

Toward the Regeneration of Tropical Peatland Societies

A new project at RIHN aims to explore the transformability of environmentally vulnerable societies and establish an international network for research and learning.

Kosuke Mizuno

Project Leader

Research Institute for Humanity and Nature (RIHN) and Kyoto University

A global problem, a regional crisis, and a concerted response

The destruction of tropical peat swamp forests is a major contributor to global greenhouse gases and an urgent international health crisis in Southeast Asia. An estimated 20 percent of global soil carbon is accumulated in tropical peat swamp forests, 76 percent of which are found in Southeast Asia. Carbon dioxide (CO₂) emissions from fires in Indonesia during July to November 2015 exceeded CO₂ emissions from fossil fuel use in Japan during the whole of 2013 (GFED, 2015).



▲Waste peatland damaged by fire

Due to their physical characteristics, tropical peat swamp forests have been difficult to utilize, and therefore, spared from development for a long time. Howev-

er, drainage associated with plantation development of fast-growing and oil palm trees has led to a decrease in groundwater table levels and the drying of peat swamp forests. This has in turn resulted in an increase in CO₂ emissions caused by peat decomposition



and frequent fires. In Indonesia alone, an estimated 2.1 million hectares of forest—most of them peatlands—were burned in 2015. The resultant haze caused incalculable damage to the local economy and has impacted the health of not only the local people, but also those in Malaysia and Singapore. In 2015, 0.5 million people in the region were diagnosed with upper respiratory infections. Haze has become a trans-boundary environmental, economic, and political issue.

Peatland is vulnerable both environmentally and socially. Damage to peatland is ecologically irreversible: once it is made use of, land subsidence begins, and it cannot be restored even if the land is rewetted. Draining and drying peatland for cultivation destroys habitat and leads to frequent fire, and the fire further destroys the habitat. The lost biodiversity in the habitat, for

example, can be gradually restored, but it is not completely rehabilitated as it used to.

Historically, peatland areas were not settled as they are not suitable for agriculture. Most peatland is classified as state land, and state appropriation has created contestation, overlapping, and insecurity over forest tenure conditions. Companies that were granted concessions in peatland areas developed plantations, roads, and canals under weak state regulations, attracting people to move in. The complexity and vagueness of land possession has prevented local villagers from managing peatland sustainably and continuously.

How can society develop institutions to control and manage these fires and mitigate degradation? Our five-year research project, which began in April 2017 and is headquartered at the Research Institute for Humanity and Nature in Kyoto Japan, conducts trans-disciplinary research on the socio-ecological systems of tropical peatlands to understand and address their vulnerabilities. Through collaboration with local stakeholders, the research will integrate scientific findings with local practices to establish mitigation and adaptation strategies to achieve sustainable (low carbon) use and conservation of peatlands. Ultimately, the project intends to elucidate the transformability of environmentally vulnerable societies.



▲Degraded peatland and haze.

A deep commitment

The project has a deep commitment to local communities and policy processes that attempt to reach solutions. It encourages people to take part in the program actively, to reaching consensuses, and secure the wider participation of communities to identify solutions. One strategy we are in favor of to generate

participation among local communities is to secure land rights for the people who join the programs.

Most peatlands are officially deemed state land, and this has led to degradation, widespread fires, and abandonment. Officially, people should not utilize state land, and should not be granted land rights simply because the land is designated as state land. Yet one of the reasons why people do not properly tend the land is that their land rights are weak. We therefore study the issue of land rights, actively propose solutions to relevant ministries and agencies, and present our arguments at seminars with the hope that people can secure rights to their cultivated land.

One of the solutions that we have proposed to many parties is a social forestry program with which people can secure land rights for 35 years. As we maintain a strong commitment to sustainable solutions, we are deeply involved in activities surrounding peatland rehabilitation and the improvement of local livelihoods. Through this approach, we are able to understand the material conditions of the situation and continue to propose meaningful plans to secure a better future for peatland societies.



▲Locating a monitoring system at Tanjung Leban

Understanding the problem, seeking solutions

The research topics of the project attempt to understand the problem and seek solutions from the perspectives of many disciplines. Research topics include:

- 1) Studies of the institutions and organizations that have the potential to encourage communities to join the peatland rehabilitation program, as well as the rewetting of peatland and the maintenance of paludiculture (sustainable peatland livelihood activities) for

the sake of the local livelihoods.

2) Studies concerning the political, economic, and governmental aspect of peatland conservation and peatland utilization.

3) Geographical studies that include aerial photography and creation of peatland distribution and land title maps, specifically in Tanjung Leban where we have conducted research since 2008.

4) Continual monitoring of the material cycling of the peat environment, especially carbon and nutrient cycling, ground and river water quality, and greenhouse gas (CO₂ and CH₄) dynamics in Riau and Kalimantan.

5) Continual monitoring of water table levels and assessments of the effects of canal blockage constructed for rewetting peatlands.

6) Historical studies of the social and environmental formations of the trading system of sago palm in Kapau Baru where we started our study in 2016 to seek potential alternative systems.

7) Measuring the balance between organic matter inputs to soils and decomposition affected by the growth and death of trees, as well as determining the physical properties of peat, such as their bulk densities, soil moisture retention curve, and so on.



Research Organization

The project is organized according to the following study groups.

The Social, Corporate, and Governance Group conducts field research on the socio-economic aspects and historical background of peatland societies. Study focuses on livelihood strategies, land tenure, and resource use to identify factors that cause peat

degradation. The group works with local institutions and organizations at the village level to establish mitigation and adaptation practices such as paludiculture. National, subnational, and local governance structures, private company initiatives, and environmental finance mechanisms such as REDD+ and PES are reviewed for efficacy.

The Material Cycling Group conducts intensive multidisciplinary research, particularly on water and material cycling, in several representative peatlands in Southeast Asia for the integration of natural and social scientific mapping to better understand peatland ecosystems. The group will create a “Tropical peatland characteristics map” based on hydrological, geophysical, and social information of peatlands for integrated management.

The International Research Group will establish an international research and implementation collaboration hub for coordinating research and integrating experiences on sustainable peatland management. This group comprises Asian and European universities, and international and local organizations. Coordinating partners include Riau University and Bogor Agricultural University in Indonesia, the University of Malaysia, Sarawak, the Research Institute of the Peruvian Amazon (IIAP), UNDP, CIFOR, Walhi, AMAN, and Sawit Watch.

Toward transforming environmental vulnerability

We seek to demonstrate the transformability of peatland-based societies, and thus their future prospects, through the phasing out of monoculture production activity, the development of paludiculture, and the expansion of protected peatland areas. The project research will examine several livelihood strategies addressing the environmental and social vulnerability of tropical frontier societies with a commitment to the solution, thus advancing global environmental studies.

Reference:

GFED (2015) “Emissions estimates.” [last accessed January 10, 2018 from Global Fire Emissions Database website: <http://www.globalfiredata.org/updates.html>].

Meeting Report of JICA Partnership Program

JICA Partnership Program for restoring waste peatland in the village of Tanjung Leban came into action with a kickoff meeting!

The JICA Partnership Program for restoring peatland in the village of Tanjung Leban came into action with a kickoff meeting!

On December 9, 2017, a kickoff meeting and workshop of the JICA Partnership Program was held in Pekanbaru, Riau, Indonesia. This three-year program was launched for the purposes of rewetting dried peatland and developing livelihoods in the village of Tanjung Leban, which suffered serious damage during the peatland fires of 2015.

Under the sponsorship of the Japan International Cooperation Agency (JICA), the Japanese working team from Kyoto University under the leadership of Osamu Kozan (subleader of RIHN’s project) and Riau University organized the workshop to confirm cooperation with the various bodies concerned.

In the meeting, Haris Gunawan, Deputy of Research and Development at Indonesia’s Peat Restoration Agency, took the role of the keynote speaker. Various opinions were exchanged among the academic working team, officials from each local administrative level, and the

villagers of Tanjung Leban. Finally, the start of the program was declared.

This partnership program focuses on the concrete actions of restoration and development. It is expected to create synergy among various stakeholders in cooperation with RIHN’s peatland project, which is collecting scientific data and building a body of knowledge in order to restore peatland environment and society more effectively and sustainably.



One Map Policy and Peat Restoration

It has been a major problem for the Indonesian government to produce accurate and reliable maps of its territory. It is not an easy task: Indonesia's vast and complex geographic setting and unintegrated mapping by various ministries and agencies have been serious obstacles. However, the "one map policy" adopted by the Indonesian government in 2011 has been dramatically improving the accuracy and reliability of geospatial information, and this is expected to contribute to better political and economic decisions around land management. The One Map Policy and improved geospatial technology may also prove to be crucial in the effective and sustainable restoration of tropical peatlands in Indonesia.

Dheny Trie Wahyu Sampurno

Geospatial Information Agency, Indonesia
Asian and African Areas Studies (ASAFAS), Kyoto University

The challenge, and importance, of mapping

Indonesia has a broad territory and complex geographic setting. Successive governments have tried to produce accurate and reliable maps since the Dutch colonial era. While relatively accurate maps have been drawn up of population-dense areas, there is a dearth of geospatial information and maps for more remote and forested areas. Existing maps lack consistency in terms of land designation and state forest boundaries, and map versions vary across different administrative bodies.

Although Indonesia's vast tropical forests support high biodiversity, they are also an arena of mining, logging, and plantations. In order to manage forest land and natural resources more effectively and sustainably, it is an important national issue to synchronize inconsistencies among different maps, and—critically—to create maps that are based on a common reference and standard.

One map, one nation

In 2010, President Susilo Bambang Yudhoyono pointed to the startling differences among primary forest maps generated by various ministries as an example of the inconsistency in the government's mapping. Consequently, the Indonesian Law of Geospatial Information, or the "One Map Policy" was passed in 2011 for the purpose of promoting the integration of map references and standards. The Geospatial Information Agency (Badan Informasi Geospasial, or BIG) regulates and manages the One Map Policy in any sector concerned.

The policy has been implemented in four important steps: (1) one reference, (2) one standard, (3) one geo-database, and (4) one geo-portal. First, BIG, as the official base map producer, created the Indonesian Geospatial Reference System (SRGI). Second, the National Standard Agency issued standards for mapping. Third, the Indonesian Geographic Element

Catalog (Katalog Unsur Geografis Indonesia or KUGI) was developed to accommodate various geospatial databases. The catalog is stored and shared with nodes of the central government as well as with provincial and regency governments as part of the National Spatial Data Infrastructure.

Finally, at the distribution level, BIG operates an official national data portal (see "ina-geoportal" site).



Discrepancies with land permits

The initial product under the One Map Policy was a national land cover map that consists of synchronized data from various ministries and agencies. However, when a map of the concessions issued by the Ministry of Forestry (Kementerian Kehutanan) and one issued by the National Land Agency (Badan Pertanahan Nasional or BPN) were compared, spatial discrepancies were revealed. According to data from Forest Watch Indonesia (2013), nearly 15 million ha of land had overlapping licenses for forest concessions, industrial forest plantations, and mining. To address this, the Ministry of Forestry and BPN synchronized their maps according to BIG's official base map.

The One Map Policy also played an essential role in Presidential Instruction 10/2011, which postpones the authorization of any new land concessions. New authorizations are postponed until licenses that were already issued by any ministry are synchronized with the official base map produced by BIG. Citing the need for national development to be based on accurate and reliable maps, the current president, Joko Widodo, has continued the One Map Policy.

Until today, the authorization of new land concessions has also been postponed in peatland forests, which are an arena of corporate entrepreneurship.



▲Tropical peat swamp forest

Measuring and mapping peatlands

In accordance with repeated forest fires in Indonesia and the global movement to reduce carbon dioxide emissions, the protection of tropical peatlands became an important national issue in the early 2010s. As a result, the creation of accurate and reliable maps of peat areas became an essential task for the government.

The Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan or KLHK) was tasked with the duty to protect and manage the peat ecosystem. The KLHK, BIG, and the Ministry of Agriculture (Kementerian Pertanian or KEMENTAN) integrated their respective geospatial data to create what is known as the Peat Hydrological Unit (Kesatuan Hidrologi Gambut or KHG). The KHG is a unit of the peat ecosystem located between two rivers, rivers and the coast, or within swamps (KLHK, 2015). The KHG was designed to measure the degradation of peat vis-à-vis the hydrology system.

In order to manage 24.6 million ha of 865 KHGs, peatlands were divided into two zones according to a designation of either Protected or Cultivated. This zonation system is now represented in Peat Ecosystem Function Maps that have become the reference maps for ministries and agencies, as well as provincial and regency governments.

The KHG and peat restoration

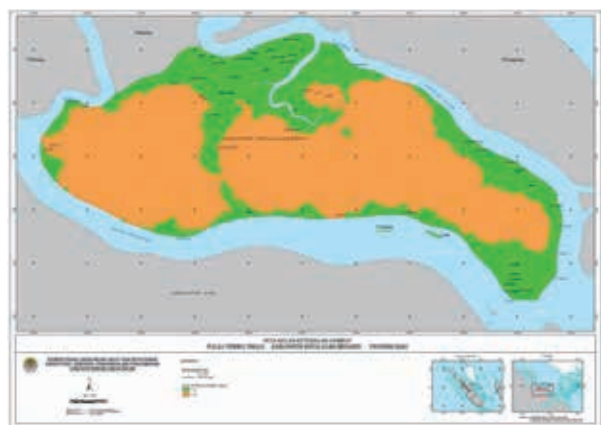
As a result of the great fires during 2014 and 2015, the Peat Restoration Agency (Badan Restorasi Gambut or BRG) was established in early 2016 to restore 2 million ha of degraded peat in seven provinces. The BRG collaborated with ministries, agencies, NGOs, academia, and international stakeholders to address the peat crisis. Restoration involves re-wetting and re-vegetating peatlands, and revitalizing the local economy.

Restoration locations were selected based on the KHG maps, while the restoration process varied according to the concession authority. Land cover, land use, peat characteristics, and other related geospatial data within the KHG are used to analyze peat conditions. These data originated from custodial ministries and agencies, and were integrated to develop a holistic spatial peat ecosystem restoration and management plan.

Geospatial information for peat restoration on Tebing Tinggi Island

Tebing Tinggi Island is one of the coastal peat areas of Riau Province. After severe degradation from peat fires in 2014 and 2015, 135,000 ha of the peat ecosystem on Tebing Tinggi were designated a national priority for restoration and rehabilitation.

Peat thematic maps of varying scales and types were used to implement the BRG's restoration plan. The KLHK created a Peat Ecosystem Map in 2015 based on field surveys conducted with augers. The map shows the depth of peat soil and its distribution (see Map 1). It also divides the KHG on Tebing Tinggi into 89,831 ha of protected peat zone and 45,605 ha of cultivated peat zone (see Map 2).

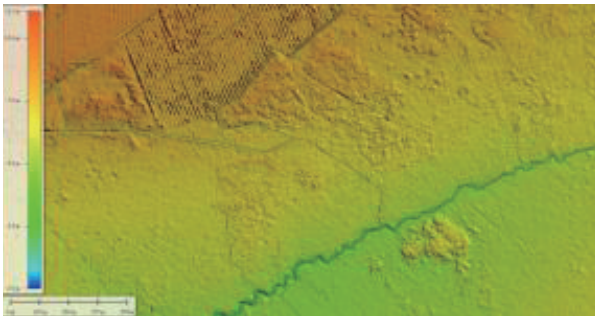


▲Map 1. Peat depth distribution map of Tebing Tinggi Island (KLHK, 2016)

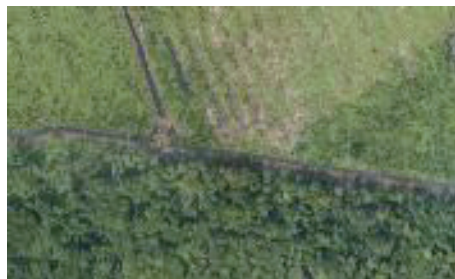


▲Map 2. Peat ecosystem function map of Tebing Tinggi Island (KLHK, 2017)

In mid-2016, BRG created high-resolution maps with LiDAR technology and aerial photographs to get an overview of the detail of the peat landscape on Tebing Tinggi Island (see Figure 1 and Figure 2). With aid from the Norwegian government, LiDAR and aerial photos were processed into a Land Cover and Hydro-topography map. These maps have sub-meter accuracy and a scale of 1:2,500. They can be used for actual restoration activities, such as constructing canal blockage and identifying vegetation.



▲Figure 1. Digital terrain modeling (DTM) on Tebing Tinggi Island (BRG, 2017)



▲Figure 2. Aerial photograph of peat landscape on Tebing Tinggi Island (BRG, 2017)



▲Peatland field survey on Tebing Tinggi Island (KLHK, 2015)

Conclusion

Accurate geospatial information is an indispensable tool in identifying objective areas and implementing peatland restoration. Moreover, combining geospatial information with social and economic data contributes to visualizing and understanding social and economic realities in peatland environments.

The Tropical Peatland Society Project of the Research Institute of Humanity and Nature has embarked on peat ecosystem restoration and rehabilitation not only to achieve environmentally sustainable land management, but also to revitalize local livelihoods. In this regard, BIG's provision of base maps and border maps with orthorectified high-resolution satellite imagery will benefit participatory mapping and social forestry efforts toward peat restoration and improved land management.

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Project Members



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◎Project Leader

MIZUNO, Kosuke (RIHN*/ CSEAS**, Kyoto University)

◎Subleader

KOZAN, Osamu (RIHN*/ CSEAS**, Kyoto University)

◎Project Members

(●: Leaders of Working Groups/ ○: Core Members)

[Material Cycling Group]

- **ITOH, Masayuki** (CSEAS**, Kyoto University)
- **KOZAN, Osamu** (RIHN*/ CSEAS**, Kyoto University)
- **SHIMAMURA, Tetsuya**
(Graduate School of Agriculture, Ehime University)
- HIRANO, Takashi**
(Research Faculty of Agriculture, Hokkaido University)
- IIZUKA, Kotaro**
(Center for Spatial Information Science, University of Tokyo)
- IRIANA, Windy**
(Graduate School of Frontier Sciences, University of Tokyo)
- **KAWASAKI, Masahiro** (RIHN*/ CSEAS**, Kyoto University)
- KOBAYASHI, Shigeo** (CSEAS**, Kyoto University)
- KUME, Takashi**
(Graduate School of Agriculture, Ehime University)
- KUWATA, Mikinori**
(Asian School of the Environment, Nanyang Technological University)
- MATSUMI, Yutaka**
(Institute for Space-Earth Environmental Research, Nagoya University)
- MIZUNO, Kei** (CSEAS**, Kyoto University)
- NEOH, Kok Boon** (National Chung Hsing University)
- PAGE, Susan** (Department of Geography, Leicester University)
- SABIHAM, Supiandi**
(Faculty of Agriculture, Bogor Agricultural University)
- SETIADI, Bambang**
(Agency for the Assessment and Application of Technology Indonesia)
- **SHIODERA, Satomi** (CSEAS**, Kyoto University)
- TONOKURA, Kenichi**
(Graduate school of Frontier Sciences, University of Tokyo)
- UEDA, Kayo**
(Graduate School of Engineering, Kyoto University)
- YAMANAKA, Manabu**
(Japan Agency for Marine-Earth Science and Technology)

[International Research Group]

- **NAITO, Daisuke** (CSEAS**, Kyoto University)
- ABE, Kenichi** (RIHN*)
- ISHIKAWA, Noboru** (CSEAS**, Kyoto University)
- SASAKI, Katsunori** (FoE Japan)

SAMEJIMA, Hiromitsu

(Institute for Global Environmental Strategies)

UBUKATA, Fumikazu

(Graduate School of Environmental and Life Science, Okayama University)

Wil De Jong (CSEAS**, Kyoto University)

[Community, Corporate and Governance Group]

- **MIZUNO, Kosuke** (RIHN*/ CSEAS**, Kyoto University)
- **OKAMOTO, Masaaki** (CSEAS**, Kyoto University)
- **SUZUKI, Haruka** (RIHN*)
- ABE, Ryuichiro** (Japan NGO Network on Indonesia)
- AMINAH MEUTIA, Ami**
(Faculty of Global and Regional Studies, Doshisha University)
- DEWI, Kurniawati Hastuti** (Indonesian Institute of Sciences)
- DHENY, Trie Wahyu Sampurno**
(Geospatial Information Agency Indonesia/ Graduate School of Asian and African Area Studies, Kyoto University)
- GUNAWAN, Haris** (Peatland Restoration Agency, Indonesia)
- HASEGAWA, Takuya** (Tsukuba University)
- HAYASHIDA, Hideki**
(Institute for Study of Humanities and Social Sciences, Doshisha University)
- HONNA, Jun**
(Collage of International Relation, Ritsumeikan University)
- HOSOBUCHI, Michiko** (Tokyo Metropolitan University)
- **KAJITA, Ryosuke** (RIHN*)
- KANO, Hiroyoshi** (CSEAS**, Kyoto University)
- KAMEDA, Akihiro** (CSEAS**, Kyoto University)
- MASUDA, Kazuya**
(Faculty of Agriculture and Marine Science, Kochi University)
- **NAITO, Daisuke** (CSEAS**, Kyoto University)
- **OSAWA, Takamasa** (RIHN*)
- PRASETYAWAN, Wahyu**
(Syarif Hidayatullah Jakarta, Islamic State University)
- SAMBUAGA, Adlin**
(Faculty of Social and Political Sciences, Riau University)
- SATO, Yuri**
(Area Studies Center, Institute of Developing Economies)
- van SCHAİK, Arthur** (CSEAS**, Kyoto University)
- TERAUCHI, Daisuke** (Faculty of Sociology, Toyo University)
- WATANABE, Kazuo** (CSEAS**, Kyoto University)
- YOSHIDA, Koshi** (Collage of Agriculture, Ibaraki University)

[Research Associate]

- **KATSURA, Tomomi** (RIHN*)

* : Research Institute for Humanity and Nature
** : Center for Southeast Asian Studies