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Poster Presentation Abstracts

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Precise Impact Assessments on Climate Change in the Sousei Program of Japan

Eiichi NAKAKITA[1], Sunmin KIM[2], and Sousei Group D Members
1: Disaster Prevention Research Institute, Kyoto University, nakakita@hmd.dpri.kyoto-u.ac.jp
2: Graduate School of Eng., Kyoto University, kim.sunmin.6x@kyoto-u.ac.jp

Theme D, precise impact assessments on climate change, aims to scientifically demonstrate the connection between the aforementioned increase in natural disasters and global warming in the future to see how serious it may become. The research results are to be presented as "actual figures" and to be provided as a valuable data for the government and municipalities to consider how to protect the lives of people in urban and rural areas, coastal areas, and river areas.

The first sub-theme, climate change impacts on natural hazards, is handled by DPRI-KU, together with Global Centre of Excellence for Water Hazard and Risk Management (ICHARM/PWRI). We aim to produce predictions for scenarios including worst-case particularly in the case of typhoons, which cause the most serious weather- related damage in Japan, concerning the frequency, scale, accompanying precipitation, strong winds, high tides, and high waves, including during the Baiu season. The second sub-theme, climate change impacts on water resources, is handled by DPRI and IIS. When the climate changes due to global warming, the rain amount and rain patterns change significantly. It is also possible that what formerly fell as snow will change into rain. In Japan, which has many mountainous regions, it is anticipated that this would cause a great change in the "pattern of water flowing into rivers." The third sub-theme, climate change impacts on ecosystem and biodiversity, is supervised primarily by Graduate School of Life Sciences at Tohoku University, and other participants include Nagoya University, Hokkaido University and NIES. We aim to predict and assess whether ecosystems are capable of changing abruptly due to global warming, taking as models the forests of northeastern Japan and the marine life in the ocean near Japan.

Of all the themes in this project, the issues examined in Theme D are the most specific and the closest to us. Naturally, work on this theme will enable more accurate prediction of "how climate and meteorological phenomena will change," but the theme will also explore how to utilize the research results in society in order to minimize the lives and assets lost in natural hazards. We look forward to results that enable proposals that will cause a paradigm shift among policymakers.

High-resolution Climate Modeling and Application for Future Projection

Tomoaki Ose[1)], Ryo Mizuta[1)], Hiroyuki Murakami[2)], Shoji Kusunoki[1)], Akio Kitoh[3)] and Izuru Takayabu[1)]
1) Meteorological Research Institute (MRI/JMA in Tsukuba, Japan), 2) Geophysical Fluid Dynamics Laboratory (GFDL in Princeton, USA). 3) University of Tsukuba (in Tsukuba, Japan)
Key words: climate projection, extreme precipitation, tropical cyclone, high resolution, downscaling

High-resolution (20km and 60km) Atmospheric General Circulation Models (AGCMs) have been developed at MRI/JMA and applied to climate projections for extreme weathers such as tropical cyclones and heavy precipitation, and also to regional projections for extreme precipitation using 2 to 5 km downscaling (Kitoh et al., 2009) in the research projects for the past decade, sponsored by the Japanese Ministry of Education, Culture, Sports, Science and Technology (J-MEXT). Use of high resolution AGCMs provides significant merits. (1) Simulated present-day climatology is much better than those of coupled models because of real sea surface temperatures specified in AGCMs. This is critical for studying regional climate change (Kusunoki et al. 2006) and downscaling (Kanada et al. 2010). (2) High resolution models are able to represent realistic tropical cyclones (Murakami et al. 2008) as well as the effect of fine topography. (3) Variously controlled future projections are possible with the same AGCM. Actually, a CMIP3-ensemble-mean SST change was adopted for the 'most reliable' future projection in the J-MEXT KAKUSHIN project. Besides, uncertainty of projections was estimated by comparing the impact of different SST future changes and cumulus schemes in the ensemble projections (Endo et al. 2012).

For high resolution AGCMs, development of physical schemes, especially cumulus schemes, is still quite important. A new cumulus scheme was developed for high resolution AGCMs (MRI-AGCM3.2) in the KAKUSHIN project (Mizuta et al. 2012). Comparison of numerical metrics clarified that the new AGCM incorporating the new cumulus scheme improved the present-day climatology of precipitation, upper and low-level air temperature and circulations. In particular, subtle but significant improvement was obtained for the East Asian summer simulations. Tropical cyclones were simulated more realistically in respect to their distribution and strength (Murakami et al. 2012).

All ensemble simulations consistently project significant reductions in global tropical cyclone (TC) genesis number as well as ocean-basin scale reductions in TC frequency of occurrence and genesis in the western North Pacific and South Pacific Ocean (Murakami et al. 2012a). The previous and new versions AGCM commonly project a future increase of frequency of intense TC globally. The new 20km AGCM is able to simulate extremely intense TCs (categories 4 and 5) and indicates an increasing potential for those TCs in the western North Pacific future (Murakami et al. 2012b).

A new J-MEXT project (SOUSEI-C) is started, where the 20km-resolution MRI-AGCM3.2 is being integrated for a four-member ensemble of RCP8.5-scenario future projections using one CMIP5 ensemble mean and three statistically classified SST changes as well as the present-day simulation. The 20km AGCM outputs for further downscaling in any regions of the world will be available as well as the outputs for analysis.

Future change projections of the baiu and large-scale features associated with global warming.

Yasuko OKADA, Tetsuya TAKEMI, and Hirohiko ISHIKAWA
Disaster Prevention Research Institute (DPRI), Kyoto University, Gokasho, Uji, Kyoto 611-0011, Japan.
okada@storm.dpri.kyoto-u.ac.jp

Recently, the relationship between global warming and rainfall during the rainy season, which called the baiu in Japan, has been attracting attention in association with heavy rainfall in this period. In the Innovative Program of Climate Change Projection for the 21st Century, many studies show a delay in the northward march of the baiu front, and significant increase of daily precipitation amounts around western Japan during the late baiu season (e.g., Kusunoki et al. 2011, Kanada et al. 2012). This study focuses on atmospheric circulation fields during the baiu in Japan with global warming projection experimental data conducted using a 20-km mesh global atmospheric model (MRI-AGCM3.2S). Support of this dataset is provided by the Meteorological Research Institute.

The increase in moisture content is evident around East Asia, during the spring and summer. The baiu front indicated by the north-south gradient of moist static energy moves northward, both in present and future climate simulations. The rate of progression is very slow in May and June. Particularly in the future climate, the baiu front stagnates in south of Japan, including the Okinawa region. In July, the baiu rainband shifts northward, and moisture flux convergence concentrates on the Japan Sea side. In addition, instability deepens in the same area along with the season progresses. This northward shift is associated with the westward expansion of the enhanced the North Pacific subtropical high (NPSH) into Japan region.

In the mid-troposphere, the horizontal warm advection roughly corresponds to upward vertical pressure velocity, and shows northward migration as seen in the lower troposphere. In the future climate, the shift is delayed about 10 days compared to the present-day climate. This tendency is evident in the north-south term of 500-hPa warm advection in particular. Average temperature of during summer of the mid-, and upper troposphere has risen in all areas. However the temperature rise is small compared to the south in the north of Japan. As a result, the jet stream maintains around 25˚N. It is resolved that this suppression will be in July.

In conclusion, rate of temperature rising at upper layer is change the position of the jet stream, it suppresses extend westward the NPSH and shift northward baiu front. The precipitation is increased by the supply of moisture content associated with the circulation of the lower layer, especially in the late baiu. The results shown in previous studies are apparent from the point of view of atmospheric fields.

This work was conducted under the Program for Risk Information on Climate Change supported by the Ministry of Education, Culture, Sports, Science, and Technology-Japan (MEXT).

Risk of Flooding at the Global Scale under Climate Change

Yoshihiko ISERI[1], Wee Ho LIM[2], Tiratas SUWATHEP[2], Chihiro MIYAZAKI[2], Yukiko HIRABAYASHI[3], Roobavannan MAHENDRAN[4], Sujan KOIRALA[5], Dai YAMAZAKI[6], Satoshi WATANABE[3], Hyungjun KIM[3], Shinjiro KANAE[2]

1: Tokyo Institute of Technology, iseri.y.aa@m.titech.ac.jp

2: Tokyo Institute of Technology

3: The University of Tokyo

4: University of Technology, Sydney

5: Max Planck Institute for Biochemistry

6: Japan Agency for Marine-Earth Science and Technology

Flooding is among the costliest natural disasters on the human society. In 2012, it was reported that total damages due to flooding exceeded US$ 19 billion (Ward et al., 2013). Increasing greenhouse gas emission fuels climate change and might alter the risk of flooding at the global scale. To perform flood risk assessment under climate change, we need to utilize the best possible scientific tools at the forefront of the climate change investigations. One possible way is by using the hydroclimate outputs corresponding to different future climate scenarios that are available at the CMIP5 data archives. These outputs could be used to drive a macro-scale river routing model (we use CaMa-Flood model (Yamazaki et al., 2011); spatial resolution: 0.25ºx0.25º) to get detailed hydrological outputs at the global scale, e.g., discharges, river depths, storages and etc. Based on the extreme values statistics, long-term change in flood risk could be projected. Whilst our earlier results showed that the flood risk at the global scale would increase and the severity depends on different future climate scenarios (Hirabayashi et al., 2013), it is not clear about the severity of flood risk for different geographic regions. For each region, we estimate climate change impact (i.e., results with inter-annual variability and that with long-term average change) and project flood risk (e.g., exposures, damages) from the 20th century to the end of the 21st century. We also develop a Bayesian model to relate recorded flood losses with the result of our flood risk projection. Using this Bayesian model, more reliable projection of flood losses could be achieved. These results might be informative for formulating adaptation strategies on flood risk reduction across different regions.

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Water and Sediment-Related Extreme Event in the Western Pacific Region

Faizah CHE ROS [1], Goro Mouri[2]
1: Department of Systems Innovation, University of Tokyo
2: Institute of Industrial Science (IIS), University of Tokyo

In a volcanic environment, many sediment discharge's drivers are significantly greater compared with other mountainous. It is believe that sediment transport in and to river channels in volcanic mountainous terrain is strongly influenced by climate conditions, particularly when heavy precipitation and warmer climate triggers a mud-flow in association with snow melting. Focusing on the river of active volcanic territories in Kamchatka Peninsula located in east of Russia. Two sets of data has been taken in a different year and time in 2012 and 2013. Three exponential graphs of suspended sediment (m^3/s) and river discharge were plotted for both periods as shown in Figure 1. For main channel in 2012, the graph shows huge variation of suspended sediment when the discharges is only around 10 to 30 (m^3/s) at the main channel. By plotting the tread line, the slopes were around 4.2 whereas for left tributary during the same period, the discharge was varied but compared to suspended sediment where the slope is only 0.25. This can be explained as main stream bed is thick fluvial sediment bed containing loose bed materials whereas for left tributary, the bed is consist of gravel and boulders. For left tributary in 2013, the relationship between suspended sediment and river discharge is stable due to the low concentration in sediment and the water is limpid.

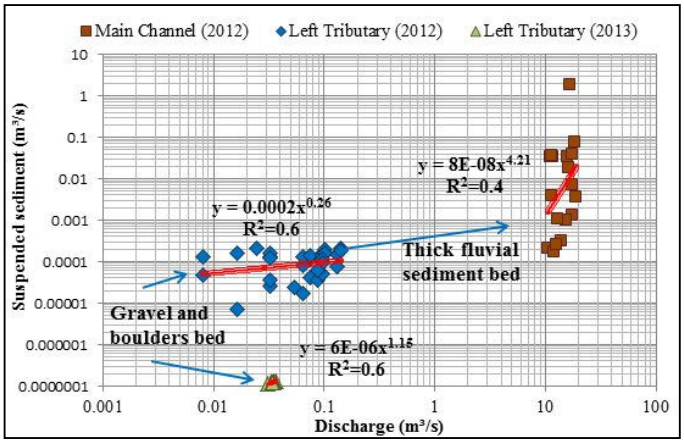

Figure 1: Suspended sediment versus river discharge for both period (Mouri et. al, 2014)

Rainfall Intensity-Duration Thresholds and Recurrence Intervals for Landslide Occurrences in Granitic Mountains, Japan

Hitoshi SAITO[1,3], Wataru MURAKAMI[2], Hiromu DAIMARU[2], Takashi OGUCHI[3]
1: College of Economics, Kanto Gakuin University, Japan, hsaito@kanto-gakuin.ac.jp
2: Forestry and Forest Products Research Institute, Japan
3: Center for Spatial Information Science, The University of Tokyo, Japan

Dealing with predicted increases in extreme weather conditions due to climate change requires robust knowledge about controls on rainfall-triggered landslides. Numerous studies have attempted to decipher critical rainfall conditions during which hillslopes become unstable. This study examined recurrence intervals of heavy rainfall and rainfall intensity-duration (I–D) thresholds for shallow landslide occurrence in two granitic mountains in Japan which have different climatic conditions and topography. Mt. Ichifusa is located in southwestern Japan, and characterized by a mean annual precipitation of more than 3,000 mm. Shallow landslides frequently occurred after clear-cutting since the 1960s in the mountain. The Abukuma Mountains are located in the northeastern Japan where the mean annual precipitation is about 1,500 mm, and extensive rainfall-induced shallow landslides in 1971. We interpreted orthorectified aerial photographs, and calculated landslide areas in the study areas since the 1950s. We also calculated mean rainfall intensity (I, mm/h) and the duration (D, h) of all rainfall events since the 1950s in Mt. Ichidusa, and since the 1970s in the Abukuma Mountains. Rainfall events were separated by the absence of rainfall for 24 h. We then examined the I–D thresholds of extreme rainfall events for extensive shallow landslide occurrences in each period of aerial photographs. We used a quantile-regression method and assumed that the threshold curve is a power law $I = \alpha \times D^{\beta}$, where α and β are constants, to determine the I–D threshold. Finally, we estimated recurrence intervals for rainfall thresholds using a Gumbel distribution.

In Mt. Ichifusa, results show that few shallow landslides occurred at the beginning of clear-cutting but occurred frequently after clear-cutting, such as during periods of 1976–1980, 1980–1985, and 1990–1995. The cumulative shallow landslide area reached c.a. 6 % in the clear-cutting area. I–D thresholds after the clear-cutting declined to one-third of those at the beginning of the clear-cutting. These thresholds roughly correspond to return periods of >5 yr and <1 yr for before and after clear-cutting, respectively. In the Abukuma Mountains, the I–D thresholds for the extensive shallow landslide occurrences correspond to a return period of >5 yr. These results seem to be important for landslide hazard assessments and future forest management but should be verified in other granitic mountains in Japan.

Simplified Flood Hazard Assessment Methodology: A step towards Global Risk Assessment

Maksym GUSYEV [1], Youngjoo KWAK[1], Toshio OKAZUMI[2], Sangeun LEE[1,3], Daisuke KURIBAYASHI[1], Nario YASUDA[4], Hisaya SAWANO[1]

1: International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO, Japan
1-6 Minamihara, Tsukuba, Ibaraki, 305-8516, Japan, e-mail: maksymgusyev@gmail.com; gusyev55@pwri.go.jp

2: Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan

3: National Urban Disaster Management Research Center, Land Management and Urban Research Division, Korea Research Institute for Human Settlements, Republic of Korea

4: Japan Dam Engineering Center, Japan

The global risk assessment of water-related disasters is indispensable to set global measurable goals to mobilize international cooperation and coordination towards disaster risk reduction (DRR) actions. Since the available data for the global assessment are limited, a simplified methodology has to be adopted by international organizations. In this study, we demonstrate a simplified flood hazard assessment methodology in the Pampanga (the Philippines) and Chao Phraya (Thailand) river basins by 1) using numerical models with globally available data at each river basin, 2) estimating flood discharge and potential inundation using model outputs, and 3) quantifying the effectiveness of water infrastructure to reduce flood hazard (Okazumi et al. 2014). In our simplified methodology, we used the globally available and free data sets (e.g, precipitation, temperature, topography, soils, land use, etc.) to construct the Block-wise TOP (BTOP) and the Flood Inundation Depth (FID) models. When the river discharge and water level data were available, these data were used for the BTOP and FID model calibration to improve simulated results. For the flood river discharge, the 50-year return period flood discharge was estimated from the simulated daily river discharges at each BTOP model grid considering individual dams' flood control effectiveness, which reduced the 50-year flood discharge downstream of the dams' locations. For the flood inundation, the FID model used the BTOP simulated 50-year flood discharge results and produced cumulative (maximum) flood inundation depth maps. The use of the FID model allowed us to consider levee effectiveness when producing flood inundation depth from flood water level due to the 50-year flood river discharge. Therefore, the benefit of the proposed methodology is twofold: 1) the flood hazard methodology is consistent for any river basin size producing universal measurement tool for the flood risk assessment and 2) the flood hazard results could be compared with other river basins. From these preliminary results, we conclude that our flood hazard assessment methodology can alleviate the limitation of the data unavailability globally, especially in developing countries, and can produce tangible results that are used for the local risk hotspot identification (Lee et al. 2014, Okazumi et al. 2014).

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Agricultural Flood Risk Assessment in the Pampanga River Basin of the Philippines

Badri Bhakta SHRESTHA[1], Hisaya SAWANO[1], Miho OHARA[1] and Naoko NAGUMO[1]
1: International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute (PWRI), 1-6 Minamihara, Tsukuba 305-8516, Japan, shrestha@pwri.co.jp

Risk of flood disaster has been increasing tremendously by rapid urbanization and development activities constituting threat to economies, population and sustainable development, which will be increased more by climate change impact. To reduce the risk of flood damage, risk assessment to identify existing risk in the areas is first step. In this study, agriculture damage estimation method was developed for risk assessment. Agriculture damage refers here as damage occurring to rice-crops. The agriculture damage was defined as function of flood depth, flood duration and growing stage of crops. Figure 1 shows developed rice-crops damage function at each growing stage of rice-crops as an indicator to estimate flood damages. By using developed damage function, flood damage for past flood event was simulated with flood hazards simulation done by using Rainfall Runoff Inundation (RRI) model developed by Sayama et al. (2012). Figure 2 shows calculated agriculture damage for September 2011 flood, in which severe flood damage occurred in the Pampanga river basin of the Philippines. The estimated affected area and amount of damage of the agriculture in the Pampanga river basin for September 2011 flood are 45,900 ha and 1,461 million Pesos, respectively. The developed methods of agriculture damage can be applied to other river basins.

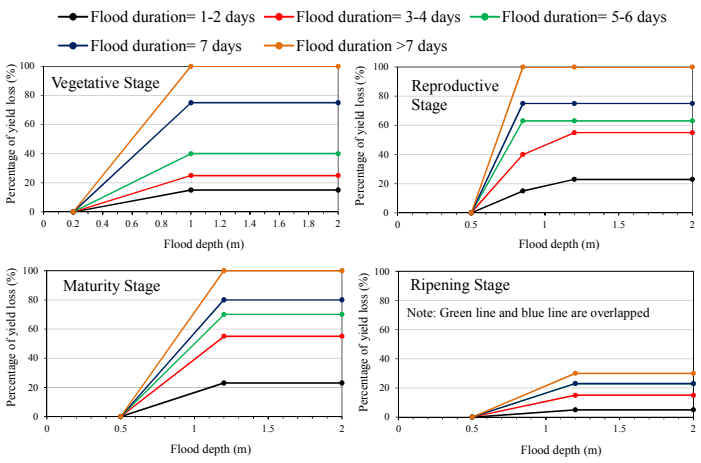

Figure 1 Developed flood damage function for rice crops.

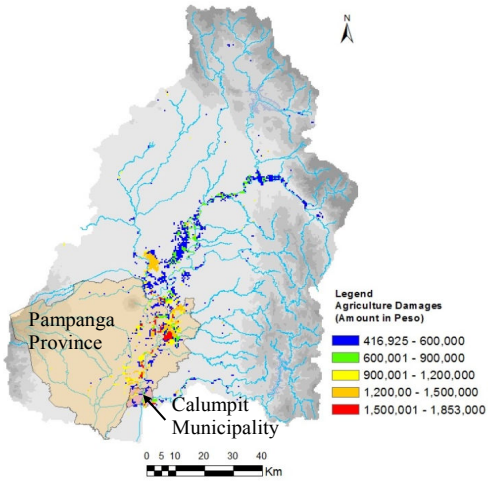

Figure 2 Calculated agriculture damage for September 2011 flood (500m x 500m grid size).

Reference

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Application of flood analysis models using satellite-based rainfall to mitigate flood impact

Morimasa TSUDA [1], Mamoru MIYAMOTO [2], Takahiro SAYAMA [2], Yoichi IWAMI [2]
1: International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute (PWRI), mori-tsuda@pwri.go.jp
2: International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute (PWRI)

In basins where flood control facilities have not been developed sufficiently, timely evacuation is important for reducing loss of life and property. Forecasting the extent of flooded area is useful to support evacuation during a flood, and equally useful to design effective rescue plans for future events. However, the application of flood forecasting and analysis models in such basins has not advanced as expected for various reasons, including financial difficulties and lack of hydrological data (i.e., rainfall and river water level data). ICHARM has been studying two flood analysis models, the Integrated Flood Analysis System (IFAS) and the Rainfall-Runoff-Inundation Model (RRI) to help overcome such constraints. Both models can utilize globally-available topographical datasets in case local information is insufficient and not only satellite-based rainfall data (i.e., GSMaP, 3B42RT) but also ground-based rainfall data.

IFAS is a flood forecasting system which calculates river discharge mainly in the mountainous area. This system contains GIS functions to create a flood-runoff model with interfaces to import rainfall data and display output results effectively in a short period of time. IFAS is also extremely cost-effective; the software is downloadable for free at the ICHARM website. Moreover, default parameters for runoff analysis are prepared for immediate use, and flood analysis can be implemented even with limited hydrological data for parameterization.

RRI can simulate the processes of rainfall-runoff and inundation simultaneously based on two-dimensional diffusive wave equations. RRI is advantageous, especially when flood inundation occurs at multiple locations in a basin or when it is difficult to separate rainfall-runoff and inundation processes within a basin. In addition, since RRI is an open source code program, it allows advanced users to customize the program for further simulations.

Flood forecasting and analysis systems based on IFAS and RRI have already been applied to some basins, such as the Indus river basin of Pakistan. The application results suggest that satellite-based rainfall data and GIS-based models are applicable to basins with insufficient hydrological and geophysical data although simulations using satellite rainfall data need further improvement in accuracy for operational use in the future. ICHARM hopes that the two models will be useful for the immediate and efficient implementation of flood impact mitigation in insufficiently-gauged basins.

Early Warning System for Flash Floods in Capital of Pakistan

Dr. Ghulam Rasul

Islamabad is capital of Pakistan located over the foothills of Himalayas comprising steep slopes which generate high speed rainfall runoff. Heavy monsoon downpours exceeding 200mm per days during summer is the common feature of the terrain. During summer season (June-September) monsoon low pressure systems locally known as depressions form over the Bay of Bengal and they travel westward along the southern slopes of the Himalayas. Through Kashmir they enter Pakistan which is the western limit of the Asian Summer Monsoon. Due to inverted V shaped topography, rainfall intensity is generally very high as compared to rest of the areas under the influence of monsoon. Climate change has visible impacts on the increased frequency and intensity of rainfall since 1990s. On 23rd July 2001, cloudburst event produced 620mm rain during 10 hours and Pakistani capital and its neighbouring city of Rawalpindi both were heavily flooded despite the steep slopes of terrain. It took 235 human lives, 3290 buffaloes and destroyed 337 houses. Damages to public sector infrastructure were estimated to the tune of $760 million. A main stream called Lei Nullah runs north to south from Islamabad to Rawalpindi discharging huge volume of water. Its basin is spread over an area of 700 km^2 and several minor streams converge into the main stream. The heavy downpour event of 2001 was an extraordinary one which urged the planners to develop an effective early warning system which could save huge losses to property and human as well as animal lives. Over the basin, there are 2 river gauges and 10 automatic rain gauges passing rainfall amount at 10 minutes interval by telemetry to the control room where data processing system is installed. On the basis of analysis, alerts and warnings are generated which are then conveyed to the public through 8 acoustic siren warning posts located in the endangered population living along the Nullah Lei. The warning criteria are based on both progressive totals of rainfall in the basin and the level of river gauges at representative locations. There are four stages of the warning system i.e. pre-alert, alert, siren and evacuation. With the help of local administration, at critical levels, sometimes forced evacuation is exercised. This is the best example of public service and coordination of meteorological service and public safety sector in the region.

Integrating Disaster Risk Reduction into Ecological Restoration of the Five Lakes of Mikata, Fukui, Japan

Takehito YOSHIDA[1]
1: Department of General Systems Studies, University of Tokyo,
Komaba, Tokyo, 153-8902 Japan, cty@mail.ecc.u-tokyo.ac.jp

The Five Lakes of Mikata are located in the central part of Japan on the Japan Sea coast. They are a part of Wakasa Bay quasi-national park and registered as a Ramsar wetland, harboring substantial biological diversity and having a long history of human-nature relationship since the Jomon period. Similar to other inland-water ecosystems, degradation of the environment has been threatening the biodiversity, resulting in the decline of ecosystem services that the ecosystem provides to the local community. As the countermeasures, ecological restoration based on the law for the promotion of nature restoration is in progress. The nature restoration committee was established in 2011 by having diverse members including residents, farmers, fishermen, NGOs, researchers and local governments (Fig. 1). Then, long-term goals of the restoration and implementation plans for meeting these goals were decided by 2013, although predicted climate change and disaster risk reduction against it were not considered yet.

The local community around the lakes has experienced floods every five years on average (Fig. 2). This is due to the low discharge capacity, which depends on the single outflowing river to the sea, and the countermeasures have been discussed for the last decade or so. Among other countermeasures, the construction of a new tunnel as another drainage from the lake to the sea is about to be decided, based on the cost/benefit analysis of the different countermeasures. This cost/benefit analysis takes some economic valuations into account, but ecological costs and benefits are not fully acknowledged, partly because there is no formal process to include the ecological cost/benefits and to integrate both the economic (monetary) and ecological (non-monetary) valuations into one.

In this presentation, I will summarize the current situation of the ecological restoration and the disaster (floods) risk reduction in this system, and discuss the potential for merging the two different aspects of ecosystem management.

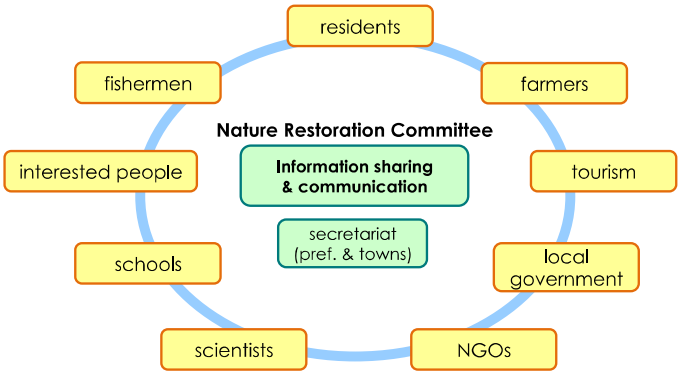

Fig 1. Members of the *Five Lakes of Mikata* Nature Restoration Committee

Fig 2. Floods of Lake Mikata caused by the typhoon *Tokage* in 2004.

Disaster Risk Reduction of World Heritage Sites of Iran, The case of Persepolis and Naghshe – e Rustam Sites

IranGhazi[1],Masoud Rezaei Monfared[2],Hassan Shahamat[3]
1: Emeritus professor of geography at the University of Isfahan and also the vice chancellor of Research Institute of Shakhes Pajouh, iran_ghazi@hotmail.com
2: Ph.D student in Crises Management of Shakhes Pajouh and also the head of the department of Persepolis World Heritage and Naghshe –e Rustam Sites
3: MD, Persepolis Historical Site Researcher

Geological and geotechnical hazards such as landslides, earthquakes**,** floods and drought threaten numerous cultural heritage sites around the world (Gizzi**,** 2008)
Persepolis world heritage and Naghshe – e Rustam sites which are among the significant legacies of Iran are the obvious examples. These historical monuments have remained from Achaemenid period (530-330 B.C).The sites are located in the Marvdasht plain of the province of Fars **,** south eastern part of Iran. Integrated disaster risk reduction research in these areas is one of the most fundamental prerequisite to the introduction of any disaster risk reduction policy.

A recent hydrological study indicates that more than 20 meters of the earth's crust layers have been subsided due to drought and extensive digging of water wells and also over extraction of water have resulted in the creation of long deep cracks on the nearby surface layers detected for the first time in 2012. In this paper, the authors through the deployment of reliable documents as well as field observations, present an evidence–based description of the issues and recommend some practical strategies to eliminate underlying causes of disaster risks such as drought, excessive ground water withdrawal and inefficient irrigated agricultural system of the plain.

Disaster Risk Reduction in River Basins of Iran
The Zayandeh Rud River Basin illusive picture

Iran Ghazi[1]
Research Institute of Shakhes Pajouh, Isfahan, Iran

Natural hazards and their consequent disasters have been affecting Iran for many years. The contrasting natural hazards such as drought and floods have had chronic impacts on Iran. In many basins including the river basin of the Zayandeh Rud river of Isfahan, drought always automatically leads to farmer's insecurity and poverty.
In 2007 the office of the vice president of Iran in science and technology was formed and the department of water resource, drought, desertification and environment was established, as its name explains, as a disaster risk reduction mechanism. In spite of this attempt, drought has remained a household term in the region, costing the loss of tens of thousands of agricultural jobs every year. The looming of climate change combined with inefficient water resource management in the basin, punctuated the day to day life of more than 300000 farming families in the basin. To reduce the disaster risks in the basin, a recently established Supreme Water Council chaired by the president of Iran, introduced some strategies to be implemented by different regional authorities. So far the strategies have mainly remained as rosy picture on paper and are difficult to make impact on the region.

The past years shortage of water affected tens of thousands people. This has triggered all the major stakeholders to come together to demonstrate and demand the implementation of strategies to end water shortage emergencies and local unrests. To carry out some of the plans, requires a fund of hundreds of billions of rials[2]. However, the impact of any initiative will be seen in the years to come.

This paper assesses the past performance of water management and development sustainability in the region and critically investigate the Supreme Water Council objectives. It also probes into the process of water disaster risk reduction strategy formulation by making the following relevant questions:

1. Is the disaster risk reduction strategy in the Zayandeh Rud basin research/science – based or simply council - based?
2. Why have water shortage and drought prevention remained as an illusive picture?

[1] Iran Ghazi (iran_ghazi@hotmail.com) is an emeritus professor of geography at the University of Isfahan and also the vice chancellor of Research Institute of Shakhes Pajouh
[2] Iranian currency, (each 35000 rials equal to 1 US$)

Lakes and Aquatic Ecosystems in Danger: Urmia Lake in Iran, Causes and Countermeasures

Ali CHAVOSHIAN [1], Bahram TAHERI[2], Alireza EFTEKHARI[3], Majid SAYYARI[4]
1: Regional Centre on Urban Water Management (RCUWM) under the auspices of UNESCO, International Drought Initiative Secretariat, chavoshian@gmail.com
2: Urmia Lake Restoration Committee, Cabinet Office of Iran
3: Water research Institute, Ministry of Energy, Iran
4: Iran Water Resources Management Organization, Ministry of Energy, Iran

Urmia Lake is one of the largest salt lakes in the world and is located in a closed basin in north-west Iran. The basin area is 51,870 km^2 and at its full size, it is the largest lake in the Middle East and the sixth largest saltwater lake on earth with a surface area of 5,000 to 6,000 km^2, and an average depth of 5.4m depth. Due to its unique natural and ecological characteristics, Urmia Lake is a protected area as a UNESCO Biosphere Reserve and a Ramsar Convention site.

The lake surface and water volume have been decreased dramatically over the last two decades. The lake's surface area has been estimated to have been as large as 6,100 km^2 in 1995, but since then it has generally been shrinking and was estimated from satellite image to be only 1300 km^2 in August 2014, approximately 20% of its original surface area. The drying Urmia has severe socio-economic and environmental impacts in the region. The basin area is an important agricultural zone with a population of around 6.4 million people; an estimated of 76 million people live within a radius of 500 km of the lake in five countries of Iran, Turkey, Iraq, Armenia and Azerbaijan.

Those around the lake are afraid of a situation similar to Aral Sea, which has dried up over the past several decades. Disappearance of the Aral Sea has been an environmental disaster affecting people throughout the region with windblown salt-storms. The population surrounding Urmia Lake is much denser putting more people at risk of impact.

Present status of Urmia Lake is the result of complex of various natural and human factors such as increasing of the agricultural land, changing the crop pattern and producing high water consuming products on the basin area, low water productivity and lack of effective protection from the basin ecological and environmental resources, as well as, climate change and decreasing rate of precipitation and surface runoff all over the Urmia basin. In other words, lack of enough water flow into the lake in the recent years resulted in an intensive trend of decreasing rate of water level and lowering its water volume.

This poster abstract is describing the major causes of Urmia Lake shrinking area and possible solution to deal with this regional disaster and restore the lake.

Potential of Disaster Waste Generation from Durable Household Goods

Tomohiro TABATA[1], Ou ZHANG[2], Yuna YAMANAKA[2], Peii TSAI[2]
1: Kobe University, tabata@people.kobe-u.ac.jp; 3-11 Tsurukabuto, Nada-ku, Kobe 657-8501 JAPAN
2: Kobe University

The restoration of areas affected by natural disasters such as earthquakes and tsunamis requires the immediate removal and treatment of wastes generated by the disasters. Estimating the potential of disaster waste generation in advance is preferable during the formulation of the disaster response plans regarding waste management. Japan is frequently prone to natural disasters and related damages. Therefore, it is important to understand how the volume and types of disaster waste generated in cities are influenced by factors such as economic scale and population density. This study aims to develop a model for estimating disaster waste generation, with emphasis on the involvement of durable household goods. The size of household stock is small in comparison with the overall city stock. However, it should not be neglected given that the estimated retention of Japanese durable household goods is approximately 130 trillion JPY [1]; this retention value corresponds to 25% of the Japanese GDP in FY2013 (FY means fiscal year. FY2013, which ends in March 2014).

Firstly, regression analysis is conducted to estimate the amount and types of durable household goods using parameters such as household size and annual income [2]. Secondly, durable item weights are estimated through web-based searches. The household stock is quantitatively estimated by multiplying the amount of durable goods with the corresponding item weights. Finally, the potential of disaster waste generation is estimated by taking into account seismic and/or tsunami damages. This model was applied to Japanese cities affected by the Nankai mega-thrust earthquakes, and the generated disaster waste was estimated.

Acknowledgements

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Tsunami erodes rocks: assessment of characteristic morphology from high-resolution topographic measurements in the Sanriku Coast

Yuichi S. HAYAKAWA[1*], Takashi OGUCHI[1], Hitoshi SAITO[2]
1:Center for Spatial Information Science, The University of Tokyo, 5-1-5, Kashiwanoha, Kashiwa, Chiba 277-8568, Japan *hayakawa@csis.u-tokyo.ac.jp
2: Department of Economics, Kanto Gakuin University 1-50-1, Mutsuurahigashi, Kanazawa-ku, Yokohama, Kanagawa 236-8501, Japan

Severe tsunami waves induced by the 2011 Tohoku-Oki earthquake (Mw 9.0) attacked rocky coasts and valleys along the ria-type coast in Sanriku, northeastern Japan. The tsunami waves caused erosion of not only the coastal cliffs but also valley-side slopes inland composed of bedrock (Fig. 1). We performed field measurements of terrestrial laser scanning (TLS) to obtain detailed topographic data in the coastal Aneyoshi Valley after the tsunami incident. High-resolution digital elevation models (DEMs) obtained by TLS (Fig. 2) were then analyzed to reveal typical topographic features in the bedrock, and four characteristic features were identified: 1) a series of small cliffs on the valley-side slopes whose heights tend to correspond to tsunami inundation heights, 2) inverse asymmetry of valley-side slopes at ingrown meander bends, 3) an unusually wide valley bottom near the coast, and 4) a knickpoint located around the maximum tsunami run-up height. The four features seem to have formed by recurrences of tsunami wave erosion since the mid Holocene. Such morphological features may be utilized to estimate the typical magnitude of tsunami waves in other areas prone to tsunami, helping evaluation of disaster risk therein.

Fig. 1. Aneyoshi Valley eroded by the March 2011

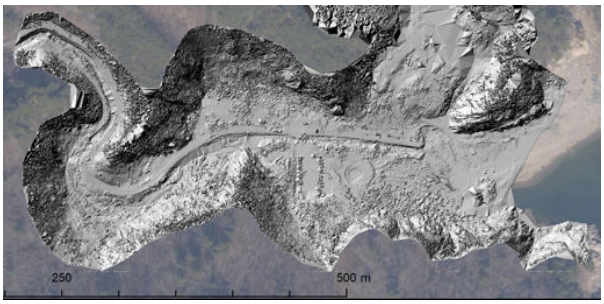

Fig. 2. Shaded relief image of Aneyoshi Valley from TLS

Causes and Risk Strategy of Natural Disasters

Yasunori Miura
Yamaguchi University, Japan, yasmiura50@gmail.com

All natural huge disasters of earthquake, volcano and asteroid-impact which are caused by strong shock-waves more than rapid sound-wave (Miura, 1996), would change continuously to the Earth system and life substances. In active planet Earth with dynamic systems, desired strategy of terrestrial activity with human society for disaster risk reduction and resilience would be summarized as follows:

1) Origins of three shock-waves of earthquake, volcano and asteroid impact are based on extreme explosive phenomena of higher temperature and pressure followed by high velocity to transportation. Three shock-wave phenomena are observed on terrestrial surface through the terrestrial interiors (in earthquake and volcano) and extraterrestrial collisions (in asteroid impact).lived by human kinds. We cannot predict the detailed time and space of three shock-waves in advance.

2) Volcanic explosion is originally caused by extreme magmatic condition
Through volcanic vent with higher uplift velocity, which are observed by mountain change and explosive dusts and rocks for living people. Earthquake event is originally caused by explosive condition of higher temperature and pressure related with volatiles from water and gas at limited dynamic locations of terrestrial surface based on plate-movements on the ocean water system, which can be found by the surface changes with fault-formation activity after effective detections of earthquake. Extraterrestrial collisions related with asteroid impacts are originated from extraterrestrial explosions of star (supernova) and dusts-planets collisions, which would be controlled by the extraterrestrial tracking-and attacking-stations from terrestrial surface and proposed other celestial bodies in advance.

3) The effective reduction strategy of global warming caused mainly by natural shock-waves and industry-related high temperature carbon dioxides could be applied by continuous condition-changes without any stopped disposals (Miura, 2013, 2014) on active planet and human life effectively in future.

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Disaster Management in Japan

Akihiro SHIMASAKI [1], Yusuke AMANO[2]
1: Ministry of Land, Infrastructure, Transport and Tourism,
2-1-3,Kasumigaseki, Chiyoda-ku, Tokyo 100-8918 JAPAN, shimasaki-a2hh@mlit.go.jp
2: Ministry of Land, Infrastructure, Transport and Tourism, amano-y2z2@mlit.go.jp

Japan frequently suffers from various disasters such as floods, droughts, sediment-related disasters, volcanoes, earthquake and tsunami because of its geographical, topographical and meteorological conditions. Based on the lessons learned through our past experience in disaster management, Japan is seeking more effective disaster management including both structural and non-structural measures.

The scopes of the presentation are to overview the characteristic of natural and social conditions in Japan, and to explain the measures taken in the disaster management with the description of examples of water related disaster management. The characteristics of Japanese disaster management system are: 1) to take importance in investment for “disaster prevention”; 2) to combine structural and non-structural measures appropriately utilizing advanced technology; 3) to recover and reconstruct the facilities for reducing damages; 4) to record the disasters for evidence based disaster management; and 5) to make various stakeholders to participate in disaster management.

Japanese Technologies Utilized in water related disaster Management and Its Contribution to the World

Akihiro SHIMASAKI [1], Yusuke AMANO[2]
1: Ministry of Land, Infrastructure, Transport and Tourism,
2-1-3,Kasumigaseki, Chiyoda-ku, Tokyo 100-8918 JAPAN, shimasaki-a2hh@mlit.go.jp
2: Ministry of Land, Infrastructure, Transport and Tourism, amano-y2z2@mlit.go.jp

In Japan, we have developed a variety of technologies for water disaster management, ranging from preventive structural and non-structural measures to post disaster measures. We have also developed technologies for utilizing existing facilities more effectively. These technologies are contributing to water related management not only in Japan but also in various countries in the world.

We introduce some technologies for water disaster management such as advanced rainfall observation system, advanced drainage technology, the technology for monitoring and observing landslide dams and so on. And we show some examples of how these technologies contributed to the water related disaster management in various countries.

NARBO's Achievement and Future

Kentaro KIDO
Tadashige KAWASAKI
Secretariat, Network of Asian River Basin Organizations (NARBO)
kentaro_kido@water.go.jp
tadashige_kawasaki@water.go.jp

Network of Asian River Basin Organizations (NARBO) was established in 2004 to achieve Integrated Water Resources Management (IWRM) throughout Asia by enhancing the capacity of River Basin Organizations (RBOs). Our main activities are i ; Capacity Development through training course and workshops on IWRM, ii ; Information sharing through publications and website, and iii ; Telling Asian voice to the world at the international conferences. Especially, we're promoting implementation of IWRM by showing how to implement by using "IWRM Guidelines at River Basin Level" which was launched by UNESCO in 2009 and 'NARBO RBO Performance Benchmarking' which is using 14 original indicator to measure the situation of the development of RBOs.

As results of NARBO activities, influence in Asia has increased drastically. Now, we have 84 organizations from 18 countries as member organizations, and 1st chairperson of NARBO has become the Minister of Ministry of Public Works and Housing in Indonesia. In addition, many of the head of NARBO member organizations are the people who have joined NARBO's activities such as IWRM training courses. In this way, leadership to promote and implement IWRM is expected to be provided, and it will contribute to promote IWRM.

10 years have passed since the establishment of NARBO. NARBO hold the 10th Anniversary Meeting in Manila on 19-20 November, 2014 to review our achievement and discuss future NARBO. Concrete achievements of NARBO have been introduced and expectations to NARBO were shared with member organizations. In addition to the issues of sustainability of NARBO activities, issues to the impact of climate change were pointed out at the discussion. Unexpected hydrological events have already occurred around the world. More collaboration with scientists and practitioners are needed to be enhanced to cope with it by boosting the implementation of both structural and non-structural measures at field level. 'Manila Declaration' which was released as a summary of the NARBO 10th Anniversary Meeting mentioned it.

The poster introduces how NARBO contributed to improve IWRM in Asia through capacity development of RBOs and explores the necessity of collaboration with scientists and researchers for future IWRM.

“Advanced Dam Operations” for the flood due to the extreme rainfall

Kentaro KIDO
Director, International Affairs Division,
kentaro_kido@water.go.jp
Water Resources Engineering Department, Japan Water Agency

In our poster, we would like to introduce the historical achievement for the dam operation for preventing flood on 7th October 2009 caused by Typhoon No.18.

In this case, the torrential rain occurred at the upstream of Nabari River, and the serious inundation was estimated to be inevitable around the urban area of Nabari City which is a major residential area for Osaka and Nagoya City, if the dam operations follow the regular rule.

To prevent the flood, several JWA’s dams located at the upstream of Nabari River, Shorenji Dam , Hinachi Dam and Murou dam , were harmoniously operated to avoid catastrophic disaster, following a legal framework, but flexibly establishing a new approach to dam flood operation.

This harmonious dam operation was named “Advanced Dam Operations” for flood control . This method is based on not only improved rain forecasting and runoff analysis technology, but also well collaboration between the dam operation office and competent authorities , i.e. the regional office of Ministry of Land Infrastructure, Transport and Tourism and Mayor of Nabari city government.

Due to the result of this effort, We could successfully reduce the water level at Nabari City 1.5m comparing the result of the regular operation. And JWA received a letter of appreciation from Mayor of Nabri City, and an Outstanding Civil Engineering Achievement Award from Japan Society of Civil Engineers in 2010.

This significant achievement shows one of the key for the solution of the extreme rainfall events, which may occur more frequently due to the future global climate change.

And additionally, we would like to introduce the activity of Japan Water Agency”

Flood Analysis and Forecasting by Spatio-Temporal Data Mining based on historical satellite image database

LI Xi[1] and Wataru TAKEUCHI
[1]Institute of Industrial Science, University of Tokyo, Ce-505, 6-1, Komaba 4-chome, Meguro, Tokyo 153-8505, Japan
lixi@iis.u-tokyo.ac.jp

ABSTRACT: AMSR-E data were used to map land surface water coverage (LSWC), which can fast reveal large-scale flood patterns. And the daily LSWC database in time series from 2002 to 2011 was built. Then, PALSAR data (ScanSAR mode) was used to compare to AMSR-E, it is indicated that the availability and importance of LSWC database for flooding detection, moreover, by using PALSAR data (Fine mode) to map water coverage, showed its superiority in the accurate flood evaluation based on a known flood event. Finally, focused on one flood event to analyse and then conducted image similarity calculation, gave a ranking and lined up all the historical images from highest to lowest of LSWC to discover hidden regularities and useful information from collection of LSWC images.

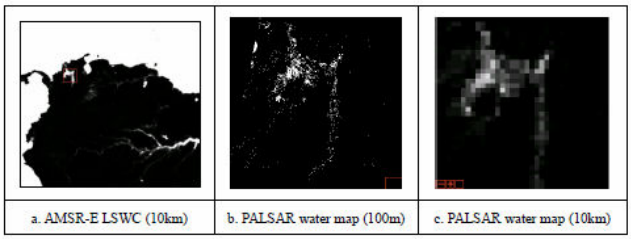

Figure 1: Two kinds of remote sensing image in Colombia (2011/05/23)

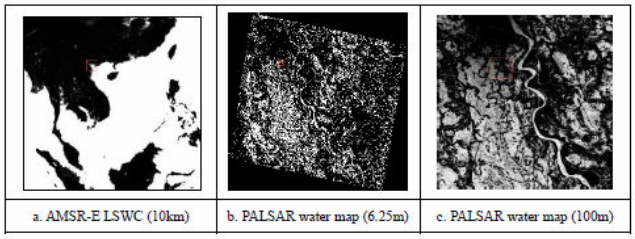

Figure 2: Two kinds of remote sensing image in Vietnam (2008/11/05)

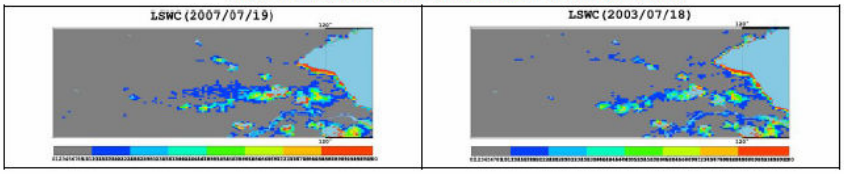

Figure 3: Comparison of LSWC map between standard (2007/07/19) and target (2003/07/18) in Huai River Basin

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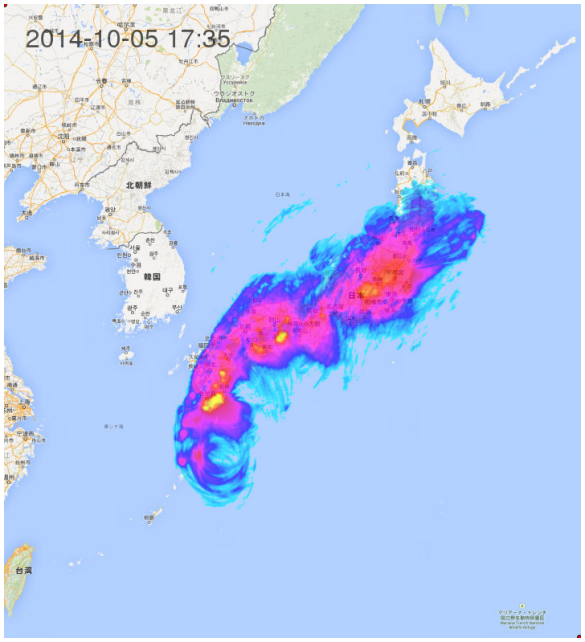
Disaster Hazard Information Providing System using Hi-Resolution Precipitation NOWCAST

Nobuhiro SAWANO [1], Takahiro SAWADA[2]
1: Women's College Department of Kanazawa Seiryo University,sawano@y8.dion.ne.jp
2: Nabla-Zero Co., LTD., saw@computer.org

Japan Meteorological Bureau (JMB) and Japan Meteorololical Bussiness Support Center(JMBSC) started providing Hi-resolution Precipitation NOWCAST (HPN) from August 7, 2014. HPN is a kind of radar-raingauge analyzed precipitation data consisted of 250 by 250 meter grid with 5 minutes' time interval. HPN is created from two different radar observations; JMB original radar network and X-Band radar network operated by Monastery of Land, Infrastructure and Transport. Before JMBSC's starting to submit HPN, they have provided Precipitation NOWCAST of 1,000 by 1,000 meter grid with 10 minutes' time interval. HPN data providing service has started from August 7, 2014.



We have started to receive HPN at 10:00 on September 2, 2014 by our own internet server. Each 5 minute scene of HPN is created with GRIB2 binary format consisted of four parts of data such as 1) maximum strength 2) accumulation 3) forecast of strength and accumulation with 250 meter grid and 4) forecast after 35 to 60 minutes with 1,000 meter grid.

Commonly, WGIB2 by NOAA is used to process radar-raingauge analyzed precipitation data, however this code cannot treat HPN, then we extended this source. Some other original source codes are also developed by authors to calculate accumulation of past 24, 36 and 48 hours and forecast of 30 and 60 minutes later.

Deluge and other disasters such as landsides are thought to be caused by integration of time-varying with non-time-varying factors. Rainfall and its accumulation is one of the typical former factors while vulnerability of soil and some other hydraulic characters defined by terrain are the latter. Our information providing site can provide both factors. Details are shown in our presentation.

A investigation report of the tornado disaster at Houjyo, Tsukuba, Ibaraki Pref. by latest small UAVs

Hiroaki YAMATO 1, Masaki USAMI2, Takeki IZUMI 3
1: Chuo University, 1-13-27 Kasuga, Bunkyo-ku, Tokyo, 112-8551, Japan,
yamato@tamacc.chuo-u.ac.jp
2: Air4D Co., Ltd 3: Tokyo Metropolitan University

Recently, in a field of UAV, helicopter type UAVs which need higher control technology than airplane type UAVs have developed well. Helicopter type UAVs have mainly two advantages, one is there is no limit to take off because they don't need runways, the other is they can hover, so that they can do the fixed point observation. Therefore, the purpose of this study is to inspect the benefit of practical use of the latest helicopter type UAVs in the field of meteorology. Investigation had done to the damaged fields by the tornado that occurred in Tsukuba-shi on May 6, 2012. We used two UAVs, one is GrassHOPPER made in Japan which sold by Information Science Techno System Co., Ltd. (ISTS), the other one is Falcon-PARS made in Germany. Both UAVs are the helicopter type UAV (Fig. 1).

Fig.1 UAVs (Left: GrassHOPPER, Right: Falcon-PARS)

Figure 2 is the bird-view photograph which was taken by GrasHOPPER at near around the Houjyo district where the most severe damages were observed. Figure 3 shows the orthophotograph and DSM made from 12 pieces of stereo pair images. Ground resolution is about 2cm. It was confirmed that aerial photograph taken by UAVs were effective to grasp the damage situation.

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Yamashita et al. 2005, J. Meteor. Soc. Japan, 83**A**: 121-136.

Fig.2 Aerial photograph by GrassHOPPER (from the viewpoint to north direction over the Pref. road 19 at about 45m high).

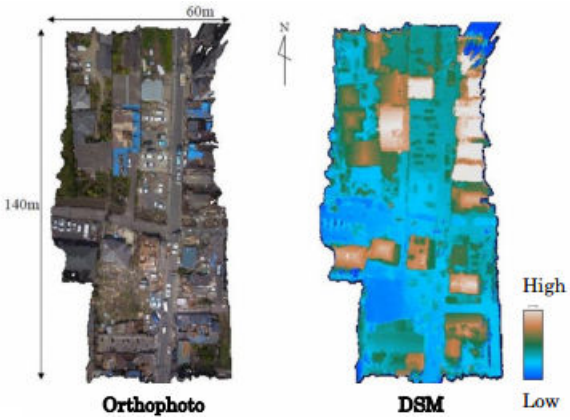

Fig.3 Orthophoto and DSM made from stereo pair photographs by Falcon-PARS

A study on creating ultra high resolution orthophoto and DSM using small UAVs

—A case study in southern base of the Mt. Yatsugatake in 2014 —

Hiroshi Omi[1], Kengo Sakai[2], Ryosuke Yamamoto[2], Koichi Hasegawa[3], Takeki Izumi[2]
1: Tokyo Cartographic Co.,Ltd. 2-4-4 Amanuma, Suginami-ku, Tokyo,167-0032, Japan
omi@tcg.co.jp
2: Tokyo Metropolitan University,
3: Komazawa University Senior High School

Landslide disasters in the forest occur in all over Japan. One caused by becoming the weak forest for Landslide disasters because forest management is not perfect. It is important that making the forest resisting a disaster by promoting efficiency of forest management more. It is a purpose to clarify what kind of role UAVs (Unmanned Aerial Vehicles) can play for forest management.

In the Larix leptolepis on the southern base of Mt. Yatsugatake of Yamanashi, we investigated the forest by UAVs. A vegetation observation tower of JAXA is built near. A study for neighboring vegetation is considered to be it. We used UAVs which was improved shooting and flight performance on the basis of the products made in Japan (Martin kai, K&S). We used NEX-7(SONY) for photography.

Fig.1 is the image which photographed a study area for by UAVs. We can confirm the situation of the thinning of the study area from this image. Fig.2 is the DSM (Digital Surface Model) which we made from data of UAVs. We can extract information of the height of the tree by putting DSM and DEM (Digital Elevation Model) together. We can understand the growth situation.

As well as two things that we showed it this time, much possibility is hidden in UAVs. We will conduct further research and want to clarify it about the role that forest management of UAVs can serve as in future.

Fig.1 Study area
(2014/6/1)

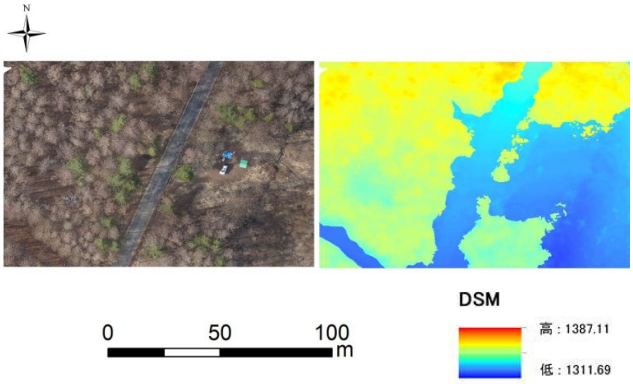

Fig.2 The orthophoto (left) and the DSM(right)
(2014/4/16)

A study of practical use of small UAVs in a disaster targeting the landslides disaster in Hiroshima-city in August 2014

Kengo Sakai[1], Takeki Izumi[1]
1: Tokyo Metropolitan University, 1-1 Minami-osawa, Hachioji-city, Tokyo, Japan, 192-0397,
sakai-kengo@ed.tmu.ac.jp

A landslides disaster due to heavy rainfall occurred in Hiroshima-city, in the early morning of August 20, 2014, and 74 people dead in the disaster after all. Although intense rescue operations had been performed immediately, it was very dangerous for people to have gone into the disaster field. In this situation, knowing the accurate conditions of disaster is important to evaluate the risk. Since it is difficult to get an ultra-high resolution images from airplane or helicopter because of altitude constraints, we conducted a survey of the disaster site with UAVs. The target survey areas are Midorii, Asaminami-ku, Hiroshima-city. Specifically, we conducted a reconnaissance flight by the small UAVs (Unmanned Aerial Vehicles) in August 21 and 22. This flight was based on the request by the Hiroshima-city headquarters of disaster control. Moreover, we shot stereo image pairs for the deposition amount of sediment grasp from 27 to 31 August. We used UAVs which was improved shooting and flight performance on the basis of the products made in Japan (Neo Martin kai and K4-R, K&S, shown picture1). In addition, we used other UAVs made in China named DJI FHANTOM2 modified to make waypoint system and FHANTOM2 Vision+.

Pic.1 Neo Martin kai and K4-R

As a result of our survey, aerial video images and stereo pair images were obtained. These data especially obtained in August 21 and 22 were used for one of the decision whether to continue the search or not. It was for the first time in Japan that UAVs was operated in the disaster site by the official request by headquarters of disaster control in Japan. We showed the utilization possibility of the UAVs in the disaster site. It is planned to estimate the deposition amount of sediment grasp, through the data analysis.

Pic.2 aerial view of the upstream portion

Acknowledgement : We are grateful to Ryosuke Yamamoto and Yukiko Izumi (Tokyo Metropolitan University), Shinji Urita (Remote sensing Technology Center of Japan), Toshio Kasama (Information & Science Techno-System Co., Ltd), and Minoru Masuda (Nissohken Co., Ltd).

A study on creating ultra high resolution orthophoto and DSM using small UAVs
—A case study at landslides caused by the Heavy Rainfall in Northern Kyushu in July 2012—

Ryosuke YAMAMOTO [1], Takeki IZUMI [1]
1: Tokyo Metropolitan University, 1-1 Minami-osawa, Hachioji-shi, Tokyo, 192-0397, Japan,
yamamoto-ryosuke@ed.tmu.ac.jp

Landslides can cause enormous damage to the society. Therefore it is important to know their topography in detail. Ground survey is one way for that, but it requires a lot of manpower and time. Moreover, it is impossible to survey some places where are dangerous to entry. Aerial survey is an alternative way, but there is a limit to the resolution of the data due to the limit of the flight altitude and the angle. In this study, we used small UAVs (Unmanned Aerial Vehicles) to perform photogrammetric analysis. Our aim is to examine its utility and lead to develop the next generation of small UAVs.

The study area is Saishigahana in Aso City, Kumamoto Pref. It locates the east side of the outer rim of Mt. Aso, where a lot of landslide occurred by the Heavy Rainfall in Northern Kyushu in July 2012. We surveyed there on September 5, 2012. We loaded with a digital camera (RICOH GX200) to the UAV and acquired 180 pieces of the stereo pair images. After that, we created the orthophoto and the DSM (Digital Surface Model) from the images using a photogrammetry software.

As a result, we could create an orthophoto with the resolution of about 4 centimeters, and a DSM that of 10 centimeters (Fig.1). We could decipher small scale terrains and the distribution of gravels from them. We are planning to survey the area periodically to monitor temporal changes in the landslides.

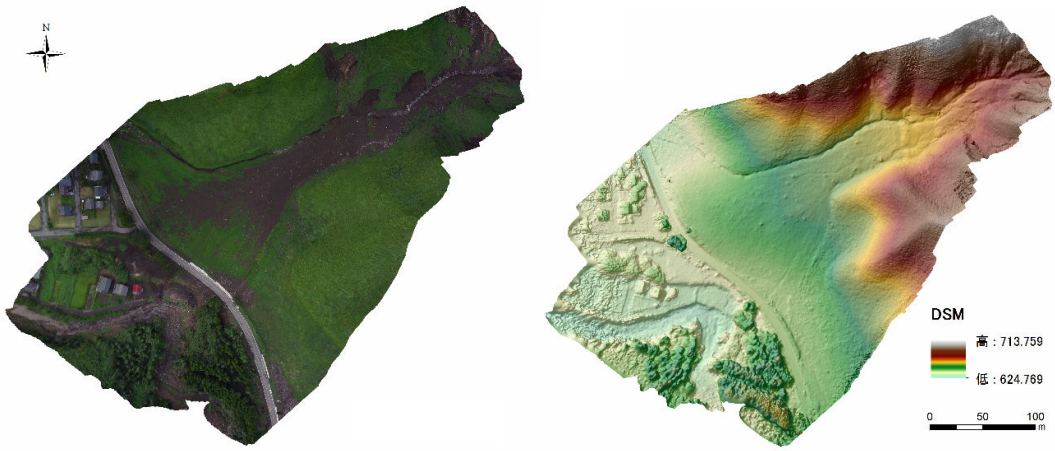

Fig.1 The orthophoto (left) and the DSM (right, superimposed on hillshade), created from the stereo pair images acquired by the UAV.

A study on creating ultra high resolution orthophoto and DSM using small UAVs —A case study in a disaster area by debris flows in Nagiso Town, Nagano Pref.

Yukiko IZUMI[1], Ryosuke YAMAMOTO[1], Takeki IZUMI[1]
[1]: Tokyo Metropolitan University, 1-1 Minami-osawa, Hachioji-shi, Tokyo, 192-0397, Japan, yukiko.izumi.joy@gmail.com

Landslides can cause enormous damage to the society. Therefore it is important to know their topography in detail. Ground survey is one way for that, but it requires a lot of manpower and time. Moreover, it is impossible to survey some places where are dangerous to entry. Aerial survey is an alternative way, but there is a limit to the resolution of the data due to the limit of the flight altitude and the angle. In this study, we used small UAVs (Unmanned Aerial Vehicles) to perform photogrammetric analysis. Our aim is to examine their utility and lead to develop the next generation of small UAVs.

The study area is Nagiso Town, Nagano Pref. Debris flows occurred there, caused by Typhoon Neoguri on July 9, 2014. We surveyed there from July 13 to July 15, 2014. We loaded with a digital camera (RICOH GX200) to the UAV and acquired about 1,800 pieces of the bird's-eye photo and the stereo pair images. We also acquired 18 points of GCPs (Ground Control Points) using a handy GNSS receiver. After that, we created the orthophoto and the DSM (Digital Surface Model) from the stereo pair images using a photogrammetry software, Agisoft PhotoScan.

As a result, we could create an orthophoto with the resolution of about 4 centimeters, and a DSM that of 10 centimeters (Fig.1). We can recognize the situation that sand, gravels and boulders have been swept through the stream. We could acquire the invaluable data at immediately after when the disaster occurred. We are planning to survey the area periodically to monitor the temporal changes.

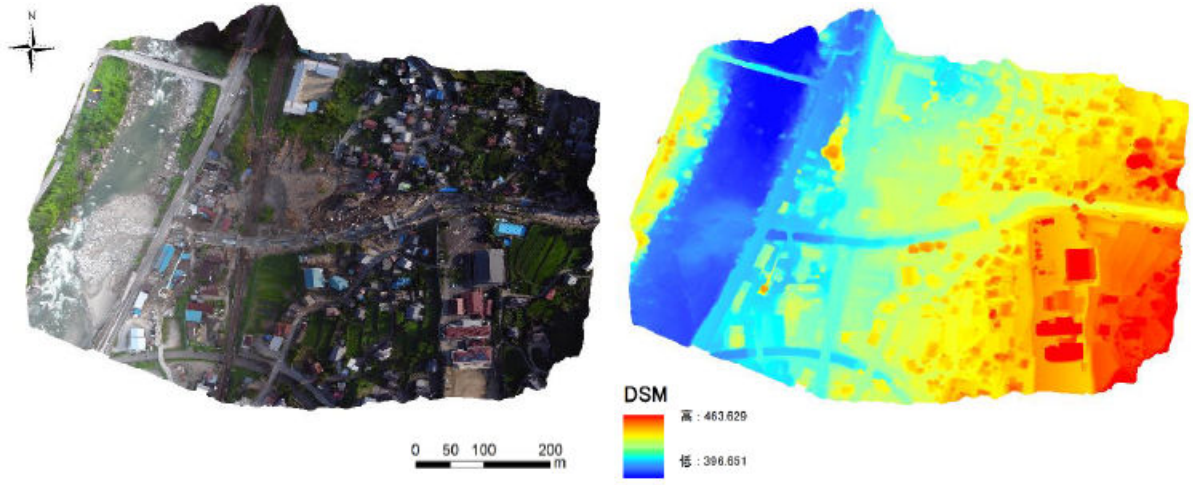

Fig.1 The orthophoto (left) and the DSM(right), created from the stereopair images acquired by the UAV.

Monitoring and Early Warning for Surface Failure of Slopes by using Tilt Sensors

Taro UCHIMURA [1], Ikuo TOWHATA[1], Lin WANG[2], Shunsaku NISHIE[2],
Hiroshi YAMAGUCHI[2], Ichiro SEKO[2], Jianping QIAO[3]
1: University of Tokyo, uchimura@civil.t.u-tokyo.ac.jp
2: Chuo Kaihatsu Corporation, Tokyo
3: Institute of Mountain Hazards and Environment, Chengdu, China

A low-cost and simple monitoring method for early warning of rainfall-induced landslides is proposed. Tilting angles in the surface layer of slope are mainly monitored in this method. In the first stage of this study with a scaled model slope, distinct behaviors were observed in the tilt angles monitored on the surface of slope prior to the failure. Hence, a set of equipment has been developed for practical use, which is equipped with a MEMS (Micro Electro Mechanical Systems) tilt sensor and a volumetric water content sensor. An optional arrangement of tilt sensors is also developed in order to investigate the deformation of the deeper layers. The equipment were deployed at more than 80 slope sites in Japan and China. A slope failure test was also conducted on a natural slope by applying artificial heavy rainfall. The developed system detected distinct behaviors in the tilting angles in some sites in the pre-failure stages. Considering the behaviors of tilting monitored on the surfaces of these slopes, it is proposed to issue precaution at a tilting rate of 0.01 degrees per hour, and warning at that of 0.1 degree per hour, for conservative decision. The authors are also transferring this technique to Asian countries, Taiwan, Sri Lanka, Indonesia and Thailand.

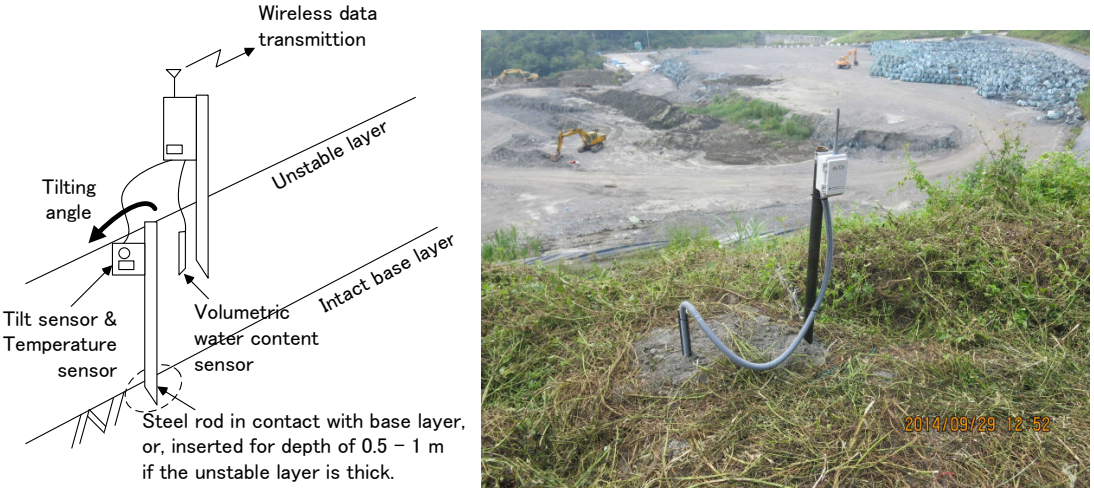

Fig. 1 Surface tilt sensor for slope monitoring

Selecting and Preparing Sites to make geomagnetic observations used in the study of earthquakes

Ivan HRVOIC [1], Mike WILSON [1], Blair WALKER[1]
1: GEM Systems, Inc., blair.walker@gemsystems.ca

The research using magnetometers to measure changes in magnetic fields resulting from crustal stress change, fluid flow and volcanic activity to predict earthquakes is ongoing.

As important as the analysis of the magnetic data, is the selection and preparation of sites to make the magnetic observations, ensuring that measurements are not influenced and contaminated by magnetic interference from cultural sources.

Researchers have found that the number of magnetic pulses from electrical discharges from crustal stresses prior earthquakes dramatically increase about 2 weeks prior to the event, but in order to be able to study all of the magnetic events of any amplitude that can be precursors to earthquake activity, the magnetometer must be ultra sensitive, but the observatory site must also contribute a minimal amount of magnetic noise, or the magnetic events of interest will be lost in the noise.

Magnetic events with picoTesla amplitude, can be recorded and analyzed, if magnetic sensors are mechanically isolated from noise from air currents, ground motion, magnetic interference from electrical currents and magnetic material. The amount of magnetic interference can be quantified with a ground portable high sensitivity magnetic gradiometer survey of the site and the observatory magnetometers must be installed, in areas of low magnetic gradient, identified by the portable gradiometer survey. The study provides a practical, detailed analysis of how to establish a site to study magnetic events that can be precursors to earthquake activity, from lessons learned on two continents.

Building Damage Detection from the 2011 Great East Japan Tsunami by Using Integrated GIS and High Resolution Satellite Imagery: Toward Enhancement of Disaster Risk Management

Youngjoo Kwak[1], Atsuhiro Yorozuya[1], Yoichi Iwami[1]
1: International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO, Public Works Research Institute (PWRI), 1-6 Minamihara, Tsukuba, 305-8516 Japan, kwak55@pwri.go.jp

Integrated GIS and advanced remote sensing play an important role in effective emergency response activities for disaster risk management. For example, the use of near real-time satellite data for assessing building damage offers significant advantages to quickly address emergency situations after an earthquake. In order to respond to an urgent demand for interpretation methods in tsunami damage assessment, automatic and unsupervised change detection using high-resolution Synthetic Aperture Radar (SAR) is applied to detection of inundated areas and estimation of building conditions (Bovolo, et.al, 2007). The purpose of this preliminary study was to detect buildings in tsunami inundation areas and to establish a change-detection map of buildings before and after tsunamis by using high-resolution multi-temporal optical images, i.e., GeoEye-1 (0.6 m spatial resolution) and X-band SAR images, i.e., COSMO-SkyMed 2 (2.5 m spatial resolution). The proposed algorithm of building change detection was applied to calculation of statistical thresholds and processing of morphological images, based on backscattering characteristics, over a coastal zone in Rikuzentakada City, devastated in the 2011 Great East Japan Earthquake (Kwak, et.al, 2014). The total number of building changes was counted automatically, and the result was validated in numerical comparison with multi-temporal images. Although it is difficult to identify a single tiny house in a complex dwelling zone due to a heterogeneous composition of the rubble, this approach can provide information on damage over a wide area, which will be useful to organize initial disaster responses and discuss restoration plans, as well as information on causes of damage, which will support future urban planning for improved disaster reduction and resilience.

References

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[2] Y. Kwak, A Yorozuya, Y Iwami, J Park, “Detection of Building Loss in High Resolution COSMO-SKYMED Multi-temporal Images: Application to 2011 Great East Japan Earthquake and Tsunami”, *International Geoscience and Remote Sensing Symposium (IGARSS), 2014 IEEE International* , pp.2150-2153

A study on the coastal forest condition using high-resolution images taken by a large UAV and small UAVs imagery archives of the reconstruction process from the Great East Japan Earthquake —A case study in Iwanuma City, Miyagi Pref.—

Takeki IZUMI[1], Ryosuke YAMAMOTO[1] and Satoshi OSAWA[2]
1: Tokyo Metropolitan University, 1-1 Minami-osawa, Hachioji-shi, Tokyo, 192-0397, Japan, izumi@tmu.ac.jp
2: Nihon Univ.

In this study, there are two purposes, one is to take high-resolution images for making orthophotograph by a large UAV, the other is to archive of the reconstruction process from the Great East Japan Earthquake taken by small UAVs.

It is important to observe changes of the seashore forest which were suffered from the 3.11 Tsunami. Some trees are withering after more than one year from the Tsunami and archive of the reconstruction process. At first about 1,600 stereo photographs were taken by small UAVs and orthophotograph and DSM (Fig. 1) were made by the photogrammetry software, Photoscan (Agisoft). According to the orthophotograph, object base analysis were done to distinguish the tree species in the remain seashore forest.

Secondly so much aerial photographs(Fig. 2) were taken by small UAVs (GrassHOPPER (ISTS), NeoMatinKai, K4-R (K&S), DJI F450, DJI FANTOM2 and FANTOM2 vision+ etc.) These photographs are submitted to the NPO called Ganbat Tmaura and the city office of Iwanuma city.

Reference

Ishikawa, M. and Satoshi, Osawa., Report of the seashore forest in Sennan basin, pp149, 2013

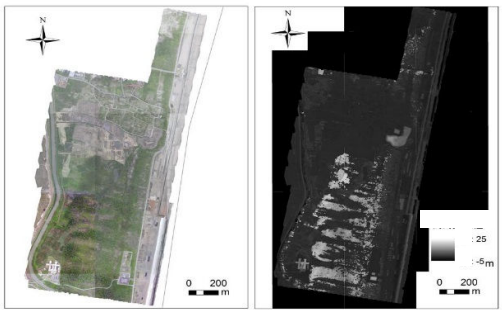


Fig.1 Orthophotograph (left figure) and estimated tree height (right figure)

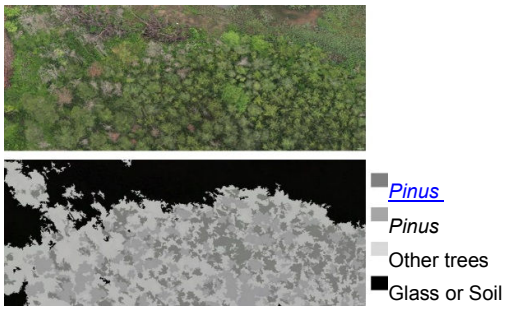


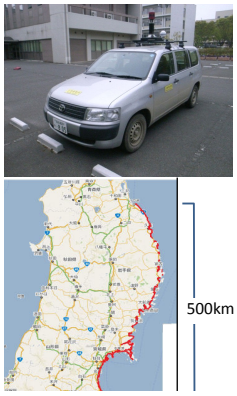
Fig. 2 Orthophotograph (upper figure) and result of the automatically distinction of tree species (lower figure)

Fig. 3 Aerial photographs of the reconstruction process taken by small UAVs

Archiving the Spatio-Temporal Detail and 360°Image Data of 3.11 Earthquake and Tsunami Disasters with Visualizations of Damages and Their Recovery Processes

Koichiro Deguchi, Takayuki Okatani, and Ken Sakurada
Tohoku University, Sendai, Japan

From April of 2011, we have been continuing to obtain video records of 3.11 Large Earthquake and Tsunami disasters at Tohoku coastal areas in Japan. We install 360°directional camera on a special car, and are visiting **same areas at every one or two months**, and obtained **detail images at every 1*m* to 2*m* step on streets**. Total amount of image data up to now, for three and a half year activity, becomes **more than 12 million 360°scenes of 45 Tera Bytes**.

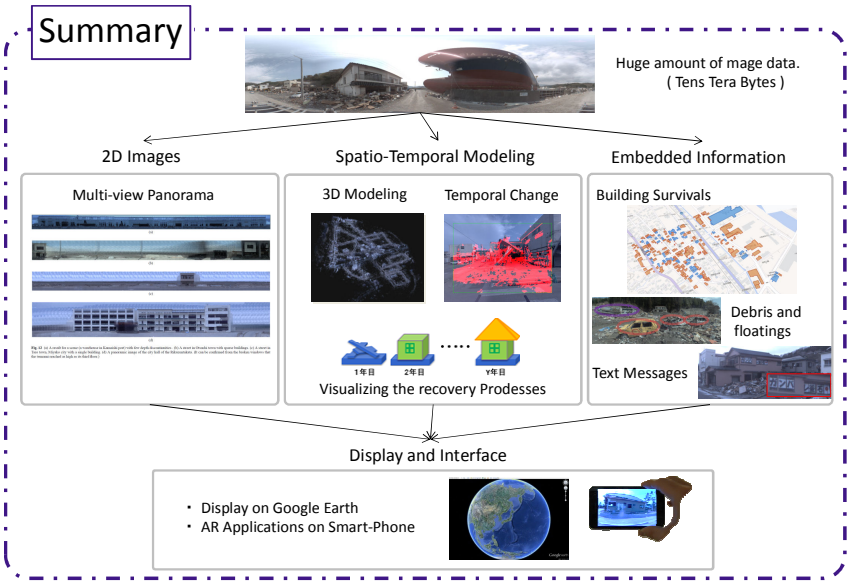


Special car mounting 360 − directional camera, and places of the data recordings in North East part of Japan.

Examples of the 360° panorama images obtained at Kamaishi, Otsuchi, and Tarou, respectively, in April, 2011.

We construct a video archive for recording the real detail damages of towns, industrial areas, and agricultural lands. The main purpose of this activity is **to visualize the process of reconstruction and long term recovery from the disaster**.

By those image sets, **employing the computer vision techniques**, we have been studying the **spatial modelling of the temporal changes of city structure by the disaster and the afterward recovery process**. They are summarized in the left figure.



One of additional role of our detail spatial and temporal **observation on surface is to bridge between wide and global satellite or aerial observations and real local human lives**. The combination of those observations with different spatial and temporal resolution and different view-points is **important to estimate the effectiveness of the recovery from the serious disaster.**

Urban Earthquake damage Assessment and Reconstruction: 2010 Haiti Earthquake

Kit. MIYAMOTO[1], Amir GILANI[2], and Akira WADA[3]
1: President, Miyamoto International, West Sacramento, CA, 95691
2: Senior Associate, Miyamoto International, West Sacramento, CA, 95691
3: Professor Emeritus, Tokyo Institute of Technology, Tokyo, Japan

The Mw 7.0 20101 Haiti Earthquake caused extensive damage. In its aftermath, the authors, working with the Haitian Ministry of Public Works developed a comprehensive damage assessment and reconstruction program. The first phase of this project has been completed and over 400,000 structures in the greater Port-au-Prince area were surveyed for. Of these buildings, approximately 50%, 30%, and 20% have been tagged as green (safe), yellow (limited occupancy), and 20% red (unsafe), respectively. As a result, over 500,000 displaced people have left the temporary camps. The second phase of the effort involves repair and reconstruction of damaged buildings. Repair strategies have been developed and are being implemented and are intended to provide structures that are more robust and can withstand earthquake shaking without collapse. The first batch of 10,000 buildings has been repaired successfully. The repair of damaged buildings will allow many more people to return to their buildings.

Seismic Isolation of 200 Year Old Heritage Cathedrals in Haiti

Akira WADA[1], Kit MIYAMOTO[2], and Amir GILANI[2]
1: Professor Emeritus, Tokyo Institute of Technology, Tokyo, Japan
2: Miyamoto International, Los Angeles, CA

Historic and heritage building present a unique class of structures. These buildings form a cultural pillar of the communities and thus require preservation. However, given their vintage, they have sustained severe damage and collapse in recent earthquakes, including in Italy (2009), Haiti (2010) and New Zealand (2011). The main vertical and lateral load bearing members for these buildings is typically comprised of unreinforced stone masonry (URSM) walls. These walls have experienced both in-plane and out-of-plane failures, leading to the collapse of the structures. Given that the walls have little lateral capacity, it is critical to limit the input forces acting on them. In addition, these structures do not have a well-defined load path or diaphragm for seismic loading. A proposed mitigation strategy combining seismic isolation and superstructure intervention is discussed to address these deficiencies. Advanced nonlinear global and local finite element analysis is used to assess the efficiency of the proposed retrofit. The proposed method significantly reduces the level of seismic excitation acting on the existing walls and limits the superstructure retrofit, and thus preserves the historical features of the structures. Application of this technique to two Cathedrals in Haiti is presented.

Research Efforts to Protect Buildings and Their Functions Based on Recent Seismic Hazards in Japan

Kazuhiko KASAI [1], and Satoshi YAMADA [2]

1: Science Council of Japan, and Structural Engineering Research Center,
Tokyo Institute of Technology kasai@serc.titech.ac.jp
2: Structural Engineering Research Center,
Tokyo Institute of Technology naniwa@serc.titech.ac.jp

After the 1995 Kobe earthquake showed destructive effects of the near-field ground motion on the metropolitan area, several strong earthquakes that occurred later indicated new issues in seismic design.

The 2003 Tokachi-Oki earthquake, 2004 Chuetsu and the 2007 Chuetsu-Oki earthquakes caused long period earthquake shaking in Tokyo. The 2011 Tohoku-Oki earthquake magnitude 9.0 caused tremendous tsunami damage along the pacific coast of eastern Japan, and this initiated improvement of building design in tsunami-prone areas. Moreover, the ground shaking by the 2011 quake caused enormous failures of industrial facilities, warehouse, and school gymnasiums of large span structures. Tokyo located 300 km away from the epicenter recorded ground motions of wide range of short to long period contents. The shaking was the strongest ever for all the super-tall buildings that had been constructed in Tokyo in the last 40 years. The long period shaking that followed after the major shaking was stronger than those recorded from the 2004 and 2007 quakes.

The presentation discusses Japan's development such as investigations into new effects of the above-mentioned recent earthquakes and new publication of design specifications for the value-added steel structures. Three major topics are selected as follows:

(1) Spatial structures such as gymnasiums, factories, and warehouses.
(2) Super-tall buildings in metropolitan area
(3) Design specifications on protective systems for buildings and functions

Disaster Mitigation for Earthquake Prone Countries with Seismic Isolation and Passive Control Technologies from Japan

Mineo TAKAYAMA [1], Akira WADA [2], Toru TAKEUCHI [3], Shingo TORII [4],
Yozo SHINOZAKI [5], Shigenobu SUZUKI [6], Yasuo TSUYUKI [7], Yasushi ICHIKAWA [8],
Ryotaro KUROSAWA [9]

1: Chair, Committee for the Overseas Deployment of Seismic Isolation and Passive Control Technologies, JSSI, mineot@fukuoka-u.ac.jp
2: President, Japan Society of Seismic Isolation (JSSI), 3: Tokyo Institute of Technology
4: Nikken Sekkei Ltd., 5: Taisei Corp., 6: Bridgestone Corp., 7: Kayaba System Machinery Co.,
8: Nippon Steel & Sumikin Engineering Co., Ltd., 9: Kurosawa Construction Co., Ltd.

Japan is situated at the complex intersection of the Eurasian, North American, Pacific and Philippine tectonic plates boundaries, a region that is considered as having one of the highest risks of severe seismic activity of any area in the world. In Japan, the seismic threat faced by the entire country has led to the extensive development and application of the field of earthquake engineering and resulted in widespread innovation and application of innovative seismic structural technologies.

The number of seismically isolated buildings in Japan has increased dramatically since the 1995 Kobe earthquake and the total number now exceeds 3200. The seismic isolation technology has been applied to office buildings, condominiums and hospitals. Additionally, the number of detached houses using seismic isolation has reached 4500. In order to obtain the good isolation performance, various devices such as rubber bearing, sliding bearing, roller bearing, hysteresis damper, oil damper are used in combination.

As with seismic isolation, similar advances have been made in passive control technologies for tall buildings in Japan. The total number of passive controlled buildings exceeds 1000. Active and semi-active control systems have also been applied to 70 buildings in Japan since 1989.

The seismically isolated buildings and the passive control buildings in Japan showed good performances in the 2011 Great East Japan Earthquake, and these technologies have become proved ones. These technologies are also useful in other earthquake prone countries. The committee for international activities of these technologies was established in both the Japan Society of Seismic Isolation and the Japan Bosai Platform in 2014. The following subjects are tackled in this committee:

1: Overseas deployments of these design codes and construction technologies
2: Overseas deployments of design expertise, devices, evaluations, constructions and management
3: Education and cultivation of structural engineers for these technologies

Coastal Structures, Coastal Species Preservation, and Migration facing 2011 Tohoku Earthquake and Tsunami

Kohei IMAMURA [1,2], Kohei Takenaka TAKANO [1], Nobuhito MORI [3], Tohru NAKASHIZUKA [1], Shunsuke MANAGI [4]

1: Graduate School of Life Sciences, Tohoku University, 6-3 Aoba, Aramaki-Aza Aoba, Aoba-Ku, Sendai 980-8578, Japan, 2: pbilvowxwovlidq@yahoo.co.jp

3: Disaster Prevention Research Institute, Kyoto University, Gokasho, Uji, Kyoto 611-0011, Japan

4: Graduate School of Environmental Studies, Tohoku University, 6-6-20 Aramaki-Aza Aoba, Aoba-Ku, Sendai 980-8579, Japan, managi@mail.kankyo.tohoku.ac.jp

Facing potential coastal disasters of storm surge, storm waves and tsunamis, the construction of coastal structures such as seawalls or breakwaters is being planned at Japanese coastal areas. However, coastal ecosystems, which are most threatened ecosystems in Japan, might be deteriorated by the construction of seawalls. In considering Japanese coastal disaster prevention policies, this trade-off becomes the critical question. This study analyzed public preferences in coastal disaster reduction systems (especially, seawalls and migration) and coastal ecosystem conservations by choice-based conjoint analysis using the questionnaire to coastal citizens. As a result, the number of coastal species loss accepted as the trade-off was 13.6% (95%CI: 10.2 - 17.5%) (Fig. 1. a), and the amount of money donated for preventing deteriorations of ecosystems by the construction of seawalls was 559 JPY (95%CI: 332 – 1019 JPY) per person (Fig. 1. b). We also found that people, who wanted to migrate from potentially vulnerable area (e.g., low land coastal zone) to safety area (e.g., a hill), increased by 9% with increasing municipality support for migration costs (Fig. 2). The results of this study indicated that seawalls were preferred than migration as the coastal disaster reduction policy. However, the ecosystem loss accepted as a trade-off of seawall is not much.

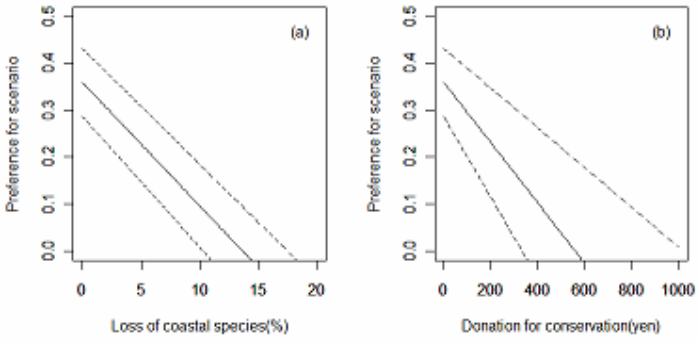


Fig. 1.

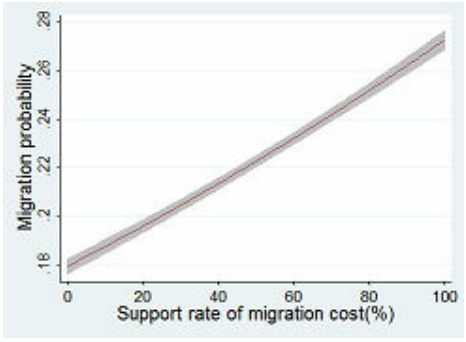


Fig. 2

Eleven Years of Activities at the Center for Urban Earthquake Engineering (CUEE) in Tokyo Institute of Technology

Kohji TOKIMATSU [1], Saburoh MIDORIKAWA [1], Junichiro NIWA [1], Kazuhiko KASAI [1], Kazuhiko KAWASHIMA[1], Toru TAKEUCHI[1], Hiroaki YAMANAKA[1], Masaki KITAZUME[1], Toshiyuki OGAWA[1], Souichi HIROSE[1], Ryuzo OHNO[1], Hitoshi MORIKAWA[1], Akihiro TAKAHASHI[1], Toshihiro OSARAGI[1], Satoshi YAMADA[1], Jiro TAKEMURA[1], Yutaka YOKOYAMA[1], Hiroyasu SAKATA[1], Shojiro MOTOYUI[1], Daisuke FUKUDA[1], Susumu KONO[1], Yasuo ASAKURA[1], Shizuo HAYASHI[1], Tatsuo OHMACHI[1], Akira WADA[1],
Stephen MAHIN[2] and Ross BOULANGER[2]
1: Tokyo Institute of Technology, Tokyo, Japan, ttoru@arch.titech.ac.jp
2: Pacific Earthquake Engineering Research Center, California, U.S.

There is a great risk (denoted as *seismic mega risk*) of huge damage by large earthquakes centered underneath major cities of Japan, since vulnerability to natural disasters has been increased due to complicated urban functions that have resulted from excessive concentration of population, economic activities that include infrastructures. Such mega-scale damages caused by a large earthquake may bring the Japanese economy to ruin as well as impact the world economies at the same time.

Center for Urban Earthquake Engineering (CUEE) has been established in Tokyo Institute of Technology in 2003 supported by this 21COE Program and Global COE (G-COE) Program by MEXT, targeting reduction of globally increasing seismic mega risks, aims at fostering leading researchers and specialized engineers at higher level in the field of Earthquake Engineering. The program has provided the most advanced educational and research environment with the worldwide top-class staff establishing international collaboration system in education and research activities in Urban Earthquake Engineering, including tenth of international conferences. In this presentation, eleven years of the activities of CUEE from 2003 to 2014 is summarized, and their achievement and future directions are demonstrated.

Relocation of Residential Area and Debate of Breakwater Construction in Moune District, Kesennuma City after the 2011 Tsunami Disaster

Tomohiro ICHINOSE [1], Taiyo YAGASAKI [2], Satoru ITAGAWA [3]
1: Faculty of Environment and Information Studies, Keio University
Endo 5322, Fujisawa, Kanagawa, 252-0882 Japan, tomohiro@sfc.keio.ac.jp
2: Graduate School of Life and Environmental Sciences, University of Tsukuba
3: Graduate School of Media and Governance, Keio University

A magnitude 9.0 earthquake struck the northwestern Pacific Ocean off northeastern Japan on 11 March 2011. The subsequent tsunami wrought destruction on a massive scale. The government's proposed reconstruction plan, released in June 2011 (http://www.cas.go.jp/jp/fukkou/english/pdf/report20110625.pdf), explains that we need to change our attitudes about disaster prevention. For example, although 10-m breakwaters erected in Taro district of Iwate Prefecture worked well against a tsunami caused by the great Chilean earthquake of 1960, they were destroyed by the 2011 tsunami, which killed 200 people and flattened 1,000 houses there. We have to recognize that we cannot completely protect ourselves against natural disasters.

Kesennuma City was one of the most heavily damaged regions in Miyagi Prefecture, where more then thousand people were died by the tsunami and fire caused after it, and 230 people are still missing. Miyagi Prefecture has been presented with plans for breakwaters ranging from 5.0 to 11.8 meters (m) in height, even though the most recent tsunami topped 12 m. Most breakwaters, totally 25 kilometers, have been already constructed along Sendai Costal Area. A fishing village in Kesennuma, called Moune, has submitted a formal request to the mayor of Kesennuma to withdraw the plan for its 10-m breakwater, because most households will relocate on a new residential area constructed by the government. Moune was the first district to decide the relocation plan to upland and request it to the government.

The district is already famous for its afforestation movement, called *Mori wa Umi no Koibito* ("The Forest is a Lover of the Sea"). In 1989, an oyster farmer named Shigeatsu Hatakeyama started planting trees on the hills around the village to preserve the seawater quality for his oysters. His activities have influenced previously-uninterested residents to object to the breakwater plan. Also, Moune has a strong community before the disaster. Four people were killed by the tsunami, but most were survived by helping each other. An association for relocation of residential area has been established since the middle of April, 2011, then the general meeting has been held every month. We will discuss resilience and sustainable development of Moune District through our three-years survey.

Earthquake Disaster Conquest Research by a Union of 40 Academic Societies, the Transdisciplinary Federation of Science and Technology

Koichiro DEGUCHI[1], Yoshiyasu TAMURA[2], Masaaki OHBA[3], Yoshifumi YASUOKA[4], Motohisa FUNABASHI[5]
1: Tohoku University, 2: The Institute of Statistical Mathematics, 3: Nihon University,
4: Research Organization of Information and Systems, 5: TraFST Office

The Transdisciplinary Federation of Science and Technology (TraFST) is a union of 40 academic societies of social science, engineering, applied mathematics, and human sciences [1]. We have been sentencing the importance of the transdisciplinary science and technology for solving versatile modern complex problems in human lives.

After the large earthquake disaster of 3.11, we decided to devote ourselves to design and reconstruct more robust social infrastructures. From 2011 to 2013, we conducted the joint project of the Earthquake Disaster Conquest Research. We organized three working groups in Table 1, in which more than 80 researchers total participated from our member societies.

Three themes were focused on the continuity of everyday life, the business continuation, and compatibility of renewable energy supply and environments, respectively. They are problems covered by the TraFST member societies and faced with the disaster.

Table 1. Working groups, their themes, and problems.

WG-A	**Establishments of More Resilient Societies to Continue Everyday Life**
Problems discussed and issued as reports and proposals	・Improvement of the forecast accuracy of natural disasters. ・Learning the past disasters and their recoveries in Japan. ・Construction of disaster prevention and rescue system for aging society. ・Furnishing human centric and elderly person acceptable services by universal participation in planning. ・Frame working of cooperation among agriculture, industry and commerce businesses.
WG-B	**Advancement of the Management and Reinforcement of the Resiliency**
Problems discussed and issued as reports and proposals	・Construction of effective disaster recovery process of businesses and their Continuation Plans (BCP). ・ Stabilization of social basic services, such as logistics, transportations, water and energy supplies, IT services, and so on, by systemizations. ・Mutual dependency analysis and information sharing about social infrastructures. ・Improvement of the social infrastructures by shifting the strategy from local optimization to global optimization.
WG-C	**Reinforcement in Environmental Conservation and Resilient and Robust Energy Supply Systems**
Problems discussed and issued as reports and proposals	・ Development of evaluation frame work for environmental sustainability. ・ Stable supply of the renewable energies. ・ Examination of the problems and improvement points in diversification of energy supplies to establish the compatibility with environments. ・Stabilization of water supply systems by managements of local water cycles and desalination plants.

In the table, problems discussed in the WGs are listed. For them, reports and proposals submitted by the WGs were published in the Journal of TraFST, in 2013 [2]. They will be summarized on the poster. Every group emphasizes commonly that the system science and the social science should be maintained for the reconstruction of robust and dependable social infrastructures.

[1] http://www.trafst.jp
[2] Special Issue on “Earthquake Disaster Conquest Research – WG Reports,” Oukan - Journal of Transdisciplinary Federation of Science and Technology, Vol.7, No.1, 2013

Global Earthquake and Volcanic Eruption Risk Management Activities of G-EVER

Shinji TAKARADA[1], Joel Bandibas[1], Yuzo Ishikawa[1], G-EVER Promotion Team[1]
1: Geological Survey of Japan, AIST, Site 7, 1-1-1, Higashi, Tsukuba, 305-8567, Japan s-takarada@aist.go.jp

The Asia-Pacific Region Global Earthquake and Volcanic Eruption Risk Management (G-EVER) Consortium among the Asia-Pacific geohazard research institutes was established in 2012 with the main objective of reducing the risk caused by earthquakes, tsunamis and volcanic eruptions worldwide. The first G-EVER workshop was held in Tsukuba, Japan in February 2012. The G-EVER1 accord was approved by the workshop participants which made 10 recommendations that focused on the enhancement of collaboration, sharing of resources and making information about the risks of earthquakes and volcanic eruptions freely available and understandable. The G-EVER Hub website was setup to promote the exchange of information and knowledge about volcanic and seismic hazards among the Asia-Pacific countries (http://g-ever.org). Establishing and endorsing data interchange and analytical methods standards for geohazard institutes of the world are important to promote data sharing and comparative analyses. Several G-EVER Working Groups and projects were proposed such as the Next-generation volcanic hazard assessment WG and the Asia-Pacific region earthquake and volcanic hazard mapping project. The G-EVER volcanic assessment support system is developed based on eruption history, volcanic eruption database and numerical simulations. The G-EVER hazard assessment support system is implemented with user-friendly interface, making the risk assessment system easy to use and accessible online. Preliminary version of the volcanic hazard assessment system using Energy Cone and Titan2D simulations is available. The system can assess any volcano in the world using ASTER Global DEM (10m resolution DEM is used in Japan). The Asia-Pacific region earthquake and volcanic hazard mapping project aims to make an advanced online hazard information system that provides past and recent earthquake and volcanic hazards information, risk assessment tools for earthquake and volcanic eruption hazards, and links to global earthquake and volcanic eruption databases. The information system will also show tsunami inundation areas, active faults distributions, and hazard and risk maps. This project will be implemented with the cooperation of major research institutes and organizations in the Asia-Pacific region such as Center for Volcanology and Geological Hazard Mitigation (CVGHM) in Indonesia and Philippine Institute of Volcanology and Seismology (PHIVOLCS). The Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP) is going to make a new geoinformation sharing infrastructure for East and Southeast Asia. The 2015 International Workshop on Earthquake and Volcanic Hazards and Risks in Asia-Pacific Region will be held during the 3rd UN World Conference on Disaster Risk Reduction on March 16-17, 2015 in Sendai, Japan.

Disaster Monitoring and Risk Reduction by Earth Observation Satellites

Takeo TADONO[1], Masanobu SHIMADA[1], Fumiko ODA[1], and Hiroto NAGAI[1]
1: Japan Aerospace Exploration Agency (JAXA), tadono.takeo@jaxa.jp
2-1-1, Sengen, Tsukuba, Ibaraki 305-8505, Japan

Many natural disasters caused by volcanic activities, earthquakes, landslides, floods, tsunamis, snow avalanches, droughts, etc. are depend on terrain conditions i.e. topography, land-cover, land-use, which are a kind of geospatial information and some of them can be observed by earth observation satellites. This study will be described how to contribute the satellite remote sensing techniques for prevention and response to natural disasters, and show some practical usage examples.

Topography is fundamental information for any geospatial applications on Earth. The Japan Aerospace Exploration Agency (JAXA) is starting to release the precise global digital 3D map called "ALOS World 3D" (AW3D) [1] that is processed using some 3 million images acquired by the Panchromatic Remote sensing Instrument for Stereo Mapping (PRISM) onboard the Advanced Land Observing Satellite "Daichi" (ALOS). The digital 3D map consists of a digital elevation model (DEM), and ortho-rectified images (ORI) that indicate geolocation and features. DEM has 5 meters in spatial resolution with 5 meters height accuracy (RMSE) that enables us to express land terrain almost over the world, therefore it is also contributed to make hazard map in prevention phase. The map processing will be completed by March 2016.

"Daichi-2" (ALOS-2) satellite has been launched on May 24, 2014, and is now operating very well [3]. ALOS-2 carries on an L-band Synthetic Aperture Radar (PALSAR-2) and be able to obtain precise surface information in not only daytime but also nighttime even under bad weather conditions. JAXA has been conducted the emergency observations for assessing damaged areas of natural disasters by ALOS-2.

References:

[1] "ALOS World 3D" http://www.eorc.jaxa.jp/ALOS/en/aw3d/index_e.htm
[2] T. Tadono, H. Ishida, F. Oda, S. Naito, K. Minakawa, H. Iwamoto. "Precise Global DEM Generation By ALOS PRISM," ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol.II-4, pp.71-76, May 2014.
[3] "ALOS-2 Research and Application Project" http://www.eorc.jaxa.jp/ALOS/en/index.htm

Disaster management with micro-satellite constellation promoted by international consortium

Yukihiro Takahashi[1]
[1]Hokkaido University, Kita 10 Nishi 8, Kita-ku, Sapporo 060-0810, Japan,
yukihiro@mail.sci.hokudai.ac.jp

Micro-satellite with a weight of 50-100 kg has various merits compared to middle and large sized satellite, that is, 1) low cost fabrication compared to middle or large sized satellite, namely, few M USD including BUS and mission payloads. The launch cost will be about 1-5 M USD as piggyback, 2) quick fabrication: about one or two years for flight model would be sufficient, enabling application of the latest technologies, 3) on-demand operation, taking detail information at a point of interest, and 4) the low cost and quick fabrication make us possible to launch not a small number of satellites, which is called as “constellation” flight. If we launch an order of 20 or 50 micro-satellites, we could monitor any locations in the world continuously, which will open the new door of real-time disaster monitoring with very low budget. Also the advanced sensors developed for the micro-satellite, such as super multicolor (hyper) spectral imager, will realize the detection of detail effects of disaster, such as tsunami, sea water, volcano or pollution caused by plant accident, on crops or environment that have not be detected even with larger satellites.

We would suggest the establishment of international organization, "Asian micro-satellite consortium" (AMC), which promotes and accelerates the micro-satellite development and the discussion of data utilization. AMC will consist of domestic working group in each country. The each working group is composed of 3 parts: BUS development team, payload development team and data user team, involving various field scientists or engineers, such as forestry, agriculture, fishery, forest fire, bio-diversity, flood, meteorology, climate change, ionospheric / magnetospheric science, and disaster management. Also in AMC we would discuss the possibility of future projects, such as “on-demand operation” or “super constellation” involving more than tens of microsatellites and unmanned air vehicles (UAVs) under international collaboration. We have been contacting and encouraging institutes/universities in about 10 countries in SE-Asia to be the founding member of AMC. Almost all countries basically agreed the concept of AMC and we would like to establish AMC formally very soon.

Sentinel Asia's contribution to the disaster risk reduction in Asia by the utilization of space technology

Masaru ARAKIDA [1], Makoto IKEDA[2], Takeshi NAKAO[2]
1: Asian Disaster Reduction Center (ADRC), ma-arakida@adrc.asia
2: Asian Disaster Reduction Center (ADRC)
1-5-2-5F, Wakinohamakaigan-dori, Chuo, Kobe 651-0073, Japan

One of the high priority challenges on DRR in the developing countries is to grasp the situation after disaster strikes. HQs need disaster situations and available routes for quick response, however they have fewer resources to do so including for utilization of remote sensing data.

The Sentinel Asia initiative was established in 2005, as collaboration between regional space agencies and disaster management agencies, applying remote sensing and Web-GIS technologies to assist disaster management in the Asia-Pacific region. To date multiple national agencies of about 25 countries in the region have joined and benefited from the disaster support services provided by Sentinel Asia.

In this presentation, one best practice of collaboration between DRR agency and Space agency in case of emergency will be shared for the better understanding of the contribution of Sentinel Asia.

Figures are as follows;

- Trend of disaster size, amount, damages
- Limitation of resources for disaster response
- Mechanism of the Sentinel Asia
- Best practice by the Sentinel Asia

Tables are as follows;

- Differences in case of disaster response between Japan and developing countries
- Summary of present Sentinel Asia activities

References are as follows;

- Kazuya Kaku, Alexander Held, Sentinel Asia: A space-based disaster management support system in the Asia-Pacific region, International Journal of Disaster Risk Reduction, Volume 6, December 2013, Pages 1–17

Role of Geospatial Information for Disaster Risk Reduction

Geospatial Information Authority of Japan,
Kitasato 1, Tsukuba-shi, Ibaraki-ken, 305-0811 JAPAN
bousai@gsi.go.jp

Geographic location is one of the most fundamental and indispensable information elements in DRR. Without the information on geographic location, which is often referred to as "geospatial information" by the experts, the effect of measures or actions for disaster risk reduction would be quite limited. Last ten years have seen rapid, significant development and dissemination of innovative technologies that are relevant to geospatial applications, including satellite positioning, wireless internet access, smart mobile device, satellite-based and *in situ* Earth observation, web mapping, and near real-time Big Data analysis. Local communities, particularly in developing countries and regions, have been benefitted by these advanced technologies in sharing geospatial information between remote areas where no conventional communication infrastructure is available. These technologies have also enabled decision-makers and the general public to employ geospatial information and integrate it with other information in an easy-to-use and affordable manner in every phase of the disaster management cycle, including disaster risk assessment, emergency response operations in disasters, and "build back better" recovery from disaster damage at any time and any places. For example, in the case of the Great East Japan Earthquake in 2011, aerial photos taken immediately after the Earthquake greatly improved the information sharing among different government offices and facilitated the rescue and recovery operations, and maps prepared after the disasters have been assisting the rapid reconstruction of the affected local communities. These contributions of geospatial information led the Japanese Government to amend the Basic Act on Disaster Control Measures to mandate the relevant organizations to employ geospatial information in disaster information collection and sharing in 2012. .

In this connection, post-HFA should take full advantage of the potential of geospatial information and its applications in disaster risk reduction by incorporating geospatial approaches in its relevant actions and by strengthening geospatial capacity in developing countries.

Geographical Activities and its Contribution in Disaster Prevention

Commission of Disaster Responses of the Association of Japanese Geographers[1]
1: Commission of Disaster Responses of the Association of Japanese Geographers,
saigai.chiri@gmail.com

The study of disasters is more being focused on than ever, and geography can contribute directly or even indirectly to society through the promotion of basic researches concerning to natural disasters. In this presentation, we will introduce the activities by "Commission of Disaster Responses of the Association of Japanese Geographers (AJG)" and their contribution in disaster prevention/mitigation. The"Commission of Disaster Responses" was established in the AJG in 2001 whose objectives are, to coordinate geographers' surveys and studies of disasters, to share information when disasters occur, and to issue the results of geographical studies (http://www.ajg.or.jp/disaster/). Just after the 2011 Off the Pacific Coast of Tohoku Earthquake occurred on March 11, 2011, AJG acted by the special framework. One of the very notable activities of AJG was the 1 : 25,000 mapping of a tsunami stricken area of whole areas of Japan. This activity was carried out, with supports by the commission, by the great cooperation of geomorphologists who have the skill of aerophotograph interpretation and geographers specializing in GIS technique. On the occasion of this unforgettable huge disaster, such above academic and cooperated activities made us re-realized the public awareness about the importance of geographical viewpoint in disaster reduction. Geography should take an initiative role because its discipline includes both physical and human aspects, which elucidating spatial properties and their relationships. For such a special position in scientific community, geographical disaster studies should be applied to the real society. At the same time, geographers are now in urgent need to open their research results to the society widely. The geographical study of disasters must be more critical in Japan, where subject to various type of disasters due to its complicated natural condition.

Improving Information Quality of Hazard Maps by Utilizing Information and Communication Technologies

SURINA[1], Monang GULTOM[2] and Masahiro ARIMA[3]
1: Graduate School of Applied Informatics, University of Hyogo, surina2012@gmail.com
2: Graduate School of Applied Informatics, University of Hyogo, monanggultom@gmail.com
3: Graduate School of Applied Informatics, University of Hyogo, arima@ai.u-hyogo.ac.jp

Hazard maps are considered helpful for people to judge whether places they live, work, or shop at are safe or dangerous under natural disasters. They are also useful for people to decide whether, and where--and through which route--to evacuate. In Japan, local governments are mandated through laws and guidelines, to prepare and publish hazard maps for various disasters such as flooding of rivers and sewage systems, landslides, volcanic eruptions, storm surges and tidal waves. Although not all local governments have been able to prepare these hazard maps, but a considerable of number of them have done so. In spite of these hazard maps' capabilities to reduce victims caused by natural disasters by correctly informing residents of the disasters' risks, public opinion poll conducted by cabinet office of Japan in 2009 and Aichi prefecture in 2012 shows that few residents utilize hazard maps to prepare for natural disasters. Furthermore, commuters, shoppers and travelers neither utilize hazard maps of commuting or visiting municipalities.

We suspect that low information quality of hazard maps play a role in the low utilization rate of hazard maps by residents. Information quality is a concept introduced and defined by Wang et al.(1996) as "the fitness for use of the information provided". Information quality (IQ) can be measured in terms of four dimensions and their elements; intrinsic IQ (accuracy, objectivity, believability, reputation), contextual IQ (relevancy, value-added, timeliness, completeness, amount of information), representational IQ (interpretability, format, coherence, compatibility), accessibility IQ (accessibility, access security).

Following this definition, the information quality of hazard maps can be defined as their "contribution to residents' survival under natural disasters". Following Wang's IQ metrics, we surveyed all hazard maps published on websites of 4 prefectures: Aichi, Shizuoka, Mie, and Hyogo. The former 3 were chosen because it is estimated that a gigantic earthquake with its epicenter in central or eastern Japan could occur in the near future. Hyogo prefecture on the other hand, was chosen due to its experience in such gigantic disaster--the Hanshin-Awaji earthquake of 1995.

Our survey revealed that accessibility IQ of hazard maps are low because they are only distributed within the borders of each municipalities. While digital versions are available, they are only accessible through searching through poorly designed municipal websites. The country also runs a "Hazard Map Portal Site" through the Ministry of Land, Infrastructure Transport and Tourism, but its cognition rate seems to be low. Representational IQ of hazards maps were low due to the lack of unification in terms, symbols and coloring, scales and names. These make understanding hazard maps difficult especially for travelers who are unfamiliar with the local landscape and prone to misreading. It is also important to care for those who cannot read maps at all. Based on the results of the survey, we began development of an information system that support people's understanding of their locations' safety. As a first step, we have developed an Android OS based application capable of displaying--both in map and text--whether the phone's location and its nearby areas are safe. While our prototype is limited in its area of usage, we will demonstrate our prototype application and the users' evaluation obtained through questionnaire survey conducted.

A Basic Study of Crowd Platform System that gathering local information of stricken area state as a real time Database of Evidence Resource Seeds used by Scientific Advisors on Science and Technology at Urgent Disaster

鈴木 羽留香 (Haruka SUZUKI) [1]
1: 立命館 大学 (Ritusmeikan University), suzukiharuca@hotmail.com

Miscellaneous information to useful evidence made from all Society including layperson. First step is to automatics selection by ontology technology. Continue making scientific evidence on time when disaster. Evidence made by Crowd established by Scientific Advisors on Science and Technology Policy. This presentation shows what is the real time Evidence at urgent disaster needs. It is important for Scientific Advisors on Science and Technology Policy to stocks a lot of Information Resources on real time that has some possibility to be Evidence of Potential. This system bring firsthand information that help Scientific Advisors.

Toward Network Governance for Sustainability: Resilience and Disaster Risk Reduction in Global Energy Systems

Masaru YARIME [1,2], Ali KHARRAZI[1], Masahiro SATO[3], Hirofumi NAKAYAMA[4], Steven KRAINES[5]
1: Graduate School of Public Policy, University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo, 113-0033, Japan, yarimemasa@gmail.com
2: Department of Science, Technology, Engineering and Public Policy, University College London
3: Economic and Social Research Institute, Cabinet Office, Government of Japan
4: Institute of Economic Research, Kyoto University, Japan
5: Future Centre Initiative, Graduate School of Frontier Sciences, University of Tokyo, Japan

Energy is a critical component of our efforts moving towards achieving sustainable development. While three aspects of promoting access, renewables, and efficiency have been emphasized in many of international proposals in the field of energy, it is also critically important to take into consideration the dimension of resilience and disaster risk reduction in energy systems. The implementation of resilient energy systems requires social transformations, which in turn depend upon active engagement with all stakeholders. Such an engagement needs a quantitative understanding of the socio-economic practices underlying resilient energy systems. The ecological information-based network approach can be used as a methodological tool to evaluate the system-level interactions and synergies of various socio-technical practices leading to resiliency of energy resources. This research demonstrates the effectiveness of the ecological information-based approach in evaluating the resiliency of energy systems at the global level. With the increasing globalization of trade, there remains a critical knowledge gap on the link between embodied energy in the production and consumption of traded goods. To bridge this knowledge gap, we attempt to quantitatively explore global energy resilience through an examination of global embodied electricity trade based on multi-regional input-output (MRIO) networks, evaluating system-level metrics relevant to resilience such as efficiency, robustness, and flow dependencies among various economic sectors in different countries across the globe. This research highlights future directions of research utilizing network approaches towards developing objective policy tools for managing resilience in energy systems. These policy tools can lead to new dimensions in promoting energy goals in-line with sustainable development goals. From a broader perspective, this research addresses a general issue of global governance of various resources through networks. Network governance for sustainability would be a grand challenge worth exploring seriously, including energy, water, food, and other materials and resources. By identifying potential problems in the networks and coordinating our technologies and behavior to address them, we will be able to tackle with the global challenge of sustainability collectively through network governance. This research is an attempt through a study on energy to explore the possibilities and implications of the approach of network governance of resources for sustainability by strengthening resilience and disaster risk reduction at the global level.

Introduction of the International Research Institute of Disaster Science, Tohoku University

Daisuke Sugawara[1*], Anawat Suppasri[1], Takeshi Iinuma[1], Fumihiko Imamura[1],
1: International Research Institute of Disaster Science, Tohoku University,
468-1, Aza-Aoba, Aramaki, Aoba-ku, Sendai 980-0845, Japan
*sugawara@irides.tohoku.ac.jp

In April 2012, Tohoku University established the "International Research Institute of Disaster Science (IRIDeS)", as a new integrated interdisciplinary research team to overcome the low frequency great disaster and to use the lessons learned and experiences from the historical global great disasters, after the 2011 off the Pacific coast of Tohoku earthquake (M9.0) and the following tsunami had occurred and caused the 2011 great east Japan earthquake disaster on 11 March 2011. Scholars from 37 research fields, who shared high ideals and a strong sense of urgency, came together in 7 divisions from both the humanities and the natural sciences, to participate in a multi-disciplinary and multi-layered approach to lead the studies of disaster science.

Two years has passed since the foundation of the IRIDeS, efforts of our surveys and research include the 2011 M9 earthquake, as well as other natural disasters inside and outside the country, have been performed and produced outstanding results. We have also worked to provide relief aid within the disaster area, and to gather accurate information about the damage caused. We initiated a digital archive project in collaboration with several partners in order to compile data, information, and records related to the 2011 earthquake disaster.

One of the noteworthy results of the IRIDeS is the publication of "HFA IRIDeS Review Report Focusing on 2011 Great East Japan Earthquake" in October 2013. To learn from devastating experiences such as the 2011 earthquake disaster in northeastern Japan for the sake of future societies, professors at IRIDeS to disseminate the event's lessons learned in terms of HFA guidelines from the academic viewpoints. This review analyzes the five goals of the HFA from a unique perspective. It highlights good practices and problems and recommendations that can be taken in the future.

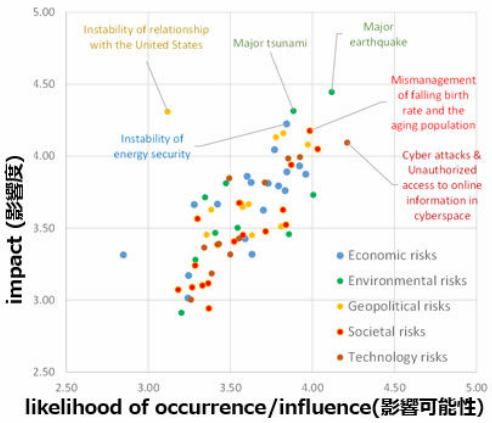
We will introduce the results of other projects for supporting reconstruction and future preparation at the sessions in the meeting.

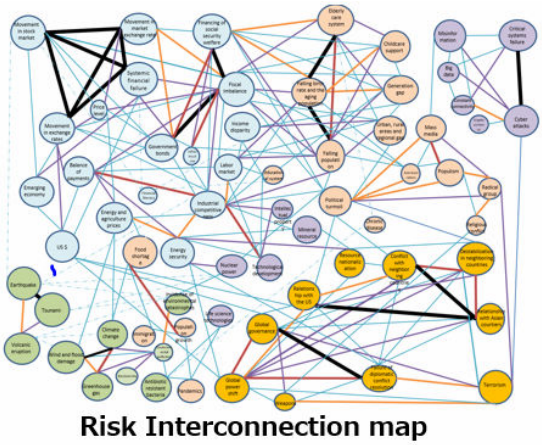
The Need for Integrated Governance Approach in Face of Multifaceted and Systemic Nature of Risks

Makiko MATSUO [1,2], Atsuo KSHIMOTO [1,2], Katsunori MIKUNIYA [1],
Hideaki SHIROYAMA [1,2], Taketoshi TANIGUCHI [1]
1: the University of Tokyo, Policy Alternative Research Institute (PARI), 2: the University of Tokyo, Graduate School of Public Policy (GraSPP), Contact: matsuoma*j.u-tokyo.ac.jp (replace * with @)

Many risks we face today are multifaceted, complex and systemic in nature. The so-called "all hazards" approach is now introduced in many developed countries to overcome the interconnected nature of risks. However, in Japan, despite the experience of the Great Eastern Japan Earthquake, subsequent Tsunami and the nuclear power plant accident in Fukushima which revealed such systemic nature of risks, the need for integrated governance approach is yet to be realized.

In order to consider and institutionalize "integrated approach" in risk governance, we are conducting two studies; (1) identification of national risk landscape of Japan and (2) consideration of incorporating National Risk Assessment (NRA) in Japan. The former study aims at mapping a *risk landscape in Japan* to find major risks that would have impact in the future. By conducting a web-based survey, we tried to visualize the relation and structure of identified risks in different fields (ie; societal, economic, geopolitical, environmental and technological) in Japanese context. The latter study is more objective in nature. It explores procedure for methodology and scenario development in doing NRA. It further considers governance challenges for institutionalization of such activities in Japanese risk governance structure. The aim of this paper is mainly focused on the first part of our study. It presents the outcome of our second web-based survey in August-September 2014 (Mikuniya et al, 2015).





Reference: Mikuniya, K., Taniguchi, T., Shiroyama, H., Kishimoto, A., Hiruma, Y. and Matsuo, M. (2015), *Risk Landscape in Japan - the result of the second web-based survey* (in Japanese) http://pari.u-tokyo.ac.jp/policy/WP15_20.pdf and Mikuniya, K., Taniguchi, T., Shiroyama, H., Kishimoto, A., Hiruma, Y. and Matsuo, M. (2014), Risk Landscape in Japan - the result of the first web-based survey (in Japanese) http://pari.u-tokyo.ac.jp/policy/WP14_12.html

The politicization of disasters and its effects on disaster vulnerability and resilience

Elisa HÖRHAGER
Research Fellow, Goethe University Frankfurt am Main
Senckenberganlage 31, 60325 Frankfurt am Main, Germany
hoerhager@soz.uni-frankfurt.de

The study of disasters long lacked a political analysis, and attempts at understanding processes of disaster politicization are fairly recent.[3] Yet these are crucial when it comes to formulating effective policies for disaster risk reduction and resilience. Just as disaster vulnerability is mediated by a country's political system, measures for dealing with disasters are made more or less effective by the interaction of civil society and state actors.

The classical approach to disasters characterized them as "consensus crises" which allow the affected community and even the nation as a whole to come together in goodwill and philanthropic effort. This presentation however stresses the potential for conflict inherent in disasters, in which contentious interaction in society based on perceived social injustice and inequality is brought to the forefront. My poster will present the research I am conducting on the politicization of disasters through a visualization of the three major phases of politicization. This conceptual model attempts to theorize the development away from consensus and towards contention in the political discourse surrounding a disaster. Its application will be demonstrated through evidence gathered on the case of the 2008 Wenchuan earthquake in Sichuan, China.

Finally, I attempt to show how politicization – in the form of contested interpretations of a disaster and of state legitimacy in dealing with the crisis – can, in the short term, seem to have a detrimental effect on community resilience. Yet in the long term, it has the potential to lead to policy changes which decrease communities' level of disaster vulnerability.

[3] Pelling, M. & Dill, K. (2010) 'Disaster politics: tipping points for change in the adaptation of sociopolitical regimes', *Progress in Human Geography,* vol. 34, no. 1, pp. 21-37.

Two suggestions for the post-2015 framework for disaster risk reduction

Takuma YAMAGUCHI[1], and Rena KIKUCHI[1]
1: Undergrad student, Department of Civil Engineering, The University of Tokyo

Zero draft of the post-2015 framework for disaster risk reduction was prepared in October, 2014 to serve as the basis for negotiations for establishing the post-2015 framework for disaster risk reduction at the 3rd UN World Conference on Disaster Risk Reduction in Sendai, Japan. We reviewed the zero draft and suggests to the zero draft from two view-points.

The first suggestion is about the relationship of priorities and stakeholders. There are two sections about the approach to disaster risk reduction in the zero draft: D. Priorities for action and E. Role of stakeholders. In these two sections, we pointed out that which activity each stakeholder should do was not clear. Therefore, we represented the priorities in form of matrix. All activities were considered which stakeholder should implement and divided up. Then the contents in these two sections were got easier to understand. Moreover, it was found that some priorities were not mentioned in detail for each stakeholder.

The second suggestion is inserting the chapter about database for disaster risk reduction in the post-2015 framework. For each priority, collecting data and sharing information are important and it is discussed in each priority section. However there is no part discussing about database or sharing information comprehensively. So we suggest including the chapter about database for disaster risk reduction in the post-2015 framework. In this chapter, data that should be collected or shared in the database for priorities and how to put it into practice should be discussed. We extracted paragraphs that relates to collecting data, and made the list of data that should be collected.

Implementation of the “post-2015 framework for disaster risk reduction”; cases of Japan

Seina UCHIDA[1], and Satoru HAGINO[2]
[1:] Undergrad student, Department of Civil Engineering, The University of Tokyo, seina.uchida@gmail.com
2;Undergrad student, Department of Civil Engineering, The University of Tokyo, hagino@geot.t.u-tokyo.ac.jp

Our presentation is about how to implement the zero draft of the post-2015 framework for disaster risk reduction. In the zero draft, there is a paragraph of “Guiding principles.” There are a) to l) principles written in the paragraph. However, it doesn’t tell local people what to do to reduce disaster risk. It shows the principles, but it doesn’t show concrete activities. We found some Japanese local activities that are in line with those principles.

There are still some countries and regions that cannot effectively reduce disaster risk. There will be two reasons for people in those areas not able to reduce disaster risk. The first one is they don’t have enough knowledge about disasters, and the second one is they think they need too much tools like money or special machines to protect from disasters. In order to help them to protect from disasters, we refer to Japanese examples that have succeeded in reducing disaster risk. These examples are simple, no need for special tools, low-cost, easy to conduct. Of course, some examples (ex. Hazard map) will have better result if they have database (ex. geographical data, former disaster data), but most of them can be conducted in almost all the countries.

It is better for communities to start conducting activities at local level than to wait for government to do some large-scale disaster protection. We hope we show some kind of help to people suffering from disasters.

The Important Social Science to Success of ICT-City

The Creation for Information and Communications Technology Government

Dr. Toshinobu Obata [1]

1: Honda Motor Co., Ltd., Director (Headquarters of The Building Surveyor's Institute of Japan) Quantity Surveyor, Ph.D. (Dr. Eng., The University of Tokyo), obataceo@yahoo.co.jp

Keyword: ICT-City (Information and Communications Technology-City)

Only for the technique theory that ICT does not couple with philosophy in the social science very much, it is in the difficult times to need a complex system multifaceted thought not to be able to talk about an ICT-city. Including problems of population composition such as the super aging society, the declining birthrate, we need an information-intensive society system of the comprehensiveness unification to urgently solve the problem that is the much social such as medical transport system, urgent disaster prevention information system, the traffic plan to prevent the traffic accidents, the energy control system for total, and I enunciate by a creation process to the ICT-city, ICT-government definitely. "Comprehensiveness unification" is what I unify while containing a variety of elements named personality such as different kinds, thoughts, and the sense of values in various ways. When it is only diversification, it is scattered and lost and is not gathered up well. And a nobler ICT city is completed by the spread developing the growth to cooperation network thoughts from a hierarchy thought to the side, a superior social system by unifying it by some kind of methods of the dissipative thing.

I begin to knit the rule system which area ICT-city each can be made up mainly of by planning it on the theme "the creation city resists the disaster, and to have perpetuity" beforehand. It is dispersed, and the total amount of damage of the whole country for the disaster comes to relatively have few disaster risks if I do it like that. I change into the system which the ICT-government supports while I tie up the tender network of the ICT-city, and a duty to bundle up is the ICT-government, and respecting the independence of will of the ICT city (including the town and the village). This will bring a change of the political system that became separation of threes powers of administration and the order of the existing analog thought at the same time. The change to a maturing rule system is an ICT-city, birth of the ICT-government. It is the chance when Japan is granted by the model rule system which the world does not have for the first time. Triggered by the great disaster of the earthquake and the tsunami, I review the way of the rule system, and this is because the country structure that is safety can do the rudder more. It is to solve the chronic problem of the big city at the same time to activate natural rich local IT-city and town and village, and it is in peace, and the whole world is connected in thought system philosophy to become happy. Medical care, study, economy, politics cooperate to make "The National-land development program long-term vision" clear. And I bundle up all study domains as a social science high research institute and gather wisdom. I found fundamental researches of the tip thought improvement process serious consideration to push forward while the network unifies horizontal connections from the hierarchy and the ICT government mainly involving the graduate school.

Development of educational methods for disaster nursing simulation

Simulation Education Project Team of Disaster Nursing Global Leader Program[1]
1:University of Kochi, University of Hyogo, Tokyo Medical Dental University, The Japanese Red Cross College of Nursing, Chiba University, dngl@cc.u-kochi.ac.jp

As is the case, disaster nursing comprises a various collection of knowledge, skills and attitudes. The candidate for disaster nursing leader must complete a large number of learning objectives of each domain of learning which is considered as core-competency. Simulation can be achieved crosses geographical boundaries and time zones and provides an access to a wealth of resources prepared for catastrophe. Disaster Nursing Global Leader Program adopts lectures and practical training that include both individual and group learning, by distance learning and simulation-based education which take future disaster into consideration. This program has developed educational methods that disaster nursing require.

A project was established within the project team, which performed education and distance simulation trials in addition to undertaking tasks such as examining the best methods for sharing educational material developed by participating universities and clearly defining the challenges of conducting multi-site simultaneous remote and their solutions.

The program performed the functional enhancement of the lab, the development of the lab's educational content, and methods. The center will function as the hub of researches such as 'comprehensive research on post-disaster stress,' 'building an industry-government-academia model for overall disaster reduction through the use of local ICT,' and building a model for 'decision-making training. Peripheral systems where then installed for tools such as the distance simulation environment, video delivery system, and preparations were made for offering interdisciplinary and trial-based education.

Within the SM Lab is a facility for joint education and researches on disaster nursing

We have begun to develop educational content and have moreover participated in simulation education seminars in Japan and overseas for students, nurses, and faculties.
. It can be concluded that we need to select the right method for different kinds of educational purposes taking into account not only expected situations but also unexpected disasters.

Program Development of Cooperative Doctoral Program for Disaster Nursing

DNGL Program Administrative Council[1]
1:University of Kochi, University of Hyogo, Tokyo Medical Dental University, The Japanese Red Cross College of Nursing, Chiba University, dngl@cc.u-kochi.ac.jp

Nurses work in various field such institutions as medical service and home care, public sector and academic field all over the world. We have been making hard efforts in disaster nursing practice, education, and research while supporting survivors in disaster affected area, from supporting survivors in disaster affected areas to educate disaster nursing as specialists. However, it has become apparent that we did not have a leader in disaster nursing who could assess the entire problem in broad perspectives and make appropriate decisions in a timely manner in the aftermath of the Great East Japan Earthquake on March 11, 2011. Unresolved issues of professional, ethical and social considerations of disaster response and preparedness could hamper availability of nurses to care and the disaster risk reduction. A concerted effort to solving these problems interdisciplinary as well as globally is needed.

In Japan, currently, number of graduate programs in nursing rapidly increased. The Japanese nursing professionals have made efforts to advance nursing practice skills in disaster nursing and establish the disaster nursing as a specialty in graduate program. To change the paradigm, the University of Kochi, the University of Hyogo, Chiba University, Tokyo Medical and Dental University and Japanese Red Cross College of Nursing have put their resources and expertise together to launch a new graduate program in disaster nursing to educate global leaders who will solve a wide range of problems in the time of disasters, perform interdisciplinary leadership in global settings, and contribute to promoting health and safety in disaster-affected communities based on human security. This program adopts lectures and practical training that include both individual and group learning, by distance learning and simulation-based education which take future disaster into consideration.

This program is expected to 1) seamless nursing practice through cycle-based disaster risk reduction, 2) advanced scholarship through exploration of new research and expansion of interdisciplinary methodologies as well as 3) establish the system model for interdisciplinary collaboration and human security.

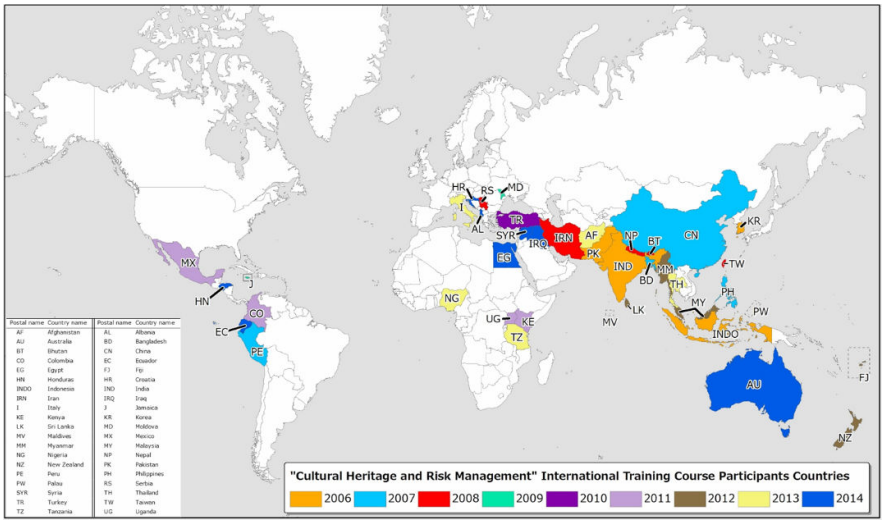
This program is modeled to dissolve the boundaries of traditional practice and to found a leading new approach to disaster risk reduction.

UNESCO Chair Programme on Cultural Heritage and Risk Management, International training course (ITC) on disaster risk management of cultural heritage

Takeyuki OKUBO[1], Rohit JIGYASU[2], Naoko ITAYA[3]
1: Director, Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University (R-DMUCH)
Professor, Department of Civil Engineering, College of Science and Engineering, Ritsumeikan University,
okubo-t@se.ritsumei.ac.jp
2: UNESCO Chair Holder, Professor, R-DMUCH
3: Associate Professor, R-DMUCH
Postal address: 58, Komatsubara Kitamachi, Kita-ku, Kyoto, Japan 603-8341

Cultural heritage is increasingly vulnerable to various natural and human induced disasters such as earthquakes, floods, typhoons, tsunami, fires, terrorism etc. The international training course provides the trainees efficient knowledge and skills to undertake measures for reducing disaster risks confronting cultural heritage site by taking into account heritage values and recognizing specific challenges for their protection, conservation and disaster risk management facing respective countries. The program brings together experts from the fields of cultural heritage conservation and disaster risk management who have not had the opportunity to work together before. During the course they are also expected to formulate disaster risk management plan for specific cultural heritage sites in their home countries. During last nine years, 691 candidates submitted their applications, out of which 84 participants from 39 countries have attended the course. The activity has received international recognition and needs to continue in the future.

Fig.
Participated Countries Map of ITC



Developing the In-service Teacher Training Program and Materials for the Disaster Prevention and Mitigation Education: A Case of the Fukushima Prefecture, Japan

Tatsuya FUJIOKA [1], Hiroki ABE [2], Hisashi OTSUJI [3]
1: Shiga University, Hirazu 2-5-1, Otsu City, Shiga, Japan, fujioka@edu.shiga-u.ac.jp
2: Board of Education, Fukushima Prefecture, Japan; 3: Ibaraki University, Japan

After the 2011 Great East Japan Earthquake (Mw:9.0, Dead:15,889, Missing:2,601), all of local school boards have enhanced the Disaster Prevention and Mitigation Education in Japan. In Fukushima Prefecture, where severe damage by nuclear power plant accident was followed, the Board of Education has planned and conducted several projects for resilience, such as development of the in-service teacher training program of Disaster Education and Radiation Education for all public schools and the distribution of a series of supplementary textbooks and teacher's guides (Fig.1 & 2). The authors coordinated the program, gave the lectures at regional meetings and edited the materials, which were aimed to cultivate students' ability for survive in the case of emergency, by making own decision. Totally, more than 800 leading teachers from all public schools participated in a locally held in-service program, with the use of newly developed materials. The teacher training program covered the following contents: (1) the disaster memorial education, (2) the understanding of the natural environment of Fukushima Prefecture where any kind of natural disaster can occur, such as heavy rain, snow, earthquake, tsunami and volcanic eruption, (3) the blessings of nature and the attachment for the homeland through the awareness of the rich culture and tradition to be praised, (4) the recognition of the nature of STS (Science, Technology and Society), and (5) the integrated initiatives of school and community for safe and secure local place and human development. The implementation rates of radiation and disaster prevention education in public elementary and junior high schools were 100% and 95.8% respectively in 2013. A questionnaire revealed that, depending on our developed materials, each school has prepared an overall disaster prevention plan, which was concerned for the actual condition of the students and community. Fukushima Prefecture has entered into the next long-term stage, overcoming the chaotic confusion.

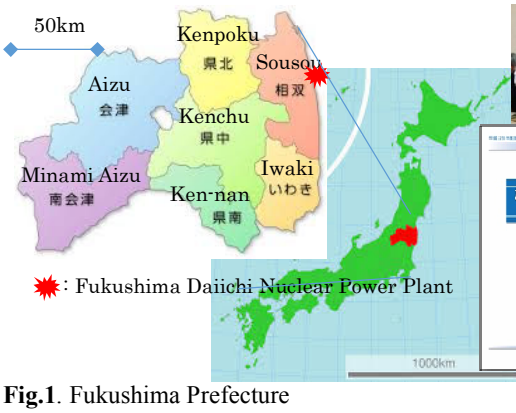


Fig.1. Fukushima Prefecture

Fig.2. In-service training at the capital city of Fukushima Prefecture in Kenpoku Area, and the teacher's guidebooks for disaster and radiation education edited by the school board.

The execution supports for self-help and mutual aid by an experienced type disaster reduction educational program

Yoshiro AZUMA [1], Akiyoshi TAKAGI [2]

1: Department of Civil Engineering, Gifu University, azuma@do-it-yourself2014.com

2: Department of Civil Engineering, Gifu University

In order to realize a disaster reduction society, home disaster prevention measures (Self-Help) and mutual assistance with neighborhoods (Mutual Aid) are essential. Consequently, we are implementing a lot of practice-based programs such as DIG (Disaster Imagination Game) at schools or communities. The program contents are based on a lot of research and previous cases, such as, the different flood or disaster stricken areas (USHIYAMA 2010), alternative evacuation except for horizontal movement (Central Disaster Prevention Conference 2012), and event with a playful psychology. However, not much research has been done about measuring the effects of Self-Help and Mutual Aid that are necessary for the improvement of disaster programs.

The purpose of this study is to improve the content and the execution of the program, and to contribute to the realization of a disaster reduction society. Therefore, we came up with a CHECK SHEET for Self-Help and Mutual Aid to realize the effects of the program (i.e. Self-Help program for earthquake, Self-Help and Mutual Aid for flood 10 items).

Firstly, we conducted a survey among local residents using the CHECK SHEET to describe the characteristics of different areas and residents' attribute. Second, we observed the behaviors of the residents who took part in the program (such as the work that residents have been doing one year after taking part in the program) Third, we compared the completed items before and after program participation. Finally, we investigated the program contents and the status of program implementation and presented the task needed for improving the program.

According to the completed items of the program, a number of differences in resident characteristics were observed (about 5, 000). We found the intentional increases and unconscious increases before and after program participation. It was clear that the execution support such as "discussion at home and in communities" should take place, as the execution rate was still low. And the execution support such as "fixing furniture game" was observed to be more acceptable among the local residents.

We can therefore say that through the implementation of the CHECK SHEET, the weakness in residential disaster prevention and intention of residents are predictable. And, the CHECK SHEET is supposed to be used independently, effective for executing support planning and the improvement of program.

Next, we will continue to update the items in the CHECK SHEET, reflecting its importance, and try to support residents for the development of regional planning.

Disaster Research in "DECISION SCIENCE" - A New Interdisciplinary/Transdisciplinary Graduate Education and Research Training Program in Kyushu University -

Tadashi TAKAO [1], Tatsuro SATO [2], Kenichi TSUKAHARA[3]

1, 2: Graduate education and research training program in DECISION SCIENCE for sustainable society, Kyushu University, takao@doc.kyushu-u.ac.jp

3.Faculty of Engineering, Kyushu University

Integrated Research on Disaster Risk (IRDR) was initiated by International Council for Science (ICSU) and the International Social Science Council (ISSC) with an understanding that interdisciplinary approach is essential to develop the field of disaster risk reduction research in 2008. In 2013, Kyushu University launched a new doctorate program "Graduate education and research training program in decision science for sustainable society" (the Decision Science Program) as a Leading graduate schools by the Ministry of Education, Culture, Sports, Science and Technology, Japan. The Decision Science Program includes the Disaster Module that deals with Disaster Risk Reduction (DRR) issues with interdisciplinary/transdisciplinary approach. Our poster presentation introduces features and activities of the Disaster Module of the Decision Science Program of Kyushu University from the viewpoint of raising next generation leaders in DRR activities.

The next generation of global leaders in DRR will need to possess, disciplinary knowledge within particular subject areas as a major; a broad range of interdisciplinary knowledge to help bring about social sustainability; and new forms of transdisciplinary knowledge for making the decisions that can lead to innovative solutions as practitioners. The Decision Science Program is a unique five-year integrated program, consisting of five modules, environment, disaster, health, governance, and human modules with students from wide variety of majors. This will give students the opportunity to develop innovative forms of knowledge and skills. In addition, students participate in solutions-based joint international research and acquire practical, interdisciplinary/transdisciplinary knowledge through actual experience in the field.

At the poster presentation, we would like to introduce Disaster Module activities with visual materials.

Community-Based Disaster Prevention Learning: Case of Students in a Primary School near Merapi Volcano in Indonesia

TUSWADI [1], Tohru DOI[2], Hayashi TAKEHIRO[3]
[1, 3:] Graduate School of Education, Hiroshima University, tus5800@yahoo.com
[2:] Shinonome Primary School attached to Hiroshima University

Collaboration between the school and community in providing the common and local knowledge on disaster-risk reduction can improve the students' awareness and understanding about the appropriate evacuation process when they face a natural disaster.

We implemented a community-based disaster prevention learning in a primary school, which points out the importance of knowledge input from the school and the community that can be shared and deepened by the students through the group-discussion and presentation activities for preparing each student the effective actions to anticipate the Merapi eruption disaster.

The learning process contained a set of activities: pre-test, lecture, field-survey, discussion, and post-test. The pre-test was used to know the students' prior knowledge, attitude and behavior related to Merapi volcanic eruption disaster; the lecture was given to make the students understand the mechanism of the volcanic eruption and its hazards; field survey was done in order to give the students chance to collect information among the community members regarding their experience in the event of 2010 Merapi volcanic eruption; and discussion was the moment for students to report what they have gotten from the interview with the community members as well as to share their own opinion and ideas about the effective actions they should do to anticipate the future Merapi volcanic disaster.

From the result of the interview by each student's group to the community members, it was reported that in October 2010 Merapi eruption, many people were staying at home and getting panic while some others had already evacuated. None of the staying people in the village was killed, although some of them got injured and several houses were damaged. If Merapi volcano erupts again, the people would quickly follow the government instruction to evacuate by preparing in advance the vehicles, maskers, and bringing their own precious goods and important documents.

The result of the students' group discussion about their actions for evacuation showed that when there are some signs that Merapi volcano will erupt, the students and their family members prepare the important goods and documents, determine the safer places to evacuate, not getting panic, and wearing maskers to avoid the volcanic ashes. After the eruption and the condition is safe, the students will make sure that the situation is really safe to return to their homes and clean the houses from the volcanic ashes.

In conclusion, through the lecture given by the teacher and the interview with community members, followed with the group discussion and presentation, the students could collect, share, and deepen their knowledge regarding the Merapi volcanic eruption prevention, and by doing so they can decide his/her own actions for effective evacuation. All students were also very excited to enjoy the learning and felt the importance of the lesson for themselves and their family members.

A Development of a Learning Program for Disaster Prevention: In Collaboration with Administrations, (MLIT), Classroom Teaching (Schools), and Research Institutes (Universities)

Takamine KUROMITSU [1], Tsuyoshi ABE [2], Hiroaki MURAKAMI [2]
1: Kagoshima University, kuromitu@edu.kagoshima-u.ac.jp
2: Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

In the areas affected by the Great East Japan Earthquake in 2011, some elementary school students who had received disaster prevention education were able to spontaneously evacuate and later helped and coordinated with each other. This incident confirmed that improvement of people's awareness of disaster prevention is essential to prepare for future disasters. School education on disaster prevention has a particularly important role to play in this situation. Currently, various approaches have been used to implement disaster prevention education in schools. However, certain issues need to be addressed in order for these programs to result in effective learning within a limited period of time. Thus, it is important to implement more concrete lessons and develop appropriate teaching materials that focus on practical situations.

This study aimed to develop a systematic disaster prevention learning program, such as flood disasters and so forth, which can be incorporated into the school curriculum in collaboration with administrations (MLIT), classroom teaching (Schools), and research institutes (Universities), using classroom teaching methods. The objectives of this study were as follows: 1) to develop learning programs on disaster prevention, 2) to evaluate the effectiveness of these learning programs, 3) to implement these programs as part of the school curriculum. The results of this research can be summarized as follows:

1. The learning program developed for this study had the following three characteristics: (1) it was aligned with the current school curriculum; (2) it was systematic; (3) it could be implemented locally.
2. The learning program was carried out in three elementary schools in order to verify its effectiveness. The evaluation of the effectiveness of the program was conducted for (1) learners (2) teachers and (3) school administrators.
3. The evaluation of the three areas revealed that students' understanding, interests, and concern were enhanced; it was also confirmed that the program will blend with the current curriculum.

Do Countries Adapt to Disasters by Learning from Past Death Toll?

Hiroki ONUMA [1,2,4], Shunsuke MANAGI[1]

1: Graduate School of Environmental Studies, Tohoku University, 6-6-20 Aramaki-Aza Aoba, Aoba-Ku, Sendai, 980-8579, Japan.

2: Research Fellow of Japan Society for the Promotion of Science, DC2

Disasters have been considered as one of the major obstacles to achieve sustainable development. As in the Intergovernmental Panel on Climate Change, adaptation to natural disasters is mainly discussed climate-related disasters such as flood, storm, and drought. However, many notable various types of large scale disasters occurred in many countries, for example: earthquake and tsunami in Haiti (2010), Japan (2011), Philippines (2012 and 2013), storms in the United States (2005), Myanmar (2008), Philippines (2011), heat waves in Europe (2003), Russia (2010), and large scale flooding in Thailand (2011). Our paper studies the learning effect of each country's own disaster experiences and other countries' disaster experiences on the damage reduction of the future disasters by using a dataset from 1990 to 2010 in 159 countries with ordinary least squares regression.

Our study has mainly two contributions as followings. First, we extend the empirically test of learning effect to wide range of disasters including various natural disasters and technological disasters. We analyze aggregated data that includes 12 types of disasters. Second, in addition to the calculation of learning effect index by aggregating the damages of past disasters that has taken place in a country, we also create the similar index, which include the disaster damages of other geographically nearby countries in order to study cross-country diffusion of learning effect. In an international context, it is considered that the one country's disaster experiences impacts not only the future damage reduction of domestic, but also the future damage reduction of foreign countries.

The results from empirical analysis show that increase in each country's own disaster experiences lead to reduction in the consequent damage from both natural and technological disasters. The learning effect of other countries' disaster experiences, however, is only relevant for the natural disasters. In sum, the disaster experiences promote an effective adaptation strategy to the future damages from disasters.

Key words: Disaster, Adaptation, Disaster Experience

[4] Corresponding author. Tel.: +81 (0)22-795-3217, *E-mail address:* h.onuma122@s.tohoku.ac.jp

Building communities resilient to disasters by evidence-based preparedness: Lessons learnt from the survey of stay-at-home victims in Ishinomaki

Mariko INOUE [1], Aya ISHIGURO [2], Shoko MATSUMOTO [1], Yuriko TOGITA[1],
Akie MIDORIKAWA [1], Kaoru MORIMITSU [1], Kunio HARA [1], Shinsuke MUTO [3],
Kazue YAMAOKA [1], Eiji YANO [1]
1: Teikyo University Graduate School of Public Health (Teikyo SPH)
inoue-ph@med.teikyo-u.ac.jp 2-11-1 Kaga, Itabashi-ku, Tokyo, 173-8605 JAPAN
2: Department of Hygiene and Public Health, School of Medicine, Teikyo University
3: Health and Life Revival Council in Ishinomaki district (RCI)

The city of Ishinomaki in the Miyagi prefecture was one of the municipalities severely damaged during the Great East Japan Earthquake (GEJE) and tsunami in March 2011. After GEJE, approximately 8,700 families in Ishinomaki remained at home, despite serious damage to their houses. Moreover, many were living only on the second floor of their houses because the tsunami had swept away the first floor completely. This vulnerable population called the stay-at-home victims were provided less support by governmental agencies compared with those living in temporary shelters.

To identify and evaluate the stay-at-home victims to be able to provide rapid and appropriate support in response to their needs, RCI conducted a face-to-face survey using a semi-structured questionnaire between October 2011 and March 2012 (first-term survey) and between April 2013 and January 2014 (second-term survey). In total, more than 300 interviewers visited every remaining house in the area. The questionnaire consisted of following three sections: household demographics, social backgrounds, and health condition of individuals who were in most need of medical support. Teikyo SPH started to support data analysis to investigate the causes of deterioration of the victims' health after the mid-term period of GEJE. We obtained data from 4,176 households in the first-term survey, and 4,023 household members agreed to be interviewed using the written form in the first- and second-term survey.

Our main findings, which will be presented in the following poster, supported that strengthening social ties before and after disasters were important to build a resilient community capable of supporting people's physical and mental health. On the basis of the data analysis and experiences, RCI launched a community building activity from 2013. In addition, the city of Ishinomaki started to encourage community coordinators to identify the residents' needs and to link various options of support to improve the residents' quality of life. Teikyo SPH also started to analyze the community assessment and conducted a qualitative study on the role of existing and newly initiated social capital in the Ishinomaki area. This process could contribute in identifying the particular characteristics of vulnerable populations and provide further ideas to save lives and reduce the damage after the next disaster. Moreover, this process can be a model case of a possible collaboration between a non-governmental organization and an academic institution.

Social capital may be a key factor in building a community resilient to disaster: Lessons learnt from the survey of stay-at-home victims in Ishinomaki

Akie MIDORIKAWA [1], Mariko INOUE [1], Aya ISHIGURO [2], Shoko MATSUMOTO [1], Yuriko TOGITA[1], Kaoru MORIMITSU [1], Kunio HARA [1], Shinsuke MUTO [3],
Kazue YAMAOKA [1], Eiji YANO [1]
1: Graduate School of Public Health, Teikyo University (Teikyo SPH)
inoue-ph@med.teikyo-u.ac.jp 2-11-1 Kaga, Itabashi-ku, Tokyo, 173-8605 JAPAN
2: Department of Hygiene and Public Health, School of Medicine, Teikyo University
3: Health and Life Revival Council in Ishinomaki district (RCI)

The Great East Japan Earthquake and Tsunami, which occurred on March 11, 2011, devastated sizeable areas of the Pacific coastal regions of eastern Japan and often result in tremendous changes in the living situations of survivors and disrupt social capital in communities. However, less is known about the role of social capital to health conditions experienced by disaster-affected populations. We provide a review between the associations of social capital and health conditions among victims who remained at their houses in the Ishinomaki area.

A cross-sectional household survey was conducted on 4,176 household members from October 2011 to March 2012 in the Ishinomaki, Miyagi prefecture, Japan. Univariate and multivariate logistic regression models were used to examine associations between social capital and health conditions such as psychological distress and sleeping difficulties.

We have assessed the role of a wide range of social capital associated with sleep difficulties (Matsumoto S et al, Sleep 2014). Two potentially modifiable factors such as lack of pleasure in life (OR=1.37) and having interaction with neighbors (visiting one another, OR=0.42) were associated with sleep difficulties. The analysis identified potentially modifiable factors related to social and community networks that were associated with sleep difficulties. The factors that have impact on psychological distress were investigated (Furukawa H et al, in press). Our study showed less modifiable factors such as loss of pleasure in life (OR= 1.32) and change of family structure (OR=1.49) and change of working status due to the disaster (OR=1.24) were associated with psychological distress. We investigated the risk of social isolation among the survivors who returned to their homes (Inoue M et al, Disaster Med Public Health Prep 2014). Our findings showed that men, particularly these younger than age 65 years and living alone, were at risk of social isolation.

Our previous studies have important implications regarding social capital such as modifiable factors and social interactions related to health conditions in the wake of the Great East Japan Earthquake and Tsunami. We suggest that the recovery of social capital as well as physical capital should be engaged after disaster.

Building communities resilient to disasters: Coordination between sectors of health and welfare to increase social capital in the community

Aya ISHIGURO[1], Mariko INOUE[2], Shoko MATSUMOTO[2], Yuriko TOGITA[2],
Akie MIDORIKAWA[2], Kaoru MORIMITSU[2], Kunio HARA[2], Kazue YAMAOKA[2], Eiji YANO[2]
1: Department of Hygiene and Public Health, School of Medicine, Teikyo University
2-11-1 Kaga, Itabashi-ku, Tokyo, 173-8605 JAPAN; aishiguro@med.teikyo-u.ac.jp
2: Graduate School of Public Health, Teikyo University (Teikyo SPH)

Background. The Hyogo Framework for Action 2005-2015 emphasizes that disaster risk reduction is a national and a local priority, and to reduce underlying risk factors in community, the effort should be integrated into health sector. During the acute phase of disasters and the recovery and rebuilding phases, health sector can play an important role in the community having the individualized information of vulnerable people in the community.

Disaster and health sectors. In Japan, public health center and municipal health center have made remarkable achievements in prevention of diseases and promotion of health in the community. After the Great East Japan Earthquake, the Ministry of Health, Labour and Welfare (MHLW) revised the Principal Guideline for the Promotion of Health in the Community to integrate self-support as well as community support employing the concept of social capital. The sectors which deal with community are not limited to health sector but the sectors of welfare. Sectors of welfare involve very much in the community especially after the introduction of Long-Term Care Insurance scheme.

Coordination between health and welfare in the community. In 2008, MHLW released a report on community welfare and proposed a system of "community social coordinator" which will work in community to empower the community by making people in the community to support themselves and support each other rather than just waiting for the support from the local government. Following this proposal, in Ishinomaki City, Miyagi Prefecture, the whole city was divided into 16 areas with approximately 10,000 residents each, and in each area designated community social coordinator works to find the problems and seek solutions with the residents. They aim to organize the residents to help themselves and increase social capital but not simply provide the assistance to individual from them. Similar strategy has been used by health centers, as well. However, until present, professionals in the welfare sectors and in the health sectors seldom work together, even though they are dealing with the same community. The coordination between the sectors of health and welfare has long been recommended by number of reports and legislations.

Proposal. To make the community resilient to disasters by increasing the social capital, we propose the followings: 1. Coordination between sectors of health and welfare at community level should be enhanced. 2. Their activity should be based on community diagnosis by comprehending the characteristics of communities using the existing information such as the census data. 3. They need to identify and allocate competent resources in the community. Resource mapping and SWOT analysis may be useful for this. In these activities, empowerment of community shall be emphasized by promoting self-help and help each other, with appropriate utilization of governmental support.

A Fundamental Study to Comprehend the Structure of Discussion in Public Work Planning Processes with Text Mining

Asako IWAMI [1], Shinji IDE[2]
1: the University of Shiga Prefecture, E-mail: iwami.a@ses.usp.ac.jp
(2500 Hassaka, Hikone, Shiga 522-8533, Japan)
2: the University of Shiga Prefecture

Intelligence sharing between people and government is crucial to be prepared for disaster [1]. As a fundamental study to provide people with information on the structure of discussion in public work planning processes, the authors developed in this study a text mining technique to identify main- and sub-themes, and those changes in discussion as well as concerted or opposed relations among the committee members in the processes with using the processes' minutes.

As the result of applying the developed technique to the minutes of the Yodo River Watershed Committee, it was revealed that the themes of discussion in the committee had shifted first from "water demand management", "citizen participation" and "ecosystem integrity" to "dam construction" and "flood control", then "citizen participation" again, and "estimated high-water level" and "flood control", being finally followed by "review of the plan's progress" (Fig.1) [2].

It was also possible to identify concerted or opposed relations between the Kinki Regional Development Bureau and some members as well as among the members by drawing a network graph with distance of the tendency of remarks on sub-themes and response relationships (Fig.2) [2].

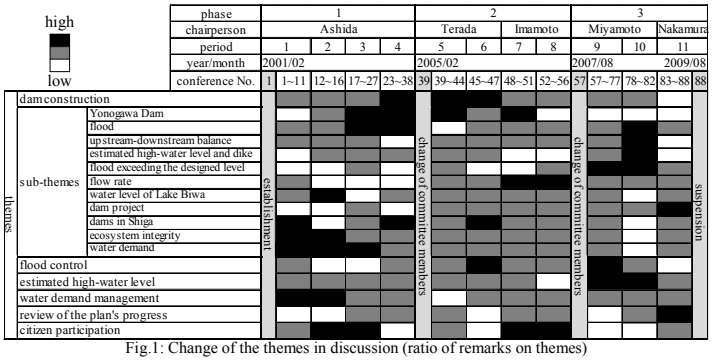


Fig.1: Change of the themes in discussion (ratio of remarks on themes)

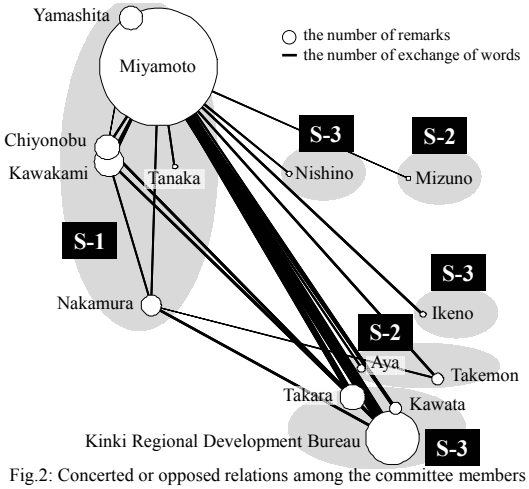


Fig.2: Concerted or opposed relations among the committee members

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Factors affecting registration for natural disasters in Japanese vulnerable people

Ayumi Hashimoto[1], Mika Okura[2], and Hidenori Arai[2]
1: Kyoto City Nishikyo Public Health Center, 1-2 Katsuraushitora-cho, Nishikyo-ku, Kyoto 615-8083. Japan, ahashimoto140@gmail.com
2: Department of Human Health Sciences, Kyoto University Graduate School of Medicine

Objective: The objective of this study was to compare the registration rate for natural disasters in several kinds of vulnerable people in Japan.
Method: A nationwide self-report questionnaire survey was conducted to disaster prevention staffs at municipalities. The data were matched with published official data on disaster prevention, characteristics of regions and municipalities. The relationship between registration rate of vulnerable people for support lists and registration system was analyzed using a Mann-Whitney U test. Characteristics of regions and municipalities were adjusted using logistic regression analysis. Vulnerable people were divided into 4 categories; the elderly household, physically handicapped people, mentally handicapped people and people requiring long-term care. Registration systems were divided into 2 categories; cooperation system and other systems including consent system and application system. The cooperation system is registration by sharing information with related organizations without individual consent. The consent system is registration by getting individual information under their consent. The application system is registration by recruiting applicants.
Results: We obtained 535 responses from 1742 municipalities (30.7%). The registration rates of the elderly household, physically handicapped people, mentally handicapped people and people requiring long-term care were 45.8±32.4%, 29.3±30.3%, 30.0±30.7% and 45.9±37.2%, respectively. The registration rate of physically handicapped people and people requiring long-term care in the cooperation system was significantly higher than that in other systems ($P<0.01$, $P<0.05$). Even after adjusting for the rate of aging, natural increase, primary sector of industry, disaster prevention accounts and financial index, we obtained similar results (OR=0.983 95%CI: 0.974-0.992, OR=0.987 95%CI: 0.974-1.000).
Discussion: Regarding physically handicapped people and people requiring long-term care, this study suggests that sharing information among several organizations supporting them in communities is necessary if municipalities adopt only consent system or application system, which depends on individual intentions. Mentally handicapped people are supposed to have difficulties to prepare for disasters by themselves and public organizations because the registration rate was low and there was no significant difference among registration systems. To promote the registration for natural disasters in vulnerable people, it is important to develop a system according to their characteristics, and to support isolated people intentionally.

Development of a Policy Model for Resilient City - Assessment of External Force Risk, Vulnerability, Situation to be Avoided and Resilient Policy by Three Indicators -

Kenshi BABA[1] and Mitsuru TANAKA[2]
1: Hosei University, Regional Research Center, Professor, kenshi.baba.44@hosei.ac.jp
2: Hosei University, Faculty of Social Sciences, Professor

In this study, we examine the concepts of a resilient city and also employ a framework of assessing it and develop and indicators to assess the resilience of local governments. As a result, we define the resilient city as one having the ability to respond to multiple risks (Fig.1) and also employ a framework of policy model which consists of three types of resilient measures, the external forces and vulnerabilities and anticipated situations to be avoided (Fig. 2). We developed more than 130 indicators in total. Results of using a questionnaire to local governments across Japan in order to measure administrative indicators showed that threats anticipated by most local governments included earthquakes, population decreases, and increases in greenhouse-gas emissions, and the resilience measures they are implementing and preparing included promotion of renewable energy as a preventive measure and enhancement of methods of collecting and providing disaster-related information as an adaptive measure (Fig. 3).

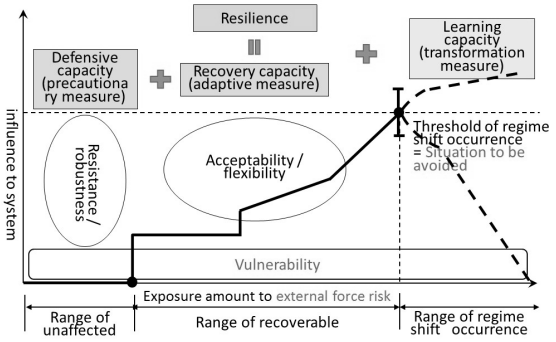


Fig.1 A Framework of Three Measures of Resilient Policy (revised from Mens et al., 2011)

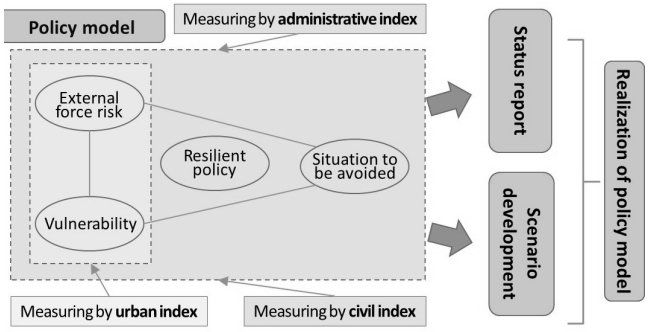


Fig. 2 A Framework of Policy Model and Indicators of Resilient Policy

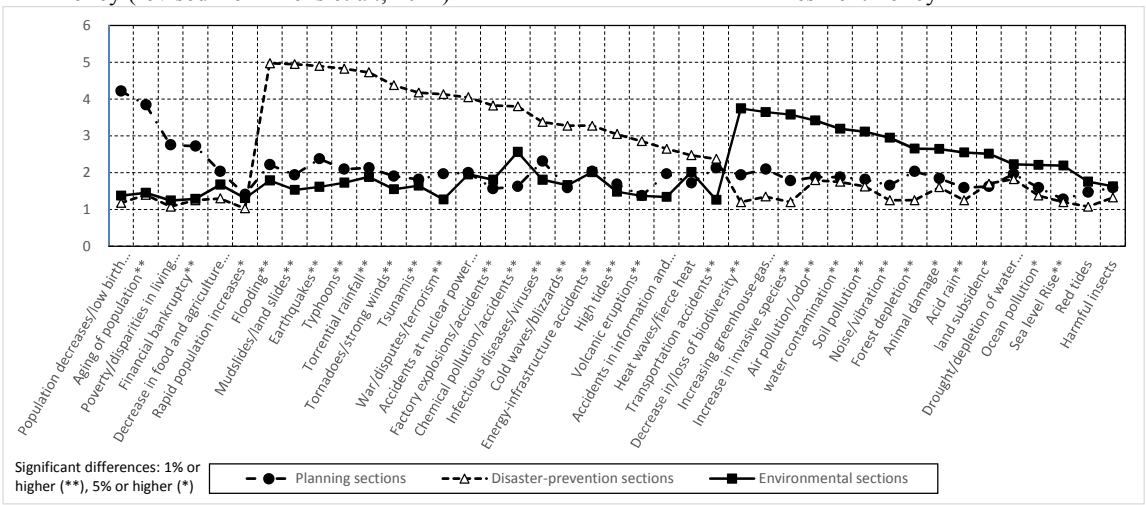


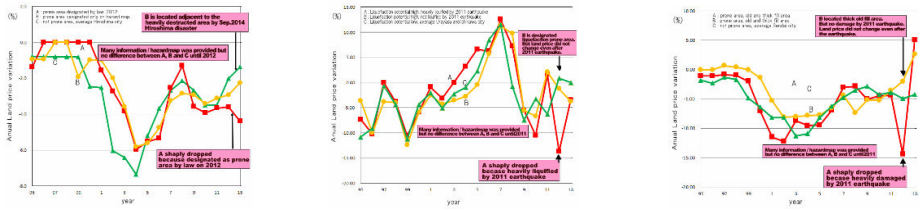
Fig. 3: Risk Perception to External Forces Assessed by each Section in Local Governments across Japan

Misunderstanding of Hazard Maps by the People. Importance of the Legislation and Home to Home Consultation

Satoshi NAKAMURA
Earth System Science Co., Ltd., satoshi@nakamura.be

Many hazard maps for natural disaster have been developed and opened for the public. However, such information is not properly understood and used by the people.
The relationship between land price and hazard map lead following matter.

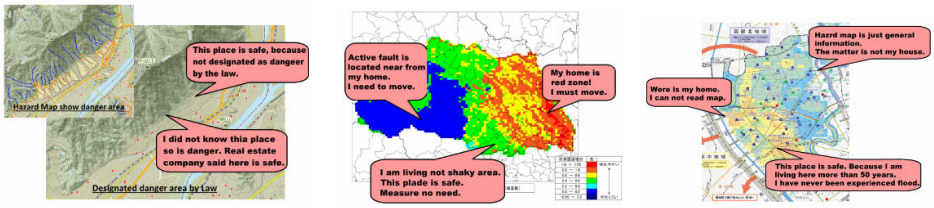
- No difference was generated in land price even hazard map / information was provided.
- Land price sharply declined after actual disaster or designation by law. However, no declining was generated at adjacent or similar prone area.



Debris flow (Hiroshima)　Liquefaction (Urayasu)　Man made Fill Destraction (Sendai)

Fig. 1 Typical Relationship Between Annual Land Price Variation and Natural Disaster Risk

Nakamura has given advice to the people regarding natural disaster for more than 400 homes. From the experience of this activity, Nakamura recognized that many people misunderstood and misused hazard maps. Typical one is as follows:



Landslied, Debris flow etc.　Earthquake Susceptibility　Flood

Fig.2　Typical Misunderstandings of the Hazard Map by the People

From the above, following matter can be lead and recommended for the vital and correct utilization of the hazard maps.

- Just to show hazard maps is not sufficient for correct understanding and utilization for the people. Home to home, person to person consultation by the specialist is essential.
- Legislation / restriction of the land for definite disaster potential area are essential and urgent to reduce casualties and damage.
- Description of the natural hazard risk must be mandatory for real estate transaction.

Community characteristics that affect the development of a disaster evacuation plan for vulnerable people in Japan

Mika Okura[1], Ayumi Hashimoto[2], and Hidenori Arai[1]
1: Department of Human Health Sciences, Kyoto University Graduate School of Medicine,
Kyoto University School of Medicine, 53 Kawahara-cho, Shogoin, Sakyo-ku Kyoto, 606-8507, Japan,
okura.mika.2e@kyoto-u.ac.jp
2: Kyoto city Nishikyo Public Health Center

Objective: The objective of this study was to elucidate the characteristics of each municipality with or without an individual disaster evacuation plan for vulnerable people who may have difficulty to escape due to any physical or mental limitations.
Method: The nationwide official data on disaster measures were matched with the characteristics of each municipality. We then analyzed the relationship between the existence of an individual plan for disaster evacuation and the characteristics of each municipality using a Mann-Whitney U test or a Chi-square test. Furthermore, we conducted a logistic regression analysis using the items with a significant difference.
Results: We analyzed the data of all 1742 municipalities. The number of municipalities in which an individual evacuation plan had been already developed was 501 (28.8%). The existence of a disaster evacuation plan was unaffected by the population size, the proportion of older adults, the natural population-increase rate, the social growth rate or the land area of each community. The total financial budget or the budget specific for disaster measures likewise did not affect the existence of a disaster evacuation plan. However, the proportion of primary and secondary economy sectors was higher in the municipalities with a plan than in those without ($p=0.001$ and 0.019, respectively). The proportion of employed staff responsible for disaster measures was also significantly higher in the municipalities with a plan than those without ($p=0.029$). The mean number of organizations to which the registry of vulnerable people was provided all the time was 2.4 ± 1.4 in the municipalities with a plan and 1.5 ± 1.5 in those without ($p<0.001$), and the mean number of organizations to which the registry was provided only in a disaster was 1.1 ± 1.5 in the municipalities with a plan and 1.0 ± 1.6 in those without ($p<0.001$). As a result of multivariate logistic regression analysis, financial budget (OR=0.621, 95% CI: 0.393-0.979), proportion of staff responsible for disaster measures (OR=1.134, 95% CI: 1.021-1.260), number of organizations to which the registry was provided all the time (OR=1.555, 95% CI: 1.440-1.678), number of organizations to which the registry was provided only in a disaster (OR=1.176, 95% CI: 1.092-1.266) had a significant contribution to the presence of an evacuation plan. However, we found no significant effect of the population size or the proportion of primary or secondary economic sectors of each municipality.
Discussion: For the development of an individual evacuation plan for natural disaster by municipality, it is important to increase the number of the staff assigned to disaster measures regardless of the financial budget and community characteristics such as the population size and the proportion of elderly. This study suggested that it is important to share a purpose and information with the related organizations such as voluntary organizations for disaster measures and persons such as social worker in the absence of any disaster for the preparation to support the evacuation of vulnerable people when a disaster strikes.

International Consensus for Disaster Medicine and Public Health Preparedness: Recommendation for Hyogo Framework for Action 2

Shinichi EGAWA [1], Hiroyuki SASAKI[1]
1: Division of International Cooperation for Disaster Medicine, egawas@irides.tohoku.ac.jp

Through the International Symposium on Disaster Medicine and Public Health, an international consensus was created and recommended to the United Nations for the post-Hyogo Framework for Action (HFA2). Pre-symposium base camp, five breakout sessions, plenary discussion and post-symposium edition achieved the following summarized recommendations through all phase of disaster.

1. Since physical and mental health status is a risk factor during emergencies and disasters, we have to establish community health resilience and well-being as an explicit outcome of HFA2. By improving the baseline of health status, availability and quality of health service, the impact of disaster is mitigated. To do so, public health and medical experts must be engaged in the disaster risk reduction and risk management process at all levels with a mind that current emerging crises demand a paradigm shift within the global community geared toward prevention and preparedness.
2. For better response, it is prerequisite to establish, coordinate and promote "accountability, transparency, oversight, professionalism and registry" among health service providers. In community, engage and empower vulnerable populations including children and disabled to identify their own needs and develop strategies to lower their risks and enhance their resilience. To increase the mental health resilience, individual, family and community support, ethno-cultural and socio-demographic considerations, connectedness and communication are fundamental risk reduction and risk management.
3. Safe Hospitals should remain and be enhanced in structural, non-structural and functional aspects. Health facilities critically require plans for continuity of health operations/logistics, human resources and prioritized funding strategies by enhancing the health component of other UN initiatives such as Climate Change, Millennium Development Goals, Sustainable Development Goals, Poverty, Human Security as the disaster risk reduction and risk management. Investment for health preparedness significantly reduces the vulnerabilities and cost for response.

In conclusion, the achievement of current HFA should be promoted and enhanced in HFA2 by incorporating the above recommendations from health side, and it is vital to increase the visibility of the health professionals in the disaster risk reduction process.

http://www.preventionweb.net/english/professional/publications/v.php?id=38336

Proposals for Maintaining Dialysis Therapy under A Disaster from the survey of the East Japan Great Earthquake Disaster

Ikuto MASAKANE[1], Toshio AKATSUKA[2], Tomoyuki YAMAKAWA[2],
Ryoichi ANDO[3], Kosaku NITTA[3]
1: Chairperson of the Working Group for "the survey for the dialysis therapy under the East Japan Earthquake Disaster (EJGED)" in the Japanese Society for Dialysis Therapy,
imasakan.aipod@seieig.or.jp
2: The Working Group for "the survey for the dialysis therapy under the EJGED"
3: The Japanese Society for Dialysis Therapy (JSDT)

On 11th March 2011 the greatest earthquake and the enormous TSUNAMI smashed the north east coast area of Japan and it was named "the East Japan Great Earthquake Disaster (EJGED)" The damages of the disaster have not yet repaired because of its severity and complexity caused by the FUKUSHIMA Daiichi nuclear plant accident.

In Japan almost 300,000 patients were under chronic dialysis therapy then and a lot of them were risked of their lives by blackout, water supply failure and depletion of medical resources. Generally there are two points in renal replacement therapy under a disaster; the first is how to manage acute kidney failure caused by rhabdomyolysis and the second is how to maintain chronic dialysis therapy. In EJGED over 18,000 people were killed by TSUNAMI so the first issue was not a major problem. The second issue collected great concerns instead; the damaged area by TSUNAMI and the nuclear accident was so wide that over 10,000 dialysis patients had to move to unfamiliar areas for receiving dialysis therapies partially far from their living places.

The JSDT surveyed the impacts of EJGED on chronic dialysis therapy including the preparation of dialysis facilities for disaster risk reduction and resilience as of the end of 2011. There were 315 dialysis facilities which could not continue routine dialysis programs because of various reasons. The most common reason for that was blackout and the next reason was municipal water supply failure. The reason of direct damages on facility's building and/or dialysis machines was not major and the severity of the damage was very different by facility-to-facility. The 4-point-rule have been proved to be important to reduce the direct damages on dialysis machines in each dialysis facility; no caster-lock of dialysis machine, caster-lock of patient's bed, fixation and/or seismic isolation of central dialysis machines and usage of flexible tubing for connecting dialysis machines.

In this paper we introduce essential proposals for disaster risk reduction and resilience in chronic dialysis therapy from 3 viewpoints as of self-help, mutual help and public help.

A national-level preparation strategy for public health crises

Nahoko HARADA [1,2], Yasuhiro KANATANI[2]
1: National Defense Medical College, nahokonobuta@gmail.com
2: National Institute of Public Health
Room #3 Division of Nursing, School of Medicine, National Defense Medical College, 3-2 Namiki Torokozawa city, Saitama, Japan 359-0044

Disasters increase the likelihood of public health crises, such as outbreak of infectious diseases, disruption of food and water supply, environmental hazards, and protection including vulnerable populations. Public health centers in Japan hold the responsibility for securing public health during hygiene hazards. This presentation aims to reveal public health management problems at the time of disasters and introduce efforts to fill the gaps by the National Institute of Public Health.

Disaster medical response systems in Japan were founded upon the experience from the Great Hanshin-Awaji Earthquake in 1995. The Great East Japan Earthquake, however, turned out to surpass the capacity of existing systems of public health and hygiene support. The deterioration of non-communicable diseases such as hypertension and diabetes might be part of the consequences of diminished public health in internally displaced people (Figure 1).

In order to fill the gap between need and response capacity, the National Institute of Public Health has renovated its health crises management training programs since 2011. The renovation aimed to 1) utilize and localize global standards such as the Sphere Handbook to the health crisis management plan of a community, 2) strengthen relationships between response organizations, and 3) familiarize participants with information technology devices for need assessment. Information technology with customer relation management systems enables us to aggregate multiple layers of information input from responders of participating agencies. Information obtained from these programs can be shared across the national government, prefectural governments, and local communities.

Figures

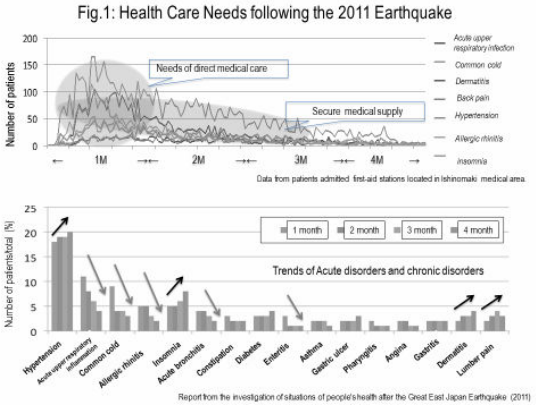


Fig.1: Health Care Needs following the 2011 Earthquake

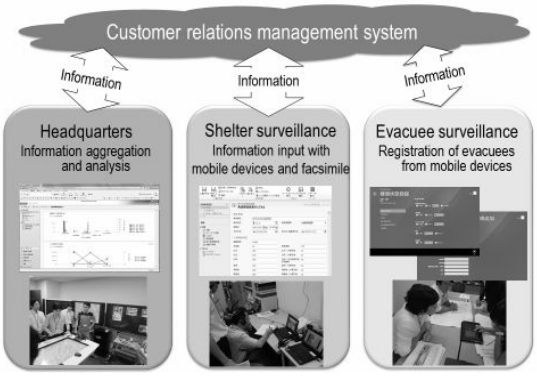


Fig. 2: A cloud base health support system for disaster management

Development and Dissemination of Disaster Preparedness Manuals and Drills for Persons with Disabilities

Yayoi KITAMURA [1], Asami MAEKAWA[2], Reiko FUKATSU[1], Hiromi AFARIE[1], Mayuko SUZUKI[1], Akiko FUKUDA[3], Yoko GRIE[4], And Hiroshi KAWAMURA[5]
1: National Rehabilitation Center for Persons with Disabilities,
kitamura-yayoi@rehab.go.jp; 4-1 Namiki, Tokoroawa, 359-8555, JAPAN
2: Tokyo Woman's Christian University, 3: Zureta Project, 4: Yotsuba Club,
5: NPO Assistive Technology Development Organization

Purpose

Persons with disabilities (PWD) have a lot of difficulties in emergencies such as fires and natural disasters**.** To increase the ability to cope with emergencies, disaster preparedness manuals and drills for PWD were developed and showed the effects.

Methods

Two accessible manuals, one brochure, three leaflets and an iPad application of disaster preparedness for PWD were developed. One of the accessible manuals was evaluated by 84 support centers for persons with autistic disorders through the Internet. Nine persons with disabilities including persons with visual, hearing, mobility and cognitive impairment participated in annual disaster drills by the local government for two years with the help of guides, personal care assistants and sign language interpreters. In addition to researchers' observations, questionnaires and interviews were conducted to participants with disabilities, assistants, and chairpersons at local neighborhood agencies.

Results

Although 46% of service providers failed to download or to run over the accessible manuals, 56% of service providers answered that they wanted to show the manuals to their clients**.** Misunderstandings on methods to assist PWD and isolation of PWD from community residents were observed at the drills of the first year. However, considerations to PWD by community residents increased at those of the second year.

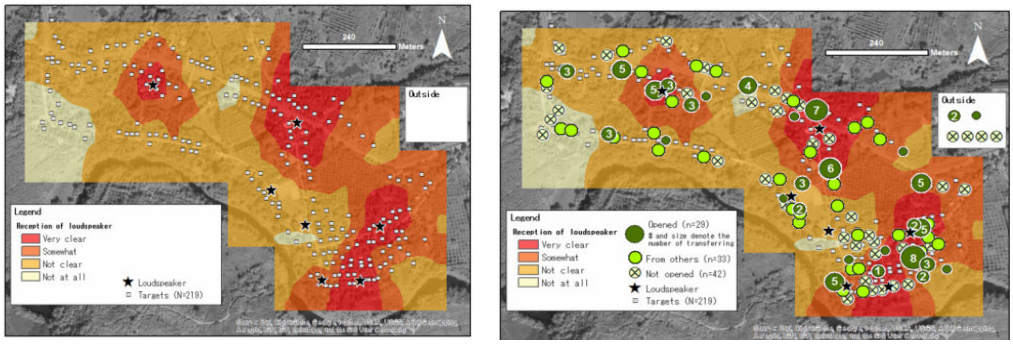
Discussions

Further studies are required to evaluate the effects of the revised materials and improve the participation of PWD to community activities including disaster drills.

A trial to investigate the possibility of SMS to be a medium for warning the public at rural mountainous areas in Thailand

Akira KODAKA [1], Akiyuki KAWASAKI[2], Miho OHARA[3], Shinya KONDO[4]
1: Institute of Industrial Science, The University of Tokyo, akira@iis.u-tokyo.ac.jp
Bw603, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan
2: Department of Civil Engineering, The University of Tokyo
3: International Centre for Water Hazard and Risk Management (ICHARM) under the Auspices of UNESCO, Public Works Research Institute (PWRI)
1: Disaster Reduction and Human Renovation Institution

Mobile phone has been taking an important role for risk reduction during the time of disasters by warning the public. Especially, for rural mountainous areas where sufficient structural measures to mitigate disaster damages are not expected, mobile phone could be a useful medium instead. In this study, one of those in Thailand was chosen as mobile phone has become popular. The authors investigated the possibility of a mobile phone in terms of warning the public by sending Short Message Service (SMS) and compared to loudspeaker, current warning medium in the area. This is presenting how SMS would be able to cover shortcomings of loud speaker, which has a limitation in the area of information available. Furthermore, it could be seen that content of SMS was transferred from recipients to others even to those who did not receive the messages. The experimental results demonstrate the possibility of mobile phone for strengthening current dissemination system in the area by multiplexing channel of communication and information representation.



Spatial comparison in areas of information available from loudspeaker and SMS message

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Social Media GIS to Support the Utilization of Disaster Information from Normal Times to Disaster Outbreak Times

Kayoko YAMAMOTO [1], Shun FUJITA [1], Jiawen ZHOU [1], Takuma MURAKOSHI [2]
1: University of Electro-Communications, k-yamamoto@is.uec.ac.jp
2: Fujitsu Limited

At the time of disaster outbreak, it is necessary for us to obtain the information regarding the safety of families and friends and the damages in the current places and residential areas. However, disaster message board on the Internet gives us only safety information, and it is difficult to obtain imminent detailed local information on TV and radio. Considering the above-mentioned backgrounds, this study aims to design, develop, operate and evaluate a social media GIS (Geographical Information Systems) specially tailored to mash-up the information that regional residents and local governments provide to support information utilization from normal times to disaster outbreak times in order to promote disaster reduction.

The conclusions of this study are summarized in the following three points.

(1) Social media GIS, an information system which integrates Web-GIS and SNS in addition to an information classification function into a single system, was conducted in Chofu City, Tokyo. The social media GIS used a design which showed information as semitransparent circles depending on its present location data and contents. This made it propose an information utilization system based on the assumption of disaster outbreak times when information overload happens as well as normal times.

(2) The social media GIS was operated for regional residents who are more than 18 years old for seven weeks. Although about 52% of the users were in their twenties, about 36% were aged forty or above. Users submitted and inspected disaster information using both PCs and mobile information terminals.

(3) The system was evaluated based on the results of a questionnaire survey to users, an access survey using log data during operation and an analysis of the submitted information. The questionnaire survey showed the usefulness of the system in terms of its operability especially regarding specific functions, and the possibility to provide disaster information mainly for mobile information terminals. Additionally, since it also showed effects of use, we expected that systems will be used according to their purpose. The access survey showed that users continuously accessed the system and 181 pieces of disaster information were distributed throughout the whole city of Chofu.

A Trial of Collaboration on Local Weather Information

Kensuke TAKENOUCHI [1], Yasuhito KAWATA [1],
Chihiro NAKANISHI [1], Katsuya YAMORI [2]
1: Graduate School of Informatics, Kyoto University, k.takenouchi@drs.dpri.kyoto-u.ac.jp
(36-1 Yoshidahonmachi Sakyoku, Kyoto 605-8501, Japan)
2: Disaster Prevention Research Institute, Kyoto University
(Gokasho Ujishi, Kyoto 611-0011, Japan)

1. An approach to relationship between weather information and our society

Various approaches on severe weather information are tried for disaster prevention. As an approach for better weather information system, this study focuses on not contents of weather information, but social relationship among relevant groups about weather information.

Takenouchi et al., (2014) indicates the extreme unidirectional risk communication on Japanese weather information system, that means weather information is basically to be received. Moreover, bidirectional risk communication among relevant groups is significant and the authors suggest "Collaboration on weather information" as one of public participation model.

A trial of collaboration on local weather information

Fig.1. Pictures at a trial of the collaboration

Reference: Takenouchi, K., Kawata, Y., Nakanishi, C. and Yamori, K., Collaboration of Local Weather Information - Sharing Disaster Risk between producer and user of Weather Information -, *Journal of disaster information*, No.12, pp.100-113, 2014.

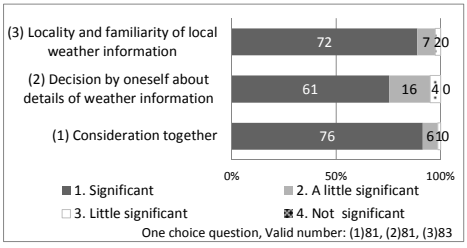


Fig.2. Significance of the collaboration on weather information

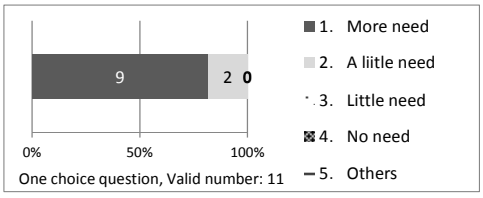


Fig.3. Necessity of users' participation to weather information

A trial of collaboration on local weather information (LWI) was conducted with local meteorological office, local government and residents at the study area; Nakajima school district in Ise located in the center of Japan. LWI is the information to enhance weather risk awareness between forecasters and users of weather information with familiar, plain and local expressions.

This trial was separeted into two main parts; one is a process of information production by many participants and the other is a process of discussing the availabilities by the representatives of relevant groups. Fig.1, 2, 3 shows the picures of this trial and the result of the questionnaries. This positive answers about this collaboration is very significant in terms of risk communication.

Building a storage house on upper hill as a flood preparedness measure

Chiho OCHIAI [1]
1: Graduate School of Global Environmental Studies, Kyoto University,
ochiai.chiho.2x@kyoto-u.ac.jp

People in Japan have led the life with the blessing and threat of nature such as a river and mountains for many years. The study area of Hongu-cho in Wakayama prefecture has little flat land because the forests and mountains are surrounded, and they had been depended on the river transportation for a long time in the past. This area is also famous for high rainfall in Japan, and the residential areas were built along or in the juncture of main and subsidiary rivers. Traditional flood prevention or preparedness measures like a circle levee are well known and similar measures can be found throughout in Japan by changing a form and a style.

This study present another ways of flood preparedness measures such as constructing storage house on the upper hill or constructing their home on the upper hill. The study explain characteristics of buildings, and historical back ground and changes of these flood preparedness housing on the hills. The study was conducted by interviewing residents and measuring the houses in May 2013 to September 2014.

The flood preparedness house called “Agariya” was first constructed as a form of storage by shops and inns owners to protect their goods and commercial goods. Most of shops and inns were located at lower level of flat land along the main river called Kumano for serving customers and visitors of the famous shrine. The Agariya was usually built on the higher ground of 4 to 15 m above their ground. The size of Agariya varies from 16 to 50 m^2. In 1953, the area experienced a heavy rain and a major flood that cased housing damages of 193 out of 250 houses were washed away in Hongu-cho. After the flood, local government constructed semi-permanent houses for victims of the flood at their land and later offer them with low price. This semi-permanent house is designed to have one living, two bedroom, and bath and toilet about 50 m^2. Many local residents consider this semi-permanent houses as Agariya when they are located on the upper hills. Most of this semi-permanent houses are replaced by new permanent houses or demolished as it got dilapidated. But, some of them are still remaining and used as a retirement house of elderly parents or rented out for others.

It is not clear when the Agariya was first built but it had already existed in 1930s according to the interview with residents. Many of remaining Agariya are disassembled after large flood in 2011. In addition, they have been decreased by numbers because of the public works of dam development, dike improvement and land leveling, and construction of two-stories residential homes. Furthermore, a public evacuation places have been assigned and improved, the role of the Agariya was gradually lost. Nowadays, young generation no longer knows a life in Agariya and this very unique measures for flood preparedness.

Urban crisis in Iran: New strategies for urban sustainability,

Professor Asghar Zarrabi, Urban Planner, assistant director, Shakhes Pajouh Institute of Natural Hazards, Esfahan, Iran
Dr. Amir Mahmood zadeh, Director of Shakhes Pajouh Institute of Natural Hazards, Esfahan, Iran
Email address: aszarrabi@yahoo.com

Iran has high urban disparities. More than 22 percent of Iranian population living in one large city such as Tehran Metropolitan. It is projected that by 2050 more than 50 percent of Iranian population will be living in this city. The infrastructures are under very severe Stress. The ground water is depleting rapidly, pollution is reaching crisis levels, the transportation system is in disarray, and sewerage and sanitation are under pressure, all of which is affecting public health and make city unsustainable.
On the other hand, the main natural disaster in this large city is probably earthquake in future of Tehran. This city is located at the southern foot of the Alborz Mountains. There is a large fault in this mountain range and there are a number of fault lines in the plans south of Tehran metropolitan. This city surrounded by faults which may has suffer large earthquake disaster in future. This paper analyses the programs and policies adopted so far to correct the situation, identifies their shortcomings, and looks into the new strategies that have been undertaken to make the city self-sustainable units of governance and reliable service-providers for solving the future problems and have Disaster risk reduction in order to have more urban sustainability.

Impacts of Accurate Stress Response, Perceived Risk and the Consideration of Responsibility on Earthquake Preparedness

*Haburi MUNKH[1], Yutaka MATSUI[2]
1: Institute of Human Science, University of Tsukuba, Japan, habura_smile1987@yahoo.co.jp,
Address: Room A311, Institute of Human Science, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8572 Japan
2: Institute of Psychology, University of Tsukuba, Japan

Abstract

This study examined the earthquake preparedness of Japanese university students at the time about two years after The Great East Japan Earthquake, as well as the impact of the Accurate Stress Response (ASR), Perceived risk as well as the consideration of responsibility on it. A questionnaire-based survey was administered to a number of 313 college students studying in the universities or colleges in the capital region in Japan where was affected by The Great East Japan Earthquake. The result of exploratory factor analysis of earthquake preparedness revealed that three factors had been extracted, which were named as *behaviors of evacuation*, *household strategy* and *earthquake information seeking*. Then, the result of exploratory factor analysis of Consideration of Responsibility showed that a construction of two factors of *self- responsibility* and *government-responsibility* was confirmed. Moreover, we undertook a multiple regression analysis using the three factors as dependent variables respectively, and the result revealed that, each of the three factors was being promoted by ASR, while only behaviors of evacuation and earthquake information seeking were impacted by the perceived risk. Though both self- responsibility and government-responsibility were impacting earthquake information seeking, the former one was promoting while the later one was inhibiting. There also found an indirect influence from ASR to earthquake information seeking mediated by perceived risk and government-responsibility (Figure1). The result implies that earthquake preparedness of Japanese university students could be classified into three categories, of which the determining factors are different.

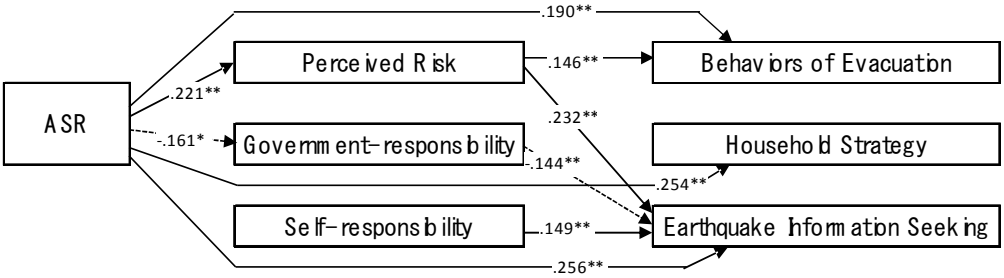


Figure1 Multiple regression analysis using the three preparedness factors as dependent variables respectively

Disaster Literacy: Mapping of Disaster Risk Data and Creating Information Web

Hiroko KANOH [1],
1: Yamagata University, kanoh@pbd.kj.yamagata-u.ac.jp
Disaster Literacy, Mapping of Disaster Risk Data, After the Great East Japan Earthquake

1. Introduction

Disasters attacked us suddenly. Many people would be wander to seek the necessary information. However, the data that the government and the mass media to publicize, in the case of the data and a rough information, the distant region is large. By creating their own hands resident, data of residential areas around, can make the necessary data for the occupants. For that purpose, I want to suggest that all people learn the disaster literacy.

2. Mapping of Disaster Risk Data and Creating Information Web

After the Great East Japan Earthquake, the diffusion of radiation, was the anxiety people of East residents. Therefore, I report an example of children's page creation and create a map of the result of the radiation measurement in Yamagata Prefecture (Fig.1).

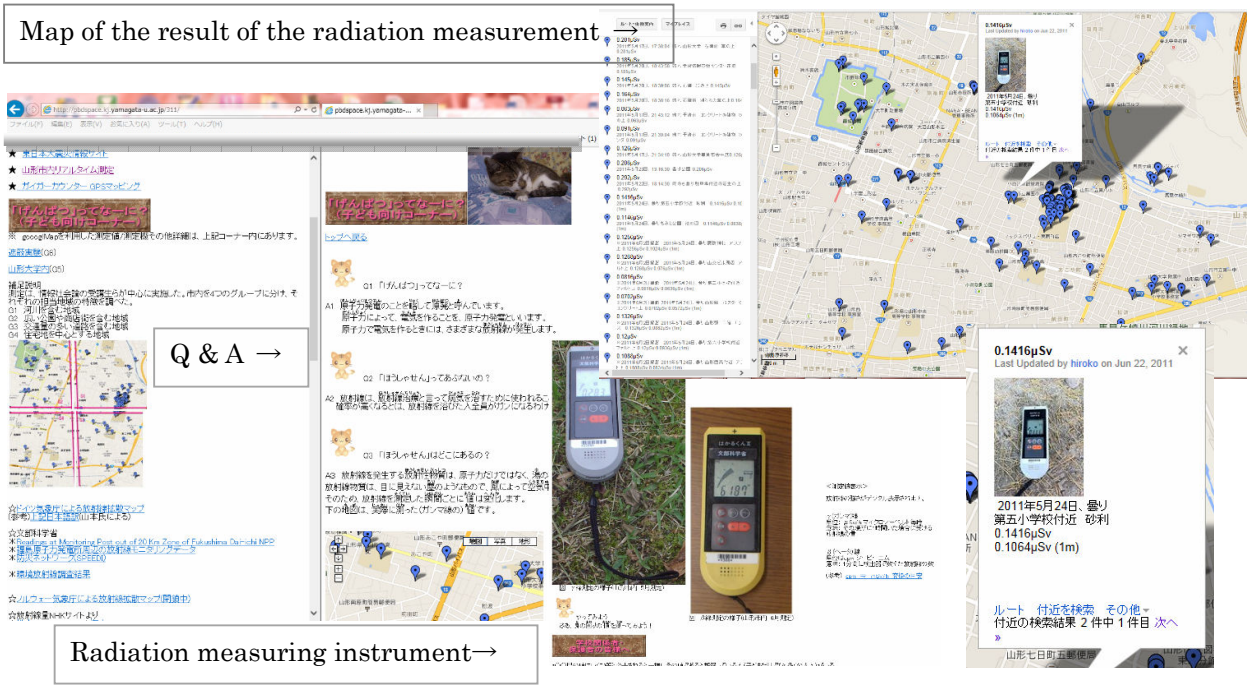


Fig1 Children's Pages for Disaster Literacy and the Map of the Result of the Radiation

URL:
http://pbdspace.kj.yamagata-u.ac.jp/311/

Area Risk Management of East Mikawa Region in Japan to Prepare for Nankai Trough Earthquake

Taiki SAITO
Toyohashi University of Technology, tsaito@ace.tut.ac.jp

East Mikawa Region in Japan is an important area to support the circulation of goods and manufacturing industry of our country as well as blessed with a rich natural environment and nation's leading farming area.

On the other hand, not only Nankai Trough Earthquake which may cause large-scale disaster in this area, it is also a high-risk area of natural disasters such as storm surges and heavy rains caused by typhoon. Additionally, in recent years, concerns about food and water safety are also increased. Therefore, it is important to prepare and respond appropriately to various future risks.

The Research Center for Collaborative Area Risk Management (CARM) was established in Toyohashi University of Technology to conduct research and development to mitigate disasters in the area collaborating with local governments, private companies, and citizens. This presentation introduces the current activities of CARM and future scope of research, especially focusing on area risk management for earthquake disaster mitigation.

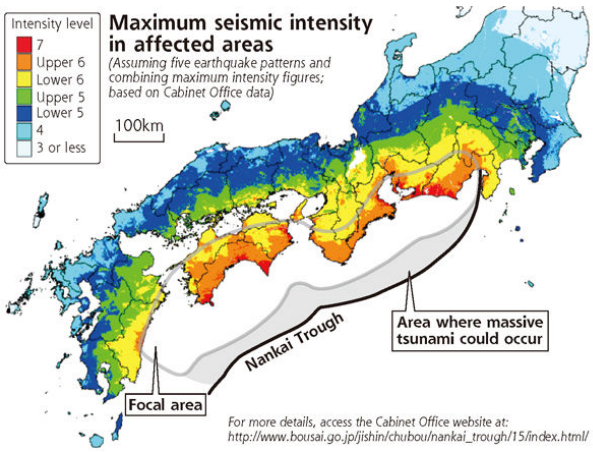


Figure 1 Prediction of Nankai Trough Earthquake (by Cabinet Office, Japanese Government)

Photo 1 Establishment of Disaster Risk Reduction Research Consortium among Universities in Tokai Area (March, 2013)

Photo 2 Public Symposium "Towards Disaster Mitigation of East Mikawa Region against Nankai Trough Earthquake" (December , 2013)

A new proposal for tsunami hazard map explicitly indicating uncertainty of tsunami hazard assessment

Yo FUKUTANI[1], Anawat SUPPASRI[1], Fumihiko IMAMURA[1]
1: International Research Institute of Disaster Science, Tohoku Univesity,
〒980-8579 Aoba 468-1 S305, Aramaki, Aoba, Sendai, Miyagi, Japan
E-mail address: fukutani@irides.tohoku.ac.jp

The tsunami caused by the 2011 Great East Japan Earthquake mainly inundated the Tohoku coastal areas, most of which exceeded inundation area specified in tsunami hazard maps. A report by the Japanese government for the IAEA Ministerial Conference on Nuclear Safety clearly stated that there is difficulty of quantitatively assessing natural disaster risk associated with a rare event such as tsunami because of uncertainty, and sufficient effort have not been made so far to enhance the public confidence in the risk assessment by explicitly assessing the uncertainty. Based on the statement, we propose a new? method for explicitly indicating the uncertainty of tsunami hazard assessment in terms of the tsunami hazard map.

Firstly, we estimated stochastic wave height along the Tohoku coastal areas using a method for probabilistic tsuami hazard assessment in order to quantitatively assess the uncertainty of coastal wave heights. We selected eleven earthquake-generic areas along the Japan trench as the areas that could generate tsunamis. Secondly, in order to calculate tsunami inundation area due to the coastal average wave height for one return period, we identified the earthquake fault that generate the target wave height and conducted tsunami numerical simulation using non-linear long-wave equations with inputting their fault parameters. On the other hand, in order to calculate tsunami inundation area due to coastal fractile wave height that consider the uncertainty of tsunami hazard assessment, we generated a hypothetical earthquake fault that the dislocation of which was uniformly increased or decreased by multiplying a constant number according to the change of each fractile wave height, and conducted tsunami numerical simulation in the same way. As a result, there were big differences among tsunami inundation areas due to 0.05 fractile wave height, simple average wave height and 0.95 fractile wave height at coastal points even though the assumed wave height generate by one target return period.

A preliminary assessment of tsunami hazard includes large uncertainty. Therefore, we expected that what we quantitatively assessed how much the tsunami hazard assessment includes the uncertainty and clearly show the uncertainty in the tsunami hazard map leads to a proper understanding of users such as regional residents who utilize the tsunami hazard maps.

Choice Behavior Model of Refuge Building Selection during a Tsunami in Coastal Areas

Takashi YAMADA [1], Tatsuya KISHIMOTO [2]
1: Doctoral Course, Graduate School of Science and Technology, Keio University, M. Eng.
2: Assoc. Prof., Faculty of Science and Technology, Keio University, Dr. Eng.
takashi.yamada0804@gmail.com

This study aims to formulate a numerical model to predict choice behavior of refugees seeking a tsunami refuge building in a coastal area. We interviewed respondents about their choice of building during a tsunami and analyzed their selection behavior. Figure 1 shows PC screen of interview. The interview was conducted in the following manner. Respondents chose their most desirable refuge building from among 27 buildings on a PC screen. We then deleted the chosen building from the screen and the respondents chose from remaining buildings. By repeating the above procedure, we continued until all the buildings were deleted. Consequently, the respondents' choice varied as per personal attributions. For example, one of the respondents first chose a building far from the sea, whereas another chose a building close to location where the evacuation started.

We established the utility of the tsunami refuge buildings on the basis of a multinomial logit model of random utility theory, which was used to estimate the utility's parameters. This model consists of the utility variables that are psychological utility of the refuge direction, the distance to the tsunami refuge building, the tsunami refuge building located at inland, the height of the tsunami refuge building and the capacity of the tsunami refuge building (Figure 2). We analyzed choice behavior models of different attributions by respondents' age or gender. As a result, parameters of these models were different by each attributions. We have quantitatively indicated the characteristics that attract refugees to the tsunami refuge buildings (Table 1).

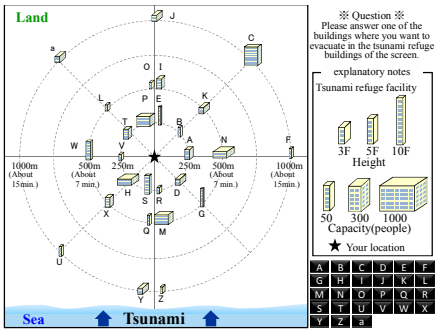


Figure 1. Interview screen

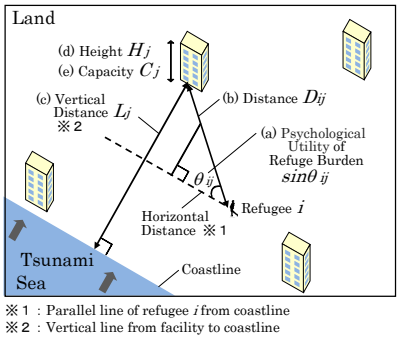


Figure 2. Variables in this model

Table 1. Estimated result of each parameter

Variable	Coefficient	Age all	Age 10-20	Age 60-70
$sin\theta ij$	α	0.910 ***	0.950 ***	1.203 ***
Dij	β	-0.003 ***	-0.004 ***	-0.002 ***
Lj	γ	0.002 ***	0.001 ***	0.002 ***
Hj	δ	0.701 ***	0.840 ***	0.755 ***
Cj	ε	0.266 ***	0.311 ***	0.240 ***
likelihood ratio		0.25	0.26	0.29
predictive value		44.65 %	46.32 %	49.70 %

significance level
*** : 1%, ** : 5%, * : 10%

The Evolutionary Psychology of Tsunami Evacuation Behavior —Beyond Rational Decision-Making Models

Masahito TAKAHASHI [1]
1: Yamaguchi University, takahasi@yamaguchi-u.ac.jp

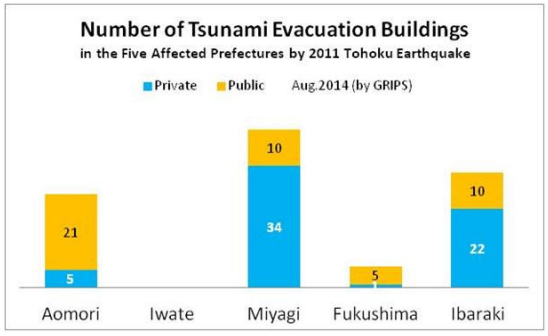
Many researchers interested in disaster reduction have focused on precise prediction—a rapid alert system—and effective guidance to safety zones. Although these rational devices have saved many people from disasters, they also have been blind to the heuristic nature of disaster evacuation. Why do few people follow evacuation alerts during natural disasters? Based on data of the tsunami evacuation survey (MLIT 2012, N = 10,603) and Miyagi health survey (Miyagi Pref. 2012, N = 26,772) concerning the March 2011 tsunami, we will explain the heuristics of tsunami evacuation behavior from an evolutionary viewpoint. Our findings show some psychological vulnerabilities that we need to overcome through evacuation drills.

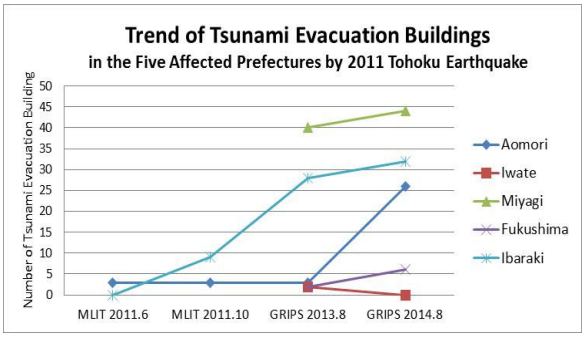
1. The Limits of Rational Decision-Making Models
   Surprisingly, only 21% of the survivors escaped immediately after the M9 earthquake. The drone of sirens rather triggered risky behaviors such as gathering information, searching for children, steeling for desperate roles, or excessive dependence on the safety zone. These behaviors can be understood as human errors in the tsunami evacuation behavior.
2. The Perspective of Evolutionary Psychology
   Evolutionary psychology assumes that the human brain was shaped mainly in the stone age and functions unconsciously and automatically (Tooby & Cosmides 1992, Gigerenzer 2007). If our fear system detects a threat, it triggers our sympathetic nervous system, firing up the "fight-or-flight" response (Haidt 2012). Even in "natural" disasters, however, it can mistakenly trigger a "fight" response, which evolves through group competition.
3. "Tsunami-Tendenko" Interpreted by Evolutionary Psychology
   The March 2011 tsunami proved that "Tsunami-Tendenko" (running to a higher ground by oneself, without finding family members) is a successful strategy of tsunami evacuation (Katada 2014). It maximizes the number of survivors by inhibiting the risky behaviors for family and community. This individualistic maxim corrects our inappropriate group mind (kin selection, role responsibility, bystander effect, and feelings of guilt) to the simple objective of survival in a tsunami disaster.
4. Revising the Heuristics of Emergency Evacuation
   Our heuristics of emergency evacuation have an evolutionary bias toward the fight response. For successful evacuation, we need to understand the biases of our heuristics and correct them for appropriate action during different disasters by evacuation drills. Human concerns for the family and community must be resolved "before" disasters. Disasters often require us to make a ruthless trade-off between survival and morality.

Trend of Tsunami Evacuation Buildings in the Affected Regions by 2011 Tohoku (Great East Japan) Earthquake and Tsunami

Shoichi ANDO [1],
[1] : Prof., National Graduate Institute for Policy Studies (GRIPS),
ando@grips.ac.jp : 7-22-1 Roppongi, Minato-ward, Tokyo, 106-8677 Japan

Before the 2011 Tohoku Earthquake (Great East Japan Earthquake), tsunami evacuation buildings were designated in the affected regions in Iwate, Miyagi and Fukushima prefectures. Most of them functioned against tsunami and saved many surrounding residents' lives. The photo 1 shows a tsunami evacuation building in Minami-sanriku town was a public hospital with five-story and although even fourth floor was inundated, many people evacuated fifth or top floor. However, municipality of Kamaishi city retracted the designation even for a remained building with eight stories. It seems that heavily affected municipalities tend to be more circumspect to designate tsunami evacuation buildings again.





On the other hand, less affected areas even in Miyagi prefecture like Tagajo city or other prefectures like Aomori and Ibaraki, municipalities in the coastal area designate many tsunami evacuation buildings recently. The author shows actual conditions and analyses the background of tsunami evacuation buildings in the affected regions.

Photo 1: (left) Demolished Tsunami Evacuation Building in Minami-Sanriku, Miyagi June 2012 (S. Ando)

Photo 2: (right) Tsunami Evacuation Building remained but retracted its designation in Iwate Aug. 2013 (S. Ando)

Systems for Food Stockpiling in Urban Cities

Mayumi MORI [1,2], Shigeaki MORI[3,4], Shigeru Beppu[5], and Harumi YASHIRO[6]
1: Japan Disaster Food Society, office@telepac.jp #901, Roppongi 7-8-5, Minato-ku, Tokyo
2: Telecom-society Planners And Corporations, Emergency Food Research Group
3: Urban Disaster Research Institute (UDRI) 4: Tokyo Station Commuters Corps
5: Forica Foods, Co., Ltd.
6: National Defense Academy of Japan

ABSTRACT In the field of Disaster Prevention, there are a few researchers concerned with the living environment in disaster-stricken areas, especially dietary life in the disaster area. Through the past large-scale natural disasters, reported are various gastronomic problems, i.e., shortage of food supplies, demand-supply mismatches, unbalanced nutrition, progression of chronic diseases especially in evacuation centers (schools, community halls, meeting places etc.) In consideration of the future mega disaster known as Tokyo Metropolitan Earthquake, the Government and 23 wards in Tokyo have started to call attention to food stockpiling for at least 3 days or possibly 7 days in accordance with the latest damage estimation published in December 2013 from the Central Disaster Management Council in the Cabinet Office[1)]. However, according to the statuses of stockpiles in 23 wards in Tokyo[2)], it is clear that such domestic stockpiling as self-help is insufficient to solve the problems, and it is necessary to establish a system of recycled emergency food stockpiling and consumption as public help. To avoid life-threatening situations in dietary life in the case of mega disaster, we make a suggestion to a) construct a publicly-aided disaster-prevention warehouse holding various foods to respond to various demands, which works as a supermarket in normal times, b) also introduce so-called "rolling stock (running stock)" method in public institutes, and c) establish local-production and local-consumption business models as means of mutual assistance and public help in case of emergency.

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Addressing diversity for post-disaster support of foreigners in Japan: a study on the 2011 Great East Japan Earthquake

Michael HENRY[1], Akiyuki KAWASAKI[2], Ichigaku TAKIGAWA[3], Kimiro MEGURO[4]
1: Faculty of Engineering, Hokkaido University, mwhenry@eng.hokudai.ac.jp
Japan, Hokkaido, Sapporo-shi, Kita-ku, North-13 West-8
2: Department of Civil Engineering, The University of Tokyo
3: Graduate School of Information Science and Technology, Hokkaido University
4: Institute of Industrial Science, The University of Tokyo

In the aftermath of the 2011 Great East Japan Earthquake, it was reported that large numbers of foreigners residing in Japan were hurriedly fleeing overseas. One month after the earthquake, roughly 240,000 foreigners with re-entry permission had left, representing more than 10% of the entire foreign population in Japan. International tourism was similarly affected, as the number of international arrivals to Japan decreased 27.6% from 2010 to 2011, the largest drop on record. The sudden evacuation of foreign residents and drop in international tourists had socio-economic implications across the private and public sectors.

This post-disaster exodus of foreigners in Japan led to increased awareness of the need to support foreign populations in a post-disaster situation. The importance of post-disaster support for foreign populations is set to increase even further, as the Japanese government, in 2013, announced plans to double the number of foreign tourists to 20 million by 2017. Furthermore, in 2014, it was reported that the government might also consider accepting more foreign immigrants to counteract Japan's shrinking population.

How to support foreigners after a disaster requires an understanding of what makes them "vulnerable." In the case of the 2011 Great East Japan Earthquake, we approach this issue by asking: what led those large numbers of foreigners to leave Japan? Using the results of an anonymous, Internet-based survey distributed after the earthquake, we analyze the post-disaster behavior from multiple perspectives, including reasons for post-disaster evacuation, the level of government advisories, length of time in Japan, and other attributes. To reduce the diversity of the sample, we then segment the respondents into groups to identify common patterns in their post-disaster behavior. Finally, we discuss practical implications for disaster management and post-disaster support of foreign residents as well as foreign tourists.

Constructing delivery framework during disaster by using “Wishlist” on Amazon.co.jp

Makoto BANDO[1]
1: The University of Tokushima Graduate School Advanced Technology and Science (Tokushima Prefectural Government), dianhua37@gmail.com

Once a major disaster occurs, many of the disaster victims are forced to spend a long period of time in shelters until settling down in temporary houses. It is very difficult for local governments to get a full picture of extremely the diverse needs in shelters because the needs in affected areas change a lot over time and are largely affected by victims’ personal circumstances.

Administrators in some shelters have attempted to seek assistance that matches their needs by using message board on the Internet, but it is extremely difficult for them to control the amount of aid from all over the country, which often caused a "quantitative mismatch", too much aid supply for the required amount.

One of the frameworks that can solve the problem in shelters by providing what and as much as they want when needed, is the effort of utilizing “Wishlist” on Amazon.co.jp during the time of the Great East Japan Earthquake.

This new approach of accepting a variety of needs in shelters and utilizing a product sales site as web ordering system, it worked successfully to deliver many items that match their needs and no wasted supplies in affected area.

Based on this experience, Tokushima Prefectural Government signed on an agreement with Amazon Japan K.K. in September 2014, and started to build a logistics model in more than 1,000 in-prefecture shelters utilizing “Wishlist” on Amazon.co.jp.

Tokushima Prefecture’s effort of utilizing its information sharing system and the site of Amazon.co.jp will be presented in this paper (poster).

Practical Using of Disaster Mitigation Assets in Historical City Kyoto, Japan: The Disaster Mitigating Plan by Utilization of The Honganji-Water Pipelines and The Abandoned Green Belt Zone.

Dowon KIM[1], Yuko ISHIDA[1], Mingji CUI[1], and Mayuko YONEJIMA[2]
1: Postdoctoral fellow, Kinugasa Research Organization, Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University (R-DMUCH), kim21@fc.ritsumei.ac.jp
2: Postdoctoral fellow, Ritsumeikan Global Innovation Research Organization, Ritsumeikan University
Postal Address: 58, Komatsubara Kitamachi, Kita-ku, Kyoto, Japan 603-8341

The cultural townscapes, which are represented by beautiful landscapes of historical city Kyoto, are exposed its high risk of an earthquake hazard that needs a regional disaster management planning. This study evaluates possibilities of the planning to supply water to the Higashihonganji-temple site and to its surrounding built-up area for the purpose of fighting fires. Furthermore, the study examines practical utilizing of disaster mitigation assets, the Honganji-water pipelines and the abandoned green belt zone in front of the temple, where would be accommodated a temporary evacuation shelter, would be a back up plan for relief crowding evacuees on Kyoto station when it is emergency.

The Honganji-water pipelines was devised as a fire fighting water supply system for Higashihonganji in 1897, which is a historical temple located in Kyoto. From 1788 to 1864, the wooden structures in Higashihonganji site were burnt down on four separate occasions. Three occasions of fire were caused of the spreading fire from the townscapes to wooden structures inside the Higashihonganji site. The Honganji-water pipelines had been designed to supply water from the water reservoir about 4.6 km apart from the site. It use a gravity based fire fighting water supply system that exploits the difference in elevation (44 m) through the cast iron pipes. Due to the high pressure in the system, the water flowing through water cannons and hydrants can reach above the height of the highest wooden structure (38 m) in the Higashihonganji site without the need for extra water pump engines.

This system is also of cultural and historic importance because its implementation pioneered the use of subsequent fire hydrant systems for the protection of important cultural heritage sites in Japan, but that pipelines was terminated due to an inadequate water supply triggered by the leaking of the cast iron pipes that feed water to the site. Moreover, the pipelines discuss conservation needs earthquake resistance condition for future utilizing. That the earthquake resistance of pipelines can be secured, the system can supply the fire fighting water for fire even when a large earthquake is feared to fire spread.

A Simulation on Networked Market Disruptions and Resilience from *"Fuhyo-Higai"*

Kazuhiko SHIBUYA[1]
1: ROIS, kshibuya@ism.ac.jp

The objective that I want to examine is the nature of socially restrained buying trends of the agricultural foods and products made in Tohoku Area. This social phenomenon often calls severe controversies as a Japanese phrase "Fuhyo-Higai". Actually these trends are still now observable anywhere ever since the Fukushima Nuclear Disaster of the Tohoku Quake (11th, Mar. 2011). Of course, these safety matters were temporally, and scientific investigations well assured of the safety of agricultural foods. But many consumers still feel unsafely sentiments. Thus, it is critically true that innocent and honest farmers lost their profits since that time.

Little is known about the nature of this social phenomenon in terms of academic concerns. At least, this social trend was not only engendered by inaccuracy rumor and media communication. Rather, one of main factors is that risk cognition among citizens easily triggers the first domino-effect for disruptions in market and supply chains whether mediated rumor can be clarified or not. These cases mean that many people do feel something unfavorable and they are not going to buy foods made in Tohoku Area. And food buyers almost break the ties of trading and supply networks from suspected as well as trustable farmers, and shopping stores often expel those agricultural foods (it just labeled and categorized as "Made in Fukushima"). Certainly, it is rational to understand the social anxiety and unsafely suspicions of naïve people for nuclear polluted contaminations within foods.

With this in mind, I intensively motivated to investigate the emergent properties on these social phenomena which are interacted with multiple factors using computer simulation. The fundamental core of this problem is underlying in a kind of systemic risk and should be considered by system thinking. So, I build three main hypotheses such as information-asymmetry in market, cascading and percolation of networking. And I define both system models and agent-based models to examine above factors. As results of simulating runs, I clarified my hypotheses and these are possibly actualized in configured conditions. Namely I can conclude that the emergent cascading of socially restrained buying trends of agricultural foods made in Tohoku Area can be engendered by information-asymmetry as the market for 'Lemons', and networked market cascaded toward systemic disruptions, and it is also ruled in the percolation principle.

Japan and Indonesia Comparison Study in Disaster Management Cycle after Disaster

Nurjanah[1], Taro ICHIKO[2], Hidenori WATANAVE[3]
1: Department of Network Design, Tokyo Metropolitan University, nurjanahjane75@gmail.com
2: Department of Urban Science, Tokyo Metropolitan University
3: Department of Network Design, Tokyo Metropolitan University

The characteristic of Disaster Management is changing over time in every century depends on the condition and needed in the millennium. In 19 Century, Disaster Management Framework is focus in Disaster Prevention. And in 20 Century, Disaster Management Framework is focus in Disaster Risk Reduction. After Hyogo Framework Action finished in 2015, the new disaster management framework base on Indian Ocean tsunami 2004 in Aceh, Indonesia and Great East Japan Earthquake in 2011 is needed in this century. This research is combined method used quantitative and qualitative method in the result of research. The locations of study area selected are: Banda Aceh, in Aceh Province, Indonesia and Kesenuma in Miyagi Prefecture, Japan. Secondary data are collected from literatures, while primary data are obtained from questionnaire and deep interviews with respondents. Sampling of respondents in this study is purposive random sampling in coastal areas of Aceh and East Japan that were affected by tsunami.

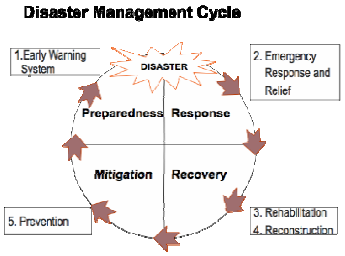

Figure 1. Disaster Management Cycle

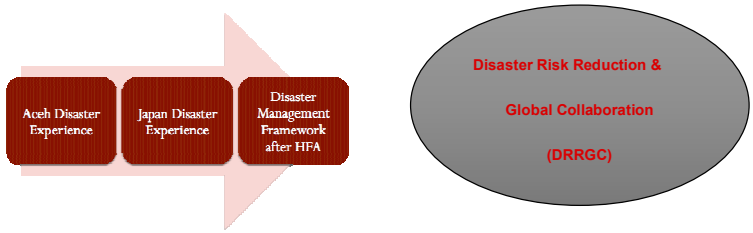

Figure 2. Disaster Management Framework in 21 Century

This research is comparison study related with disaster experiences in management cycle between East Japan and Aceh. The objectives of this study are, (1) To get lesson learn, from disaster experiences in Aceh and East Japan; (2) To sharing and transfer lesson learn of disaster experiences to the world, and; (3) To contribute to disaster risk reduction effort in the future and to function as global disaster management framework. Base on Aceh and East Japan experienced after disaster, private sector is the biggest part in the final implementing in the cycle of Disaster Management, in other words Global Collaboration is needed in Disaster Management Framework in this millennium.

Keywords: *21 Century Framework: Disaster Risk Reduction and Global Collaboration (DRRGC)*

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Use of Functional Exercises-New Evaluation Model to Improve the Decision-making Process of Municipal Governments for Disaster Management

Takaaki KATO[1], Hideki ASO[2], Tomohide KIMOTO[2], Souichi SHOUDAI[3],
Youichi YAMAMURO[3], Atsushi NAKAMURA[4], Masao TANINOBU[4], Kouji INADA[4],
Goro UMEYAMA[5], Tsuyoshi KUROME[5], Takeshi Toratani[5]
1: The University of Kitakyushu, tkato@kitakyu-u.ac.jp
2: Infogram Inc.
3: Crisis Management Department, City of Kitakyushu
4: Fire and Disaster Management Bureau, City of Kitakyushu
5: Sompo Japan Nipponkoa Risk Management Inc.

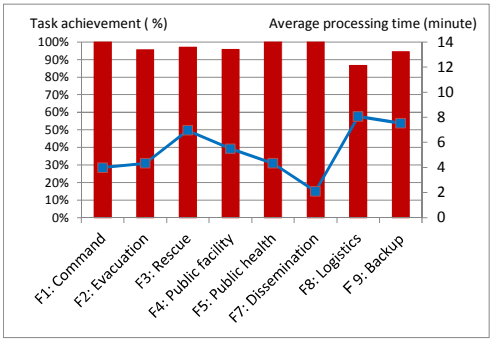

Fig 1 Task achievement by functions

This research will contribute to the disaster management strategies of municipal governments by illustrating the capacity of a municipal government in implementing disaster responses using a network of various departments within the government and with external collaborators. In the disaster response phase, municipal governments must quickly and smoothly process information and coordinate the decision-making process. Although there have been attempts to create an efficient organizational structure for disaster responses, such as the introduction of the incident command system, it is difficult to visualize and quantify the capacity of municipal governments and external organizations in coordinating activities. In this study, researchers developed a standardized list of emergency support functions and created a detailed network diagram of departments within the municipal government which would jointly process the information for each function. These diagrams can be used in a functional exercise to determine if each department was able to process and transmit information to other relevant departments as anticipated and in a timely manner. An ICT system was developed to facilitate the documentation of activities by each department in response to trainings and evaluations of organized disaster responses. These ideas and the ICT system were examined in detail and good results were obtained in one of the largest functional exercises in Japan in January 18, 2014. The functional exercise, which involved 488 personnel, was organized to evaluate the City of Kitakyushu's disaster responses to large earthquakes and tsunamis, as well as cooperative organizations. Figure 1 is a visual illustration of organized activities in the Kitakyushu city government. This figure suggests the need for further improvements in the logistics of emergency support functions.

Disaster Response Stress of Local Officer (1): A Case of Typhoon No.12 in 2011 at Hongu Area in Wakayama Prefecture, Japan

Miwa ABE [1], Yuri NAKAGAWA[2], Chiho OCHIAI[3]
1: Center for Policy Studies, Kumamoto University, m-abe@kumamoto-u.ac.jp
2-39-1, Kurokami, Chuo-ku, Kumamoto City, 860-8555 JAPAN
2: Graduate School pf Psychology, Kansai University, ny8392@mac.com
3: Graduate School pf Global Environmental Studies, Kyoto University, ochiai.chiho.2x@kyoto-u.ac.jp

This study focuses on local officers' mental stress after a natural disaster. Previous studies showed that 'Critical Incident Stress' of policemen, fire fighters and medical service workers who performs rescue tasks. However, these studies did not include the office workers in local government sector. Local government officers have to response rescue and recovery works before, during and after natural disasters. In Japan, it's needs of mental support after disaster response works was recognized after the Kobe earthquake in 1995. National government started new support systems on this issue. For example Ministry of Defense prepared a manual of prevention of posttraumatic stress disorder (PTSD) for members of the Self-Defense Forces in 2000. The National Police Agency started counseling from 2001. The Fire and Disaster Management Agency started dispatching mental health support experts from 2005. Recently these discussions on stress have included among Journalists at affected areas.

For understanding local officers' mental stress regarding the disaster response, several interviews and workshops were conducted in one of typhoon affected area. Hongu area is located in Wakayama prefecture in Japan. Population is 3,235 and area is 204 km^2 (2010). Every year this area is affected by the typhoon. Specially, typhoon No. 12 in 2011 was devastating one that affected Hongu area by severe floods. Through the workshop, data of officers' actions and affections during disaster response were collected. The data was categorized by KJ methods, and two types of factors were found. One can be prepared before the disaster, and needs to be included in a disaster prevention plan. Another one cannot be prepared prior to the disaster, but it should be included in a recovery plan.

Table1: The Way of Data Collection

Date of Workshop	6th August, 2014
Participants	14
Methods	Participants was separated 4 groups and each group took 1 hour for workshops. Officers wrote their action and affections during disaster response. Each data was categorized by KJ method.

Disaster Response Stress of Local Officers (2): Psychological Process during Disaster Response

Yuri NAKAGAWA [1], Miwa ABE[2]
1: Graduate School of Psychology, Kansai University
2: Center for Policy Studies, Kumamoto University

At the disaster situation, local government officers have to make decisions even though they feel strong stresses or they also are disaster victims. These conditions will produce a decline in cognition of risks and slow down the decision making processes. For example, Tuner (1976) shows that there is a tendency for people to accept most readily any information that enables them to disbelieve the prediction minimize the danger and view the situation optimistically. At the Tohoku earthquake in 2011, normalcy bias affected people to evacuation activity and disaster response (Hirose, 2011). Therefore, this study focused on local government officers who were in front line of disaster response to understand their psychological process during disaster, and to find out the obstructive factors of disaster responses by exploratory examination.

The survey was conducted at Hongu local office in Wakayama prefecture in August 2014. Four groups were formed to conduct group interviews and total 14 officers participated. At the group interview, the officers were asked to write their actions, affects and stresses during the disaster response. As a result of the group interview, 112 text data were collected. All data were categorized according to the same meanings. Appearance frequency was tallied, and multiple correspondence analyses conducted. Based on the analysis, these data were categorized in three stages. First stage is evacuation guidance term (Stage 1). Second stage is disaster happened (Stage 2). And third stage is disaster recovery term (Stage 3). Especially, lack of information and difficulty of communicating information were observed between Stage 1 and Stage 2. At the Stage1 and Stage2 officers tend to experience negative, but the Stage3 they tend to experience the positive. In addition, the words of information category were frequent in Stage1 and 2. Therefore, it can be said that the communication was not smooth in Stage1 and Stage2.

Prevention of child Maltreatment of post-disaster; Focus on the gray zone and vulnerability of living

Taishi ARIMURA[1], Ikuko MORI[2], Tsuneo YOSHIDA[3], Akira KAWAMATSU[4],
Risa KOJIMA[2], Tomoko NISHIOKA[2], Minako NAKATANI[2]
1: Japan College of Social Work, arimu@jcsw.ac.jp
2: Save the Children Japan, 3: Surugadai Univercity,
4: Ministry of Health, Labour and Welfare

Great East Japan Earthquake, occurred on March 11, 2011, brought a great damage to the affected areas in Tohoku region, the northern part of Japan. The prolonged reconstruction of livelihood and resettlement has been especially affecting the children's lives.
While many stakeholders and aid workers to support children and the family on the ground have not frequently observed any serious issues, such as the diagnosis of PTSD; they have discovered the issues deeply laid in their livelihoods. However, those issues were not evidently observed by the statistical data published by Child Guidance Center (Jido-Soodansho) at the prefectural level, in comparison to non-affected area by the disaster. Therefore, the current study aimed to seek for a clue to examine the underlying needs of the children and the family. **Methods:** The current study included the followings:(1) Preliminary Review, (2) Interviews/Questionnaires for the child related workers on the ground, (3) Web Survey on the perception on child maltreatment and on the reporting duty; and the analysis was made for all the above.

Results:

(1) Awareness of the well-being of children varies
(2) New concerns arise due to evacuations, relocations and changes in family structure
(3) The Study's results show a number of problems related to the "grey zone" and the urgent needs to respond to them
(4) High concentration of concerns regarding neglect in the "grey zone" implies that local municipalities are expected to play a major role in prevention
(5) A factor analysis showed hesitance in the reporting duty in vignette cases of 'grey zone'.

Discussions: Many studies relating to PTSD etc. have actually been conducted in the affected areas; however, the focus to delivery the services should be shifted to the 'grey zone' in order to tackle the children and family issues. Especially, the information around the status-quo of children's Well-being has never been adequate since the prior to the disaster. Therefore, it has been difficult to assess the changes properly. In the process of the recovery, the study indicates that it will be critical to examine children's lives and Well-being in each community context in order to ensure strengthening children's resiliency post disaster.

Dark Tourism and the Recovery from the Great Japan Earthquake

Akira Ide

About three years have passed since the Great Tohoku Japan Earthquake and conditions in the disaster areas have gradually changed. The main concern has moved from the recovery of personal life to the reconstruction of the area and social innovation. In this situation, the role of tourism in the recovery process is a topic of research. This paper deals with the recovery of the Tohoku disaster area in terms of tourism, especially dark tourism.

The disaster area extends over 300 kilometers, from north to south. Its great size makes recovery measures difficult to implement. What must be done for the recovery of the impacted area?

First, it is important to divide the area into two distinct parts, one of which embraces all of it, except Fukushima. This broader area did not experience the atomic disaster and can optimistically think about future tourism. Rebuilding is not important here, but creating new experiences that are unique to the disaster area are essential. Viewing relics or the recovery process is a unique tourism attraction. This type of experience is called ‘dark tourism’, but this phrase is not very popular in Japan. For tourism to recover, dark tourism must be more accepted.

However, in the Fukushima area, atomic control measures continue. Therefore, it is difficult to talk about tourism there at the present.

In preparation for the post-atomic accident era, it is necessary to create archives that contain material on human grief and other items. Without these archives, a museum cannot be established. Today, we must be involved in the future construction of the new museum. It is time to collect human interviews and other sources.

Recovery from the Great East Japan Earthquake and Tsunami: Future Strategies and recommendations for Disaster Risk Reduction

Fumihiko Imamura, Yuichi Ono, Osamu Murao, Shinichi Egawa, Hiroaki Maruya, Suppasuri Anawat, Aiko Sakurai and Takako Izumi
International Research Institute of Disaster Science (IRIDeS), Tohoku University
468-1 Aoba, Aramaki, Aoba-ku, Sendai 980-0845, Japan
Imamura@irides.tohoku.ac.jp

It is extremely important to share the key lessons-learnt and experiences from the Great East Japan Earthquake and Tsunami, and the International Research Institute of Disaster Science (IRIDeS), Tohoku University makes it as its responsibility and mission aiming for implementation of practical disaster risk reduction (DRR). The year of 2015 will become a turning point for DRR practitioners, government officials as well as academia as the new international DRR framework after the Hyogo Framework for Action (HFA) adopted in 2005 will be determined at the UN World Conference on Disaster Risk Reduction (UNWCDRR) to be held in March 2015 in Sendai, Japan.

Toward the new stage of DRR practice and implementation beyond UNWCDRR, IRIDeS will organize a series of discussions with various stakeholders from government officials, NGOs, international organizations, the private sector as well as academia on the challenges and opportunities to identify the next goals and strategies in 2014. In particular, a Two-day workshop will be held in Tohoku University in November 2014 inviting various stakeholders and DRR experts from all over the world to discuss five key DRR areas, namely disaster education, disaster science and risk assessment, disaster medicine and public health preparedness, architecture and land use planning for disaster mitigation as well as early warning system and evaluation/partnership. The findings from the discussions will be compiled in a report, and the recommendations and suggestions for these five key areas are identified. *"The Tokyo Conference on International Study for Disaster Risk Reduction and Resilience"* to be held in Tokyo on 14-16 January 2015 will be a great opportunity for IRIDeS to share the major findings highlighted in the discussions in November, further elaborate the discussion – what needs to be done to achieve disaster resilience – as well as strengthen collaboration and partnership with various stakeholders. An interdisciplinary approach is a key for future DRR and the role of academia will be more and more important to study and analyze disaster risks, phenomena and how to prevent such risks from multiple aspects.

Disaster Recovery Process Viewed from the "Rashomon Effect" Perspective: The Case of Oarai Town, Ibaraki in Japan

Fushing LEE [1], Takumi MIYAMOTO[2], Katuya YAMORI[2]
1: Graduate School of Informatics ,Kyoto University, lee.fuhsing.78r@st.kyoto-u.ac.jp
Gokasho,Uji,Kyoto 611-0011,Japan
2: Disaster Prevention Research Institute, Kyoto University

The devastating and lingering impact of the accident at the Fukushima Nuclear Power Plant has made the process of disaster recovery from the 2011 Tōhoku earthquake even more complicated and difficult. Because even experts sometimes provide totally different views on the safety of radioactive contamination, the boundary between scientific truth and misconception has been blurred considerably. This makes fuhyo higai, means damages caused by harmful rumors and misinformation, a serious problem. This study took a socio-psychological approach for analyzing risk communication in recovery process. We conducted field research at Oarai Town, Ibaraki Prefecture, one of the disaster-affected areas. This town is far from Fukushima No.1 nuclear plant 129 km, the environmental radioactivity was under then the standard value but suffered the fuhyo higai hardly. We made in-depth interviews with local people, town government workers, and journalists, to clarify what kind of damages were caused, how and why that happened, and what has been done to overcome the damages. The results showed that a visible, thus more easily-detected, "Rashomon effect" problem (Mazur,1998), coexistence of contradictory interpretations of the same events, between "Yes" versus "No," to the question of whether or not Oarai is safe from radioactive contamination, covers up an invisible, but, more significant and serious, "Rashomon effect" problem, between Oarai viewed only from the angle of a radioactive contamination issue, and Oarai viewed from different points of views. To overcome this problem, an "opportunity creation" approach that shows Oarai's different and new face, such as town vitalization via animation based on residents playing major roles, will be more effective than an "emergency management" approach, which focuses on only the issue of radioactive contamination. In the next step, we are developing a risk communication approach called " Crossroad: Oarai" which residents playing major roles. "Crossroad" is a gaming-style group learning procedure(Yamori,2007). The context of "Crossroad:Oarai" was created by Oarai residents and based on their disaster experiences and the dilemma of fuhyo higai. Through this game, residents could communicate the fuhyo higai issue with each community members and stakeholders as media reporters, researchers for creating a cooperative goal in recovery process.

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Integrating Research Achievements from Case Studies of the Disaster Process into 'Life Recovery Support System'

Keiko TAMURA[1], Munenari INOGUCHI[2], Haruo HAYASHI[3]
1:Risk Management Office, Niigata University：tamura@gs.niigata-u.ac.jp
8050 Ikarashi 2-no-cho, Nishi-Ward, Niigata-City, Niigata, 950-2181,Japan
2: Research Institute for Natural Hazards & Disaster Recovery, Niigata University, Japan
3: Disaster Prevention Research Institute, Kyoto University, Japan

There had not been any management system for supporting the process of "Life Recovery" of disaster victims in Japan. It was mainly because we had not have no scheme to develop the Victims' Master Database (VMDB) which records all the transactions between individual disaster victims and the local government where they register. As a consequence, it was difficult for local government to provide their services effectively and fairly.

A management system for supporting victims' life recovery process was developed after 2004 Niigata Chuetsu and 2007 Chuestu-oki Earthquakes. 7 cities and towns in Iwate Prefecture after 2011 Tohoku Earthquake utilize this system to everyday business for supporting victims in the impacted area by earthquake and tsunami. Tokyo Metropolitan Government planned to adapt it before expected Metropolitan Earthquake in the future.

The business model based on this system got the 2004 Good Design Award established in 1957, which is a program to select, evaluate and encourage products with distinguished designs in Japan's industry. This program has raised awareness about design among Japanese industries and significantly contributed to the improvement of their international competitiveness.

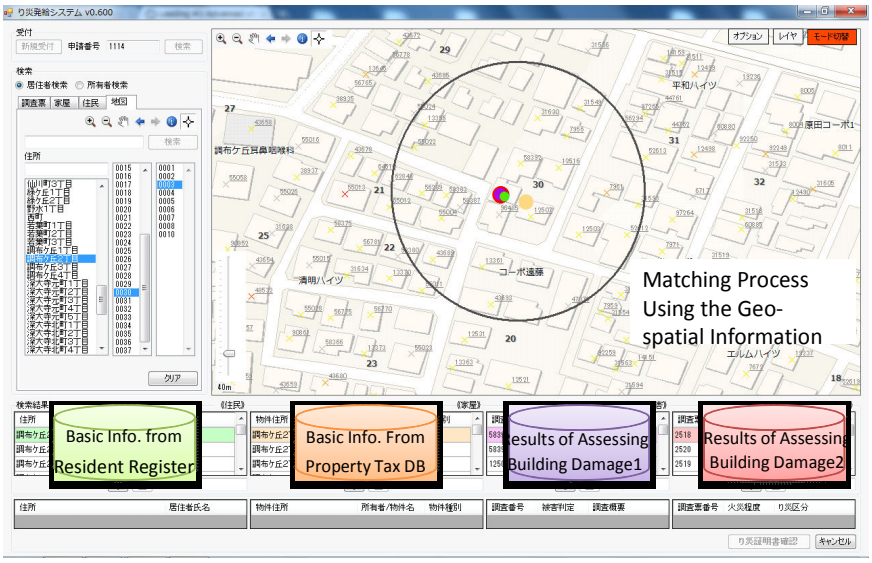

Figure1. System to Apply and Issue Disaster Victim Certificate
(Interactive information search system between an applicant and a municipality clerk)

Disaster Risk Reduction for Reactive dye wastewater by Biological Treatment in SBR Systems

Yasaman SANAYEI [1], Ali SANAYEIY[2]
1: Research Institute of Shakhes Pajouh , Isfahan ,Iran, yasaman_sanayei@yahoo.com

2: Faculty of Administrative Sciences and Economics, University of Isfahan, Iran

Reactive dyes have been identified as problematic compounds in wastewater from textile industries as they are water soluble and cannot be easily removed by conventional aerobic biological treatment systems. The bioflocculant is effective in flocculating a kind of reactive soluble dye (Cibacron yellow FN_2R) in aqueous solution. A bioflocculant–producing bacterium was isolated from wastewater and sediments of Close Drainage Systems (CDS) located at the Prai area of Penang, Malaysia. The treat-ability of a reactive dye (Cibacron yellow FN_2R) by sequencing batch reactor and the influence of the dye on concentration on system performance were investigated in this study. This paper assesses the biological performance for treatment of dye wastewater management and disaster risk reduction of textile industries area of Penang, Malaysia. Employing reactive dye by Sphingomonas paucimobilis bacteria at sequence batch reactor is a novel approach of dye removal. Two separate experiments, with different range of the dye wastewater concentrations and dosages of Sphingomonas paucimobilis were conducted. First experiment was carried out for Sphingomonas paucimobilis acclimatization on the different dye concentration of 50, 100, 150, and 200 mg/L wastewater in four reactors (R1, R2, R3 and R4). Second experiment was proceeding with the similar reactors with the dye concentration of 500, 1000, 1500 and 2000 mg/L. All experiments were analyzed for chemicals oxygen demand (COD) and mixed liquor suspended solids (MLSS) and colour removal every day. The dye removal efficiency was decreased by increasing the dye concentration. The dye removal efficiency was decreased wherever the dye concentration increases. Results show that COD reduction increased at 5000mg/L MLSS with respect to F/M ratio. Modelling for dye removal with different concentrations COD at two different MLSS concentrations (3000 and 5000 mg/L) were performed by regression analysis.

Keywords :Biological treatment, sequencing batch reactor, Disaster Risk Reduction , COD reduction.

Reducing the Risk of oil Pollution in the Persian Gulf by Isolated Bacterium

1:Director, Research Institute of Shakhes Pajouh, Isfahan,Iran
2:Assistant Prof, Research Institute of Shakhes Pajouh, Isfahan,Iran,yasaman_sanayei@yahoo.com
3:Professor of Urban Planning Research Institute of Shakhes Pajouh, Isfahan,Iran

The Persian Gulf is the most strategic waterways in the world due to its importance in the global oil transportation. Due to the war and high rate of water evaporation, extended drilling and oil extraction, land-based sources, dumping from ships and other human activities, water pollution has increased alarmingly. Many sea birds and other species of marine life have perished because of millions of tonnes of crude oil entering into the Gulf. The oil pollution problem is particularly acute in oil-producing areas such as the Persian Gulf, where approximately 60% of the marine-transported oil in the world is produced .Oil and gas field wastewater or produced water is a significant waste stream in the oil and gas industries. In this study, the performance of sequencing batch reactor (SBR) and sequencing batch reactor process treating produced wastewater were investigated and compared. The sequencing batch reactor (SBR) was operated in different hydraulic residence time (HRT) of 8, 20 and 44 h. Operation results showed that for a HRT of 20 h, the combined process effluent chemical oxygen demand (COD, oil and grease (O&G) removal efficiencies were 90.9, 92 and 91.5 %, respectively .The purpose of this study, SBR was used to treat synthetic and real produced water crude-oil-degrading *Sphingomonas paucimobilis* bacteria was isolated from oil-contaminated sites in the Persian . Based on a high growth rate on crude oil and on hydrocarbon degradation ability. That bacteria can be used in environmental risk management by focusing on strategies to prevent this human made disaster. The data obtained from microcosm experiment indicated that could be used for the dispersion of oil slicks and could stimulate the selection of marine hydrocarbon degraders thus increasing bioremediation process.

Key words: Environmental risk management, Persian Gulf, *Sphingomonas paucimobilis*, Oil pollutions

Zoning and management dust storms using satellite indicators (Case study: The Elam Province)

Mojgan Entezari 1*, Maryam Aliyari[2]
1: Assistant Professor, University of Isfahan
Address: Isfahan, Darvaze Shiraz , University of Isfahan
Email:entezary54@yahoo.com
2: Master of Science of Geomorphology, Department of Geographic science and planning, University of Isfahan

Abstract
Today's dust storm As One of the main problems surrounding in desert and neighboring areas is known. Since then, the effects of human society and the natural environment, are very Widespread than Sources, identify and prioritize their zoning is necessary precautionary measures. The first step confronting with the disaster management in Sedimentation areas is Identify areas risk. In this study, Elam Province has a special geographical position and Survey as one of the area was at risk. For Preparing Map rate extent and severity used Heat index Ackermann TDI (Thermal Dust Index) and modes satellite photos (This data 14 June 2009.)The intensity classify in 6 groups: very High, High, moderate, weak, very weak, and without dust and at final two Indexes Were compared with together. The result showed that 1.022% and 22.038% of the province in Ackerman and TDI index , respectively , are outside the scope of storms , so the extent of the storm in the TDI index is lesser then the Ackerman index , According to the Ackerman index , the highest and lowest amounts were allocated in average grade of 57.722% and non-dust grade of 0.0053% , respectively , While according to the TDI , these values are allocated in middle class of 23/304% and very severe class of 1/37% , respectively . therefore the estimated intensity the Ackerman index is greater than the TDI index on the other hand, Dehloran township experiences the strongest extent in the Ackerman index , but in the TDI index , the most severe density is observed in Dareh Shar , Mehran ,Dehloran and Shirvanan townships. Statistical analyses of meteorological stations revealed that the results of estimated intensity extent by the Ackerman index toward TDI is closer and consequently more accurate to the results of these meteorological stations.
Key word: dust storm, Zoning, Satellite data, Ackermann index and TDI

The first report management of a natural epidemic associated with VHSV infection in Isfahan

Mojgan Entezari 1*, Sadegh Jafarnejad[2],Shahram Movahedi
1: Assist. Prof. College of Research Institute of Shakhes Pajouh
Address:Iran, Isfahan, Darvaze Shiraz , University of Isfahan
Email:entezary54@yahoo.com
2:D.V.M, Veterinary office of Isfahan province
3: D.V.M, Veterinary office of Isfahan province

In May and June 2013, the virus causing viral haemorrhagic septicaemia (VHS) was detected in rainbow trout ,Oncorhynchus Mykiss, from 11 fish farms in province of Fereydoun-shahr and Semirom, Isfahan, Iran. The clinical signs and high mortality were observed in 9 of 11 fish farms; but there were no clinical signs of VHSV in the 2 VHSV-infected farms. VHSV was confirmed by virus isolation and reverse transcriptase polymerase chain reaction(RT-PCR), Based on a glycoprotein gene nucleotide sequences. All isolates were genetically closely related (99 to 100% identity), and were classified into the Subgroup I-a of Genotype I, most closely related to the Danish isolates DK-F1; It seems that the outbreak were linked to the initial infection and import of eyed egg from Denmark. In addition, another confirmation method for VHS detection in the study is based on direct methods like identification using antibody-based methods, ELISA. However, our study shows that direct nucleotide sequencing of RT-PCR products, amplified from the tissue of VHSV-infected fish, represents an applicable tool for fast routine genotyping in diagnostic laboratories. This is the first report of a natural epidemic associated with VHSV infection in Isfahan.
Key word: VHSV, Isfahan, natural epidemic, fish.

Identify and prioritize the factors affecting technological Hazards in Iran gas Refining Industry Using Multi Criteria Decision Making Techniques
(Case study: South Pars Gas Complex)

Alireza NOJOUMI [1], Saeid GIVEHCHI[2]
1: PhD Student of Shakhes Pajouh Engineering Institute of Natural Crisis& Head of HSE in SOUTH PARS GAS COMPLEX, ar.nojoumi@gmail.com
2: Assistant Professor & Consultant Author University of TEHRAN, givehchi@ut.ac.ir

In the world, and oil and gas refineries, most of the operational units in these industries are often dealing with hazardous chemicals, and work with various equipment, such as isolated towers, storage tanks, pumps, compressors, and pipelines, with high pressure and temperature, hence there is probability of accidents, such as a toxic spill, fire, or explosion, in these units, and obviously, prevention of hazards, and creating necessary infrastructures is a priority, to such organizations. Today, about 62 percent of the world's major organizations have business continuity plans, but in Iran, it still regarded as a luxury issue. However, to develop this program step by step, the first step is to know what the most important factor in creating technological hazards in vital industries, in terms of passive defense, is to then be able to design necessary strategies for effective eliminating or reducing it. In this study, in the first phase, six major factors of technological hazards were identified, using ideas of twenty experts in the industry of refinery gas and gas complex, that involve low levels of HSE, and lack of adequate policies in development of refineries and refineries change with remaining cases, which cause increased risks of process, organizational processes that are inappropriate for using the technology, the transfer of inappropriate technology, from executor to the final operation of refineries, and low level of technical knowledge related to the exploitation in indigenous contractors in order to transfer new technology, lack of training programs, tailored to the technological needs of the organization, the issue of sanctions, which causes a lack of access to necessary parts of machines, as a result, outwear, and create a hazard in the system, the lack of accurate documentation and knowledge management, for documenting the old technological problems of the organization, and therefore, lack the ability to prevent its repetition. Next, given that many of these factors have interconnections, and are not independent of each other, the analytic network process (ANP) method was chosen to prioritize them. After distributing and collecting the questionnaire survey from twenty experts of research, finally, low levels of HSE, and the lack of adequate policies, in development of refineries, refining and transformation with the remaining cases were selected as the most important factor in creating technological hazards.
This article is obtained from my PhD project.
Keywords: Technological hazards, The gas industry, Techniques of Multi Criteria Decision Making Process Analysis Network

Visually Modelling Transdisciplinary Resilience Research

Thomas J HUGGINS[1], Robin PEACE[1], Stephen R HILL[1], David M JOHNSTON, Alicia CUEVAS[3]
1: Massey University, PO Box 756, Wellington, New Zealand. t.j.huggins@massey.ac.nz
2: Joint Centre for Disaster Research, PO Box 756, Wellington, NZ. david.johnston@gns.cri.nz
3. University of Colima, Bernal Díaz del Castillo No. 340, Colima, MX. alicia_cuevas@ucol.mx

Improving community resilience is complicated -especially when groups with very different priorities and ways of working are involved. This research aimed to disentangle some of the strongly held, and very different, opinions held by groups of research and practice professionals planning collaborative solutions for community disaster resilience in the Wellington region of New Zealand, as part of a new International Centre of Excellence. A Q analysis of these groups' opinions informed our use of Duignan's Visual Monitoring and Evaluation Planning to plan trans-disciplinary research into community resilience programs for the Wellington region.

Researchers and practitioners from the new Wellington-based International Centre of Excellence: Community Resilience were asked to rank a set of opinion statements, about monitoring and evaluating community disaster resilience. Ranking patterns were used to identify three distinctive viewpoints amongst the participants. The practitioner viewpoint valorized practical knowledge derived from field experience. The researcher's viewpoint represented a strong focus on strategic management and policy-related knowledge. The third viewpoint reflected a common focus across both participant groups, on the need to improve post-disaster outcomes.

This analysis helped us adapt Duignan's Visual Monitoring and Evaluation Planning, to promote a constructive dialogue about resilience planning, monitoring and evaluation, between Center of Excellence researchers and practitioners. Duignan's approach involves the preparation of diagrams (detailed computer-generated logic maps) that can help draw out connections between brief project descriptions and their intended outcomes, to form an 'outcomes model'. The Centre of Excellence model included information about: current practitioner activities; priorities; and existing data being gathered by practitioners. A set of over-arching ethical principles was added to the initial model, once those principles had been documented by the Centre of Excellence coordinator.

The initial outcomes model was presented to a workshop attended by research and practitioner representatives, from within the Centre of Excellence. Detailed discussions were generated by presenting the three viewpoints in conjunction with the initial outcomes model. Workshop participants were able to identify 35 initial research questions which could directly inform aspects of the community resilience strategy. Archived model versions and interviews with workshop participants have been used to produce a detailed case study, outlining potentials for a range of trans-disciplinary disaster resilience initiatives.

Child centered disaster risk reduction integrating with climate smart interventions in coastal Andhra Pradesh.

Meda Gurudutt Prasad,CADME,,Krushna Sadan,Dr.Meda Ranga Prasada Rao Gardens,
1: CADME (Coastal Area Disaster Mitigation Efforts) cadmeindia@gmail.com
HUKUM PET P.O., RAJAHMUNDRY-533107, ANDHRA PRADESH INDIA. Mobile: + 91 94401 78531
Land Phone: + 91 883 2461442, Tele fax: + 91 883 2468449,e-mail:cadmeindia@gmail.com,
actionap@gmail.com, Visit us at: www.cadmeindia.org

Introduction

1002 students died in the 2001 Bhuj Earthquake. 1884 school buildings- collapsed loss of 5950 classrooms, 11761 school buildings suffered major to minor damages.

Kumbakonam fire tragedy…. A deadly fire raged through Lord Krishna School killed 93 children, all below the age of 11 years. Let us learn lessons from earlier tragedies & make our schools a safer place for children.

Intervention on Child centered disaster risk reduction has been initiated in 2012 and it is still going on in all the schools and communities.

The intervention has been initiated in 25 vulnerable schools and 25 communities in East Godavari district of Andhra Pradesh India. East Godavari District, one of the nine coastal districts of Andhra Pradesh, is a regular victim of multiple disasters and this district was badly affected by all major natural disasters time to time since independent era. Fishing community is the main victim of all disasters and all the families dwell nearby to "Bay of Bengal" at one or two kilometers distance from the sea. And vulnerable communities i.e. Children, Aged, Women, Physically Challenged, Mentally Retorted, Pregnant Women and Infants mostly the worst victims of any disaster.

Methods

CADME has initiated community based d Disaster Preparedness Program at vulnerable villages and child led disaster risk reduction at vulnerable schools of east Godavari district in the year 2008 and as a result of these interventions as many as 30 taskforce groups at community level and 25 child led taskforce groups at vulnerable schools level have been formed. Five important teams are formed: Emergency medical care team, Emergency rescue team, Relief camp management team, Warning and evacuation team, Water and sanitation team.

Results

All the 30 taskforce groups at village level are capacitated to combat the disaster situations (pre, during and post) with specific roles and responsibilities in each situation. Perfect planning is done before any disaster, predicted and warning given by metrological department. Disaster drills are organized at regular intervals to familiarize them with their taken tasks and responsibilities. Contingency plans are updated every two months. Contingency plans developed by taskforce groups have been approved at local, mandal & district levels for spontaneous actions in collaboration with government officials for quick response.

CHALLENGES: Initially there was no response from the government as well as from the local communities. Having approved the contingency plans and school safety maps has been a challenge. Motivating the community and children towards the intervention is another challenge.

Conclusion

As mentioned above this intervention can be replicated any part of the world at vulnerable village or school based on the type of disaster but same methodology can be adopted for any type of disaster. This can be replicated to any context either for Tsunami prone or cyclone prone or flood prone or flash flood prone or fire accident zone or in a peace time.

The nexus between Environment, Technology and Society a new paradigm in study of civilian protection in devolved units in Kenya

Joel Okundi OBENGO[1,2], Doreen Atieno MATIBE[2]
1: Global South Development Magazine, okundij2005@yahoo.com
2:Kenya National Young Farmers Association; doreenmatibe@gmail.com

Keywords: Nexus, Disaster Management, Risk, Kenya

Africa is one of the most vulnerable continents to disasters which is characterized and associated with poverty and very high illiteracy rate. It has presently, very few research institutions/bodies conducting researches in the field of Disaster and Risk Reduction which made its policy makers to have very limited actions when it comes to handling disaster issues hence making it very difficult for people and properties to withstand associated impacts originating from disasters when they happened. Mitigating and managing the effects of disasters effectively is a dynamic process. It is constantly influenced by a broad and changing range of environmental, technological, and social trends. Periodic identification and assessment of these trends and their effects on society, whether negative or positive, are useful in understanding how and why the preconditions for effective policy development. Such knowledge also provides authorities with essential direction that informs how best to accommodate and adapt to this inherent dynamism. The civil society organizations combating disasters in the June 2014 report aims to provide a brief, but focused examination of a range of contemporary trends that could influence Kenyan society and the County civil protection system in the next 16 years as aligned with the countries strategic vision of 2030 development blueprint.

The Report is intended as a decision support tool that should provide counties civil protection authorities with a general background to each trend, and which helps these authorities to prioritize the strategic importance of the trends in the context of the civil protection system (for this reason the report specifically avoids prioritizing the trends). These descriptions are accompanied by strategically relevant information on the challenges and opportunities each trend might pose for civil protection in Kenya. Based on the analysis of challenges and opportunities, prospective implications that the trends may raise for the ongoing development and evolution of the Counties civil protection system are identified. While the basic foundations of the Kenyan civil protection system are generally uncontested, new social, technological and environmental trends and challenges necessitate incremental adaptation of the system in order to ensure it remains effective and assures the ongoing security of the Kenyan people. To this end, it is essential to explore the possible implications of relevant trends in a proactive fashion, and where needed, to develop suitable adaptive strategies.

Table 1: Trends chosen in environmental, technological, and social realms.

Environmental	Technological	Social
The changing climate	Growing and accessing big data	Changing social norms
Urbanization and urban sprawl	Seeking situational awareness	Finance: doing more with less
Globalization of infection disease	The rise and rise of social media	Shifting Demographics
Rising critical resource uncertainty	Mobilizing society	Privatizing critical infrastructure

Twelve trends are explored in this report and are loosely classified as falling within the social, environmental or technological realms (Table 1). In reality however, each trend crosses over at least two, and often all three of these realms. The author acknowledge that many of these trends are interdependent, and their connections are noted in the individual trend descriptions, but a focus on the importance of interdependency is reserved for discussion in the concluding section of the document. Following from this brief introduction, i focus into a systematic discussion of the trends pertaining to society. For each trend i provide a general background, which is typically written with a global focus; we explore the challenges the trend could pose for rural dwellers in these counties; I discuss the opportunities presented by the trend and its development; and lastly, i highlight possible implications for the societal resilience to disasters. The conclusion draws back from the individual trend descriptions to observe and comment on those issues that either carry through several of the trends, create interdependencies between the trends, or which are found to be significant for the population in these counties.

Risk assessment to storm using GIS: The First step for disaster risk reduction in Coastal zones

Nelson Rangel-Buitrago [1], Giorgio Anfuso[2]
1: Facultad de Ciencias Básicas, Universidad del Atlántico, Km 7 Antigua vía Puerto Colombia, Barranquilla, Atlántico, Colombia. nelsonrangel@mail.uniatlantico.edu.co
2: Departamento de Ciencias de la Tierra, Facultad de Ciencias del Mar y Ambientales, Universidad de Cádiz, Polígono río San Pedro s/n, 11510 Puerto Real, Cádiz, España.

A scientific consensus exists regarding the significant impacts of global climate change over coastal zones. These impacts includes sea level rise, variability in the patterns of rainfall and runoff and changes in frequency, intensity and duration of storms. The study of the relationships existing between littoral transformation and climate change - with associated hazards, vulnerabilities and risks - represents the first step in the design of adaptation plans for coastal zones (risk reduction). Risk assessments provide information on the pressure to which the coastal zone is exposed and its adaptive capacity. In this kind of assessments, it is important to examine interacting physical attributes and socioeconomic, conservational and archeological–cultural characteristics. It is urgently required to develop reliable assessment and mitigation tools to reduce the risk associated to storms. The determination of coastal susceptibility or vulnerability is an important instrument for managers/planners for coastal preservation, protection and development, as vulnerability outcomes provide baseline information and a scientific basis for any envisaged coastal erosion management plan and mitigation measures under sustainability aspects. This work deals with a methodological approach to the risk determination for sand and cliff coasts to storm impacts. The approach is based on the selection and evaluation of three types of variables: i) the forcing variables contributing to storm-induced erosion, ii) dynamic variables that determine the resilience to erosion (Susceptibility) and iii) the vulnerable targets grouped in three different contexts (socio-economic, ecological and heritage). These are combined into two separate indices, the Hazard Index (combining forcing and susceptibility) and the Vulnerability Index, which together constitute the Coastline Risk to Storms Index as a single numerical measure of the risk for a given area. Proposed methodology has been tested in two coastal areas: Cartagena, (Colombia) and Cadiz (Spain). Results obtained in both coastal systems reveal that there are several vulnerable areas that have very dynamic processes, such as extremely high evolution rates. Hazard, vulnerability and risk maps generated with this methodology can be used as a guideline contributing to the determination of causes, processes and consequences derived from the storm associated processes. The information derived by the use of the proposed methodology in this work may have direct applications in future coastal development programs and, at the same time, can assist decision-makers in the implementation of preventive management strategies for most sensitive areas in order to reduce risk.

Disaster process mapping

Muneyoshi Numada[1)]
Kimiro Meguro[2)]

[1]Lecturer, Institute of Industrial Science, The University of Tokyo, Japan
[2] Professor, Institute of Industrial Science, The University of Tokyo, Japan

Keywords: disaster process, disaster response, disaster management system

It is important to take effective and efficient responses for the government during the emergency phase for the gigantic disaster such as the 2011 Great East Japan earthquake. However both the national and municipal levels could not take effective responses and manage appropriate operations of the organizations or the headquarters for the unexpected conditions.

This research presents a solution that classifies disaster responses with those processes to provide the total picture of disaster responses in terms of time and space for different stakeholders. The purpose of this paper is to achieve effective initial response activities immediately after disaster strikes. The initial responses taken by the local government of Yabuki town and Ishinomaki city located in Fukushima and Miyagi prefecture respectively during the earthquake are based on the development disaster response processes in this paper.

The results show that the analyzed processes can clearly explain the role of each stakeholder to response in the emergency and recovery phase. Over the whole Japan, many municipal governments still remain small population: 85% of the municipal governments have 100,000 people or fewer under them, and 53% have 30,000 people or fewer under them. The results in this paper can be applied for the other small local governments.