# T5-Session: Future Scenarios and Modelling of Natural Capital and Ecosystem Services

Date: 14 Dec. 2017, Venue: Ziyun Pavillion
Part-1: 10:30-12:30, Part-2: 14:00-17:30

| | | | |
|---|---|---|---|
| Host: | Osamu Saito | United Nations University Institute for the Advanced Study of Sustainability | saito@unu.edu |
| Host: | Kazuhiko Takeuchi | The University of Tokyo | takeuchi@ir3s.u-tokyo.ac.jp |
| Co-host: | Shizuka Hashimoto | The University of Tokyo | ahash@mail.ecc.u-tokyo.ac.jp |


## Objectives of this session:

- This session will offer an opportunity to present and share the updated science-policy issues on biodiversity and ecosystem services (BES) scenarios and modelling, the case studies at local to regional scales, capacity building efforts for BES scenarios and modelling, and policy support examples by using BES scenarios and modelling.
- This session will contribute to mobilizing and activating researchers and policy makers to strengthen network and partnership of BES scenarios and models beyond local and national scales.

# Part 1 (15 min presentation+5min Q&A)/presenter

| Time | First name | Name | Organization | Title of presentation |
|---|---|---|---|---|
| 10:30-10:40 | Osamu | Saito | United Nations University | Overview and Progress of "Predicting and Assessing Natural Capital and Ecosystem Services"(PANCES) Project |
| 10:40-11:00 | Shizuka | Hashimoto | University of Tokyo | Exploring alternative futures for the social-ecological production landscapes of Noto: implications of land use change on the provision of ecosystem services |
| 11:00-11:20 | Chihiro | Haga | Osaka University | A Development of Future Scenario Simulation System of Natural Capital and Ecosystem Services on LANDIS-II —Linking Qualitative Scenarios and Landscape Change Model in Japan |
| 11:20 - 11:40 | Michio | Oguro | Forest and Forest Products Research Institute | Modelling provisioning services and their relationship with socio-ecological factors in Japan. |
| 11:40-12:00 | Rei | Shibata | Research Institute for Humanity and Nature | Modelling and Mapping Recreation Services Using Multi-Scale Natural and Social Metrics in Japan |
| 12:00-12:20 | Ronald | C. Estoque | National Institute for Environmental Studies, Japan | Future changes in Southeast Asia's forest cover and its ecosystem service value under the shared socioeconomic pathways (SSPs) |



# Part 2 (15 min presentation+5min Q&A)/presenter

| Time | First name | Name | Organization | Title of presentation |
|---|---|---|---|---|
| 14:00-14:20 | Rajarshi | Dasgupta | University of Tokyo | Scenario-based land change analysis of the lower Gangetic Delta: An exploratory investigation into alternative regional futures |
| 14:20-14:40 | Sourya | Das | Tata Institute of Social Sciences. Ashoka Trust for Research in Ecology and the Environment | Scenario Building on the Forest Ecosystem Services and Human Well-being: a case study of Rammam Forest Village, Darjeeling, India |
| 14:40-15:00 | Xinli | Ke | Department of Land Resources Management, Huazhong Agricultural Unviersity | Inner-Provincially or Inter-Provincially? An ex-ante assessment of impacts of China's Arable Land Requisition-Compensation Balance Policy on trade-offs between ecosystem services and economic benefits |
| 15:00-15:20 | Ilkwon | Kim | National Institute of Ecology | Estimation of urban land use changes and their impacts on ecosystem services as a consequences of urban green space policies |
| 15:20-15:40 | Anna | Duden | Utrecht University | Impact of wood pellet demand on biodiversity in the southeastern US |
| 15:40-16:00 | Francesco | Accatino | INRA | Addressing the conflict between food production and other ecosystem services: scenarios on multiples spatial levels |
| 16:00-16:20 | Yuchen | Zhang | National University of Singapore | Meeting global agricultural demand in 2050: what will we sacrifice? |
| 16:20-16:40: Brief oral presentations of poster presentation submitted to Session T-5 | | | | |
| 16:40-17:00: Discussion | | | | |

PREDICTING & ASSESSING NATURAL CAPITAL & ECOSYSTEM SERVICES

The Environment Research and Technology Development Fund (ERTDF)
Strategic R&D Category
Ministry of the Environment, Japan

# Overview and Progress of "Predicting and Assessing Natural Capital and Ecosystem Services"(PANCES) Project

Osamu Saito[1], Shizuka Hashimoto[2], Kikuko Shoyama[1], Takanori Matsui[3], and Kazuhiko Takeuchi[2]

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2) The University of Tokyo, 3) Osaka University

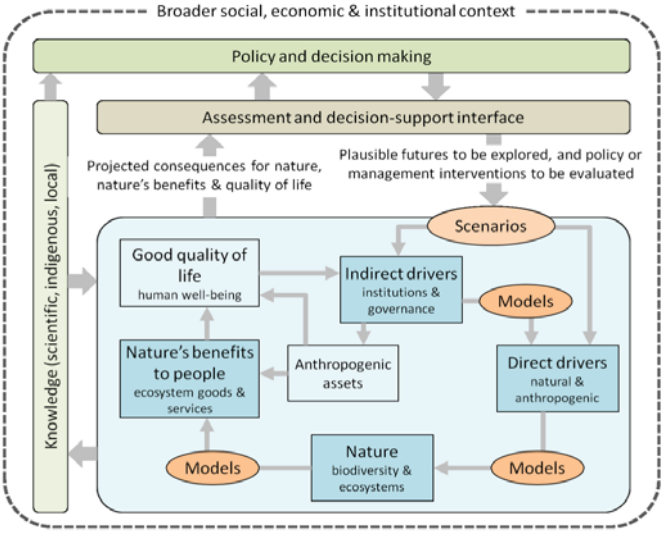
ESP·9 WORLD CONFERENCE

Ecosystem Services for Eco-civilization
Restoring connections between people & landscapes through nature-based solutions
Shenzhen, China · 11-15 Dec 2017
www.espconference.org

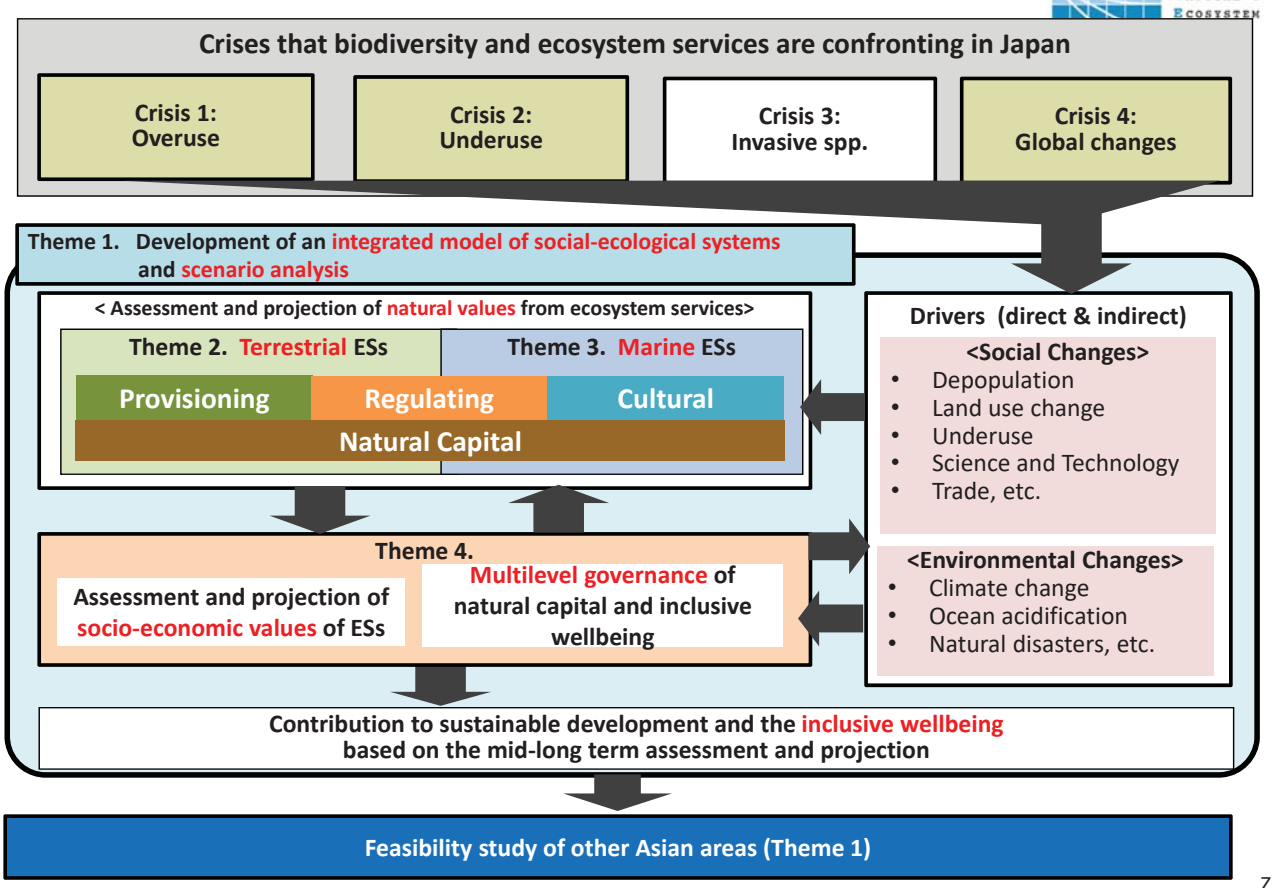
## Research Objectives and Related Activities

**Objectives**

- Develop an integrated assessment model of social-ecological systems to predict and assess natural and socio-economic values of natural capital and ecosystem services under different future scenarios of socio-economic conditions and policy options;
- Design a new conceptual framework to promote multilevel governance of natural capital to maintain and improve "inclusive wellbeing";
- Demonstrate the integrated assessment model at both national and local scales in Japan, and examine effectiveness and applicability to other areas in Japan and beyond.

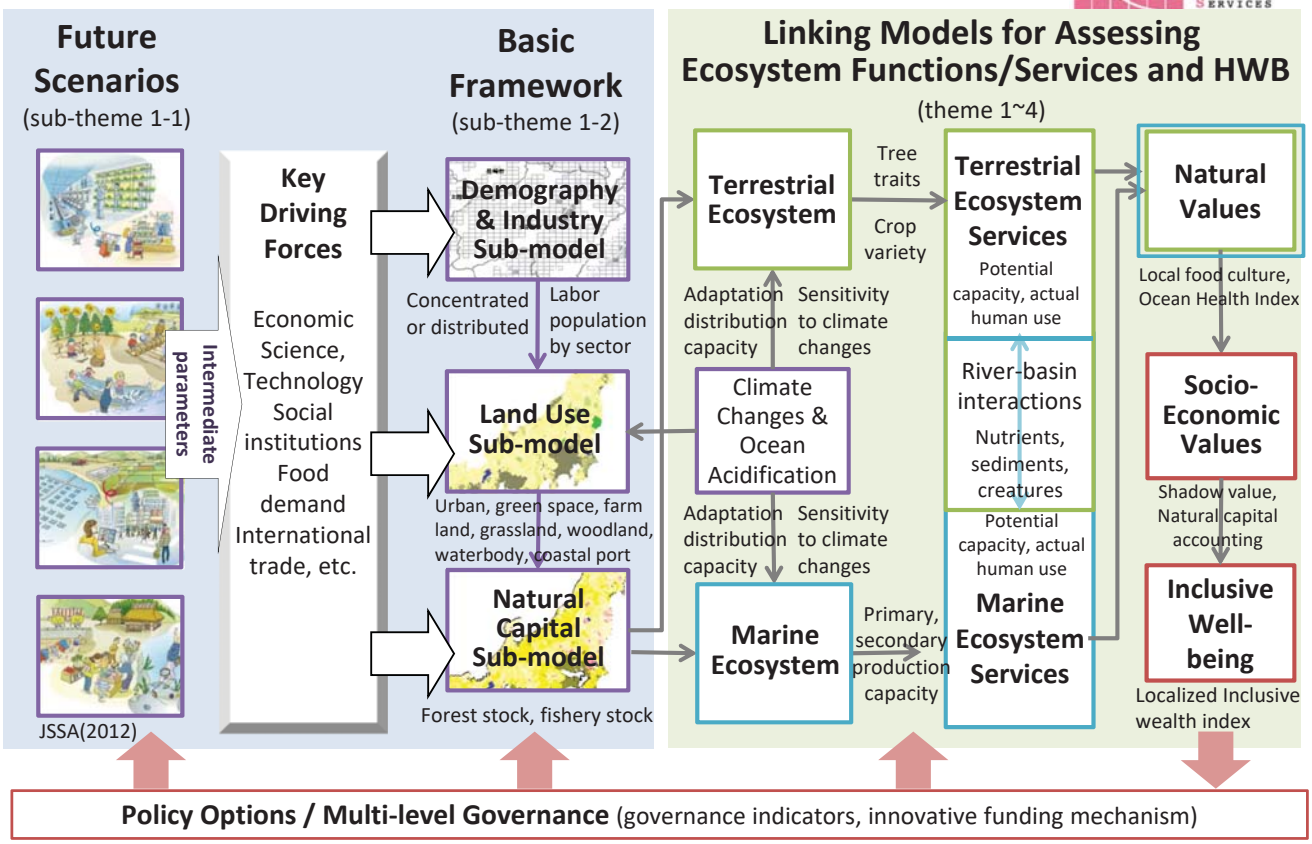


# Framework of the PANCES Project






# Framework of PANCES Scenarios and Models



# Composition of sub-models

**Anthropogenic Assets**

**Demographic and Industrial Structures Sub-model**

Populations and labor force in urban, sub-urban, rural area

**Land Use**

**Land Use Sub-model**

Land-cover and Land-use: Urban, Agricultural land (paddy, crops and fruit farm), Bamboo, Managed forest, Natural forest, Grassland, Water surface (river, pond), harbor etc.

**Natural Capital**

**Natural Capital Sub-model**

Stock assessment on Forestry, Agriculture, Fishery (see weed bed, coral reef, tideland etc.)

**Changes in Direct/Indirect Drivers**

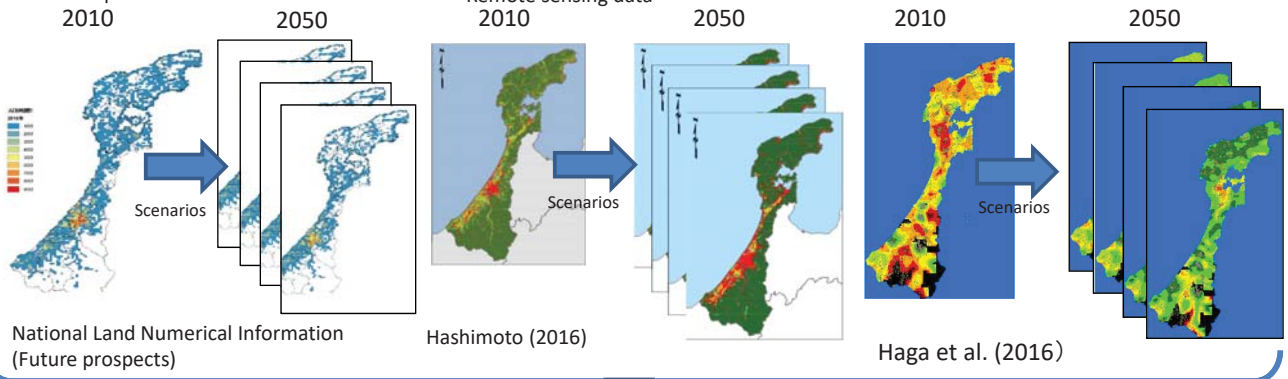
- Population distribution, Industrial structures
- Stochastic predictions

**Changes in Land-use and Land-covers**

- Spatial predictions
- Remote sensing data

**Changes in Natural Capital**

- Natural capital stock (Forest, Agriculture, Marine resources), Statistics and Inventories
- Census of Agriculture and Forestry




National Land Numerical Information (Future prospects)

Hashimoto (2016)

Haga et al. (2016)

Modelling ESs in Theme2 (Terrestrial)・3(Marine) , Scio-economic valuations in Theme4



# Strengthen science-policy interface through the use and management of information platform

**Outputs of the Project**

- Data collection and development
- Prediction and assessment through future scenarios and an integrated model
- Governance indicators

Sharing analytical results

Registering collected data

Theme 1 Theme 2 Theme 3 Theme 4

Retrieving and using collected data

**Integrated Information Platform**

Research support such as cloud-based user management, meta-data management, use control and communication between users

- Model assessment results
- Scenario analysis results

2010年 2050年

- Thematic map
- Graph drawing systems (by scenario and policy)

- Socio-economic data
- Geo-ecological data
- Existing data

Displaying thematic maps and figures

**Stakeholders**

- Formulation of national or local BD strategies
- Use for education, decision making and conservation activities

Policy development e.g.) conservation project

Env. education

CSR activities, natural capital mngt

External databases

# Study Sites & Science-Policy-Society Interface

**Study Sites:**

- Japan-wide assessment
- Three major case-study sites
  - Hokkaido (Bekanbeushi River Basin)
  - Noto Peninsula & Sado Island
  - Okinawa Islands

**Science-Policy-Society Interface**:

- Participatory scenario co-design with multi-stakeholders
- Collaboration with local governments, policy makers and practitioners including private sectors
- Promote multi-level governance of natural capital through connecting international initiatives and local actions

Japan-wide assessment of natural capitals and ecosystem services




# Delphi survey for co-designing scenarios

- Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.
- The Delphi method was selected since it has proved a popular tool in for identifying and prioritizing complicated issues for decision-making (Okoli and Pawlowski, 2004).
- The Scenario Working Group of the project developed online questionnaire for Delphi survey against PANCES project members (i.e. experts)

| | First Delphi Survey | Second Delphi Survey |
|---|---|---|
| Date | 13 Dec. 2016 – 8 Jan. 2017 | 13 Jan. 2017 – 29 Jan. 2017 |
| The number of invited respondents | 104 | 94 |
| The number of actual respondents | 94 | 86 |
| Response rate (%) | 90% | 91% |

## Drivers which may influence the future society up until 2050

| |
|---|
| 1. National GDP growth rate will significantly improve |
| 2. Primary industry will significantly shrink |
| 3. The amount of international trade will significantly increase due to advance of free trade |
| 4. Income disparity will significantly expand across regions and individuals |
| 5. International collaboration and partnership with neighboring countries for environment and resources management will be significantly strengthened |
| 6. Population concentration to Mega-cities and major urban areas will further advance by rural outmigration |
| 7. Social relations of rural communities will be further weaken |
| 8. Fertility rate will significantly improve |
| 9. Healthy life expectancy will be significantly extended |
| 10. Foreign labor will significantly increase |
| 11. Foreign visitors will significantly increase |
| 12. Compactification of urban areas will significantly advance |
| 13. Public transportation system will be significantly improved |
| 14. Ecosystem-based infrastructure development, disaster risk reduction, and land management will significantly advance |
| 15. Environmental conservation and restoration through economic incentives will significantly progress |
| 16. Transformation from non-renewable energy to renewable energy will significantly progress |
| 17. Dependency on nuclear energy will significantly decline |
| 18. Mainstreaming biodiversity in agriculture, forestry and fishery policy will significantly progress |

| |
|---|
| **19. Citizen's participation and role of non-governmental actors will significantly expand** |
| 20. Collaboration within organization (government, private company, university, etc) and across organizations will progress |
| 21. The subjects associated with environment will significantly increase at primary, middle, and high school curriculum. |
| 22. Educational methods will be significantly diversified, including partnership between community and school, active learning, experience-based learning, exc.) |
| 23. Demand for eat-outing and eating cooked food which is not cooked at home will significantly expand |
| 24. Preference to local production and local consumption as well as organic agriculture will be strengthened, and demand for value added products by production place and method will significantly expand |
| 25. Demand for place and experience-based tourism such as ecotourism and green tourism will significantly expand |
| 26. Traditional knowledge and traditional culture will be significantly lost |
| 27. Use of artificial intelligence (AI) technology will significantly expand in various sectors |
| 28. Virtual reality (VR) technology will be significantly innovated and applied to various sectors |
| 29. Use of information and communication technology (ICT) at primary industry will significantly expand |
| 30. Bio-production technology such as plant factory and aquaculture will be innovated and applied to various sectors |
| 31. Low carbon technology will be significantly innovated and applied to various sectors |
| 32Water purification technology such as sea water desalination and waste water treatment technology will be significantly innovated and applied to various sectors |
| 33. Risk of domestic terrorist attack events will significantly increase |
| 34. Incidence of committing war will significantly increase |

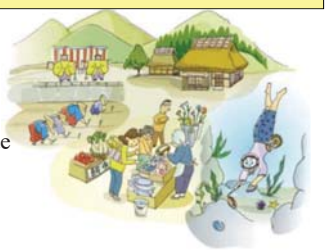


# Four PANCES Scenarios

***Base trends***: population decline, aging and low economic growth
***Uncertainties***: effective utilization of nature, population distribution

**Natural capital based compact society (NC)**

**Natural capital based dispersed society (ND)**



***Natural capital basis***

- Higher food self-sufficiency
- Eco-tourism and expansion of tourism in domestic countryside
- Use of ecosystem-based & green infrastructures
- Increase in the use of renewable energy

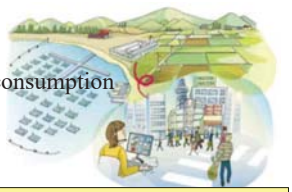
***Urban compactification***

- Promotion of compact cities
- Rewilding /greening of underutilized land
- Centralized heat and energy
- Prefer domestic products
- Association oriented (connection based on purposes)

***Dispersed population***

- Counter urbanization
- Decentralized heat and energy
- Prefer local production and local consumption
- Decentralized authority (decision making)
- Community oriented (place-based)

- Inexpensive and diverse choices by increased imports
- Extensive use of ICT/AI for improved productivity
- Conventional infrastructure development
- Improved efficiency in conventional power generation and energy consumption
- Utilization of CCS (carbon capture and storage) technology

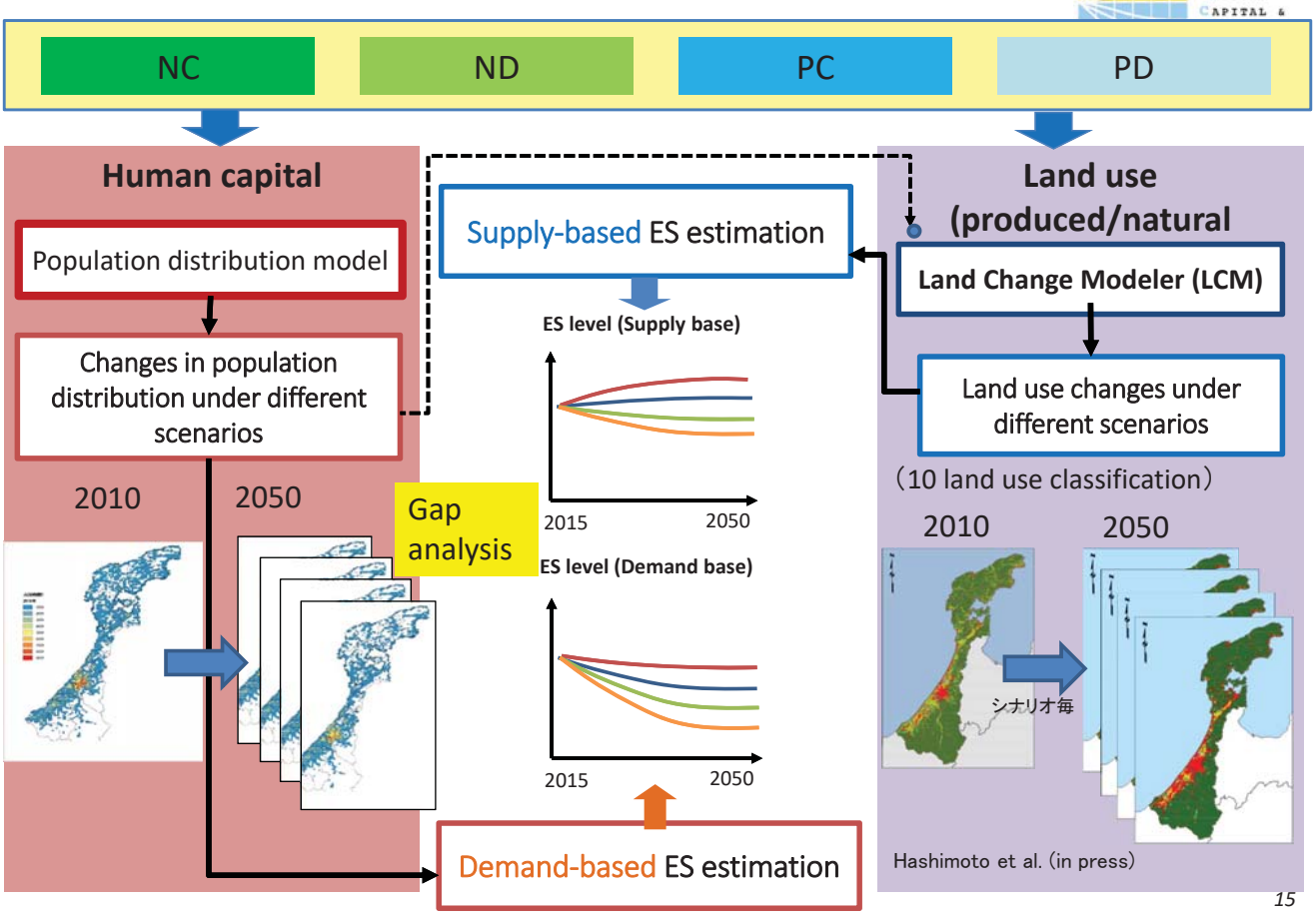


***Produced capital basis***

**Produced capital based compact society (PC)**

**Produced capital based dispersed society (PD)**

## From Scenarios to the estimation of population and land use distributions



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ANNOUNCEMENT

**Call for Papers for "Future scenarios for socio-ecological production landscape and seascape"**

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Published online: 27 July 2017


**Introduction**

Core research agendas for sustainability science include the following: (1) co-designing future scenarios and visions with a participatory approach, (2) integrating indigenous and local knowledge (ILK) systems into both scientific knowledge and future scenarios, and (3) the formulation of actions to transform society toward a more sustainable future (Miller et al. 2014; Schneider and Rist 2014; Kishita et al. 2016).

In 2016, The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) approved a methodological assessment report on scenarios and models of biodiversity and ecosystem services. This report guides experts regarding the use of scenarios and models to per-

emphasis on drivers of change in n resources, including alternative policy options. Furthermore, "models" are def or quantitative descriptions of key comp and of the relationships that exis components.

While IPBES has identified the de narios as a key to aid decision mak potential impacts of different policy o lacks studies on substantial long-term-sc (Kok et al. 2017). IPBES emphasizes ILK together with the social–ecological diversity and ecosystem services; therefo the substantial diversity of local contex patory processes is essential.

In total, 32 abstracts were submitted, and 21 were selected for this special feature

## eBook Series "Sciences for Sustainable Societies" (Springer Nature)

http://www.springer.com/series/11884

**Book title** (tentative): **Mapping Social-ecological Production Landscapes, Stakeholder, Policy and Action**

**Objectives**:

1) Generate useful knowledge and mapping (visualization) tools to development of local solutions for local challenges, and indications of how this might contribute to effective implementation and collaboration across different stakeholders.
2) Map out the current research landscape surrounding this topic to identify research gaps, challenges, and success factors, with a view to strengthening future biodiversity-related Science-Policy Interfaces (SPIs).
3) Present an alternative understanding on the measures for sustainable utilization and conservation of resources by integrating indigenous and local knowledge (ILK) systems into both scientific knowledge and future scenarios through participatory approaches; and

**Schedule**:

- Chapter manuscript submission: Aug./Sept. 2018
- Publication: Aug./Sept. 2019

# Thank you for your attention

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‘‘Predicting and Assessing Natural Capital and Ecosystem Services’’ (PANCES)) of Ministry of the Environment, Japan.