

Analyzing the Relationships between Disturbance, Landscape-level Change, Land-formation Mechanisms and Biota in Complex Socioecological Systems

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Socioecological systems are often described as 'complex' and 'dynamic' systems, but prevalent analytical frameworks have so far mainly explored biological and human parameters of the environment. The classical definition of ecosystem ecology by Odum (1953) mentions abiotic components of the environment as key to ecological dynamics, and more recent socioecological research focusing on periodic release and conservation of energy in ecosystems (Gunderson and Holling 2012) implies that landscape formation and change play vital roles in socioecological systems. However change in land-formation and landscaping processes over time and their interaction with the biotic components remain under-researched and generally poorly understood. This paper shows how such lack of understanding may be detrimental to the resilience of the landscape through a case study of the Shirakami Mountains World Heritage Property in Japan. The mountains provide one of the last natural forests of the Siebold's Beech (*Fagus crenata*) in Asia, and are protected for their biological diversity. These forests have also provided vital ecosystem services to local communities through ages. The landscape dynamics though, have not been adequately addressed in the existing protection and management frameworks. As global climate change and anthropogenic impact on land-formation processes escalate to a new level, governance of such biologically diverse and change-prone systems require understanding based on questions such as: 'what causes change in complex socioecological systems on what scales, and how it is related to the resilience of these systems?' Key findings are: Disturbance is a fundamental component in landscapes and over time generates landscape heterogeneity, but at the same time, scale is critical. If disturbance ceases to be 'local' and transcends boundaries, fragmentation of socioecological systems occurs. Landscaping mechanisms are directly linked with land-formations processes that evolved over geologic time scale and these mechanisms ought to be taken into account for socioecological system governance.

Keywords: Landscape and landform level change, Resilience of complex systems , Shirakami Mountains

The role of experts and their knowledge in managing world natural heritage: The case of Shiretoko in Japan

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The role and contribution of experts in fields ranging from ecology to economics have been recognized for natural area management in national parks and world heritage sites because the management process requires a specific set of technical knowledge. This research explores the case of the Shiretoko world heritage site. The management of the area has been executed with the help of a scientific advisory committee. Knowledge sharing and diversity are confirmed as key contributors to successful science-based management. Intentional diversification and open platforms for better management are also discussed.

Keywords: expert, knowledge, Shiretoko

The relationship between honeybees and nature in the Japanese context

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Nectar is generally not seen as a principal resource. It is only with the involvement of honeybees that nectar becomes honey, which is a food resource. The plants that are used for honey cultivation are generally of 2 types: agricultural plants and natural plants. Each of these plant types has its own ecosystem, growth environment and social and cultural connections. In this presentation, I will discuss about the environmental factors behind each of these plant types, and their relationship with honey growers, as a system of natural resource management.

Keywords: Natural resource management, environmental factors, honeybees

Declining bio-cultural diversity in the seas: The case of Satoumi –Socio-Ecological Production Seascapes of Japan.

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This paper explores the connection between declining bio-cultural diversity in the socio-ecological production seascapes in Kunisaki peninsula in Japan. Kunisaki peninsula is characterized by a complex mixture of different landscapes with rice agriculture involving the traditional 'tameike' irrigation system forming its backbone. Due to the peninsula's proximity to the Seto Inland Sea, the area can be studied as a coupled system. For centuries, the seas around the peninsula were rich with fish and other marine creatures that sustained local population. Kunisaki Peninsula was a vibrant bio-cultural landscape or 'Satoyama', managed by traditional forestry and farming methods. The people of the peninsula had a close relationship with agriculture, forestry and fisheries. However, in recent past this area also underwent land use change, which included the collapse of lower parts of the food web in coastal areas. This change is poorly understood and thus the main objective of the paper is to look at Satoyama-Satoumi as a coupled system and to provide an analysis of 'Satoumi' through the use of historical profile, and ecosystem service analysis of the area. The paper will also describe the background and methods for understanding changes in this system in order to help future rehabilitation and sustainable (ecosystem based) approaches for developments in the area.

Keywords: Satoyama-Satoumi ecosystems,, social-ecological systems, , coastal fisheries, , Japan.

Conservation of geological sites based on the Law for the Protection of Cultural Properties

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The national government designates animals, plants and geological features and minerals that possess a high scientific value for this country as "natural monument". Under the terms of the Law for the Protection of Cultural Properties, any alternation of the existing state of a natural monument, or any activities that will affect its preservation require authorization from the Commissioner for Cultural Affairs. The national government is required to indemnify owners and others for any loss to property rights which exceeds a specified limit that result from such restrictions. As a rule, however, it seeks to compensate owners by providing subsidies from the national treasury for the purchase of such sites by the local government. To ensure that natural monuments are widely used, the national government also provides subsidies for their monitoring investigation, upkeep, and repair.

In this presentation, we will introduce the concept of the recent designation, the authorized status alternation of the existing state, and the municipality of conservation projects.

Keywords: Natural Monument, Law for the Protection of Cultural Properties

Cemeteries construction and National Trust in the Sayama Hills

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The Sayama Hills area has been the stage for a National Trust activity by the Totoro Furusato Fund since the 1990s. The Sayama Hills area is an interesting example of rich natural landscapes at the outskirts of an urban area and this has attracted a lot of local support for the National trust. However plots are owned by individual owners, and this has led to issues like dumping of industrial waste. The area is under pressure from development and is undergoing fragmentation. One of the recent issues is the development of a cemetery. This is taking place in a valley where construction materials were dumped in the past due to the needs of an urban population. The cases of industrial waste dumping and cemetery development show landscapes are disturbed due to plans that have no immediate use, and such developments only damage natural landscapes that have good potential for natural diversity.

Keywords: conservation movement, value of nature, NIMBY

Construction of a new digital archiving method for gathering data on traditional knowledge by using low cost technology

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Rural depopulation and greying population are serious issues for conserving traditional agricultural land use in Japan, also known as Satoyama land use. The preservation of local and traditional knowledge is essential for preserving these agro-ecological systems. The traditional knowhow with periodic interaction with the landscape - a key feature of the Satoyama land use - is fast disappearing from rural Japan. Especially in agricultural or fishing villages there are several types of local knowledge systems that are beneficial for conservation of natural resources. Each type of knowledge is suitable for its unique environment. The disappearance of villages is therefore equal to the disappearance of such valuable socioecological knowledge. This type of knowledge has potential to be useful for many future scenarios. This requires digital archiving of such knowledge. But currently there is no standardized database for archiving this type of socioecological knowledge. Several types of technological and methodical approaches can be used for constructing such databases. Therefore, it is essential to collect various kinds of knowledge and construct digital archive as standardized knowledge base. To construct this type of knowledge base, there are some requirements in technologies and methodologies. In addition to these technical requirements, budgets are limited because most people in possession of such items do not have sufficient financial capacity. One result of the lack of finances is the need to keep the number of archiving project members to a minimum. The methods for archiving local knowledge should be as low-cost as possible. In some previous studies, low-cost digitizing workflow and information schema for local/ traditional knowledge with the Work-Oriented Approach and ISO 191XX series has been introduced. The present study however, uses a standardized digital workflow using an Interchangeable Lens Camera (MILC) and a tablet device, which is systematically formulated for this purpose. This system consists of Raspberry Pi 2 and mobile battery, and multiple accesses from tablet devices or smart phones. The workflow has been used in different types of experimental pilot projects, and a set of archiving system is under implementation. Because this system is independent from mobile network, it can be applicable in any projects.

Keywords: Rural depopulation, socioecological systems, data gathering, digital archive, low cost technology

Landscape change of *kabuyutan* sacred natural sites in Indonesia

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Thousands of sacred natural sites still remain throughout the world and many of them are little known and ignored. These places have been considerably important role to maintain and enhance the quality of environment through their function as a safeguard of the existence of biocultural diversity. In the last two decades, the topic about sacred natural sites has been widely discussed by scholars. However, few case studies have been conducted in Indonesia although Indonesia has more than 1300 ethnicities in 31 ethnic groups. To expand the geographical range of studies and enrich the repertoire of knowledge, we conducted a study on *kabuyutan* sacred natural sites. The objectives of study were to identify the structure and dynamics of *kabuyutan* landscape and to analysis its socioecological consequences. This study was conducted in *kabuyutan* located in Ciomas Village, Panjalu District, Ciamis Regency, West Java Province, Indonesia (latitude 07°07'00" to 07°12'00" S, longitude 108°15'00" to 108°19'00" E). Observation participant through in-depth interviews (four key informants were selected by snowball sampling method), three focus group discussions (5 to 8 participants per session), and participatory survey methods were conducted in February 2015 to provide a snapshot of *kabuyutan* landscape. In parallel, GIS-based analysis method with a high resolution image derived from Google Earth (year 2014) and two topographic maps (year 2000 and 2014) was used to provide scientific spatial information such as land-use classification maps and its changes. The results were analyzed qualitatively to elaborate the phenomena. Findings revealed that local people's knowledge has provided significant information in identifying *kabuyutan* landscape as well as the changes and its particular reasons. At least 26 *kabuyutan* were found and identified having a unique structure compare to surrounding landscape which symbolized by springs (38.5%), specific plant species (34.6%), graves (11.5%), stones (3.8%), and tributary of rivers (11.5%). Most *kabuyutan* were recognized in the average elevation of 718 m above sea level, average approximate distance to river of 69.26 m and to road of 111.32 m, slope ranges from 0% to 5% with 57.7% of lands toward east direction (aspect), 61.5% of them located in non-natural woody area, 76.9% of lands were owned by individual resident (private), and more than half of *kabuyutan* recognized to be protected around radius 35 m as their buffer zone. Local people perceived these land variables were important to maintain the existence of *kabuyutan*, especially to ensure the sustainability of socioecological system. Land-use changes in micro scale need to be considered due to the land ownership status. *Kabuyutan* located in private lands were more vulnerable because of the landowner's interest. This led to concern about a reduction or even loss of *kabuyutan*'s structure and function. We suggested that providing and transferring knowledge related to the important role of *kabuyutan* as well as empowering the significant role of local leader (custodian) are necessary to prevent the negative impact of changes.

Keywords: *kabuyutan*, biocultural diversity, socioecological system

Grassland landscapes and the associated ecosystem services: the Case of Aso

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This poster presentation analyzes the case of the grasslands in the outer rim of the Aso caldera system in Kyushu. Mt Aso is one of the largest terrestrial calderas, and the majestic crater rim supports a variety of forests, grasslands and agrarian landscapes. The grassland of Aso is one of the largest in Japan, and it is recognized as part of a UNESCO Global Geopark and a Globally Important Agricultural Heritage System (GIAHS). This is also a form of the traditional 'satoyama' landscape of Japan, managed through periodic human induced disturbances in the form of grassland burning.

Satoyama landscapes or the traditional agrarian landscapes of Japan are on the decline due to a variety of factors such as urbanization, rural depopulation, and unsustainable land use practices. Grasslands such as Aso were very near to village domains as the *susuki* type grasses were used for thatching roofs and fodder during the Edo period. However, with mechanized agriculture and change in building materials for houses the use of grasslands diminished. The Aso volcano and its caldera system still retain such unique grassland features. One of the factors for the sustenance of the grasslands at Aso is the particular geological formation of the landform, where we can observe the interaction of geology and culture. However, the grassland based Satoyama of Aso is on the decline as well along with the associated socioecological knowledge and the ecosystem services. This poster therefore deals with the major characteristics, functions, socioecological properties and ecosystem services of the Aso grassland landscape for sustainable management of such unique human managed ecosystems.

Keywords: Satoyama, grasslands, socioecological systems, ecosystem services, Aso Volcanic area, Japan

Analyzing Rivermouth Environment in Takatsu River Basin as a Socioecological System with a Special Focus on the Decline of Hamaguri Clams

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This poster presents the intriguing case of the Hamaguri clams (*Meretrix lusoria*) as an indicator of the complexity of socioecological systems. The Takatsu River is located at the Shimane Prefecture in west Japan, and flows into the Sea of Japan after cutting through narrow valleys through mountains. The mountains in the watershed have a rich broadleaf forest cover that is seen as an essential part of the complex nutrient flow through the basin that connects mountainous landscapes to coastal ecosystems. However, during the latter part of the 20th century, the coastal ecosystems started to undergo perceptible change, as evidenced by a dramatic decline of the Hamaguri clam (*Meretrix lusoria*). Over-collection of clams by fishermen is unlikely as local fishermen catch hamaguri by low impact methods focused on capturing a single clam at a time in this area. The decline therefore could be associated with a change in the complex web of nutrient flow, connectivity of the mountains and the sea and the capacity of the river as a flow corridor. The number of weirs increased on the river during the latter part of the 20th century, and a perceptible increase in the area of impervious concretized surface in the coastal areas took place. There is no reliable dataset on the long term trend of the hamaguri population, but according to reports by local fishermen, seabed conditions (seagrass beds, water turbidity level) have changed in a perceptible manner, and species not seen in the sea for generations have appeared recently. These trends suggest that the overall system is changing in a complex and interconnected way. The researchers conducted surveys to understand what conditions allow hamaguri clams to inhabit the coastal areas, which conditions could be detrimental, and the age profile of these clams. The findings indicate a slow recovery of the population in the recent years, but the threshold level of clam populations and their limiting factors remain quite poorly understood. As these factors are likely influenced by human interactions with the ecosystems, a socioecological framework is used to reflect on the recent changes in population of this species and its associated environment.

Geocological Processes and landscape of mountain stream and river in Japan islands

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The Azusa River that flows through the Kamikochi Highlands show characteristic vegetation colonies of *Chosenia arbutifolia*. The flow of debris and rocks due to erosion and mass wasting by the river is essential for formation of gravel beds in the stream, which are in turn related with the erosion properties of the Azusa River main channel and this comprises a large system that supports the vegetation. In addition colonies of *Fraxinus platypoda*-*Pterocarya rhoifolia* form on landscapes that are periodically affected by large peak flow events. Japanese mountain landscapes are noted for their rate of uplift, which leads to frequent slope failures, and all of this provides the backdrop for vegetation development. But, erosion control construction destroy geocological system.

Keywords: geocological processes, sabo, tectonically active and intensely denuded region