Strategic Young Researcher Overseas Visit Program for Accelerating Brain Circulation

Dispatch Report

Year: June 2013
Place of fieldwork: the University of Riau, Indonesia
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- Research background

In order to prevent environmental destruction related with biomass usage and hydrological changes in the world, an international institutional approach is essential. Water is necessary for all living organisms and access to a good water source is vital to people's lives wherever they live. The tropical forests of Indonesia represent one of the most biologically diverse regions on Earth, as well as a significant terrestrial reservoir for atmospheric carbon. Since 1990, in Indonesia, about 24% of the total forest area and 31% of the primary forest has been cleared, and plantation area increased from 2.2 million to 3.4 million hectares over the past 15 years (Food and Agriculture Organization). The World Wildlife Fund reported that the fastest rate of deforestation in Indonesia is occurring in central Sumatra's Riau Province, where some 4.2 million hectares (65%) of its tropical forests and peat swamps have been cleared for industrial plantations in the past 25 years (WWF 2009). The major causes of deforestation include illegal logging and conversion of primary forest to logging concessions and oil palm plantations. In March 2013, I started hydro-meteorological observation in order to contribute to environmental improvement in the target areas.

- Research purpose and aim

Peat land is abundant in Riau Province, covering a total area of 4 million hectares, accounting for approximately 10% of the world's total peat land. The peat land is located mostly on the east side coast of Riau Province, which contains the estuaries of two rivers that flow from the mountainous part of this province. Until as recently as 30 years ago, this whole area was covered by peat swamp forest. The people of the area engaged in mixed occupations based on agriculture, forestry and fishery in this unique hydrological environment. However, much of the peat forest has been replaced by acacia plantation because the production of wood biomass has a higher priority now. So much water has been drained from peat land, that this area has changed from "water forest" to "bare land".

Starting around 2000, wild fires have been common, and illegal oil palm plantations have been established by local people. There are two dry and wet seasons a year in Riau Province because this area is located in the equatorial zone. Because a lot of wild fires in the peat land occurred in June, 2013, I will analyze the association with the burning of a field and its land surface condition.

- Results and achievements of fieldwork

On June 6, I went to Cibinong, Indonesia, to visit the Research Center for Limnology - Indonesian Institute of Sciences. Dr. Luki Subehi and I discussed the Memorandum of Understanding between Center for Southeast

Asian Studies Kyoto University and t the Research Center for Limnology. On June 8, I moved to Pekanbaru, Riau Province, via Jakarta, and I made research arrangements with Dr. Ahmad Muhammad of the Faculty of Science at the University of Riau to discuss the impact of land use change from natural forest to artificial forest on the surrounding environment. Then, I and Dr. Ahmad Muhammad moved to the Giam Siak Kecil-Bukit Batu UNESCO-MAB Biosphere Reserve, which is located in the north part of Riau Province and conducted a field survey and observations of greenhouse gas emissions from the peat land. I measured heat and water flux with the Bowen ratio method and CO_2 density using the chamber method to estimate CO_2 emissions. The data gathered in this manner will be used as the basis for a system to reduce CO_2 emissions from peat land.

During my stay in Indonesia, I visited the Research Center for Limnology - Indonesian Institute of Sciences and observed the degraded peat land caused by wild fires in Riau Province. I mainly discussed the issue of scientific collaboration and research including the wetland conservation in Indonesia with local researchers, but it was difficult to get the cooperation from the Research Center for Limnology about the environmental problem of peat degradation caused by wild fire. In Indonesia, it is not common that researchers participate directly in domestic environment-related issues. The same lack of participation of researchers in national environmental policy exists in Japan. I want to continue to impress upon the authorities and academics in Indonesia the importance of allowing foreign researchers to work and participate in discussions on important environmental issues.

- Implications and impacts on future research

Large-scale land use and land cover changes could lead to irreversible changes on not only local environment but global climate. In particular, the many islands of Indonesia and their shallow surrounding seas constitute a large-scale environment that is neither purely oceanic nor purely terrestrial. This unique environment has been termed the Maritime Continent. The Maritime Continent lies at the heart of the Indo-Pacific Warm Pool, whose strong convective heating plays a dominant role in driving the atmospheric circulation over the entire tropical Indian and Pacific Oceans and has a significant influence on extratropical circulation. In this complex geospheric system, the state of the terrestrial surface is critical in maintaining the environmental sustainability in the region. I have started multi-disciplinary research including atmospheric, hydrological and carbon cycle investigation.