

제15차 GIS 국제세미나

The 15th International Seminar on GIS

글로벌 공간정보사회 구현을 위한 국제협력방안

International Collaboration for Global Geospatial
Information Society

일시 2011년 10월 27일(목) 9:40~18:00

장소 일산 KINTEX 3층 303호

주최 국토연구원  KRIHS  한국건설기술연구원



모시는 글 | Invitation

최근 소셜 네트워크의 전세계적인 확산으로 인해 정보통신환경이 비약적으로 발전하고 재난재해 등 글로벌 이슈가 부각됨에 따라 국제사회에서의 상호의존성이 급격히 증가하고 있습니다. 이로 인해 범지구적 협력 및 공동연구의 필요성이 증대하고 있는 실정입니다. 이에 국경을 초월한 연구협력 네트워크를 조성하여 공간정보를 활용한 글로벌 이슈 해결에 기여하기 위한 토론의 장을 마련하였습니다.

국토연구원은 정보환경의 변화에 능동적으로 대처하는 공간정보정책을 모색하기 위해 매년 국제세미나를 개최해 오고 있습니다. 금년에는 한국건설기술연구원과 공동으로 “글로벌 공간정보사회 구현을 위한 국제협력방안”이라는 주제로 국제세미나를 개최합니다.

국내외 전문가들을 모시고 공간정보 발전을 위한 공동연구 사례를 공유하고 상생적 국제협력 방안 등에 대해 심도있는 논의를 진행하고자 하오니 부디 참석하시어 자리를 빛내 주시기 바랍니다.

2011년 10월

국토연구원장 박 양 호
한국건설기술연구원장 우 효 섭



행사개요 | Summary

- **세미나명** : 글로벌 공간정보사회 구현을 위한 국제협력방안
International Collaboration for Global Geospatial Information Society
- **일 시** : 2011년 10월 27일(목) 9:40~18:00
- **장 소** : 일산 KINTEX 3층 303호
- **주 최** : 국토연구원, 한국건설기술연구원



행사목적 | Purpose

- **주요국 공간정보의 연구개발 정책을 비교·분석하고 국내·외의 연구협력 사례를 공유함으로써 공간정보 R&D의 발전을 위한 국제협력 및 연구네트워크 강화**
- Reinforcement of international collaboration and global research networks for expanding R&D on geospatial information
 - ▶ the comparative analyses of R&D policies in major countries
 - ▶ the sharing case-studies of R&D cooperation



세부주제 | Main Topic

- **주요국의 공간정보 R&D 방향 및 시사점**
- **국내·외 환경 변화에 따른 공간정보 R&D 협력 사례 공유**
- **공간정보 연구를 위한 글로벌 네트워크 조성방안 논의**
 - Directions and implications on geospatial information R&D in major countries
 - Sharing the case-studies of international R&D cooperation under the changes in the domestic and external environment
 - Discussion about the development of a global research network on geospatial information



프로그램 & 토론자 | Program & Penelists

Time	Program
09:40~10:10	Registration
10:10~10:30	Opening Address (President, KRIHS) Congratulatory Address (President, KICT)
10:30~11:10	Keynote Speech (1) Geospatial Networking in Europe: The Vision and Actions of EUROGI (Mauro Salvemini, AMFM GIS Italia)
11:10~11:50	Keynote Speech (2) Key Issues on the Management of Geographic Information: An International Perspective (Fraser Taylor, Carleton University)
11:50~13:00	Lunch

Session 1	Global Collaboration(I): International R&D Cooperation
13:00~13:40	R&D Policy on Geospatial Information and International Cooperation in Korea (Hyun Sang Choi, KICT)
13:40~14:20	The Implementation of Interoperable Massive Sensors Data Processing by Cloud Technology (Tien-Yin Chou, Feng Chia University)
14:20~15:00	Project Proposal on Building Vietnam Urban Planning Information System (Luu Duc Minh, Vietnam Ministry of Construction)
15:00~15:20	Coffee Break

Session 2 Global Collaboration(II): Global Research Network

15:20~16:00	Evacuation and Sheltering Assistance Planning for Special Needs Population: Kobe GIS-Mapping Project of People with Special Needs in Times of Disasters (Shigeo Tatsuki, Doshisha University)
16:00~16:40	Strategies for Building a Global Geospatial Information Research Network (Dong Bin Shin, KRIHS)
16:40~17:00	Coffee Break

Session 3 Discussion

17:00~18:00	Panel Discussion "Reinforcement of international research cooperation"
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토론자 | Panelists

Chair	Hong, SangKi (홍상기) Professor, Anyang University Convenor, WG 10 ISO/TC21	
Panelists	Choi, Hyun Sang (최현상) Director of U-Land Implementation Research Division KICT(Korea Institute of Construction Technology)	Shin, Dong Bin (신동빈) Research fellow, KRIHS(Korea Research Institute for Human Settlements)
	Shigeo Tatsuki Professor, Doshisha University	Kim, Min Soo (김민수) Senior Researcher, ETRI(Electronics and telecommunications Research Institute)
	Tien-Yin (Jimmy) Chou Professor, Feng Chia University	Hong, Il Young (홍일영) Professor, Namseoul University
	Luu Duc MINH Head of Database-GIS Division, Vietnam Ministry of Construction	



Mauro Salvemini

Italy

Internationally recognized expert in applied informatics to spatial planning, environment and e-government. Pioneer of spatial data infrastructure SDI. Civil engineer since 1972, he taught applied computer technology in planning and urban design in several foreign universities, professor at Sapienza University of Rome, he is now Senior Researcher. UN expert already for the UN Human Settlements initiative, recently he has been invited to join to the small group of world experts to implement the UN World Conference on Geospatial Information Management. Expert and evaluator of European Commission for e-government and the spatial information in Framework Programs of Research, he has been involved since the beginning in the INSPIRE directive of European Union. Head of Laboratory of Geographic and Environmental Information Systems, University of Rome and president of Italian Association AMFM GIS Italy, he is the past president European Association EUROGI. Former President of AGILE European association of research laboratories for geospatial information, he taught in Chinese, American, Spanish and Egyptian universities. He has been the initiator and author of ECDL-GIS certification programme. He is member of Global Advisory Committee of OGC. Head of research for public and private organizations, designer and project manager of major public contracts in the field of information systems and digital mapping. Author of more than eighty publications, most refereed and presented at international conferences. Member of national and European committees, already director of public corporations, he is settled in Italy between Rome and Anzio often world widely traveling for evangelizing geospatial information and his sustainable utilization.



Fraser Taylor

Canada

Dr. Taylor is Distinguished Research Professor of International Affairs and Geography and Environmental Studies at Carleton University in Ottawa, Canada. He is also Director Geomatics and Cartographic Research Centre. In 2008 he was elected a Fellow of the Royal Society of Canada. He is widely recognized as one of the world's leading cartographers. His main research interests in cartography lie in the application of geographic information processing to the analysis of socio-economic issues in both a national and international context and the presentation of the results in the form of cybercartographic atlases. He is a member of as the international CODATA Task Group on Preservation and Access to Scientific and Technical Data in Developing Countries, a member of the Group on Earth Observations System of Systems (GEOSS) Data Sharing Task Force and the CODATA Task Group on Data at Risk. He is also a Board member of the OGC (Open Geospatial Consortium) Interoperability Institute and the OGC Global Advisory Council. Dr. Taylor's current funded research involves working with aboriginal and Inuit communities to empower these communities to express their perceptions of their own environmental and socio-economic reality in new ways utilizing the Cybercartographic Atlas Framework.



Hyun Sang Choi

Korea

Hyun Sang Choi is Director of U-Land Implementation Research Division in Korea Institute of Construction Technology. He received Ph.D. in Water Resource Management based on GIS Technology. His Major research fields are convergence of Construction and ICT technologies,

Ubiquitous Sensor Network application for Smart City(u-City) and National R&D strategy for National SDI Technical development, etc. He had contributed in 「Strategic Planning for Korean Land Spatialization Group」(2006) and also recently has taken the lead in 「Strategic Planning for Advanced Technologies of National Spatial Digital Infrastructure」(2011).



Shigeo Tatsuki

Japan

Shigeo Tatsuki is a professor of sociology at Doshisha University in Kyoto, Japan. He received Ph.D. in Social Work at University of Toronto. He is also a senior research scientist at Disaster Reduction and Human Renovation

Institution in Kobe, Japan. His major research topics include counter-disaster measures for people with special needs in times of disaster, long-term life recovery from mega-disasters, and the power of social capital in controlling crimes. He is a Vice Chairperson of the Institute of Social Safety Science, Japan.



Luu Duc MINH

Vietnam

Luu Duc MINH is the head of Database-GIS Division of Vietnam Institute of Architecture, Urban and Rural Planning which is under Vietnam Ministry of Construction. His major was urban development policy and strategy since studied

from University of Tokyo, Japan until now. Recently, he has moved to research on applying GIS into urban planning formulation and management as well. The project proposal on building Vietnam Urban Planning Information System is now in research which is leading by him in expectation of strengthening and enhancing urban development management of Vietnam at both central and local government.



Tien-Yin (Jimmy) Chou Taiwan

Prof. Chou had his doctorate degree from Department of Resources Development at Michigan State University in 1990. He has been the Director of GIS Research Center of Feng Chia University (GIS.FCU) for 20 years, and served as a Distinguished Professor since 2009. With his profession and enthusiasm, Prof. Chou has worked hard with his 140 employees to bring the GIS.FCU as one of the leading role in the GIS-related academic and industry field. GIS.FCU has implemented a wide range of GIS projects, including resource management, hazard monitoring, e-Learning, fleet monitoring, etc. He also supervises graduate students and teaches courses pertaining to GIS science, land management, and resources management at FCU.



Dong Bin Shin

Korea

Dong Bin Shin is a Research Fellow in Korea Research Institute for Human Settlements. He received Ph.D. in Civil Engineering at Yonsei University. Major research fields are National GIS policy, Geographic Information Circulation and Quality Control of GIS Database. Recent research works include 「A Strategy to Construct the Spatial Information of National Territory for Socially Vulnerable Groups」(2009), 「GIS-based Public Participation in Urban Planning : Design of Prototype Web2.0 Site and Policy Implication」(2008), Policy Framework for introducing World Geodetic Reference System」(2007), 「Strategies for Enhancing National Geographic Information Clearinghouse」(2006), 「A Study on the Promotion of Integrated Management Plan of Roads and Underground Facilities Database」(2003).

찾아오는 길 | Direction



지하철

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버스

강 남 9700

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인천터미널 3000

영 등 포 870,873,9707

김 포 공 항 150, 공항리무진

인천 공 항 3300, 공항리무진

일 산 지 역
도시형 - 093,88,151,200,700,900,919
마을버스 - 9,091,056,057,080,082,089

자가용

영동대교 남단 > 올림픽대로 > 가양대교 남단 > 가양대교 북단 > 강변북로 > 자유로 > 킨텍스 IC > 킨텍스

How to get KINTEX(by car)

South End of Yeongdongdaeyo(Bridge) → Olympic Expressway →

South End of Gayangdaeyo (Bridge) → North End of Gayangdaeyo

(Bridge) → Gangbyeon Expressway → Jayro → KINTEX IC → KINTEX

Evacuation and Sheltering Assistance Planning for Special Needs Population: Kobe GIS-Mapping Project of People with Special Needs in Times of Disasters

Shigeo Tatsuki, Doshisha University, Japan

Abstract

This paper reports the results from the 2008 Kobe GIS-Mapping project of people with special needs in times of disasters, which demonstrates the use of GIS for mapping special needs populations in order to facilitate community-based evacuation and sheltering assistance planning. In response to a national government request, Kobe city administration collated separate social service recipient databases, resulting in an integrated database involving one hundred and twenty thousand individuals who were considered being potentially vulnerable in times of disaster. The database identified 4,329 people with physical disabilities in Hyogo Ward. The 2008 project geocoded and mapped them on land slide, flood and tsunami hazard layers. 914 individuals were found residing in hazardous areas. These individuals were visited by interviewers and 612 or 67% responded to a structured questionnaire which measured demographics (i.e., age and gender), levels of disability, social isolation, housing fragility, and physical immobility. A social vulnerability score was then calculated as a function of these five variables for each respondent. As a result, 17% of those who responded were found the most vulnerable and requiring priority assistance at times of disaster. Furthermore, a social vulnerability weighted kernel density map of people with special needs was created. The weighted kernel density map indicated which particular areas would require more man power for assisting a special needs population for evacuation and sheltering. After 2011 Great East Japan Earthquake, it became evident that recent developments in GIS-based preparedness measures had been uncritically relying on the assumption that *maximum probable event* (MP_pE) would occur. In reality, *maximum possible event* (MP_oE) occurred in Tohoku regions. Fundamentally re-thinking entire hazard estimation process from MP_pE to MP_oE framework was discussed in the end.

Key words: persons with special needs in times of disaster, hazard vulnerability, GIS mapping of social vulnerability, person-in-environment model, maximum probable event, maximum possible event

1. Introduction and Background

The issue of special needs population gained high attention after 2004 when a series of natural disasters hit the Japanese Archipelago. Those included July Niigata-Fukushima flood, October typhoon 23 and October Niigata Chuetsu earthquake disasters, wherein notably more than 60% of the victims were over the age of 65. As a response to these tragedies, Japan's Cabinet Office established a committee on "Communicating Disaster Information and Evacuation and Sheltering Assistance for the Elderly and Other Population during Heavy meteorological and Other Disasters." The committee published the first edition of the "Evacuation/Sheltering Assistance Guideline for People with Special Needs in Times of Disasters" in the following March 2005. After the guideline publication, the term *saigaiji-*

youengosha or People with Special Needs in Times of Disasters (PSND) was popularized in place of *saigai-jakusha* or Disaster Vulnerable Population. PSND is defined as “a person who is able to function daily, whereby living independently given the proper resources and services when necessary”. In normal time, institutionalized long-term care services for the elderly and/or for people with disabilities provide a safety net so that their special needs are met for living independent lives. However, when a disaster strikes, it becomes extremely difficult for institutionalized cares/supports to reach people in need for a prolonged period, causing their vulnerabilities to manifest. The emergence of new terminology, PSND, reflects a shift on the side of society from viewing difficulties experienced by the target population as being intrinsic to themselves to viewing ones as products of social interactions that fail to meet special needs in time of disaster (Tatsuki and Comafay, 2010; Comafay, 2011). Thus, the shift in societal view led a new set of questions, who should take care of people in need when the institutionalized care/support systems break down in time of disaster?

Following another series of heavy rainfall, flood and land slide disasters in the year 2005, another Cabinet Office committee conducted field research of the 2005 meteorological disaster sites and revised the evacuation and sheltering assistance guideline in March 2006. The 2006 guideline emphasized 1) establishing a special team in each municipal government that was in charge of coordinating assistance to the target population, 2) encouraging the information sharing of special needs population within the local government and, if possible, with local community organizations such as neighborhood associations and community emergency and response team, and 3) planning individualized evacuation and sheltering procedures for each PSND.

In the following fiscal year 2006, the committee on PSND continued to work on more detailed procedures and workflows in order to collect and share information on PSND and to make individualized evacuation and sheltering assistance plans. In March 2007, the committee published the “Report on Preparedness Procedures for PSND.” The 2007 report emphasized the establishment of a system to assist PSND by facilitating cooperation between the local/municipal government disaster management department and its health and welfare department. The role of the disaster management department is to provide local hazard information, while the health and welfare department provides information on potential vulnerabilities within the target population. The 2007 report encouraged the use of map where potential vulnerable individuals such as frail elderly and people with disabilities (PWD) are projected onto multiple hazard layers such as flood, landslide and seismicity. The map can help identify who are at more risk because of their functional needs (Kailes and Enders, 2007) as well as of their geographic locations.

Since the publication of the 2006 guideline and the 2007 report, the Fire and Disaster Management Agency (FDMA) has requested every municipality in the country to formulate its own master plan that directs policy formation on PSND assistance, to identify potential target groups, to clarify ways to collect and share their personal information. Based on the master plan, municipalities have been further encouraged to start project planning to assign local resident helpers to each individual PSND in time of evacuation. According to the survey conducted by FDMA, as of April 1, 2011, 1,262 out of 1622 municipalities (76.8%) finished formulating PSND assistance master plan and additional 349 municipalities (21.2%) were expected to finish within one year. Similarly, 864 (52.6%) municipalities reported that they have finished creating and have been updating the PSND registry. 684 (41.5%) municipalities said that they were currently in the process of making the registries. Municipalities have been working hard even on assigning local residents/helpers to each PSND for evacuation, much more time consuming process. 361 (22.0%) reported that they

have completed the assignment, 998 (60.7%) in the process, and 285 (17.3%) not yet initiated (FDMA, 2011).

2. Mapping PSNDs as an Effective Counter-Disaster Measure

2.1 Use of Maps to assist PSNDs during the 2007 Noto Peninsula Earthquake

At around the time when the 2007 report was about to be released, the Noto Peninsula earthquake occurred in March 25, 2007. A study was conducted by Comafay, Tatsuki and associates (2008) on to find out how PSND, especially the elderly population, was responded to during the Noto Peninsula Earthquake from the framework of the 2007 report. A series of workshop was conducted with those who provided assistance, this included representatives from the public health department of Wajima city, the private long-term care service providers and local community organizations. The results revealed that, as shown in figure 1, during the first 10 hours after the earthquake the local community organizations were first to respond to the most urgent needs of PSND. Meanwhile, the government organization was able to provide formal services 100 hours after the disaster impact. Finally, sustained service delivery from the formal organizations increased as those coming from the community organizations decreased after the first ten hours.

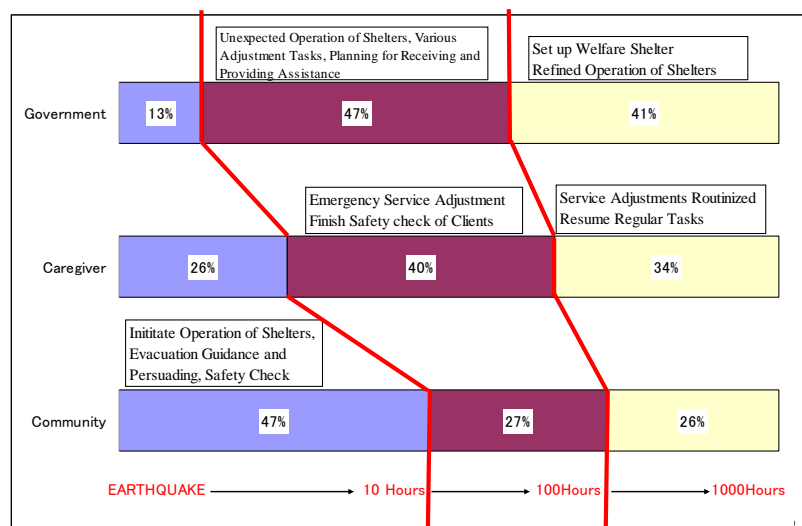


Fig 1: Responses to PSND during the Noto Peninsula Earthquake by Local Community, Long-term Care Providers and Health Service Office

It was learned that community-based help for the elderly had been predesigned and cultivated in Monzen area during normal times by indigenous community-based workers called *minseiiin*¹ or commissioned welfare volunteers who were active in building elderly-person-watch networks. The percentage of people over the age of 65 in Wajima areas² is very high at 35.2 percent. A way before the 2007 earthquake, the local health and welfare offices in then township of Monzen (currently a part of Wajima city) launched an initiative to build elderly-persons-watch networks with the *minnseiiin*. Even before that, right after the 1995 Great Hanshin-Awaji earthquake, the local health office in Monzen town which was one of the most

¹ A *minseiiin* or commissioned welfare volunteer is a community-based volunteer friendly visitor commissioned by the Ministry of Health and Welfare to assist and maintain regular watch over persons with special needs, especially the elderly, living in that district.

² In February 1, 2006, just a year before the Noto Peninsula Earthquake, Monzen town was merged with the former city of Wajima city to create a new Wajima city.

affected areas during the Noto Peninsula earthquake, started commissioning the *minseijin* to create a welfare-map plotting the exact location of persons with special needs who require constant supervision in their respective area of jurisdiction. As shown in figure 2, welfare maps are created based on existing residential maps. Buildings with households are then marked with colors according to 4 categories: a) pink for bed-ridden persons; b) yellow for elderly persons living alone; c) green for elderly only households (elderly couples); d) blue for household with disabled persons. Along with the *minseijin*, local volunteers would conduct safety checks and provide services such as delivering food or helping with their groceries to name a few.

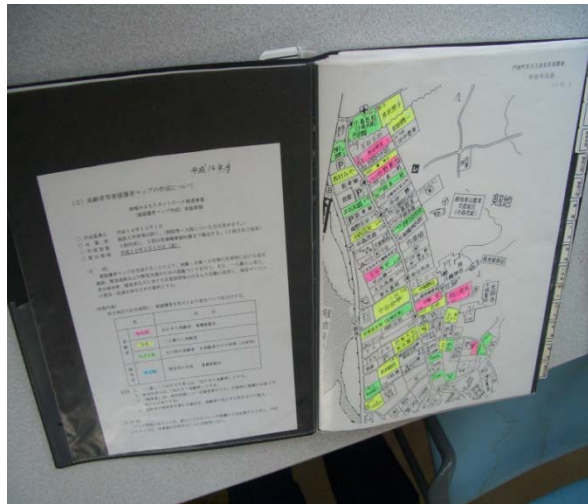


Fig 2: A picture of “welfare map” that are currently used by *minseijin* in Monzen area, Wajima city.

The paper-based welfare map was very crucial because according to the *minseijin*, although they did not need the actual map during the emergency evacuation, making the maps helped them be better familiarized with the neighborhood. Therefore immediately after the earthquake they were able to identify the persons with the most urgent needs and not only that since they had a mental map of the area they also knew their exact locations. The actual map was later used in guiding the volunteers and health nurses and non-locals who were not familiar with the area.

The above study has provided empirical evidence that community actors, being geographically accessible are the most reliable service providers during the first 10 hours after a disaster strikes. The experience of the service providers during the Noto Peninsula earthquake also demonstrated the importance of identifying during normal times the PSND with the most immediate need for assistance. As well as, providing insights on how mapping the location of disaster vulnerable members of the community would be useful for identifying actual locations of those who require immediate assistance. The familiarity of the people who provided assistance and services, mainly the *minseijin* and the local volunteers, was developed by the creation of paper maps to identify the location and condition of the special needs population.

2.2 Kobe PSND Mapping Project

Tatsuki and Comafay (2010) reported the 2008 Kobe PSND Mapping Project, which was characterized by a combined use of GIS and the social survey in order to assess overall hazard vulnerability of PSNDs. In response to the FDMA request as explained in the above, 1.5-million-resided Kobe city administration collated separate social service recipient databases,

resulting in an integrated registry involving one hundred and twenty thousand individuals who were considered being potentially vulnerable in time of disaster. The registry database identified 4,329 people with physical disabilities in 107- thousand-resided Hyogo Ward. The 2008 project geocoded and mapped them on land slide, flood and tsunami hazard layers. 914 individuals were found residing in hazardous areas (see figure 3).

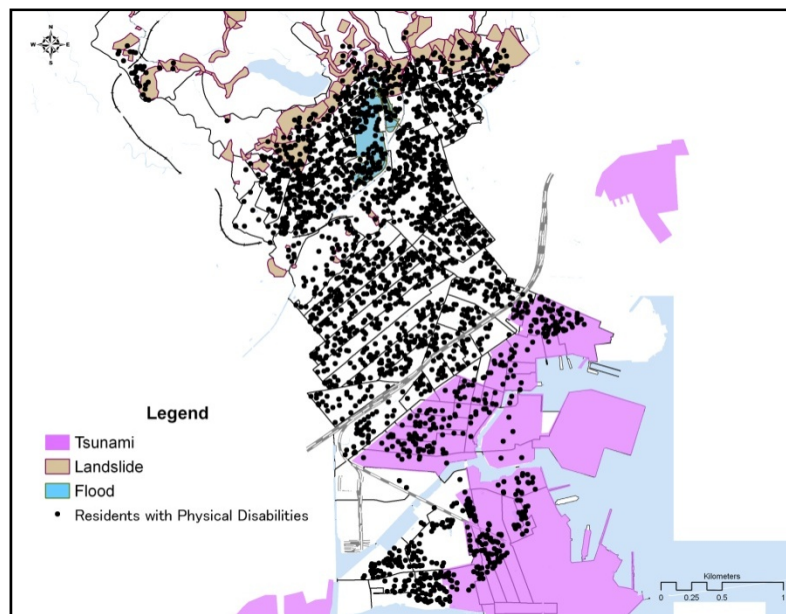


Fig 3: Persons with disabilities living in Kobe's Hyogo ward (N= 4,411)

These 914 individuals were then visited by interviewers and 612 or 67% responded to a structured questionnaire which measured those six variables as demographics, physical impairment, physical immobility, responsiveness of social environment (social capital), social isolation and housing fragility (see figure 4). The demographic, physical impairment and physical immobility variables measured a *person* factor, social capital and housing fragility an *environment* factor, and social isolation a *person-by-environment* factor.

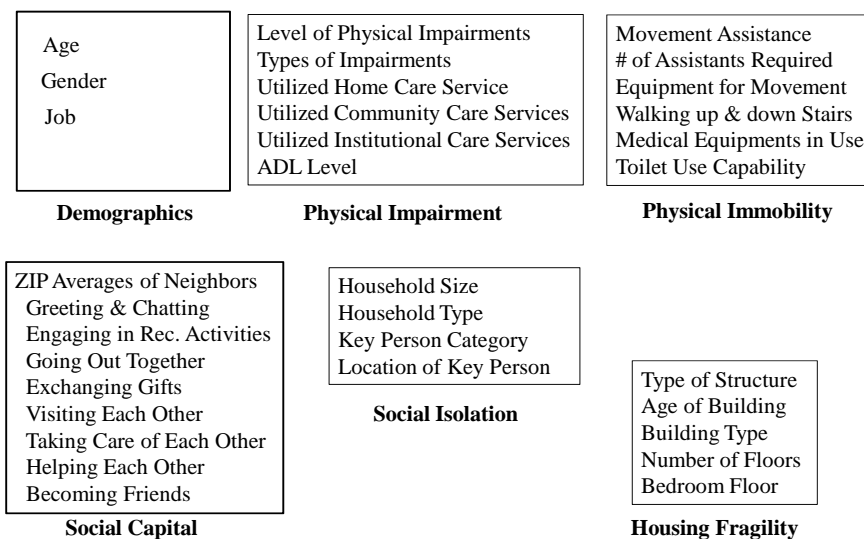


Fig 4: Variables Measured/Obtained in the Study

The 2008 project was based on the person-in-environment model of vulnerability, which defined hazard vulnerability (V) as a function of *hazards* (H), *person* (P), and *environment* (E) factors or $V = f(H, f(P, E))$ as illustrated by figure 5.

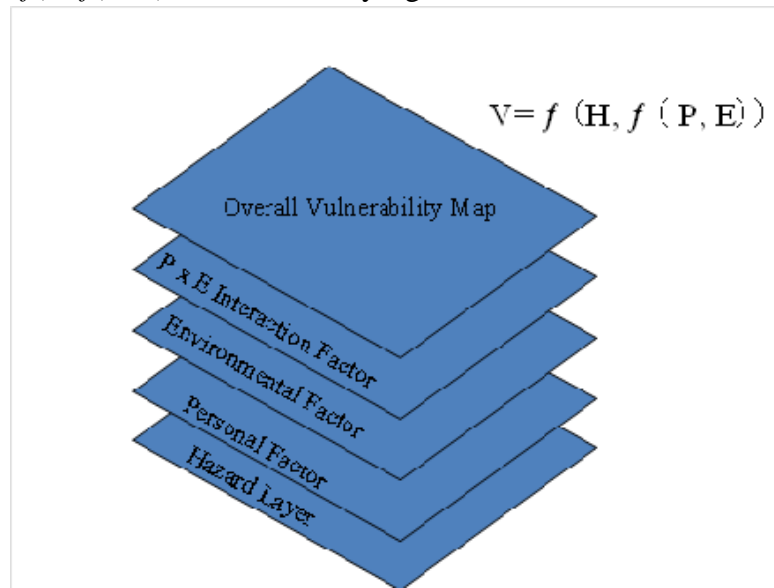


Fig 5: Person-in-Environment model of mapping hazard vulnerability

Based on the model, respondents' scores for each factor/component were calculated from social survey results and they were plotted as shown in figure 6.

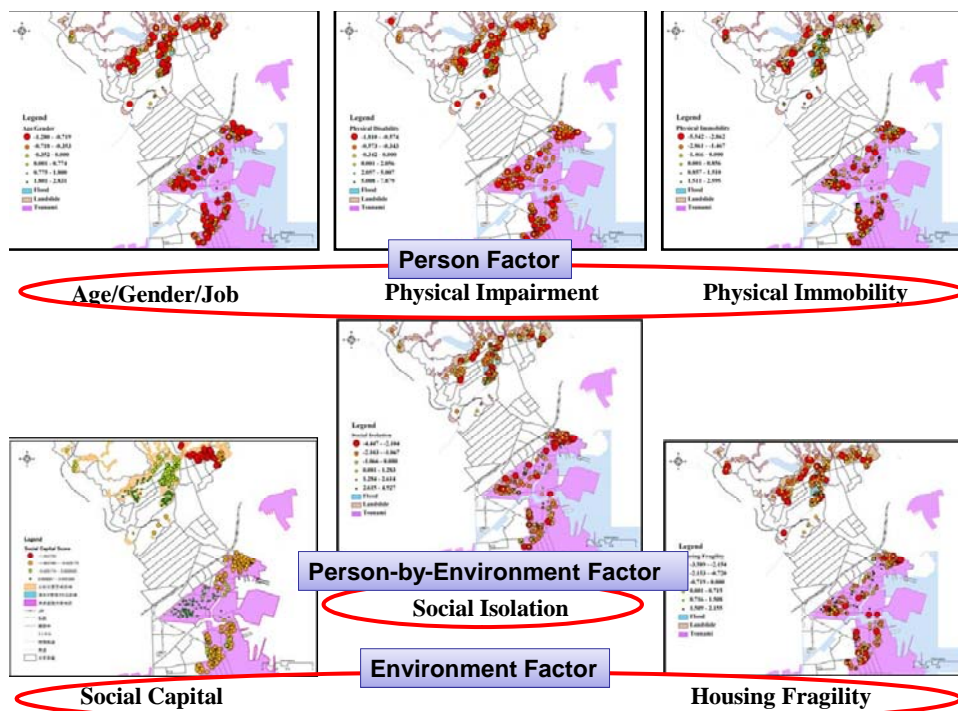


Fig 6: Component vulnerability scores mapped on to hazard layers

Finally an overall vulnerability score was then calculated as a function of hazards and the six variables for each respondent. As a result, 17% of those who responded were found the most vulnerable and requiring priority assistance in time of disaster (see figure 7).

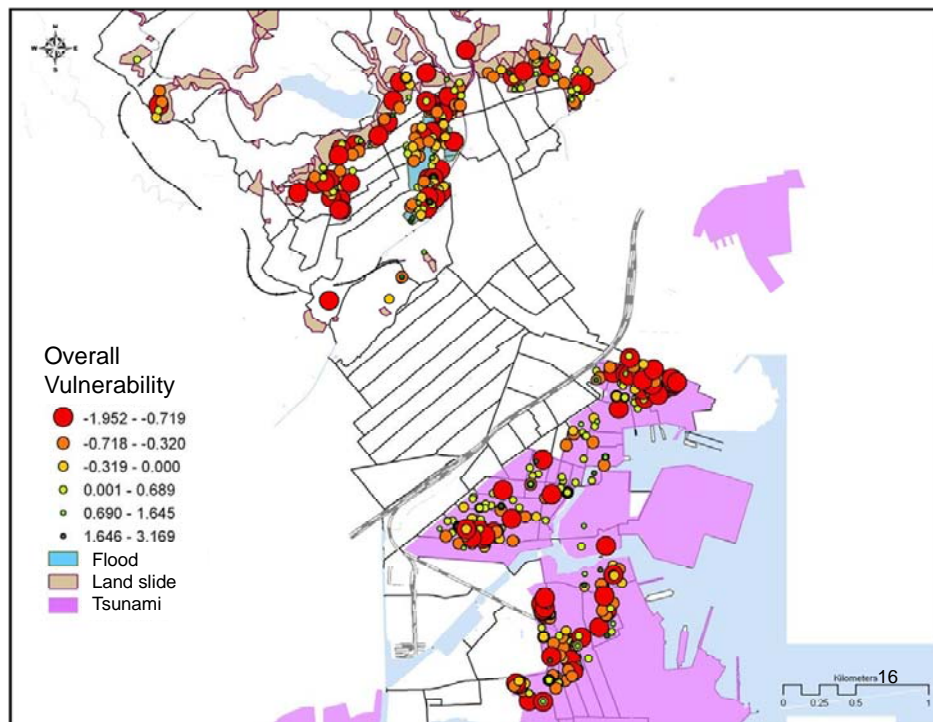


Figure 7: Overall vulnerability scores mapped on to hazard layers

Furthermore, a social vulnerability weighted kernel density map of people with special needs was created (see figure 8). This map indicated which particular areas require more human resources for assisting a special needs population for evacuation and sheltering. The project product maps helped representatives from special needs groups, community emergency response teams, community social services, and emergency management centers initiate evacuation and sheltering assistance planning in the project areas.

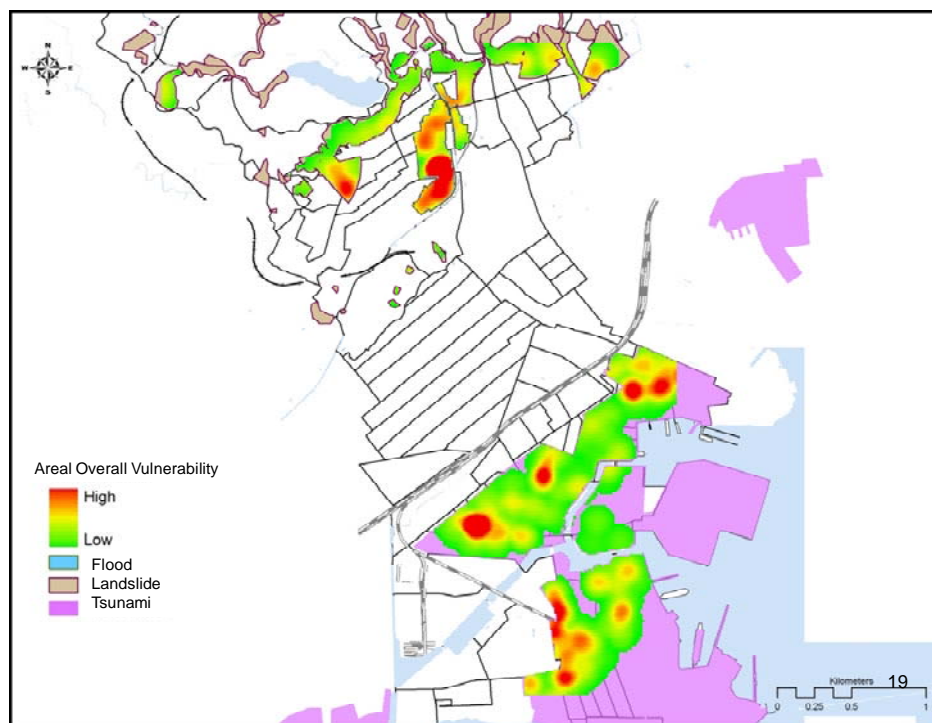


Figure 8: PSND kernel density estimation weighted by overall vulnerability index

The 2008 Kobe PSND mapping project was an attempt that aimed to provide a standardized method using individual social vulnerability mapping as analysis tool to identify more

comprehensively the risks that could affect a given community. This could help different stake holders, special needs groups, community emergency response teams, community social services, and emergency management centers initiate evacuation and sheltering assistance planning in high risk communities.

3. Toward a Refinement of Person-in-Environment Model: Maximum Probable to Maximum Possible Event Framework

Despite recent developments of PSND counter-disaster measures as illustrated in the above, serious problems confronted municipalities, communities, PSNDs and their families at the onset of March 11 Great East Japan Earthquake Disaster. Three reconnaissance missions conducted by the author team in March and April identified several challenges on counter-disaster measures for PSNDs. One of these challenges demanded re-thinking "correct" hazard estimates in the person-in-environment model of hazard vulnerability (Tatsuki, 2011).

Recent developments in preparedness measures for PSND in Japan have been uncritically relying on the assumption that hazard maps represent "correct" estimates of future hazardous events. As figure 9 in the below illustrates, this turned out to be a horribly wrong assumption. Hazard maps were created according to *maximum probable event* (MP_rE) framework. In reality, however, *maximum possible event* (MP_oE) has occurred in Tohoku regions. This has tremendous implications for fundamentally re-thinking entire hazard estimation process from MP_rE to MP_oE framework.

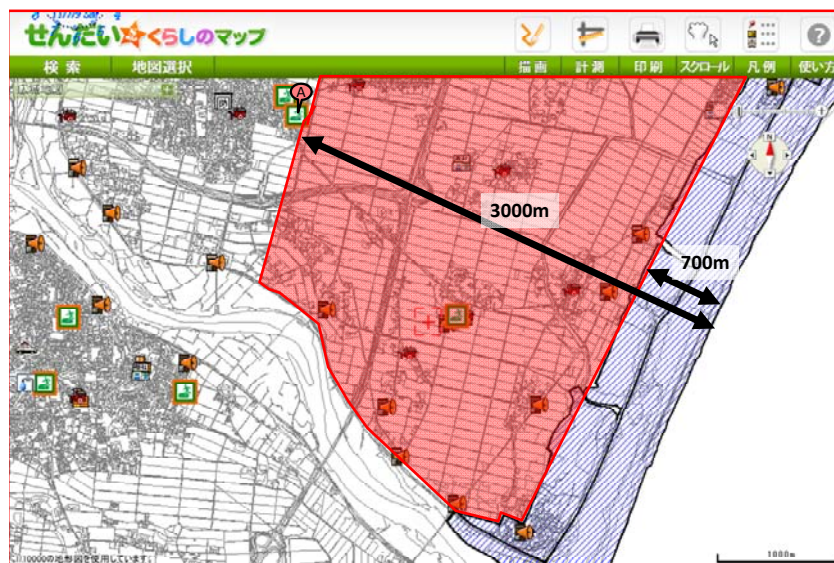


Fig 9: Tsunami hazard map and actual inundation east of Rokugo Junior high school, Wakabayashi ward, Sendai city

In the previous section, the person-in-environment model of hazard vulnerability (V) was introduced as a function of hazard (H), person (P) and environment (E) factors or $V = f(H, f(P, E))$. In practice, hazard factor was estimated by *maximum probable event* framework and therefore the model could be represented as $V = f(MP_rE, f(P, E))$. The challenge here is to replace *maximum probable event* hazard estimate with an alternative hazard estimate by incorporating *maximum possible event* framework. The modified person-in-environment model will therefore be represented as $V = f(MP_oE, f(P, E))$.

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