Island	20ha
	Sub-total	210ha
Habitat Zone	Brackish reservoir	44ha
	Tidal flats	27ha
	Sub-total	80ha
Public Access Zone	Center housing pavement	131ha
	housing pavement	10ha
	Sub-total	141ha
<b>Total</b>		<b>351ha</b>

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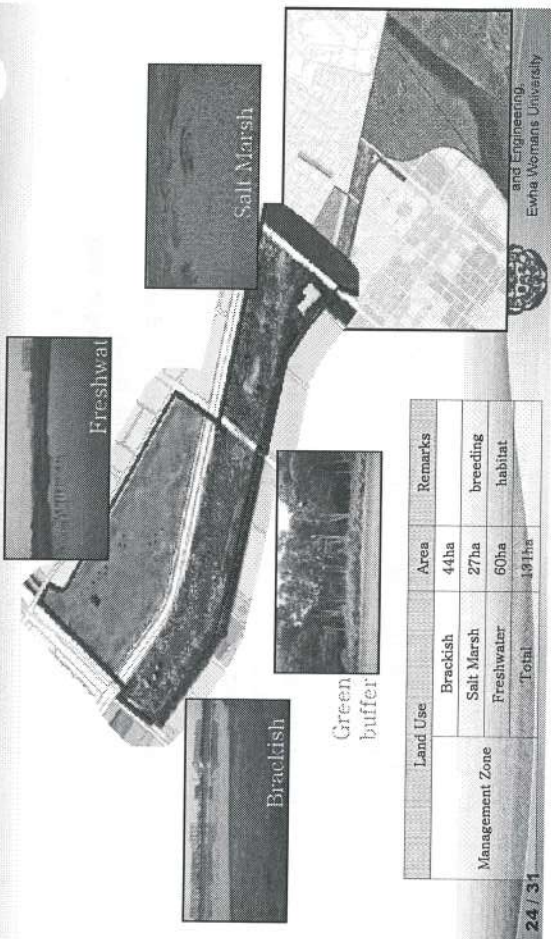
### 4. Habitat Replacement : Core Zone



components	Area	Characteristics	Remarks
Core Zone	Tidal flats	Tidal flats (stream channel)	feeding
	Islands	Salt plants	3-4 islands
<b>Total</b>	<b>210ha</b>	<b>Core zone</b>	<b>Protected areas</b>

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### 4. Habitat Replacement : Management Zone



Management Zone	Land Use	Area	Remarks
Management Zone	Brackish	44ha	breeding habitat
	Salt Marsh	27ha	breeding habitat
	Freshwater	60ha	breeding habitat
<b>Total</b>		<b>131ha</b>	

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## 4. Habitat Replacement : Public Access Zone

Land Use	Purpose	Areas	Characteristics
Public Access Zone	Center	-	Education and Advertisement
	Facilities	-	Green Wall
	Walking path	3.5km	Bird watching

## 4. Habitat Replacement : Management

### Three factors for habitat management after construction

#### Hardware

- 1) Facility Management by season and space
  - characteristics of habitat (limit entrance, etc)
  - flora monitoring, environment and breeding condition
  - controlling water level for quality and salinity

#### Software

- 2) Program development for education and advertisement
  - students, communities, residents, NGOs
  - certification program, volunteering, feeding in winter, etc
  - RAMSAR site, wetland protection areas

#### Humanware

- 3) Networking for human resources
  - researchers, Migratory bird center, etc

## 4. Habitat Replacement : Budget

### • Creation of Habitat and Maintenance

- 1) Example in Korea and Japan
  - Nak-dong estuary (Busan, ¥36.3billion, 23 Workers)
- 2) Habitat Replacement : Total of 80.0 billion
  - Migratory Center(10ha): ¥15.0 billion
  - Salt Vegetation Park (50ha): 25.0billion
  - Tidal Flat Eco-Park (200ha): 30.0billion
  - Freshwater Park (40ha): 10.0billion
- 3) Annual Maintenance : 2.5billion won/year
  - Human resources 1.3 billion, general maintenance 1.2 billion

Thank You !



and Engineering,  
Ewha Womans University

2013

## **Session II: Impact Assessment for Biodiversity**

**Chair: Prof. Kiichiro Hayashi (Nagoya University)**

**Dr. Myungjin Kim (National Institute of Environmental  
Research)**

**"Construction of alternative habitat for endangered species of  
waterbirds in the western coastal areas of Incheon"**

**Prof. Sang-Don LEE (Ewha Womans University)**

**Dr. Paik-ho Roh (Korea Environment Institute)**

**"HEP applications to EIAs in Japan -Its implications for Biodiversity  
Offsets"**

**Prof. Akira Tanaka (Tokyo City University)**

**Maiko Yoshizawa (IGES)**

# HEP applications to EIAs in Japan – Its implications for Biodiversity Offsets

Akira Tanaka<sup>1</sup> and Maiko Yoshizawa<sup>2</sup>

<sup>1</sup>Tokyo City University

<sup>2</sup>Institute for Global Environmental Strategies

Keywords: SEA, Biodiversity Offset, Biodiversity Banking, No net loss, Satoyama Banking

## 1 Introduction

1997 EIA law requires doing holistic ecosystem assessment in addition to traditional flora and fauna survey. As a quantitative method, HEP, Habitat Evaluation Procedure was introduced to Japan by author. HEP has been applied to several EIAs in Japan. On the other hand, compensatory mitigation (biodiversity offsets) has been introduced into more than 50 countries but not yet in Japan. Two case studies of HEP applications that author participated as HEP specialists were reviewed in terms of implications to biodiversity offsets.

## 2 HEP as a quantitative Ecological IA tool

HEP is a procedure to compare alternatives of human activities by using CHU/HU (Value of habitat) of selected evaluation species. Highest CHU/HU means the best alternative plans. HU is calculated by multiplying "HSI" and "area" (and "time" for CHU). The range of an HSI must fall within the range of 0 (worst) to 1(best). HSI (Habitat Suitability Index) is calculated by combining multiple "Suitability Indices (SIs)" which represent conditions of critical attributes that define habitat requisites of evaluation species.

## 3 Case studies of HEP applications to EIAs

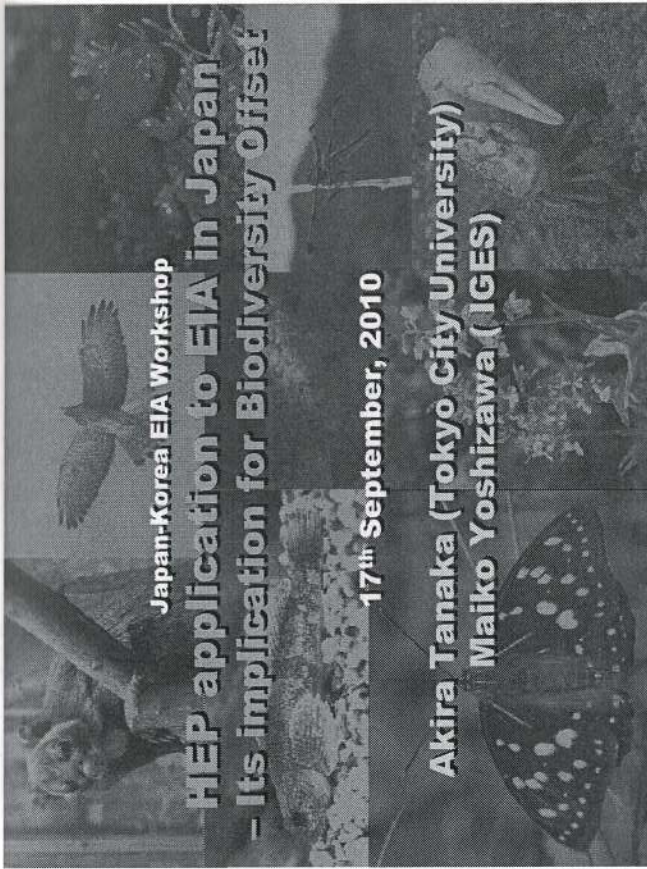
First case study was a HEP application for a residential development EIA in Yokohama. Four wildlife species were selected as evaluation species to assess impacts on "Satoyama" habitats. Development plan with mitigation measures which were advised by HEP team through HEP analysis, showed highest HUs. However, all plans showed serious decline of HUs compared to present environment. Biodiversity offset is not

mandatory in Japan. Without it, any development project never complied with "no net loss."

The second case study was a HEP application for a national highway/railroad EIA in Chiba pref. Project site was the habitat for many wetland species including an endangered bird, Eurasian Bittern (*Botaurus stellaris*) species. Seven too small sites in Inba-numa were proposed as biodiversity offset sites and project proponents alleged that all of them complied with "net gain" of habitats. That was simply because the evaluation area (i.e. impacted area) for the HEP was just around Inba-numa. Eurasian Bittern requires huge wetland for breeding. The project site was located in the middle of the largest wetland area in Kanto (around Metropolitan Tokyo). As a HEP specialist, my advice was as follows. If the project rout cut the largest wetland area into two halves, the project must compensate one half of the area. However, it is impossible to restore/create one half of the largest wetland area in Kanto. Consequently, only underground plan or roundabout route plan can achieve "no net loss" of the habitat. If the route should cut Inba-numa, Eurasian Bittern population of this area would become extinct in near future. Unfortunately Chiba pref. and the railroad company conducted their own accounting without HEP specialist and split the habitat into two halves.

## 4 Conclusions

Although HEP is good tool to assess the loss and gain of the habitat quantitatively for EIAs, it can be double-edged swords. The key point of HEP application is to organize HEP team with stakeholders fairly. HEP that can show the loss of the habitat quantitatively accelerates to introduce biodiversity offsets including "Satoyama Banking."



## Background

- Much and long experience of EIAs of both national and local governments in Japan.
- 1997 EIA law requires to do holistic ecosystem assessment.
- As a quantitative methods, HEP, Habitat Evaluation Procedure was introduced to Japan by author .
- HEP has been applied to several EIAs in Japan.
- On the other hand, compensatory mitigation (biodiversity offset) have been introduced in many countries but not yet in Japan.



## Today's topics

1. A quantitative ecological impact assessment method; Habitat Evaluation Procedure, HEP
2. Two case studies of HEP applications to EIAs in Japan
  - a. Case 1: A residential development EIA
  - b. Case 2: A national highway/railroad EIA
3. HEP applications and its Implications to Biodiversity Offsets in Japan



## What is HEP?

HEP is a procedure to compare alternatives of human activities by using HU (Value of habitat) of selected evaluation species

$$\begin{aligned} \text{Value of habitats} &= \text{Quality} \times \text{Space} \times \text{Time} \\ \text{CHU} &= \text{HSI} \times \text{Area} \times \text{Time} \\ \text{HU} &= \text{HSI} \times \text{Area} \end{aligned}$$

CHU: Cumulative Habitat Unit

HU: Habitat Unit

HSI: Habitat Suitability Index

Area: area of evaluation (m<sup>2</sup>, ha)

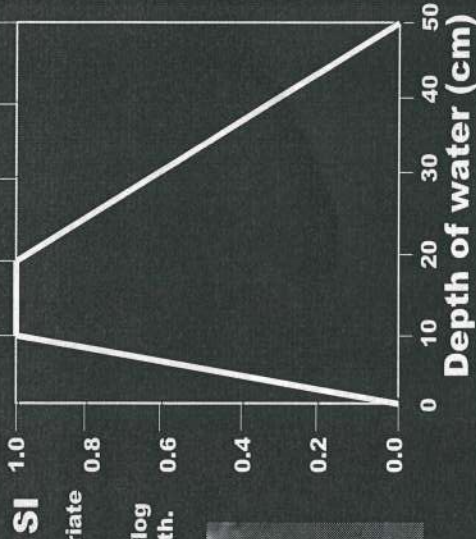


# What is HSI?

- **HSI =** Habitat condition on the site  
Optimum habitat condition
- The range of an HSI must fall within the range of 0 (worst) to 1(best).
- HSI is calculated by combining multiple "Suitability Indices (SIs)" which represent conditions of critical attributes that define habitat requisites of evaluation species.

# What is Suitability Index (SI)?

Example: a SI model of spawning pond for a frog Species.



SI=1: Most appropriate depth of water.

SI=0: None of the frog can live in the depth.



*Rana japonica*

# Relationship between a HSI & SIs

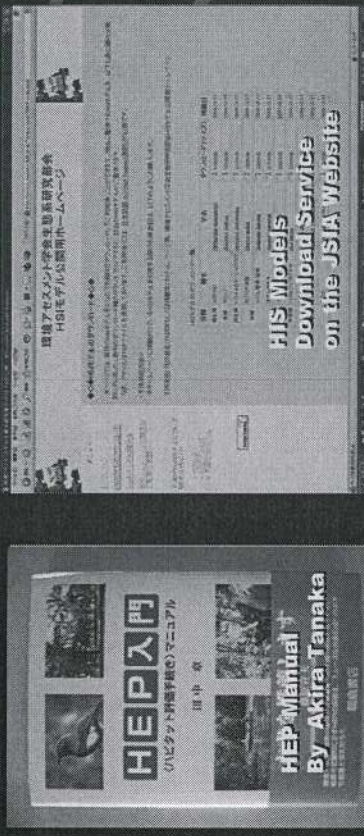
Example: Composition of a firefly Species HSI.



# How HEP works in an EIA?

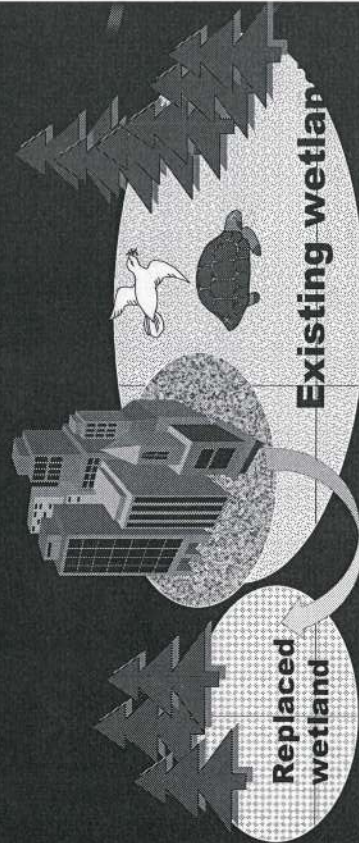


- HEP was developed by U.S. Fish and Wildlife Service in 1980's. The first introduction of HEP into Japan was in 1998 by author.
- Complete Japanese HEP manual was published and Japanese HSI models download service on the web started in 2006.
- The first application of HEP to an EIA in 2006.



## Compensatory Mitigation (Biodiversity Offset)

When we can neither "avoid" nor "minimize" the impacts, we need to "compensate" for the loss of the habitat by restoring/creating the same type of the habitat.



Restore/create wetland for achieving "no net loss"

## What is Compensatory mitigation? Biodiversity offset?

- In "avoid" mitigation,
- Totally Avoid,
  - Timely Avoid,
  - Spatially Avoid,
  - Partially Avoid,

Impacts predicted

Impacts available→1. Avoid!	
Impacts minimizable→2. Minimize!	
3. Compensate for remaining impacts!	

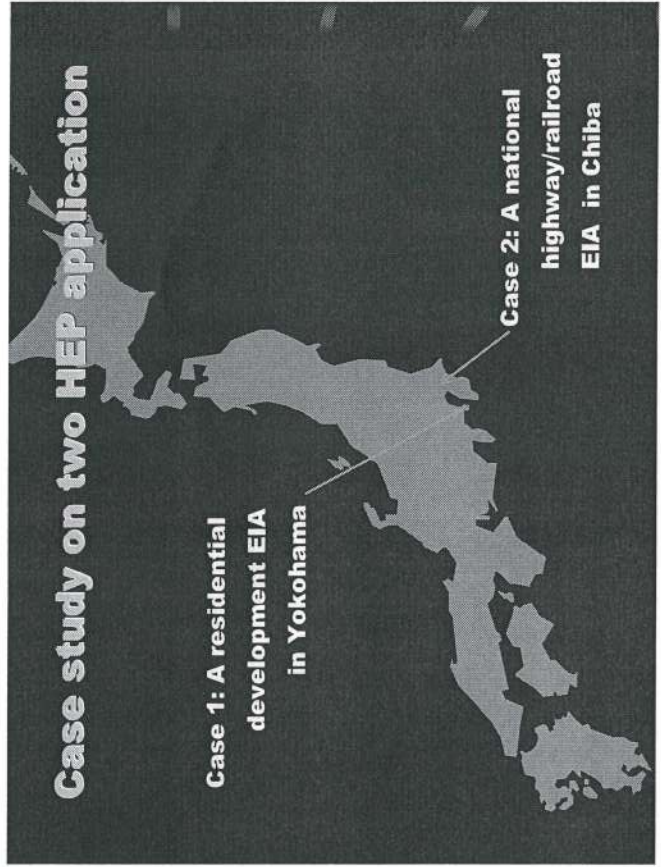
No net loss

10

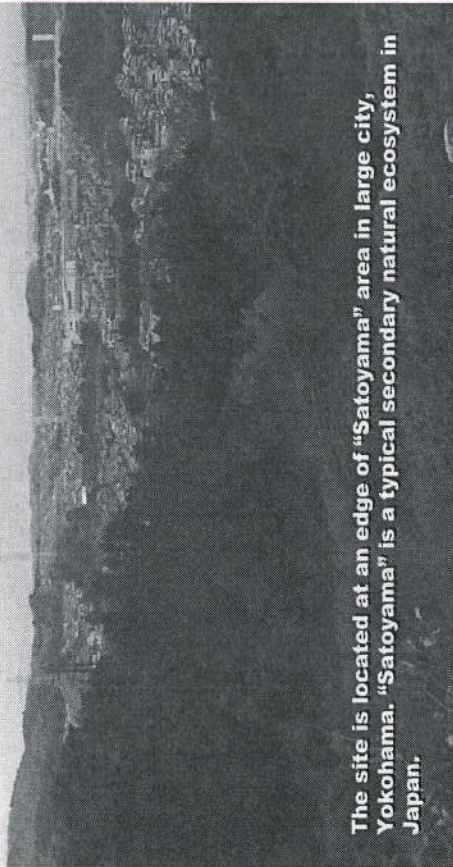
## Case study on two HEP application

Case 1: A residential development EIA in Yokohama

Case 2: A national highway/railroad EIA in Chiba

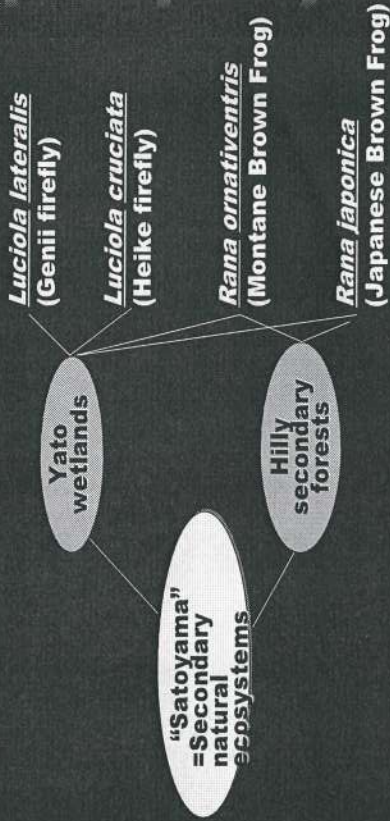


## Case study 1: A residential development EIA in Yokohama



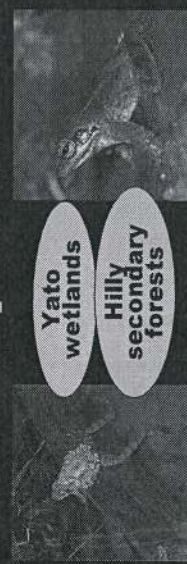
The site is located at an edge of "Satoyama" area in large city, Yokohama. "Satoyama" is a typical secondary natural ecosystem in Japan.

## "Satoyama" ecosystems and evaluation species for their conservation



Satoyama ecosystem consists of "Yato" wetlands such as paddy fields and hilly secondary forests. We chose four wildlife species using these habitats for HEP analysis.

## Evaluation Species for HEP

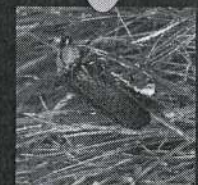


Yato wetlands

Hilly secondary forests

Montane Brown Frog  
(*Rana ornativentris*)

Japanese Brown Frog  
(*Rana japonica*)

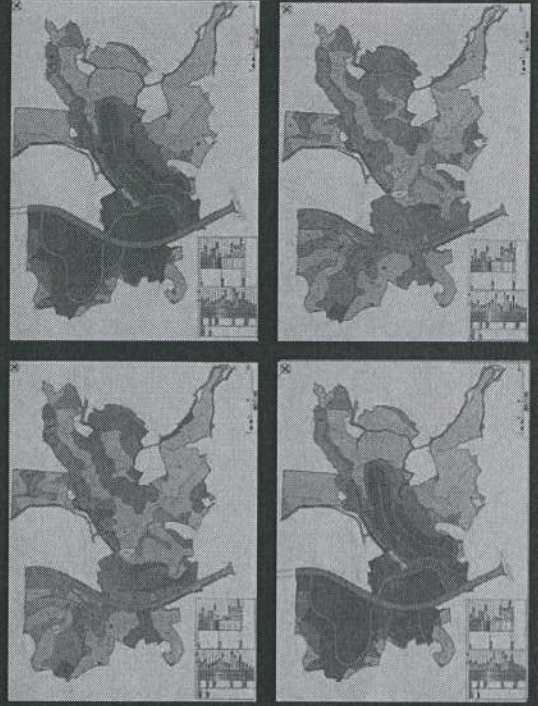


Genji Firefly  
(*Luciola cruciata*)

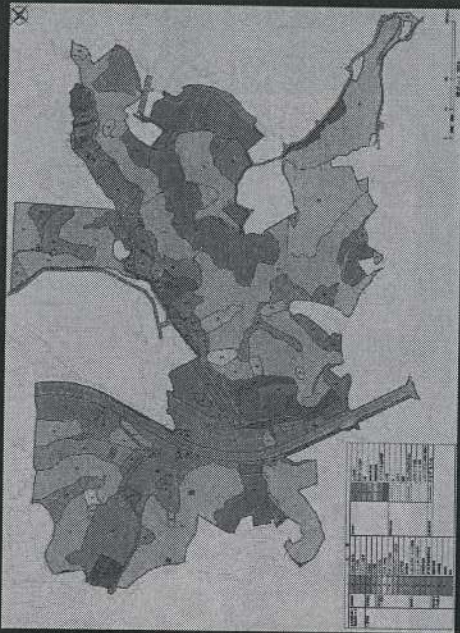


Heike firefly  
(*Luciola lateralis*)

## Four alternative plans were compared by using total HUs

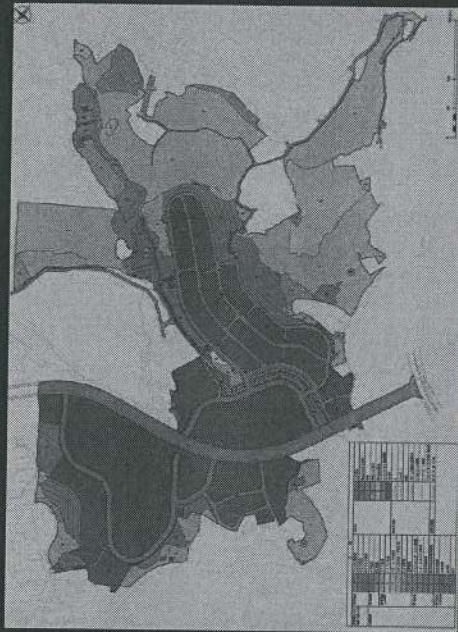


## Present (before development)



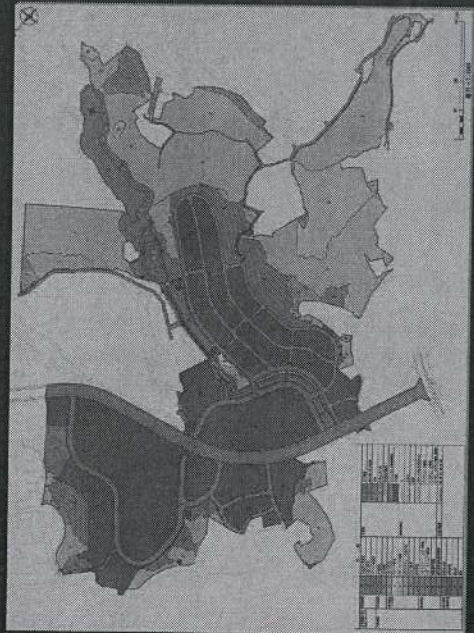
Present condition before the development project

## Development Plan A



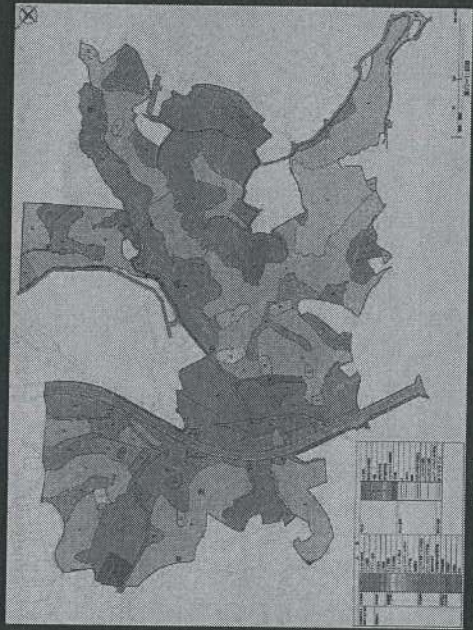
Development plan with mitigation measures which were advised by HEP team members through HEP analysis.

## Development Plan B



Original development plan before HEP analysis.

## No Action



Developer withdraw from the project. But small sale development projects will occur.

# Fair organization of the HEP team

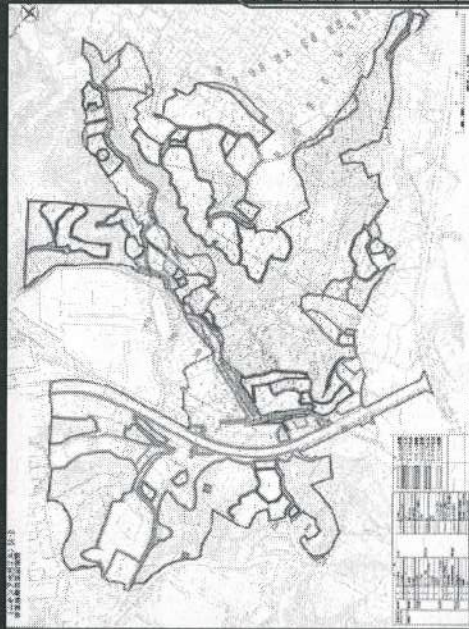
## Frog HEP team

Role	Number of people
HEP coordinator	1
Local expert of evaluation species	1
Local environmental NGOs	3
Developer	2
Consultant (ecology background)	1

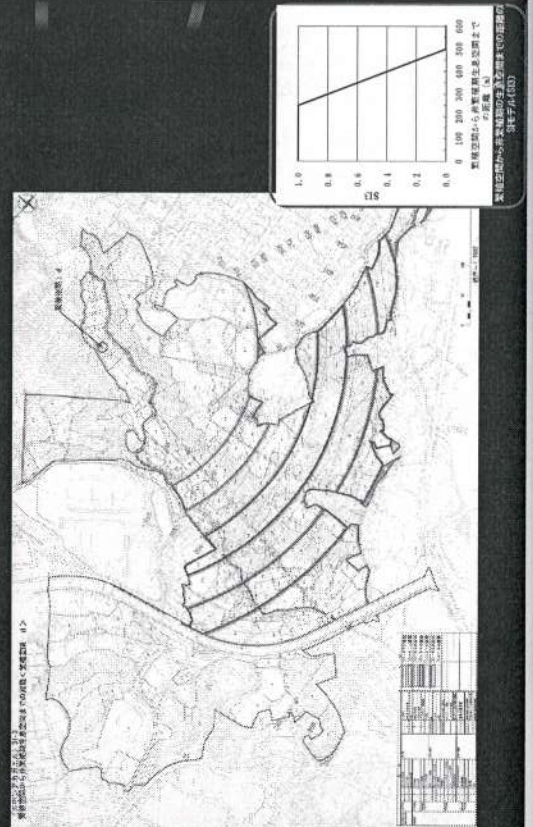
## Firefly HEP team

Role	Number of people
HEP coordinator	1
Local expert of evaluation species	1
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Developer	2
Consultant (ecology background)	1

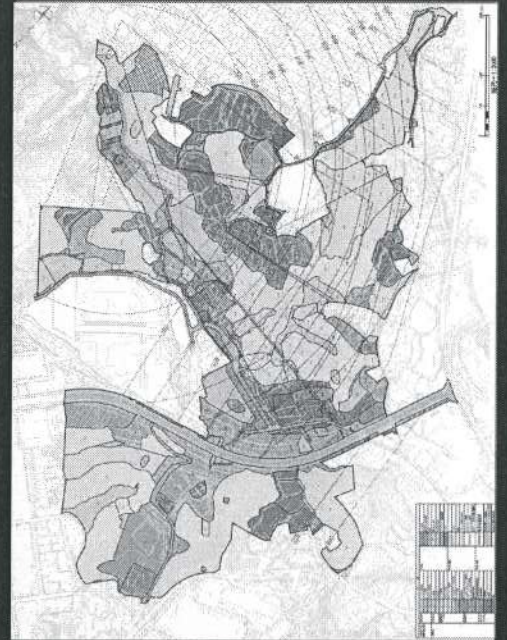
# Example: SI2 of Japanese Brown Frog



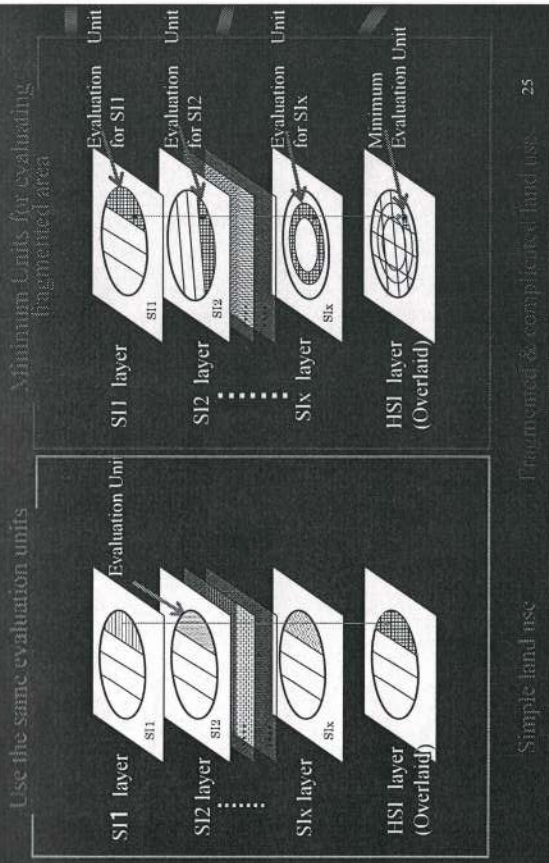
# Example: SI3 of Japanese Brown Frog



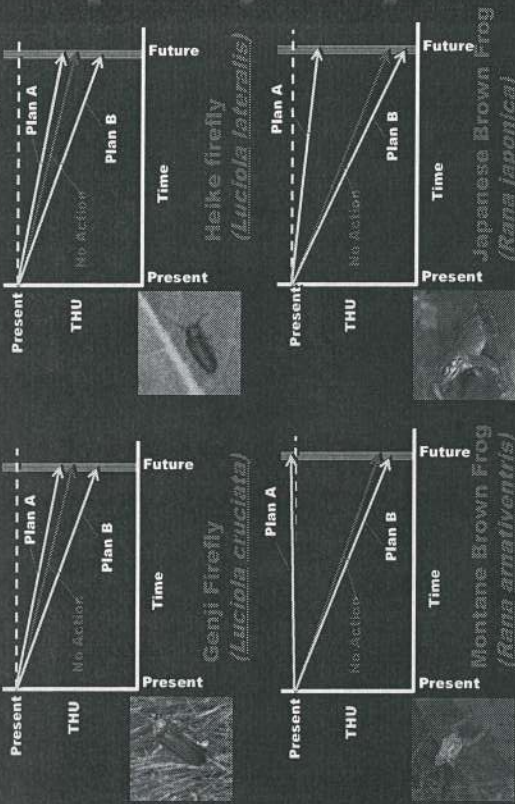
# Example: Evaluation Sub regions of the minimum units by SI2 and SI3 of Japanese Brown Frog



## HEP Accounting



## Results of HU accounting



HEP enables to see how much value of habitats will be declined.

## Result

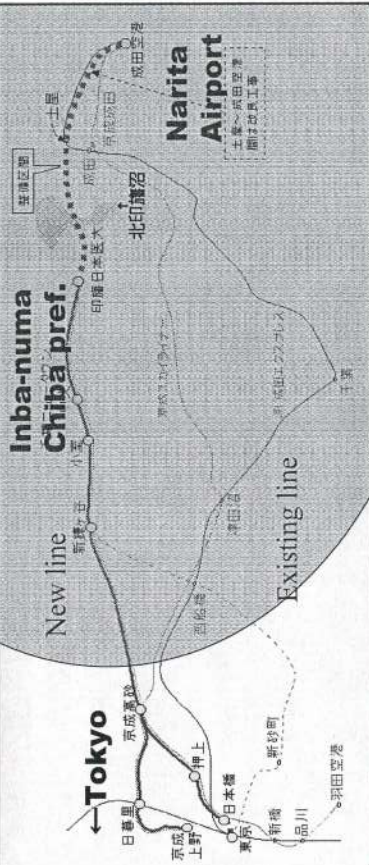
- Comparatively, Plan A, development plan with mitigation measures which were advised by HEP team members through HEP analysis, was considered best plan in terms of conservation of four species.
- All plan showed serious decline of HUs. Even, HU of plan A declines seriously.
- It is clear how much compensatory mitigation will be necessary .
- Compensatory mitigation (biodiversity offset) is not mandatory in Japan.
- Without compensatory mitigation, net loss and net gain are never balanced.

## Case study 2: A national highway/railroad EIA in Chiba pref.

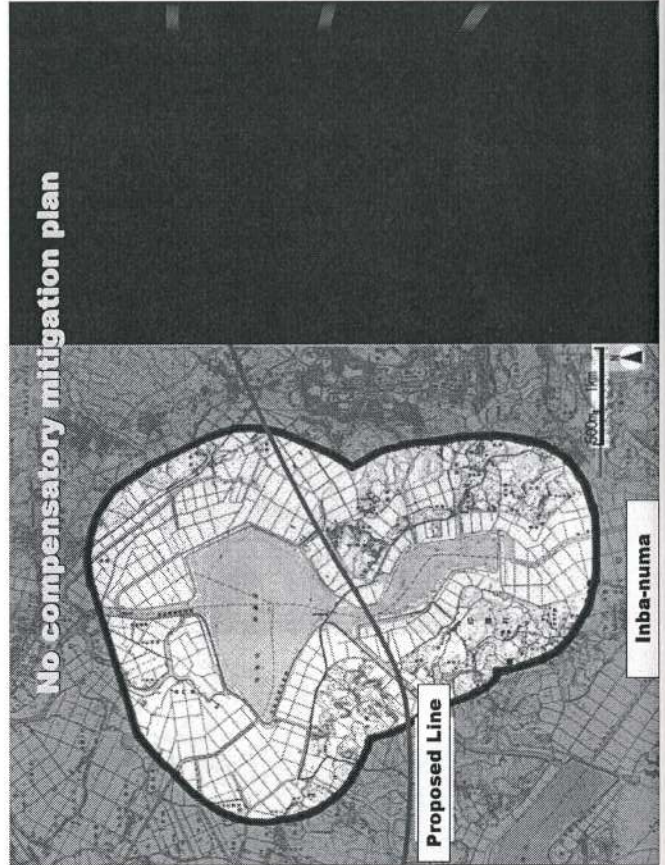


# Narita New Train & Road Construction

Largest Wetland area in Kanto

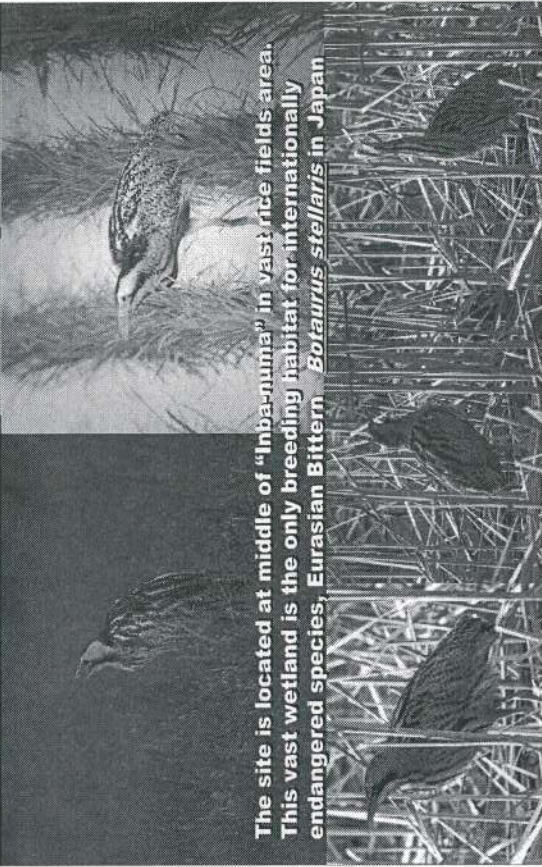


# No compensatory mitigation plan



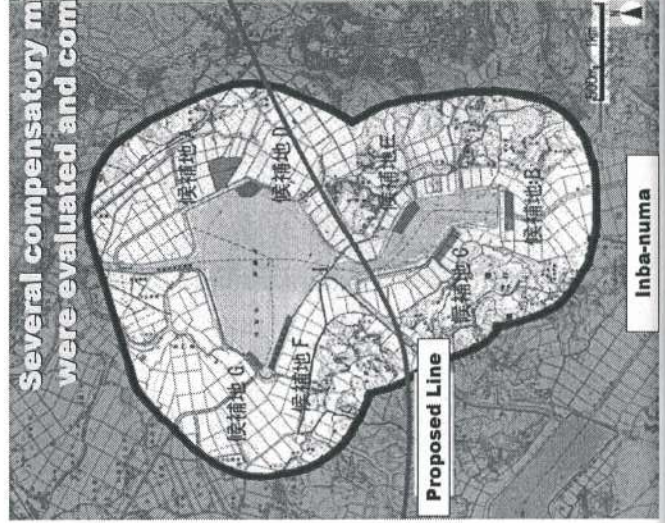
# “San-ka-no-go”

## Eurasian Bittern *Botaurus stellaris*



The site is located at middle of “Inba-numa” in vast rice fields area. This vast wetland is the only breeding habitat for internationally endangered species, Eurasian Bittern *Botaurus stellaris* in Japan

# Several compensatory mitigation sites were evaluated and compared by HEP



Site	ha
A	24
B	5
C	4
D	6
E	4
F	7
G	3

# Calculated HUs

	Baseline	Construction without compensatory mitigation	Compensatory Mitigation A	Compensatory Mitigation B	Compensatory Mitigation C	Compensatory Mitigation D	Compensatory Mitigation E	Compensatory Mitigation F	Compensatory Mitigation G
H	7331	4302	4543	4315	4305	4357	4305	4376	4310
U									

Any compensatory mitigation showed enough net gain to achieving "no net loss" of the habitat!!!!??

That is not right.

HEP was not applied correctly in this case.

1. Evaluation area must large enough.
2. "Fragmentation" must be included in SIs.
3. Fair HEP team organization is a key.

Largest wetland area in Kanto



Lessons from this HEP application

# What did I advised to Chiba pref./Railway co.?

Largest wetland area in Kanto



If the project cut the largest wetland area into two halves, the project must compensate one half of the area. =tremendous compensation!

- However, it is impossible to restore/create one half of the largest wetland area in Kanto.
- Consequently, only underground plan or roundabout route plan can achieve "no net loss" of the habitat.
- If the line cut Inba-numa, Eurasian Bittern population of this area will become extinct in near future.

# BBOP

BUSINESS AND BIODIVERSITY OFFSETS PROGRAM

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## LEARNING NETWORK MEETINGS

BBOP AT TAIA 2010

11 April 2010, Geneva Switzerland

BBOP organised a session on biodiversity offsets at the International Association for Impact Assessment (IAIA) 2010 annual conference held in Geneva from 6-11 April. The session was chaired by Helen Byron from ASPB (Birdlife in the UK) - Birdlife International is one of the members of BBOP's Advisory Group.

The session which was attended by around 40 people started with an introduction to BBOP from Helen Byron - which outlined BBOP's structure, the phase 1 pilot projects and outputs, BBOP's definition and goal of biodiversity offsets and how they are used in impact assessment and the BBOP priorities to 2012. (Click [HERE](#) for presentation in PDF)

This was followed by four presentations giving diverse perspectives on biodiversity offsets:

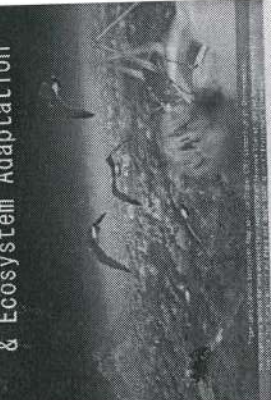
- Ambassador Project: From impact assessment to offsetting - a presentation by Paul Ardinaivaivomahela on one of the BBOP Pilot projects
- Presentation in PDF
- Max Biodiversity Offset Strategies: Earth banking and Satoyama Oshang - by Dr Akira Tanaka from Tokyo City University, Japan
- Presentation in PDF
- Stakeholder views on offsets and their use in EIA in Western Australia by Dr Garry Niddle from Curtin University
- Presentation in PDF
- Compensation and restoration: Quantitative Methods by Leonardo Marcota from Entropia Snc consultants in Italy
- Presentation in PDF

BBOP User Needs Assessment Completed

March, 2010: **Business and Biodiversity Offset Program, BBOP is proposing guidelines for international society**



# Biodiversity Offset & Ecosystem Adaptation



**Program** 2010 International Symposium on Biodiversity Offset & Ecosystem Adaptation

09:00 Registration  
09:30~10:00 Opening Remarks  
10:00~10:30 Keynote Speech  
10:30~11:40 "Innovative Mitigation in Biodiversity Offset: From Practice to Policy" (Moderated by Prof. Akira Tanaka)  
11:40~12:30 Biodiversity Offset and Ecosystem Adaptation  
12:30~13:00 Lunch Break  
13:00~14:30 "Can compensatory mitigation be ecologically effective and resilient? Interactions from New Forests" (Moderated by Prof. Akira Tanaka)  
14:30~15:00 "Biodiversity Offset and Ecosystem Adaptation"  
15:00~17:30 Panel Discussion "Offset for Biodiversity Conservation"  
18:00~19:30 Reception  
19:30~ Dinner

**Registration**  
09:00~10:00  
09:30~10:00  
10:00~10:30  
10:30~11:40  
11:40~12:30  
12:30~13:00  
13:00~14:30  
14:30~15:00  
15:00~17:30  
18:00~19:30

**Registration**  
09:00~10:00  
09:30~10:00  
10:00~10:30  
10:30~11:40  
11:40~12:30  
12:30~13:00  
13:00~14:30  
14:30~15:00  
15:00~17:30  
18:00~19:30

**Registration**  
09:00~10:00  
09:30~10:00  
10:00~10:30  
10:30~11:40  
11:40~12:30  
12:30~13:00  
13:00~14:30  
14:30~15:00  
15:00~17:30  
18:00~19:30

**2010 Jan. 18. Mon. 9:30~17:30 (Open 9:00)**

By the end of the conference, you will be able to:

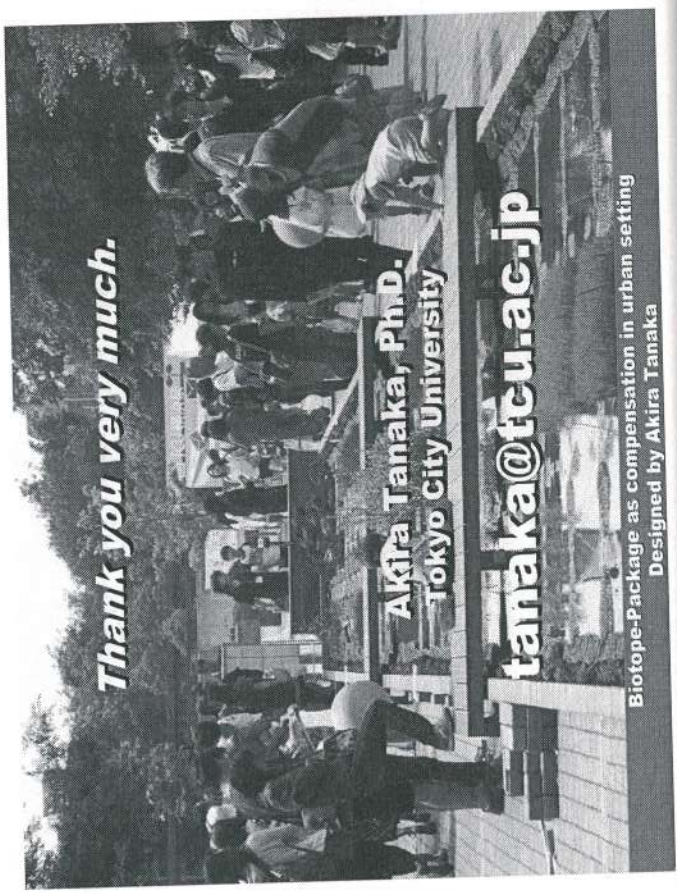
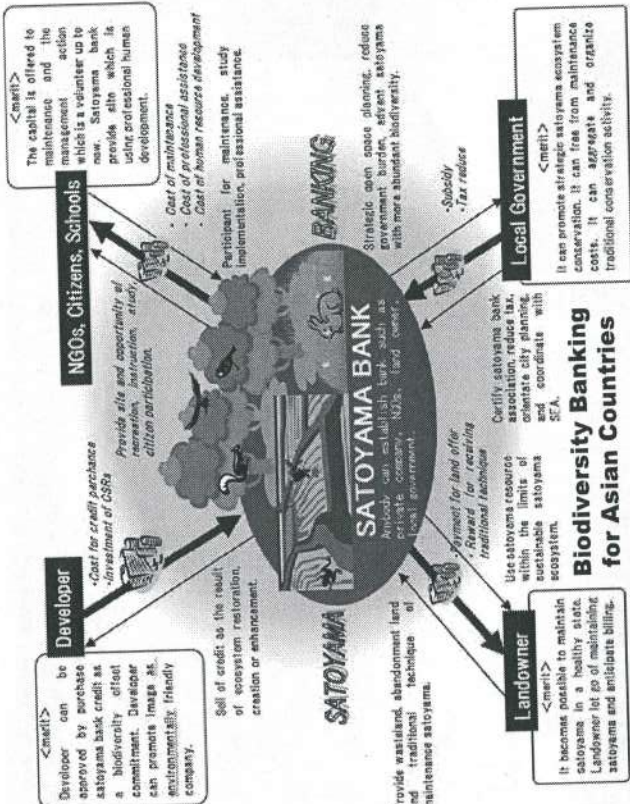
- Understand the concept of biodiversity offset and ecosystem adaptation.
- Identify the key points of biodiversity offset and ecosystem adaptation.
- Apply the concept of biodiversity offset and ecosystem adaptation to your own work.



**The first biodiversity offset/banking conference in Japan**

## Conclusion

- HEP is appropriate tool to assess the loss and gain of the habitat quantitatively for EIAs.
- HEP can be double-edged swords that can be used for enrichment as well as destruction of biodiversity.
- The key point of HEP application is fair organization of the HEP team.
- HEP that can show the loss of the habitat quantitatively accelerates to introduce Japanese style compensatory mitigation (biodiversity offset).



Thank you very much.

**AKIRA Tanaka, Ph.D.**  
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Biotope-Package as compensation in urban setting  
Designed by Akira Tanaka

## **Session III: Impact Assessment for Biodiversity: Cases**

**Chair: Dr.Jong-Gwan Jung (CDI)**

**Prof. Takehiko Murayama (Waseda University)**

**"Sakhalin Oil and Natural Gas Development and Biodiversity  
Conservation"**

**Ms. Noriko Shimizu (FoE Japan)**

**"Biodiversity Conservation and National Park Management"**

**Prof. Changwan Seo (University of Seoul)**

# Sakhalin Oil and Natural Gas Development and Biodiversity Conservation -Implication of Sakhalin II-

Noriko Shimizu

FoE Japan

Keywords: Sakhalin, Biodiversity, Oil and Gas Development Projects, trans-boundary

## 1. Introduction

The Biodiversity Group (BG) was established by the decision of the Ecological Council of the Sakhalin Oblast in August 2007 in order to develop the best approach to the conservation of Sakhalin's and Kuril's biodiversity. The BG is unique and implies future style of biodiversity conservation beyond national borders and people's position. Three uniqueness lie in the BG. Firstly, foreigners, in this case, two Japanese participate in the BG beyond national border. Secondly, the Japanese who participate in the BG are the members of experts and NGO network called 'Sakhalin Japan Wildlife Network', not the officials of Japanese government. Lastly, it is a private company who pays for almost all the cost of the BG whose purpose is to conserve Sakhalin's and Kuril's biodiversity.

## 2. Background of the BG

Sakhalin Island is the place where rich biodiversity still remains. Due to its geographic closeness to Japan, Sakhalin's biodiversity is closely linked to Japan, especially Hokkaido e.g. 'Steller's sea eagle' breeds in North-eastern Sakhalin and passes the winter in Hokkaido.

On the other hand, it is rich in natural resources and is totally surrounded by nine oil and gas development projects i.e. Sakhalin I – IX, though some of them are still in planning stage. There are foreign multinational companies involved in them.

It is the Sakhalin II Oil and Gas Development Projects (Sakhalin II) that triggered establishment

of the BG. When the Japan Bank for International Cooperation (JBIC) and other banks considered financing the Sakhalin II, many Russian and international wildlife experts and NGOs raised concerns about its adverse impacts on biodiversity in Sakhalin and in Hokkaido, Japan. This advocacy, both directly and through financiers, created pressures against the Sakhalin Energy Investment Company (SEIC), the project proponent, to establish framework of conserving the region and to include Japanese expert members in the BG for trans-boundary issues.

## 3. Future implication and challenges

The BG has already faced some challenges, though. For instance, despite its purpose of conserving Sakhalin's and Kuril's biodiversity and the fact that Sakhalin Island is surrounded by oil and gas development projects, only SEIC, among companies of Sakhalin I – IX and other companies involved in various development projects, supports the BG. Eventually, the focus of the BG has dominantly been SEIC's biodiversity action plans. More elaboration of framework and participation of other companies to join the BG will be necessary for the BG to work effectively.

Nevertheless, the uniqueness of BG implies the future possibilities and necessities of trans-boundary cooperation in biodiversity conservation by various stakeholders..

## References

Biodiversity Group (2008) Terms of the Reference of the Biodiversity Group

# Sakhalin Oil and Natural Gas Development and Biodiversity Conservation

-Implication of Sakhalin II-

Национальная экологическая организация «Друзья Земли»  
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Noriko Shimizu  
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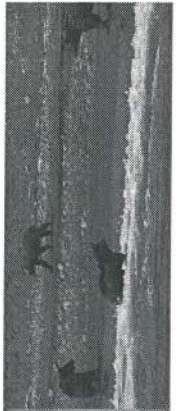
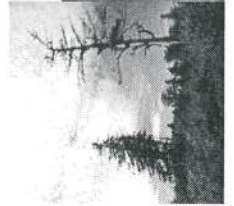


## Content of presentation

1. The Biodiversity Group
2. Background of the Biodiversity Group
3. Expectation and challenges

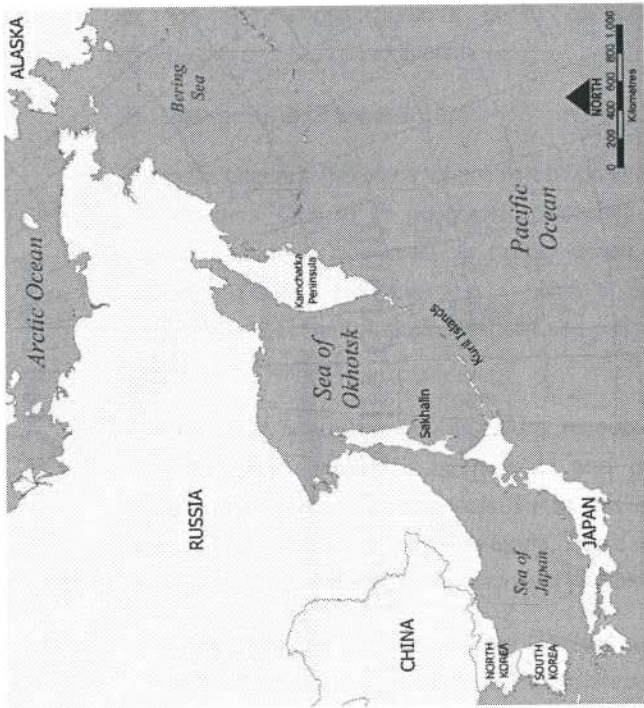
## Basic information of Biodiversity Group (BG)

- **Establishment:** Established by the decision of the Ecological Council of the Sakhalin Oblast in August 2007
- **Position in Sakhalin Oblast:** under the Sakhalin Oblast Administration
- **Goals :** To develop the best approach to the conservation of Sakhalin's and Kuril's biodiversity
- **Core Activities:**
  - Assist in development and implementation of regional and corporate biodiversity related plans and programmes, including discussion of their results.
  - Provide expert advice and recommendations to governmental and commercial institutions and NGOs with regard to biodiversity related issues



# 1. The Biodiversity Group





## Uniqueness of the BG

1. **Beyond national boundaries:** Japanese participation in the local administrative body of Russia
2. **Beyond position:** Civil Society of foreign national participate in local administrative body in Russia
3. **Cost burden:** Private company paid for almost all the cost of BG.



## Members of Biodiversity Group (BG)

### Russian public entities

- Ecological Council of Sakhalin Oblast
- Committee of natural resources and environment protection of Sakhalin Oblast
- Department of forestry and protected areas of Sakhalin Oblast
- Department of fishery of Sakhalin Oblast
- Rosprirodnadzor
- Rostekhnadzor

### Russian Academic Institutions

- Sakhalin State University
- Institute of Marine Geology and Geophysics of Russian Academy of Science
- Sakhalin Research Institute of Fisheries and Oceanography
- Sakhalin botanical garden (Russian Academy of Science)
- Moscow State University

### NGOs

- Sakhalin Environmental Watch (NGO)
- WWF (NGO)
- Japanese scientific institutions and NGOs (2)

### Company

- Sakhalin Energy Investment Company (2)

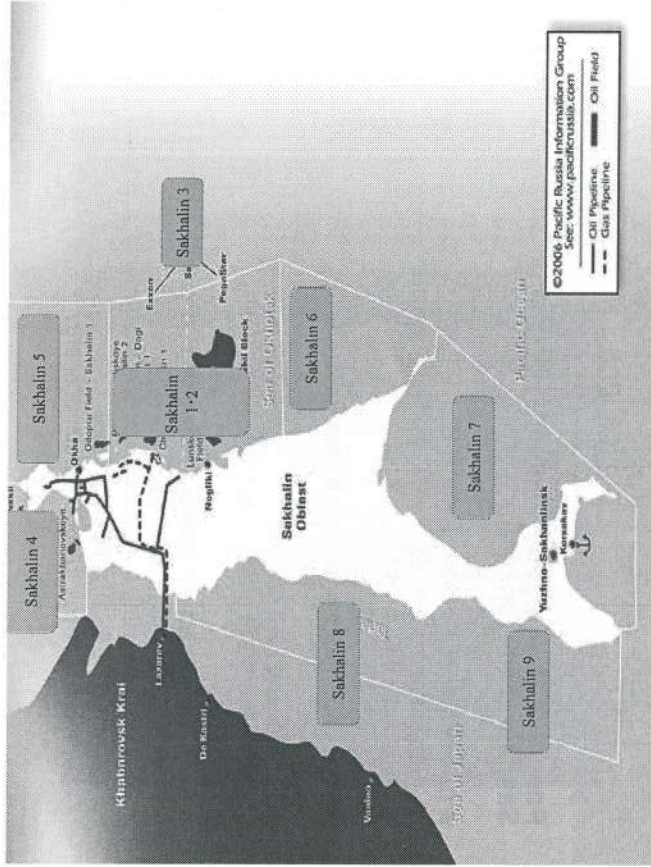
↑ 'Sakhalin Japan Wildlife Network'

Composed of Japanese wildlife experts and NGOs including FoE Japan

## 2. Background of the BG

## Sakhalin Island -Rich Natural Environment-

- 60,000 rivers runs in Sakhalin (Salmon runs in many of them)
- spawning area of salmon is 22 mil m2.
- One of the largest eagle, 'Steller's sea eagle' breeds in the North-eastern Sakhalin. Designated as protected species by the Convention Between the Japanese and the Russian Government
- Endemic subspecies of Dunlin, is designated as endangered species by Russian government. Only 900 in 2002.
- Western Gray Whales, only about 135 are living and designated as critically endangered species by IUCN. They feed in the east coast of Sakhalin



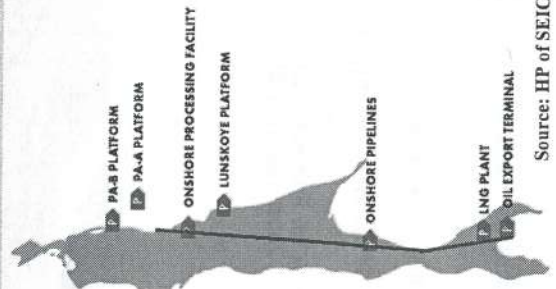
## Oil & gas development projects around Sakhalin Island

	Companies involved	Current situation
1	Exxon Neftegaz (US), SODECO (Japan), ONGC Vinesh (India), RN-Astra (Russia), Sakhalinmorneftegas-Sheif (Russia)	In production Oil: for domestic use and export to Japan and East Asia. Gas: for domestic use and will export to China?? Undecided.
2	Gazprom (Russia), Shell (Holland), Mitsui (Japan), Mitsubishi (Japan)	In production Exported to Korea, Japan, and US
3	Gazprom (Russia), RN-Astra (Russia), China Petroleum & Chemical Corporation (Sinopec)(China)	Plan to start production in 2011 at the earliest?
4	Rosneft (Russia), BP (UK)	Difficult to commercialise?
5	Rosneft (Russia), BP (UK)	Still exploration
6	Petrosakh (Russia)	
7	Information unfound	
8	Information unfound	
9	Information unfound	

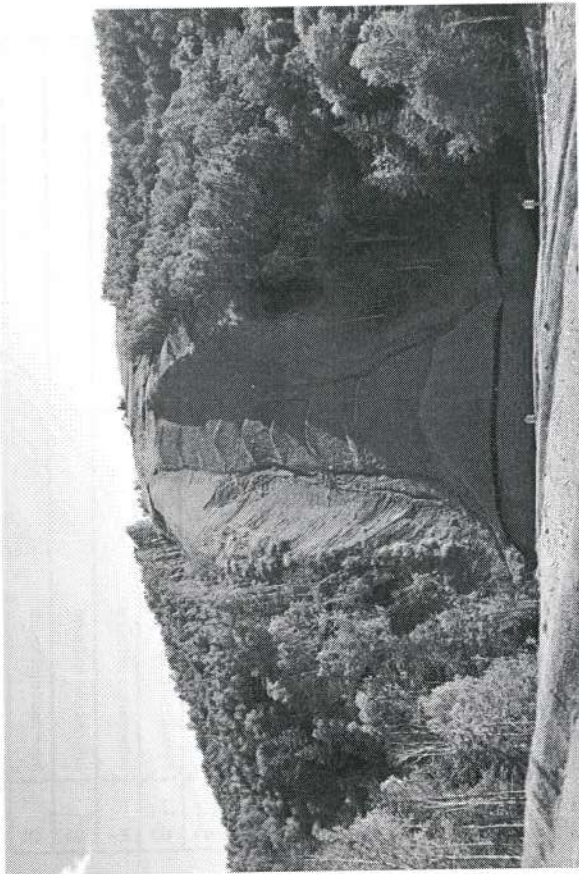
## Sakhalin II Oil and Gas Development Project

### Components of Sakhalin II (Phase 2)

- Two new offshore platforms
- Offshore pipelines
- Onshore processing facility(OPF)
- 2 onshore 800km-pipelines to carry oil and gas to the south of the island
- Liquefied natural gas plant
- Offloading terminals for crude oil and LNG



Source: HP of SEIC



Pipeline passes through Gar river (C) Sakhalin Environment Watch, Sep 2009

## Concerns about environmental impacts by Sakhalin II

### Experts and Russian/Int'l NGOs

concerns about the adverse impacts on whole biodiversity in Sakhalin and Hokkaido in Japan

### Sakhalin Energy Investment Company

(Gazprom, Shell, Mitsui, Mitsubishi) Financiers  
(Japan Bank for International Cooperation: JBIC)

### Sakhalin Oblast

Established BG.



## Implications

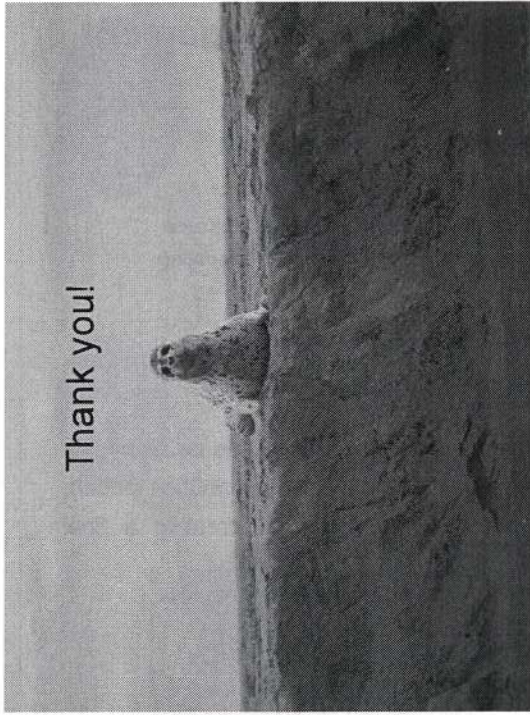
### Possibilities of cooperating environmental conservation in Sakhalin and Kuril with...

- Companies of Sakhalin I and III-IX
  - support and join in BG
  - share the cost burden
- Other companies operating in Sakhalin
- Experts and civil society
  - join in the BG to provide expertise
- Neighbouring governments and regional administration
  - support financially
  - push private companies through quasi-governmental agencies such as SODECO, JBIC, SINOPEC
  - pay more attention to supply-chain of energy

## 3. Implications and challenges

## Challenges

- **BG meetings**
  - took place once or twice a year so far...
  - have discussed only in relation to Sakhalin II
  - Minutes summary are made, but not disclosed to the public
- **Cross-border cooperation**
  - more diverse stakeholders will be involved in the oil and gas development projects Sakhalin, but...
  - Sakhalin I and III does not participate, although JBIC and Japanese company 'SODECO' is involved.
  - Sakhalin III does not participate
- **Cost of BG cannot be paid by a foreign developer forever**
  - Currently Sakhalin II pays for almost all the BG's cost, whose purpose is to the conservation of Sakhalin's and Kuril's biodiversity





# Biodiversity Conservation and National Park Management

Changwan Seo<sup>1</sup>, Hyuk-Su Kwon<sup>2</sup>, Chong-Hwa Park<sup>2</sup>, Hye-Jung Sung<sup>2</sup>

<sup>1</sup> Department of Geoinformatics, University of Seoul, Republic of Korea

<sup>2</sup> The Graduate School of Environmental Studies, Seoul National University, Republic of Korea

Keywords: Biodiversity, Conservation Planning, Park Management, Habitat Suitability Modeling

## 1 Introduction

The Ecosystem and Nature Map, which is based on not biodiversity but mostly vegetation map and wildlife survey, is used as a basis for formulating and implementing national policies and plans such as the designation of conservation and protection areas by the Natural Environmental Conservation Act in Korea (Environmental impact assessment act 2008). This map is also used by the Prior Environmental Review System and the Environmental Impact Assessment process to gauge existing conditions in project areas and to predict development impacts on the ecosystem. The purpose of this study is to support impact assessment practitioners and decision makers for conserving protected areas of high biodiversity using the biodiversity map instead of the Ecosystem and Nature Map.

## 2 Methods

The study area is located the southern part of Korea and contains a national park, a landscape ecology protected area and a wildlife protected area. We collected the location data of wildlife and plant species, implemented environmental variables, built habitat suitability models for each

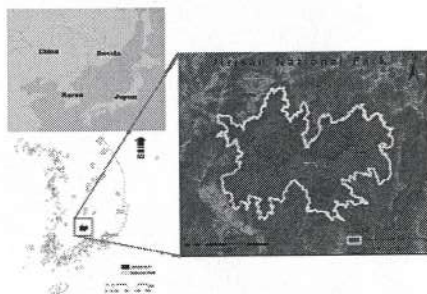


Figure 1: The study area

species to create the biodiversity map

## 3. Results

We created 2 sub-biodiversity maps for mammals and birds using SDM (Species Distribution Model), and then combined these for creating a final

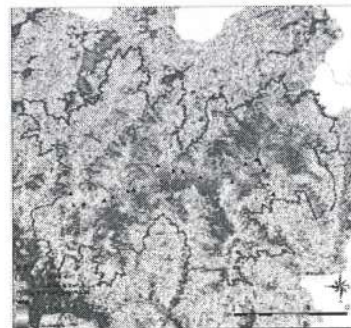


Figure 2: Biodiversity map

biodiversity map.

## 4 Conclusion

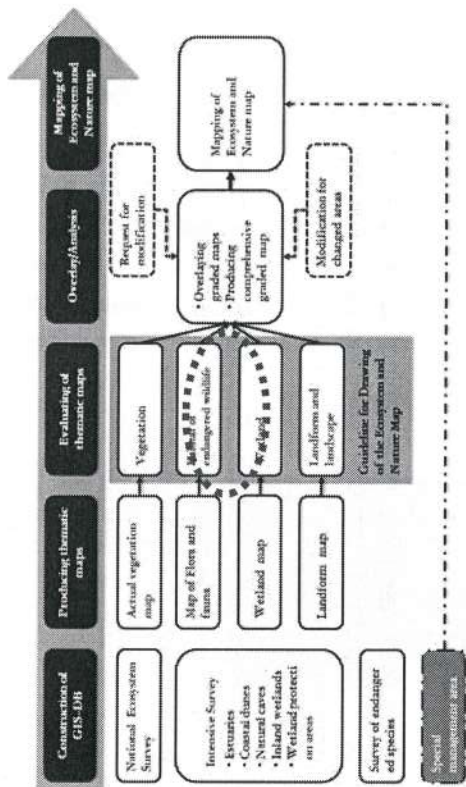
The biodiversity map can help impact assessment practitioners and decision makers to reallocate and to designate the boundary of a protected area. Our study will be useful for the management of Jirisan national park which boundary should be reallocated by the Natural Parks Act next year (Natural park act 2010).

## References

- Ministry of Governmental Legislation (2008) Environmental impact assessment act.
- Ministry of Governmental Legislation (2010) Natural park act.

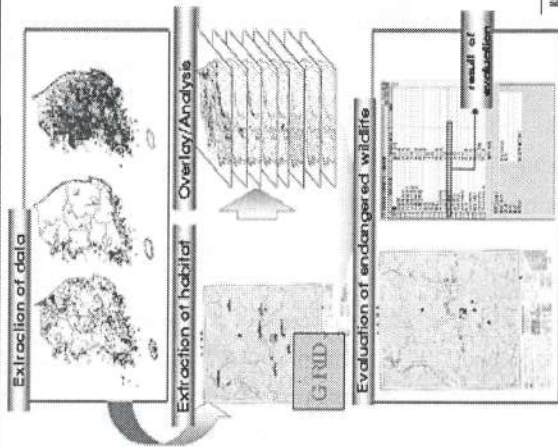


## The Process of mapping the Ecosystem and Nature Map



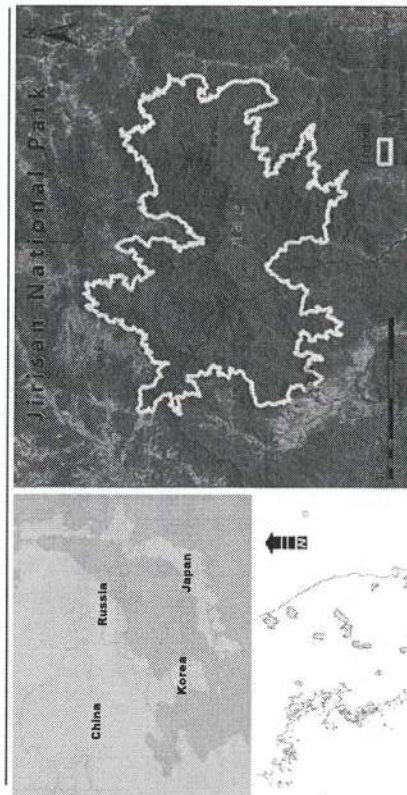
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## Evaluation of endangered species



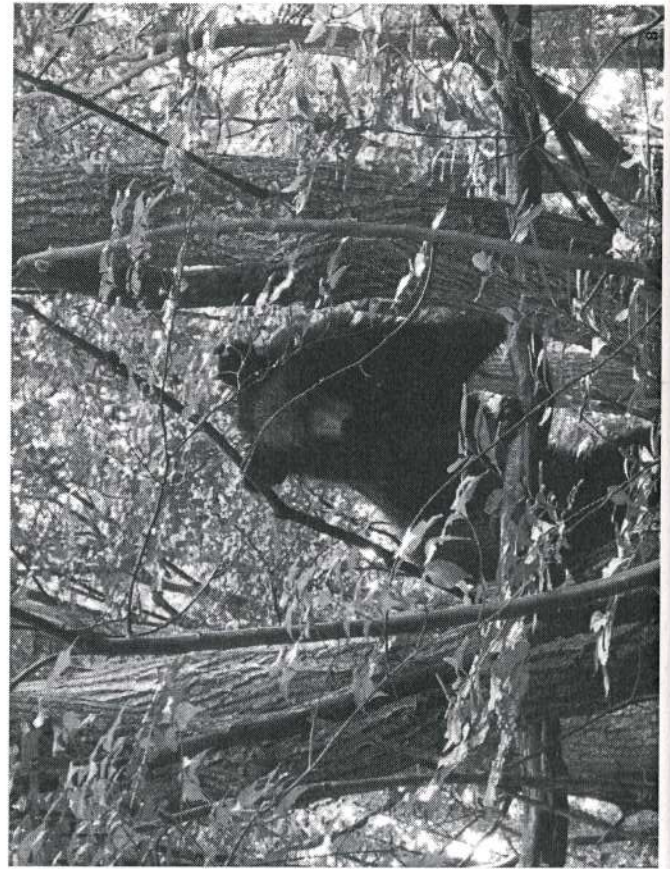
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## Study Area

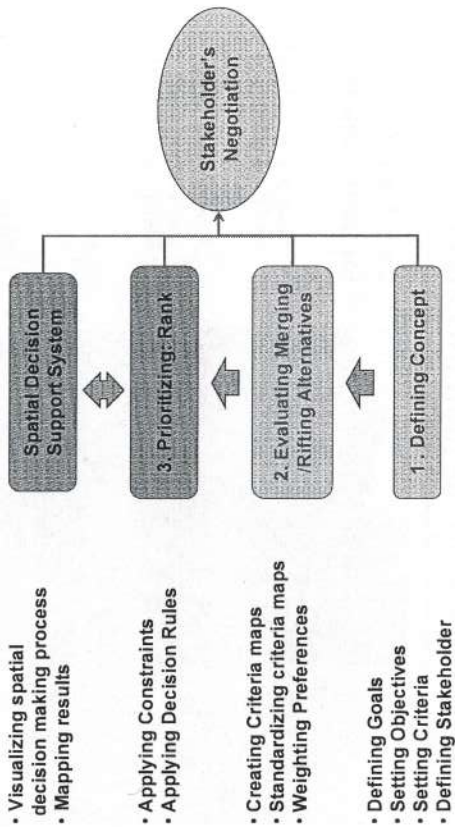


- Jirisan National Park
- Largest Mountainous National Park in Korea
- High biodiversity
- Reintroduction Project for Asiatic Black Bear

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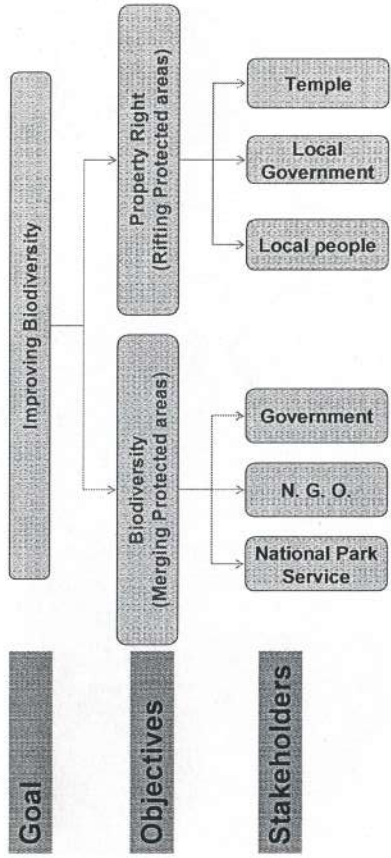


## Process of Spatial Decision Support Model

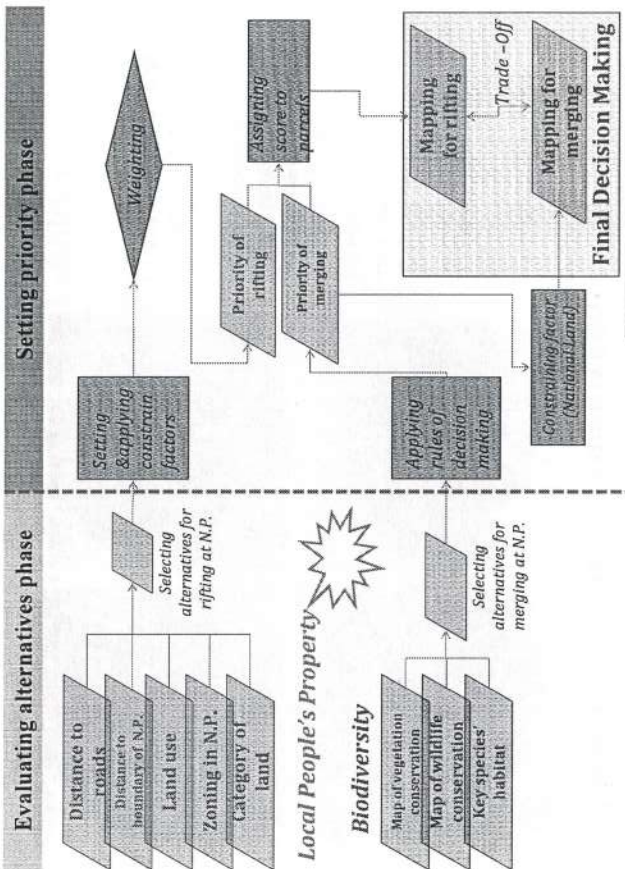


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## Defining the concept

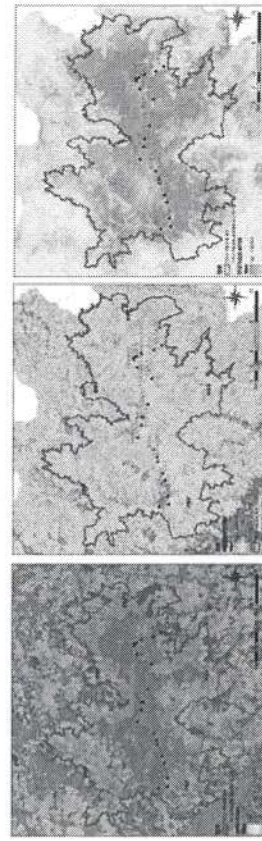


Korea-Japan EIA Workshop 2010 Nagoya, Japan 10



Korea-Japan EIA Workshop 2010 Nagoya, Japan 11

## Criteria Map for Merging



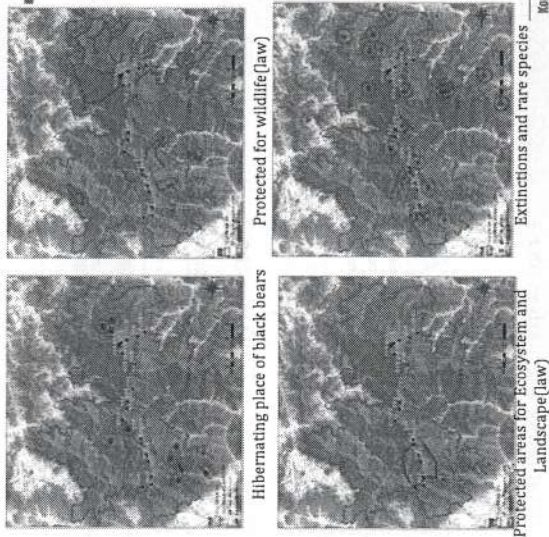
Vegetation value Wildlife value Asiatic Black bears (Key species) habitat

### Criteria for Improving biodiversity

- Vegetation value: age, density, diameter, vegetation type etc.
- Wildlife value: richness of the species of birds and mammals
- Key species: the habitat of Asiatic black bears

Korea-Japan EIA Workshop 2010 Nagoya, Japan 12

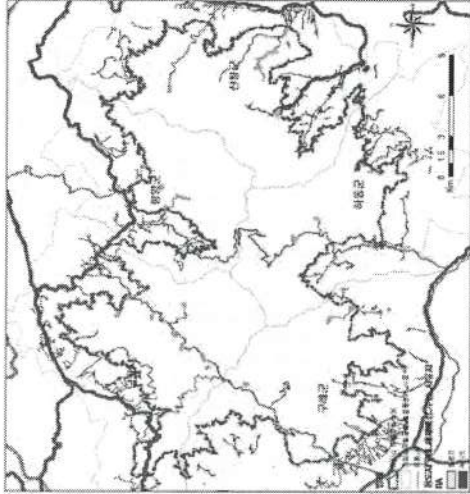
## Constraints Map for biodiversity



- **Constrain maps**
  - Hibernating place of black bears
  - Protected areas for wildlife (law)
  - Protected areas for Ecosystem and Landscape (law)
  - Extinctions and rare species (100m circle)

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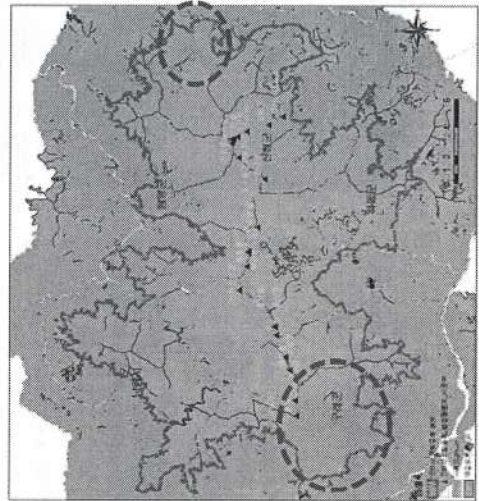
## Criteria Map for rifting



- **Criteria for Property Rights**
  - Distance from road < 200m or the boundary of N.P. < 100m (inside)
  - And Number of house < 20
  - Etc.
- The criteria are made through discussion between stakeholders
- Cyan color shows where are selected by criteria

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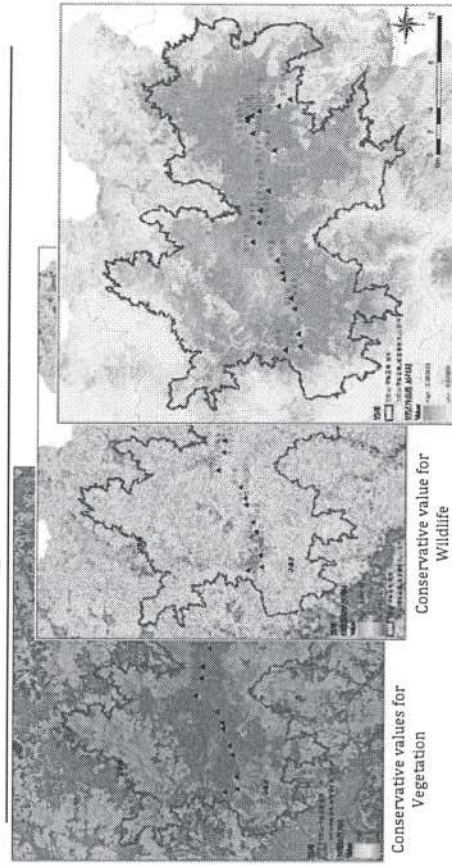
## Constraints Map for land ownership



- **Constrain factor for land ownership**
  - National and common land (blue color)
  - Temple's land (violet color and red dotted lines) ; large patches
  - Individual land (violet color)
- There are many private land at edge of the national park

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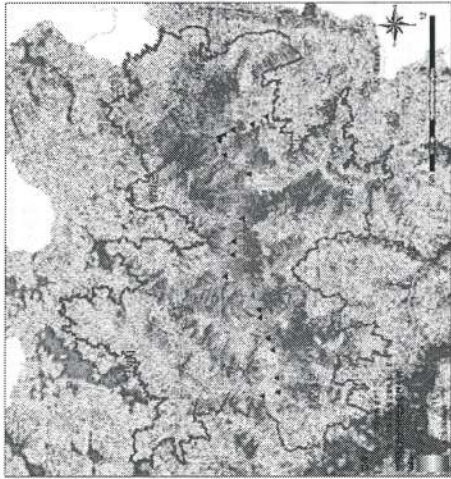
## Evaluation maps



- Standardizing estimated values 0 to 1

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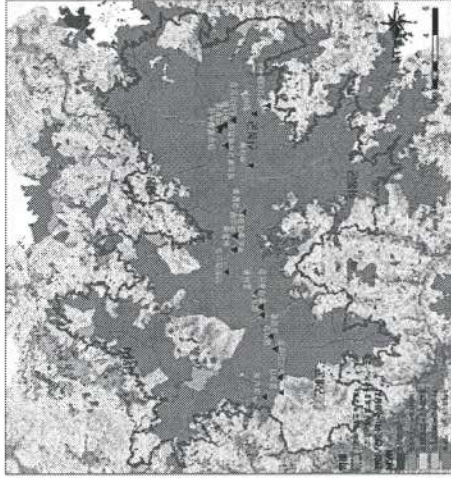
## Merging map based on biodiversity



- National Park Agency weightings:
  - Vegetation(0.143), Wildlife(0.714), Key species(0.143)

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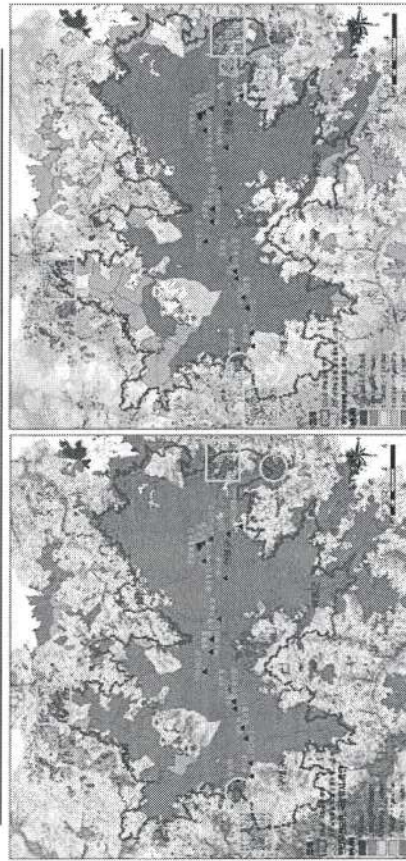
## Priority map for merging based on biodiversity



- Assigning biodiversity value to parcels
- Higher diversity more dark green

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## Comparison of results from stakeholders



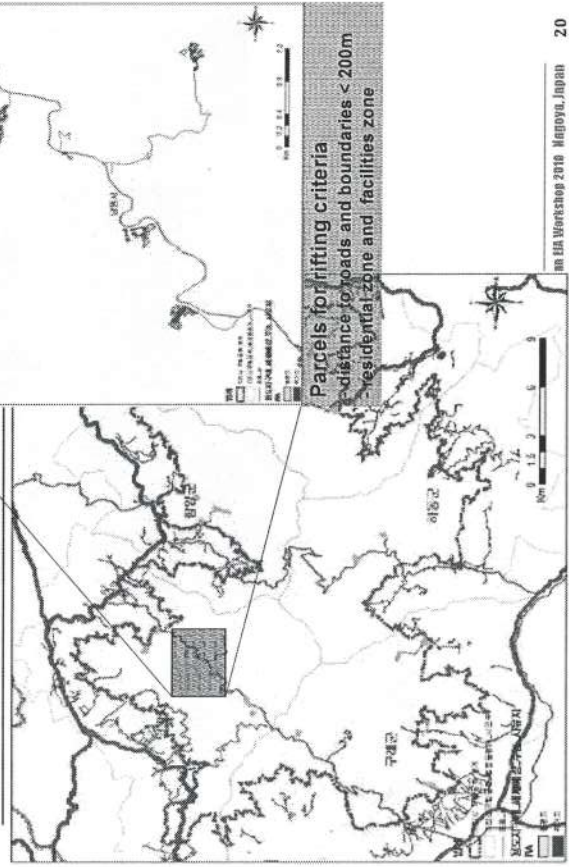
Local peoples

National park service

- The order of priority for merging area was similar relatively.
- Some region (cyan rectangle) was a little different

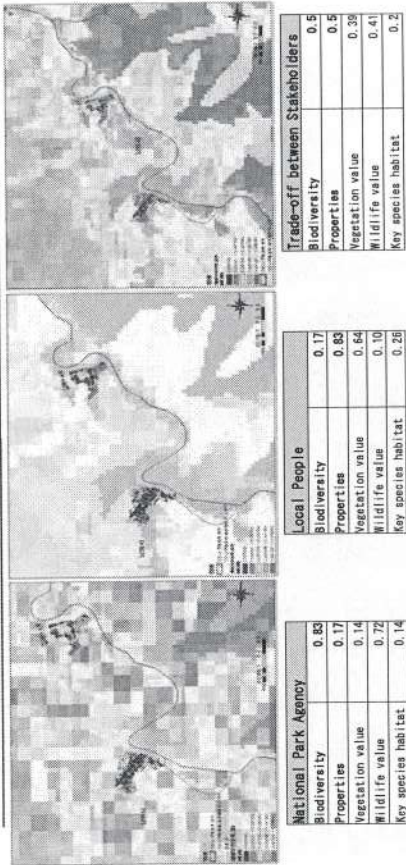
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## Rifting map based on property right



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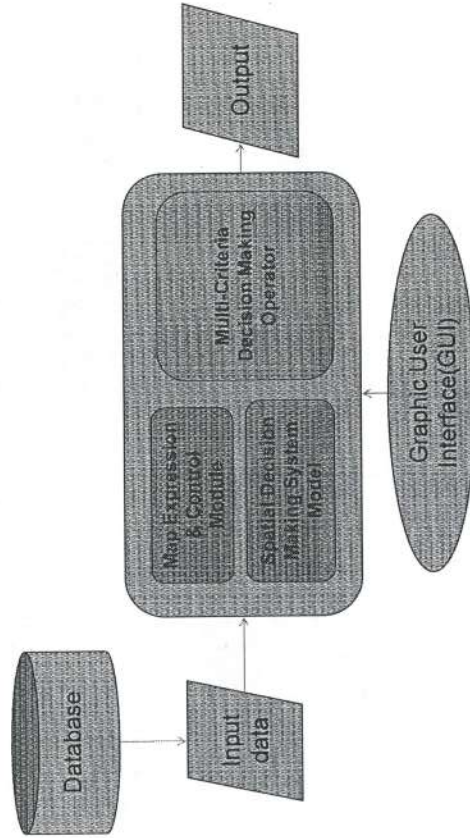
## Comparison of results by stakeholders



- Biodiversity is more priority than Property for national park agency, vice versa for local people.
- Wildlife value is more priority than vegetation and key species for national park agency, vice versa for local people.

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## SDSS Architecture



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## Conclusions

- SDSS (Spatial Decision Support System) for redesigning boundaries of National park and protected area in Korea using GIS and Multi-Criteria decision-making method will be useful
- Suitable sites will be selected reasonably using wildlife, vegetation and key species data based on biodiversity conservation
- This can support a decision-making among stakeholders in EIA process

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## Acknowledgements

- We acknowledge the Eco-Technopia 21 Project, Korean government's R&D Program on environmental technology development for funding this research.

- Thank You for your attention!!



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## History of Korea-Japan Workshops

**1th Japan-Korea Workshop on "New Trends in Environmental Impact Assessment in Korea" Held in Tokyo, Japan on December 5th, 2003**

### Part 1

"Current Status and New Movement in Environmental Impact Assessment in Korea"

Chairs: Sachihiko Harashina (Professor, Tokyo Institute of Technology), 李相勳 (Professor, University of Suwon)

"Prospects and History of Environmental Impact Assessment in Korea"

Presenter: 金是憲 (Vice President, The Korea Environment Institute)

Discussant: Naoto Asano (Professor, Fukuoka University)

"Environmental Impact Assessment in Japan"

Presenter: Shigemoto Kajihara (Section Chief, Environmental Impact Assessment Division, Ministry of Environment)

Discussant: 鄭勇 (Professor, Yonsei University)

### Part 2

"Thinking about Future from Case-studies of Korean Environmental Assessment"

Chairs: 金命振 (Researcher, the Korea Environment Institute), Masaru Ito (Professor, Edogawa University)

"Integration of Environmental Management and Environmental Assessment - Case-studies from four major river drainage plans in South Korea"

Presenter: 李宗浩 (Professor, Cheongju University)

Discussant: Yayoi Isono (Professor, Tokyo Keizai University)

"Case Study Analysis in Follow-up of Environmental Assessment"

Presenter: 李春遠 (Tousei Engineering Co., Ltd.)

Discussant: Akiko Urago (IC Net, Ltd.)



**2th Japan-Korea Workshop on "New Movement towards Strategic Environmental Assessment" Held in Jeju-do, South Korea on November 12th, 2004**

"Trends in Strategic Environmental Assessment in Japan - status of the adoption among municipalities"

Presenter: Sachihiko Harashina (Professor, Tokyo Institute of Technology)

"Introduction of Prior-Environmental Review System and SEA"

Presenter: 李宗浩 (Professor, Cheongju University)

"New Wave of EIA in Japan"

Presenter: Yasuo Shimazu (Professor Emeritus, Nagoya University)

"Current Status and Challenges of Ecosystem Assessment in Japan - case of trends in HSI modeling"

Presenter: Akira Tanaka (Professor, Musashi Institute of Technology)

"SEA Approach towards Treatment and Facility Construction for DXN Illegal Dumping of Contaminated Waste"

Presenter: Masaru Ito (Professor, Edogawa University)

**3th Japan-Korea Workshop on "Japan-Korea Joint International Symposium, Environmental Assessment of Removal and Recovery - From Case-studies of Nihonbashi, Japan and Cheonggyecheon, South Korea" Held in Yokohama, Japan on September 1st, 2006**

"History and Effects of Cheonggyecheon River Restoration Project"

Presenter: Lee Yongtae (Seoul City Official)

"Urban Renewal and Redevelopment Plan of Nihonbashi District"

Presenter: Hideo Nakamura (Professor, Musashi Institute of Technology)

"Cheonggyecheon River Restoration and Ecosystem Assessment"

Presenter: Kim Myungjin (National Institute of Environmental Research, NIER)

"Development of Ecosystem Assessment – challenges learned from removal and recovery case-studies in Japan, South Korea, and USA"

Presenter: Akira Tanaka (Professor, Musashi Institute of Technology)

"River Restoration and SEA"

Presenter: Kim Jiyong (Korea Environment Institute, KEI)

"Development and Cooperation of SEA in Asia"

Presenter: Kiichiro Hayashi (Professor, Nagoya University)

<p><b>4th Japan-Korea Workshop on "Learning from the scenes of Japan-Korea Environmental Assessment" Held in Pusan, South Korea on November 28th / 29th, 2008</b></p>
---

"Case-studies of HEP application in Residential Development"

Presenter: Akira Tanaka (Professor, Musashi Institute of Technology)

"Land Development of hop toad's habitat through residential development project in SANNAM3, Chungju, "

Presenters: Lee Sang Don (Ewha Womans University), Kim Wan Hee (Dohwa Engineering Co.)

"New JICA's Review of the Guidelines of Environmental and Social consideration"

Presenter: Sachihiko Harashina (Professor, Tokyo Institute of Technology)

"Challenges and Verification of Air Pollution Forecast on Road Projects in the Environment Impact Assessment"

Presenters: Teiichi Aoyama (Professor, Musashi Institute of Technology), Atsushi Takatori (Environmental Research Institute Tokyo)

"Method of Environment Impact Assessment of air on the Road Development Projects in Korea"

Presenters: Lee Young Soo, Kim Youngha, Mun Nan (The Korea Environment Institute)

## **Organizing Committees**

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