3rd ESP Asia Conference
14-17 December 2021 | Nagasaki, Japan
Eco-health and ecosystem services in Asia:
Bottom-up aspects for planetary health
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ESP
Asia Regional Office

BOOK OF ABSTRACTS

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I.   SESSION DESCRIPTION

ID: **T1**

Ecosystem services assessment to incorporate diverse beneficiaries into ES related policy

Hosts:

	Title	Name	Organisation	Email
Host:	Dr	Takahiro Ota	Nagasaki University	Picus.awokera@gmail.com
Co-host:	Dr	Toshiharu Kojima	Gifu University	kojima@green.gifu-u.ac.jp

Abstract:

We are facing dramatic development of ecosystem service assessment tools and methodologies. For example, mapping tools can show flow of ES. ICT or SNS can overcome existing barriers to collect data efficiently. These ES assessment can contribute to ES oriented policy improvement. There are many policy and measures to maintain and improve ESs. For example, PES is one of main financial tool to maintain ES. National strategy also aims to plan and manage future ES condition. However, such ES assessment still do not enough broadly or tightly cover beneficiaries of target ESs. Most public policy are supported by taxpayers politically and financially, which means beneficiaries will care or focus on benefits from target ES. In this session, we aim to share examples of ES assessment in order to broaden its scope to diverse beneficiaries. Through examination of presented practical examples, we want to share unique and/or difficult points to involving beneficiaries. We also want to learn lessons about how to utilize such ES assessment for specific ES related policy.

Goals and objectives of the session:

Session hosts want to initiate an exchange of experiences on the main issues and challenges surrounding beneficiary-oriented ES assessment, with a specific focus on ES related policy improvement. We think ES related policy is very broad just like ES category itself. For this reason, we invite presentations that:

- present detailed applications of specific ES assessment, framework, methodology, or related tools with intention of ES policy contribution
- present the challenges encountered and the solutions identified/proposed related with ES assessment application in the above context

Planned output / Deliverables:

The aim is to encourage participants to share experiences of application of beneficiary-oriented ES assessment method, in order to feed suggestions into ES policy improvement. Key recommendations will be developed from the session and shared with participants. The prospect of a publication will be discussed during the session together with the participants.

We expect an intermediate number (5-10) of contributions that can be presented as oral presentations (10-15 minutes). Finally, we would briefly discuss (around 20 min) the main findings obtained in the session, as well as future collaborative research on this specific context.

Voluntary contributions accepted:

Yes

Related to ESP Working Group/National Network:

TWG 1 – ES Assessment frameworks & Typologies

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II.   SESSION PROGRAM

Date of session: Wednesday, 15 December 2021

Time of session: 10:00 – 13:00, continued 15:30 – 17:30

List of abstracts and speakers

Time	First name	Last name	Title of presentation
10:00-10:05	Takahiro	Ota	Introduction: aims of this session
10:05-10:20	Hiroshi	Hashimoto	Estimation and scenario analysis of forest bird species populations during the breeding season in the upper Nagara river basin, Gifu Prefecture, Japan
10:20-10:35	Yasuhiro	Hasegawa	Evaluation method of landscape beneficiary that changes due to leading artificial coniferous forests to broadleaf forests in Gujo City
10:35-10:50	Toshiharu	Kojima	Relationship between forest growth and flood and draught mitigation function
10:50-11:05	Takahiro	Ota	Estimation of the amount of tax payment for forest management in local government: A case of Nagasaki Prefecture, JAPAN
11:05-11:20		Break	Break
11:20-11:35	Yusuke	Yamada	Proposing policies to improve ecosystem services based on local forest harvesting trends
11:35-11:50	Novelia	Triana	Economic Value Of The Sumatran Tiger Conservation And Harmonization Of Human-Tiger Conflict : Study Case In Gunung Leuser National Park, Indonesia
11:50-12:05	Chengrui	Mao	How much urban area is there on the Qinghai-Tibet Plateau? Multi-scale analysis based on the framework of urban land hierarchy
12:05-12:20	Dandan	Yu	Developing scenarios and models of biodiversity and ecosystem services in China
12:20-12:35	Tsubasa	Nakahira	An Input-Output Analysis of Japanese Industry's Dependency on Nature
12:35-13:00			Remaining questions and short discussion
Lunch break and IGM			
15:30-15:45	Li	Lei	Trends of supply and demand of ecosystem services in the Tibetan Plateau and its affected areas: a multi-scale and multi-scenario analysis
15:45-16:00	Herlin	Chien	Social Science Approaches to Critical Zone Studies: A Review
16:00-16:30			Remaining questions and discussion

III.   ABSTRACTS

Estimation and scenario analysis of forest bird species populations during the breeding season in the upper Nagara river basin, Gifu Prefecture, Japan

Presenting author: Hiroshi Hashimoto
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We estimated the current and future population densities of each forest bird species under several forestry policies in the upper reaches of the Nagara River in Gifu Prefecture, Japan during the breeding season. We used information on population densities by species by forest type from previous studies. Nine forest types in the previous studies were identified in the target watershed. Using the vegetation map provided by the Ministry of the Environment and the Light Detection and Ranging (LiDAR) data obtained by Gifu Prefecture, we created a 50-meter mesh map of the forest types classified into these nine types and other land covers. After narrowing down the bird species according to whether they were forest birds or not, and were distributed in this watershed, we set four upper limits (0 m, 50 m, 100 m, and 200 m) to assess the distance between gaps that would be acceptable as a suitable habitat for each species. Most bird species are capable of inhabiting multiple forest types, even if their density varies. The population density of each species per 50 m mesh (0.25 ha) was summed for each patch. The population density by species per 50 m mesh (0.25 ha) was summed and rounded for each patch and results where n < 2 were discarded to estimate the number of individuals by species in the watershed. This method could be useful for quantitatively assessing ecosystem services under certain forestry policies.

Evaluation method of landscape beneficiary that changes due to leading artificial coniferous forests to broadleaf forests in Gujo City

Presenting author: Yasuhiro Hasegawa
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Sustainable maintenance of ecosystem services in the basin is a social issue. We studied to create a model for the evaluation of cultural services in forest landscapes in the basin. The survey site was the basin of Gujo City, Gifu Prefecture, as an example of a mountainous area in Japan. In August 2021, the questionnaire was distributed to 634 households in 2 districts in Gujo City (Futatsumachi district and Tamema district), and the recovery rate was 30%. The questionnaire showed 3D images created by GIS modeling based on the scenario of leading artificial coniferous forests to broadleaf forests, and was evaluated by the semantic differential method, which is often used in landscape evaluation. We divided to the evaluators into a group that evaluated before leading artificial coniferous forests to broadleaf forests and a group that evaluated after led artificial coniferous forests to broadleaf forests, becouse of this we asked for an absolute evaluation of each landscape. In the questionnaire, we asked for answers the amount of daily benefits of cultural services from forests, the subjective

evaluation of their importance, and the degree of contact with the natural environment in the past. As a result, it was recognized that the cultural services of the forest landscape tended to increase due to the conversion of broad-leaved trees. It was also suggested that a landscape evaluation model could be created with variables such as the beneficiary amount of cultural services and the evaluation of importance.

Relationship between forest growth and flood and draught mitigation function

Presenting author: Toshiharu Kojima
Contact: picus.awokera@gmail.com

Flood mitigation and draught mitigation functions are one of the most expected services by beneficiaries of forest ecosystem services. Flood mitigation function is affected by canopy interception, infiltration and intermediate flow and so on. Of these, the amount of canopy interception is related to the amount of rainwater impinging on and adsorbed by the leaf, branch and trunk surface, and is therefore considered to be determined by LAI (Leaf Area Index). On the other hands, draught mitigation function is considered to be influenced by evapotranspiration and infiltration. Of these, the amount of evapotranspiration is related to the number of stomatal, and is therefore considered to be determined by LAI. Although flood and draught mitigation functions are influenced by many other processes, the impact of LAI is very large. This study investigates the relationship between LAI, which changes with forest growth, and flood and draught mitigation functions. Japanese forestry industries used yield density diagram to predict tree growth and timber harvest. In this study, the forest growth model based on the yield density diagram are developed. Two models for estimating LAI based on allometric equations were constructed: one based on diameter at breast height (DBH model), and the other based on diameter under live branches (DULB model). The relationship between forest age and LAI in a typical Japanese cedar forest in Gifu Prefecture was evaluated using a combination of models for estimating natural mortality and height below live branch associated with relative spacing index. In the DBH model, LAI was constant at 6.0 to 6.5 after 20 years of age, and in the DULB model, LAI was the almost constant at 4.0 to 5.0. The model analysis showed that evapotranspiration and canopy interception do not change significantly after a certain forest age.

Estimation of the amount of tax payment for forest management in local government: A case of Nagasaki Prefecture, JAPAN

Presenting author: Takahiro Ota
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Public money is used for private forest management. However, there is few studies about how much tax per capita used for forest management is unknown. This is partly because prefectural budget source is very diverse especially from national budget as subsidy. This study estimates the amount of tax paid by prefectural residents to be used for forest management in Nagasaki Prefecture, JAPAN. 2

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billion JPY was used for forest management in 2020 fiscal year. Among this amount, I estimate paid tax by one prefectural resident through calculation of national subsidies and prefectural forest taxation. As a result, 456.3 JPY per capita per year is used for forest management in Nagasaki Prefecture.

Proposing policies to improve ecosystem services based on local forest harvesting trends

Presenting author: Yusuke Yamada
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trends vary by region, and thus, local policies can be more effective by considering local trends and their impact on ecosystem services (ES). This study proposes policies that adopt local forestry trends of three adjacent regions: one with a long history of forestry, one where small-scale forestry has continued, and one where forestry has grown rapidly in recent years. First, we mapped recreation, sediment retention, and landslide prevention services for plantation forests in each district at a resolution of 30 m. Recreational services were assessed to be of higher value in older forests by road. Annual soil loss of each forest was estimated using the reverse Universal Soil Loss Equation (RUSLE) as an indicator of a sediment retention service. Landslide prevention services were evaluated by using a conversion chart provided by the Japanese government to assess susceptibility. Then, we overlaid the ES maps with the locations of logged forests in the previous five years to estimate the relationship between the characteristics of ES services in logged forests. The results showed that local forestry trends had quite different impacts on ES in the above three regions. Forests at risk of soil erosion and landslides had a lower ratio of the logged area than those at less risk in the region with a long history of forestry. However, recreational services are relatively low in that region, necessitating policy improvement. Furthermore, in the region where forestry has grown rapidly, the ratio was almost the same regardless of risk, raising concerns about the deterioration of ES. In such regions, it would be necessary to promote ES-friendly forestry. Thus, by analyzing the impact of regional trends on ES, appropriate policies for the region can be proposed.

Economic Value Of The Sumatran Tiger Conservation And Harmonization Of Human-Tiger Conflict : Study Case In Gunung Leuser National Park, Indonesia

Presenting author: Novelia Triana
Contact: noveliatriana06@gmail.com

use and no- use value of goods and services are need to identify and estimate their monetary value of all economic benefits that a society derives from environmental resource. They include everything which support functions associated with ecosystem health or biodiversity. However, the population reduction of biodiversity raising for instance the charismatic species in Indonesia, Sumatran Tiger is facing declined population rapidly. Human activities, fragmentation habitat and limited prey has forced tiger individual encounter the interactions to human. This harm would be difficult in both, human and tiger which leads to the conflict and impact to the loss. This research identified the

recent characteristic of human tiger conflict and conservation of Sumatran Tiger in Gunung Leuser National Park and proposing the potential conservation action using the assessment of economic value analysis in order to conserve Sumatran Tiger in situ. This study was using qualitative approach by semi-structure interview, field observation and literature studies. The result showed that the conflict between local people and Sumatran Tiger is occurring frequently and have been attacked the livestock. The recent situation of human-tiger conflict categorized moderate – high level which tiger presence in increasing seasonally. This leads to the negative directions to the local people's perception for conservation. Despite the pattern is seasonally, this does not eliminate the possibly of tiger presence to look for the prey from the village. It indicates the alert to increase vigilance to local people and national park management. Therefore, the economic value of tiger would lead to the partnership and engagement option between National Park management and local people need to be done in order to achieve the effective conflict management in protecting Sumatran Tiger, particularly in Leuser ecosystem, Indonesia.

How much urban area is there on the Qinghai-Tibet Plateau? Multi-scale analysis based on the framework of urban land hierarchy

Presenting author: Chengrui Mao
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Accurate understanding of the urban land characteristics on the Qinghai-Tibet Plateau is the basis for quantifying the process of urban expansion and its impact on the ecological environment in this region. However, the accuracy, resolution and definition of urban land used in the existing urban land data are quite different. Therefore, there will be great uncertainty in using these data to obtain the urban land area of the Qinghai-Tibet Plateau directly. Therefore, this paper aimed to clarify the urban land area and spatial distribution pattern on the Qinghai-Tibet Plateau. Firstly, we collected 12 sets of urban land data on the Qinghai-Tibet Plateau. Then, the "urban area", "built-up area" and "impervious surface" of the Qinghai-Tibet Plateau were determined based on the framework of urban land hierarchy. Finally, the urban land characteristics of the Qinghai-Tibet Plateau were analyzed at the regional, watershed and sub-watershed scales. The results showed that the areas of urban area, built-up area and impervious surface on the Qinghai-Tibet Plateau were 254895 km², 513 km² and 386 km², accounting for 9.918%, 0.020% and 0.015% of the total area, respectively. The spatial distribution of urban land on the Qinghai-Tibet Plateau presented a pattern of "large dispersion and small aggregation". The urban land was scattered in 6 basins and 15 sub-basins, which was widely distributed in the whole plateau. But the urban built-up area and impervious surface were mainly concentrated in the Qinghaihu-Huangshui basin and Lhasa River basin. In addition, there were great differences in urban development levels in different basins of the Qinghai-Tibet Plateau. Such as Niyangqu River Basin, Naqu-Nujiang River Basin etc., the urban in these sub-basins presented continuous and low-density development mode. In the future, we should focus on adjusting the mode of urban development and improve the efficiency of urban land use.

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Developing scenarios and models of biodiversity and ecosystem services in China

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response to global, regional, and thematic assessment and decision support activities undertaken or facilitated by IPBES, China has currently stressed the importance of capacity building in developing scenarios and models of biodiversity and ecosystem services. Quantitatively comparison of scenarios and models of biodiversity and ecosystem services, identification of data gap for their introduction and application, are necessary conditions to carry out and use scenarios exercises and achieve the capacity building goal. However, most current studies lack a detailed description of the principles and quantitative comparison of scenarios and models of biodiversity and ecosystem services. It may hinder further development and application of scenarios and models in China. Here, we firstly present three broad classes of models that are mostly used in the world (i.e., scenarios and models of indirect and direct drivers, biodiversity and ecosystem properties, and ecosystem services) by contrasting, analyzing the key input and output, model types, analytical technique, model structure, spatial coverage and resolution, model uncertainty, combinations of scenarios and models used in (large) assessments. Then, we reviewed the models and scenarios that are developed in China and the main problems and challenges such as data gap and etc. Finally, suggestions to resolve the abovementioned problems. Thus, we suggest that the Chinese government and scientific community should establish a collaboration with global observation networks to enhance capacity building in the following aspects: 1) integration platform of observing, data mining and statistics; 2) acquirement and processing of economic and social data with robustness; 3) promotion of data shared principles by making a commitment to policies for data access and management and long-term funding for collection, calibration and release of datasets; 4) integration of monitoring and evaluation mechanisms into policy-making at all levels to ensure that information will be available and accessible to all.

An Input-Output Analysis of Japanese Industry's Dependency on Nature

Presenting author: Tsubasa Nakahira
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The increasing human activity caused a loss of biodiversity and ecosystem services (ESs). Transformative changes in financial and industrial systems are required to restore biodiversity and ESs losses and conserve nature. From this backdrop, TNFD requires organizations to report on evolving nature-related risks. The objective of this research is to reveal how Japanese industries use ESs and depend on nature from a macroscopic view on a national scale.

We calculated direct and indirect 1) flow of provisioning services of logs, crops, and livestock and a regulating service of CO_2 sequestration and 2) dependence on nature as a source of these ESs supply for Japanese 37 industrial sectors in 2011. The intensity of direct ESs flow used by each industrial

sector (d) was expressed as the amount of ESs per domestic production. The intensity of direct and indirect ESs flow including supply chain (e) was calculated by multiplying d by the inverse matrix coefficients of the Input-Output table in 2011. From these results, the total amount of ESs flow of each industrial sector was calculated by multiplying e by domestic production. Furthermore, the total amount of ESs flow was converted to the area by multiplying the supply of ESs per area to assess the dependence on nature.

Our results suggested that industrial sectors used indirect ESs through the supply chain even if they used a little direct ESs flow. Provisioning services of crops and livestock were used indirectly by limited sectors. On the other hand, provisioning service of logs and CO2 sequestration service were used indirectly by many sectors.

This macroscopic analysis allows us to identify the dependence of each industrial sector on nature and ESs. This research looks promising to be used as the basic information of monitoring the industrial and financial nature-related activities for achieving Nature-positive.

A systematic review of coastal ecosystem services in Pacific Island Countries

Presenting author: Fanny Châles
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Coastal ecosystems such as coral reefs, mangroves and seagrasses provide a wide range of services to people, from coastal protection to climate regulation and food security. This is particularly the case for the Pacific Island countries, which strongly depend on coastal ecosystems for livelihoods and income. Although the types of services provided by coastal ecosystem are well-known, their contribution to local livelihoods and well-being at the local scale remains poorly understood. Assessing ecosystem services (ES) at the local scale could better support informed decision-making processes, through a more comprehensive assessment of trade-offs between conservation goals and the development of human activities, by combining bottom-up community needs and top-down government commitments. In this context, we conducted a systematic review of coastal ecosystem services in the Pacific Small Island Developing States, in the peer-reviewed and grey literature between 1990 and 2021. We focused on coastal cultural services, as they are often overlooked in the literature due to challenges involved in valuing them monetarily, or lack of indicators to adequately evaluate them. We identified and classified cultural services indicators from the literature into three categories: a) quantified monetarily, b) quantified non-monetarily, and c) qualitatively assessed. We found disparities of contributions of ES to livelihoods across regions, ecosystems, and types of ecosystem services. Literature on coastal ES was more extensive for Melanesia compared to Micronesia and Polynesia, and ES provided by coral reefs were more often assessed than those related to mangroves and seagrasses. We conclude by providing recommendations on where efforts should be directed to assess coastal ecosystem services, and discuss how this study can contribute to methods used to better account for coastal ecosystem services in environmental management. Lessons learned from this study in the Pacific could also support research methods anywhere, including Asia.

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Trends of supply and demand of ecosystem services in the Tibetan Plateau and its affected areas: a multi-scale and multi-scenario analysis

Presenting author: Li Lei
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The Tibetan Plateau has an important impact on the surrounding areas. Rapid population and economic growth as well as changes in land use structure will affect the balance between supply and demand of ecosystem services on the Tibetan Plateau and its affected areas. However, there is a lack of research on the future supply and demand of ecosystem services in the Tibetan Plateau and its affected areas. The purpose of this study is to evaluate the supply and demand of ecosystem services on the Tibetan Plateau and its affected areas. Therefore, based on the five regional ecosystem supply services of food production, carbon sequestration and oxygen release, water yield, soil conservation and habitat quality in 2015, this paper quantified the demand for ecosystem services under different scenarios from 2015 to 2050 by population, GDP and land use, and analyzed the relationship between supply and demand of regional ecosystem services and the trend of change. The results showed that the supply and demand of ecosystem services in the Tibetan Plateau and its affected areas in 2015 was at the average level, with an average ratio of 0.29.The supply and demand of regional ecosystem services will continue to deteriorate from 2015 to 2050, and the ratio of supply and demand of regional ecosystem services will decrease at a rate of 8.64E-4/10a-1.58E-3/10a. With the decline of population in the future, economic growth and urbanization will be important factors affecting the change of supply and demand of regional ecosystem services in the future. At the same time, moderate development (SSP2) and fossil fuel-based conventional development (SSP5) will further worsen the supply and demand of ecosystem services in the Tibetan Plateau and its affected areas. Therefore, it is necessary to attach great importance to the transition of future development.

Social Science Approaches to Critical Zone Studies: A Review

Presenting author: Herlin Chien
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More than a decade ago, Brantley et al. (2007) and their followers begun to promote the crossing of disciplines and scales to improve our understanding of critical zone (CZ) as a system of coupled chemical, biological, physical and geological processes. Yet their interdisciplinary approach often neglects the social-economic or managerial impact of human activities on the critical zone and the associated critical zone services provisioning. In other words, in the current CZ literature landscape, there remains a dearth of knowledge generated from non-natural science approaches, i.e. social science approaches to better comprehend the human-nature interaction in this outer skin of the Earth.

As critical zone is emerging as a research area for sustainability in the era of Anthropocene (Pujari et al. 2020), this paper wishes to raise the awareness that the social aspects of anthropogenic pressures as one of the main drivers that modifies land use and ecosystem services provided by above and

below Earth surface should be encouraged and effectively integrated in the studies of CZ. Before providing future research recommendations, this paper first conducts a systematic literature review on CZ by identifying researches that adopt social science approaches from three databases – Scopus, Web of Science, and JSTOR. We then launch a qualitative reading of the included 129 literature to synthesize its sub-categories in CZ, method, goal, institutional arrangement, etc. to understand the scope of the research landscape. Our synthesis endeavor aims to identify potential literature gaps and point out future research directions.