Topic-Setting Program to Advance Cutting-Edge Humanities and Social Sciences Research

（Area Cultivation）

Progress Report

（Summary of Final Report）

[**Strengthening Disaster Resilience of Local Communities through Interactive Real-Time Area Studies over SNS and Cloud GIS**]

Core-Researcher:　Takuro Furusawa

Institution:　Kyoto University

Academic Unit: Graduate School of Asian and African Area Studies

Position: Associate Professor

Research Period：　FY2014 - FY2017

1．Basic information of research project

Research Area	New regional research spurred by information media advances
Project Title	Strengthening Disaster Resilience of Local Communities through Interactive Real-Time Area Studies over SNS and Cloud GIS
Institution	Kyoto University
Core-Researcher (Name, Academic Unit & Position)	Takuro Furusawa Associate Professor, Graduate School of Asian and African Area Studies
Project Period	FY2014 － FY2017
Appropriations Plan (¥)	FY2014　3,212,000　JPY FY2015　2,535,000　JPY FY2016　2,915,000　JPY FY2017　3,108,000　JPY

2．Purpose of research

2-1. Background

This study was conducted in Research Area, entitled "New Regional Research Spurred by Information Media Advances" and thus its goal was to explore new era of Area Studies, which had faced with necessity of changes as adaptive as dramatic advances of globalization and of information and communication technologies (ICTs), by organizing transdisciplinary researches. The core researcher and co-investigators had a conception of academically creating 'Interactive Real-Time Area Studies' through fully utilizing smartphones, social media (SNS), and cloud networking system and practically contributing to resolving social problems.

Agenda in Southeast Asia and Oceania Communities today include overexploitation of resources, conflicts between environmental preservation and community welfare, extreme weather event, natural and human disasters, and others which were more complicated theme than classical Area Studies. In detail, these are natural disasters such as cyclones, floods, or droughts, which occur every year, and human disasters such as illegal logging or fish poaching. Local communities traditionally had their own knowledge and practices for coping with such various natural disasters, and for sustainable resource management. However, recent climatic and socioeconomic changes have been making resolution by local communities more difficult to resolve than before. These are the themes that Area Studies and Disaster Prevention Sciences collaborate together to tackle in one hand and new technologies to monitor the event at "real-time" and with "wide-range" are necessary in the other hand.

From the field of Area Studies, lack of "spatio-temporal Information" has been limiting sorts of research possibilities because even watches or maps are not commonly used in these rural communities. However, the spatio-temporal information will help area studies to accurately analyze when and where events happened, and enable analyses using weather information and remotely sensed data acquired for the same space and time.

Recent developments in ICT Technology are noteworthy. Spread of smartphones and social network services already achieved many rural and/or remote areas in the world. Recording space and time coordinates are now made easily by GPS Smartphone (exif information). Easy sharing of GIS files and satellite images through cloud networking system are also now available.

2-2. Aims

This study aims at

(1) Creating and developing Interactive Real-Time Area Studies by connecting peoples in Southeast Asia and Oceania and Japanese researchers through using SNS and cloud GIS technologies;

(2) Creating and developing practice oriented area studies for improving resilience of local societies. As scientists who experienced an unparalleled disaster, the 2011 Tohoku Earthquake and Tsunami, we aim at collaborating with those who are faced with challenges in life, and tackling these problems while creating next-generation Area Studies.

Significance of this study are summarized as follows:

(1) To understand traditional knowledge and practices for disaster prevention and resource management and analyze indigenous risk avoidance and consensus formation by using the Interactive Real-Time Area Studies;

(2) To give scientific advice to such communities to adapt to the changing environment through collaboration between Area Studies researchers and Disaster Prevention scientists;

(3) For this purpose, the project integrates new and familiar technologies such as smartphones, social media, and cloud networking and views from science and technology interpreters;

3. Outline of research (Including study member)

3-1. Research Questions

Scientific research questions are as follows:

(1) Can local peoples and Japanese and other researchers collaborate interactively and at real-time by using ICT?
This question will be tested in different geographical, ecological, educational, and socio-cultural backgrounds in Solomon Islands and Nusa Tenggara Timor (NTT) of Indonesia; these societies are chosen because members have had substantial amount of experience and data in these societies.

(2) What is the real-time process of the effects of disasters on local communities and their responses?
This study targets on environment changes due to climate change, infrastructure destruction by extreme flood events, fish poaching, and cultural events in Solomon Islands and severe drought, illegal logging and illegal burning in Indonesia; real-time recording of events and feedback of analyses (e.g., remotely sensed data).

(3) How can scientific findings be accepted and used by local communities?

This study integrates science/technology interpretation and visual design of publications while exploring an application for education on sustainable development.

This study always received any feedback from local peoples and researchers and modified methodologies and concepts flexibly in Plan-Do-Check-Act cycles.

3-2. Study Member

	Name	Affiliation
PI	Furusawa, Takuro	Assoc. Professor, Graduate School of Asian and African Area Studies, Kyoto University
CI	Sugishima, Takashi	Professor, Graduate School of Asian and African Area Studies, Kyoto University
CI	Iwata, Akihisa	Professor, Graduate School of Asian and African Area Studies, Kyoto University
CI	Hatayama, Michinori	Professor, Disaster Prevention Research Institute, Kyoto University
CI	Himoto, Ryuta (-31 Mar 2017)	Technician, Unit of Synergetic Studies for Space, Kyoto University
Co	Kyoto Entertainment Works Inc	
Co	Yates, Loti	Director, National Disaster Management Office, Solomon Islands
Co	Subrian, Rikson	Assoc. Professor, North Sumatra University, Indonesia (former Lecturer, Nusa Cendana University, Indonesia)

4．Research results and outcomes produced

4-1. Challenges for Establishing Interactive Real-Time Area Studies

After obtaining research permits from Indonesia and Solomon Islands governments, this study made kinds of trials and errors so as to identify potential challenges in conducting Area Studies using ICTs.

First kinds of challenges, which we faced in communication with Indonesia and Solomon Islands, were (1) difficulties in communication due to fee for communication and insufficient data transfer speed, (2) psychological barrier to share information at open SNS group but not closed for friends only, (3) cultural gaps in appropriateness of information which were shared (e.g., acceptance of photos related with death), (4) automatic removal of exif (GPS) data from major SNS (i.e, Facebook, Instagram, Twitter).

Second kinds of challenges, which we faced in data sharing through cloud networking, were (1) difficulty of downloading big file-size data (e.g., geographical data) in rural areas, (2) difficulties for rural peoples to understand concept and meaning of files, folders, and data, (3) difficulties in sending scientific knowledge at low resolution and small file-size data only.

This study in principle recognized these problems were unavoidable in already-available environment. When the research members requested or encouraged peoples to share their data or to pay

attention on cultural gaps, the peoples could adjust their behaviors to some extent; however, such behavioral changes seem not sustainable. The Interactive Real-Time Area Studies aimed at recording daily and original lives. Therefore, this study emphasized case-by-case actions adaptive as each society did, rather than that the researchers continued to send requests to local peoples.

These problems became later important keys for creating and developing new smartphone application. A new app which record location information is obviously necessary because location information, which is automatically removed in SNS, is essential in case of emergency and disasters. But this study also noticed that 'consciousness' or 'approval' of recording/sharing location information is necessary from viewpoints of privacy protection. In addition, it became the project goal to develop the app which would be easy and useful for local peoples to collect and share information which were culturally sound in different societies.

4-2. Interactive Real-Time Area Studies on Facebook

Facebook Page "Smart ASRIS (Area Studies and Resilience Implementation using Smartphones)" was first launched in 1st January 2015 and tested for its function as a center of the communication. Then, the Japanese members visited each of the research sites and explained the research purpose, ICT system, how to use smartphones, and others until November 2015 and launched Facebook Group "Smart ASRIS" as well. As the results, the Facebook Group was more actively used than the Page.

Until July 2015, 126 posts had been made at the Group. Comments were added for each of the posts and some posts gathered more than 10 comments, so that 126 posts represented 126 threads of discussion. Contents of these threads are summarized in Table 1.

Table 1. Facebook posts at Smart ASRIS Group during the project

Region	
Indonesia	
East Sumba	83 posts（65.9%）
West Sumba	16 posts（12.7%）
North Sumatra	2 posts（ 1.6%）
Flores	1 post（ 0.8%）
Solomon Islands	
Munda	4 posts（ 3.2%）
Roviana	4 posts（ 3.2%）
Japan	16 posts（12.7%）
Theme	
Livelihood/Subsistence	30 posts（23.8%）
Climate	21 posts（16.7%）
Ritual/Culture	21 posts（16.7%）
Introduction	19 posts（15.1%）
Disaster	11 posts（ 8.7%）
Daily Life	11 posts（ 8.7%）
Natural Resources	11 posts（ 8.7%）
Sea Level Rise	2 posts（ 1.6%）
Health/Hygiene	1 posts（ 0.8%）

In addition to these posts to the Group, information was also shared at individual pages and Messenger App. For example, an informant from Solomon Islands, who did not make any posts at the Group,

uploaded 7 information relevant to the project at his individual page: 2 posts for Daily Life, 1 for Livelihood/Subsistence, 1 for Disaster, 1 for Natural Resources, 1 for Climate, and 1 for Sea Level Rise.

The following are representative cases of the Interactive Real-Time Area Studies.

## Case A: Synchronicity of Agriculture and Seasonal Changes in East Sumba
[Background]

People in East Sumba lived in savanna semi-arid environment and thus usually predict the beginning of the rainy season and prepared agricultural field by burning and plowing before the first rain fall came. Then, they sowed seeds just after the beginning of the rain. How people predict the season, when they start preparation of the field, and whether or not their agricultural cycle were adaptive as seasonal changes had been questions but no previous studies scientifically analyzed it. Therefore, collaborators in East Sumba were requested to take photo and upload them at Facebook when they were engaged in grass burning and other agricultural preparation, when they observed first rain fall, and any activities related with agriculture and climate.
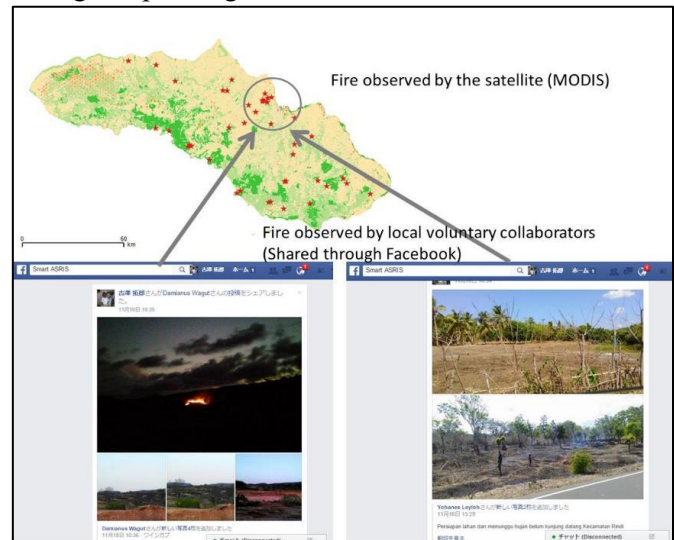
[Results]

Year 2015, when this research was conducted, was later found as a year of extreme weather – prolonged dry season due to El Nino Southern Oscillation. Therefore, the rainy season began in the end of November in Kanatang District while it usually started in September or October. Interestingly, local people did seldom upload photo of grass burning until November, as seemingly they adapted their agricultural cycle to this weather event. The Japanese researchers analyzed MODIS

satellite data which observed fire on Earth and confirmed that several evidences of fire were also observed by the satellite in the mid November – just before the rain started. Then, the researchers and local people shared this information through the Facebook. Then, soon after the first rain was reported on the Facebook, many photos which were related with agricultural activities including sowing seeds followed. The Japanese researchers further analyzed MODIS vegetation data and followed changes of biomass according to these activities.
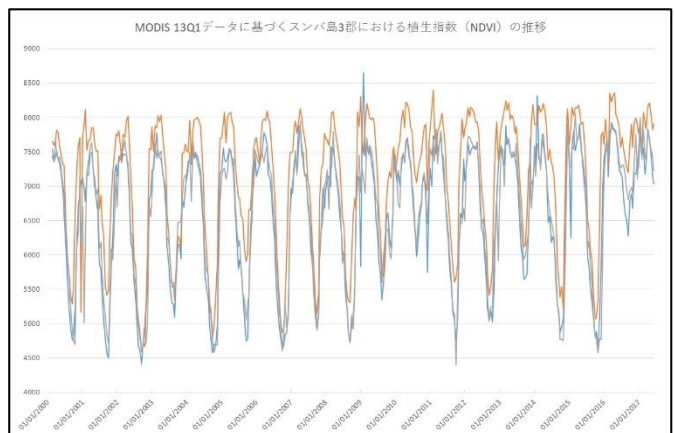
This case was successful for finding local behaviors for predicting season for livelihood by linking Facebook uploads and computer analyses of the satellite data.

Case B: *Hi'u Pa'ana* Ritual in West Sumba

[Background]

West Sumba had been known as an area where many traditional rituals and customs, such as *Pasola* – famous ritual of horse-riding spear-fighting competition – survived until today. A ritual called *Hi'u Pa'ana* was one of these rituals and recognized as the biggest ritual in Wanokaka District but rarely known in outside of the society because this ritual was not used as tourism resources nor commercialized. Schedule of the ritual was decided only in a week ago, so that it was difficult for foreign researchers to plan to participate in and observe the ritual. Therefore, a collaborator from the Wanokaka was requested to share information regarding the ritual through the Facebook.

[Results]

Thanks to the SNS communication, it was recorded that the *Hi'u Pa'ana* Ritual started on around 10th January in 2017 and its peak came on 25th January. Some photos which were uploaded on the Facebook showed parts of the ritual processes. More than 10 comments were made for this post and discussion was made on it. This is a case representing hose the ICT is useful to record time and event when the researchers cannot visit the venue. This case was used in analyses for a peer-reviewed paper (Furusawa 2017, *Asian and African Area Studies* 17 (2): 1-38.).

Case C: Environmental Changes in Solomon Islands
[Background]

In Solomon Islands, governmental services or scientific researches were not sufficient for covering remote island areas and thus local events were rarely recorded. On the other hands, this area was one of key zones to be affected by climate changes and other environmental changes and the basic information were necessary to predict and mitigate its adverse effects on people.

[Results]

Several effects which had not been scientifically recorded elsewhere were reported from remote areas, including coastal erosion due to sea-level rise and high tide caused by unknown factors. In addition, a miserable event that a village child was eaten by wild crocodile happened and this information was shared immediately with police and media, representing improving communication through smartphones.

4-3. Consideration of Analytic Methods of SNS Information

During the project period, incorrectness of the SNS information, called 'fake news' appeared as a severe social problem in the world. It is usually very difficult to detect correct information from a pool of information on the SNS. On the other hands, fieldworkers of the Area Studies had been professionals for searching reliable informant from the study site and establishing rapport with them and finally obtaining correct information. The fieldworkers also experienced necessities and difficulties to obtain huge amount of

information from a very limited number of well talented informants such as chiefs, priests, and elders. Therefore, reliabilities or correctness of informants/information had been a classical problem in the Area Studies. This study considered 'Cultural Consensus Model' as an analytical method to detect correct information from both the fieldwork and the SNS and published a review paper on this method (Furusawa 2016, *Asian and African Area Studies* 15 (2): 257-277).

In addition, this study also needed to develop an analytical method for time series data. MODIS Terra and Aqua satellite which observed the earth surface and calculate digits biweekly or monthly were gathered and data for vegetation changes (for detecting agriculture, natural vegetation changes, deforestation, etc.) and fire/burning points (for detecting human activities) were extracted. Then, statistical methods for simulating such time series changes and predicting future patterns. Bayesian statistics were integrated in both of Cultural Consensus Model and the time series analyses so as to improve accuracy.

4-4. Development of Smartphone App

Taking all results and experience described above into consideration, this study decided to create a new Smartphone App with the following functions. The application was named LOCOPAS – location, comments, photo for Area Studies.

LOCOPAS version 1

No	Function Class	Function	Explanation
1	Camera	Taking photo	Photo taken by smartphone camera
		Text	Add text to photo
		Share on SNS	Photo can be shared at SNS (Facebook, Twitter, Instagram)
2	Photo viewer	Viewing photo	Photo can be viewed on smartphone
3	Creating GPX file	GPX file output	Longitude and latitude information are obtained at the time of taking photo and location information are recorded as GPX file format
4	Usability	OS	The app can be run on old Android OS which are common in developing countries
		File size	File size is limited enough to be readily used in slow speed internet

The version 1.0 became publicly open in February 2017 and used in several study sites. Then further functions were developed based on results and experience for version 2.0 and later. In the later version, MAP function which was common way to use location information in smartphones were adopted in addition to GPX file format which was for professional use. Indonesian version was developed because Indonesia was one of the core study sites and had the biggest population in Southeast Asia. iOS was rarely used in remote areas but commonly used by researchers. This version became publicly open in July 2017.

LOCOPAS version 2

No	Function Class	Function	Explanation
1	Map	Viewed on Map	Locations of photos are viewed on Map. Location

			information is stored in folders which are made day by day
2	Multilanguage	Selection of language	In addition to Japanese, English and Indonesian can be used. English version is a default in other locales.
3	Multi OS	iOS feasibility	iPhone/iPad version

This App continues to provide update versions even after the end of the project (September 2017).

4-5. Achievements and Significance

(A) New Insights into Classic Area Studies

The Interactive Real-Time Area Studies added new knowledge even to classic Area Studies theme. For example, new findings were made about technology for indigenous calendar and ritual cycles. Some rituals and other cultural events were first recorded by this process.

(B) Immediate Application for Challenges in Today's Area Studies Theme

Area Studies now faced with new research themes such as effects of climate changes – e.g., sea level rise and relocation project in Solomon Islands. Although such cases are important to be studied, the researchers, unfortunately, can seldom visit the study sites due to logistical reasons and make scientific records. In addition to collaboration between Area Studies and disaster prevention scientist, smartphones and LOCOPAS App are immediately useful.

(C) Social Implementation

For this project, academic collaboration was sought with other fields, countries, and industries. The research members discussed with or organized a workshop with the following organizations: Japan International Cooperation Agency, Foreign Research Permit Division of Ministry of Research, Technology, and Higher Education of Indonesia, National Disaster Management Office of Solomon Islands, Kyoto Entertainment Works Inc, PASCO Corporation, ASUS Japan, Solomon Kitano Mendana Hotel, University of

Indonesia, Nusa Cendana University, North Sumatra University, Solomon Islands National University, and others.

The core researcher was invited to international conference as a key note lecturer, held in North Sumatra University and delivered lecture on possibilities of the Interactive Real-Time Area Studies. An article regarding this lecture appeared on Indonesian newspaper – *Sinar Indonesia Baru*.

(D) Expansion of Humanities and Social Sciences

Results of this project was also published in a chapter of Japanese book which introduced Area Studies in Southeast Asia (2017, Tokyo: Keio University Press). In this chapter, active utilization of climate data, geographic data, satellite data available on official internet websites were introduced and significance of collaboration between fieldwork and new technologies was addressed as future of Area Studies. In addition, the usefulness of the Interactive Real-Time Area Studies was introduced in it. This book target not only researchers but also other people so that effects of this achievement can be multiplied in future.

4-6. Future Prospects

Development of LOCOPAS App makes the academic situation ready for further advancement of the Interactive Real-Time Area Studies. Future collaboration with other academic disciplines and further fieldwork are necessary to make more achievement from this concept.

Area Studies faced with other challenges today such as difficulties of conducting fieldwork due to terror or emerging infectious diseases, fieldworker's care of child or elderlies and other personal conditions, or sickness and other physical situations. In relation with these conditions, this project also showed a new possibility that Interactive Real-Time Area Studies can be conducted by taking a "Work-Life Balance" and the Area Study itself is not a monopoly of the classical fieldworkers. This is important for researchers in future generation not only in Humanities and Social Sciences but also other academic fields.