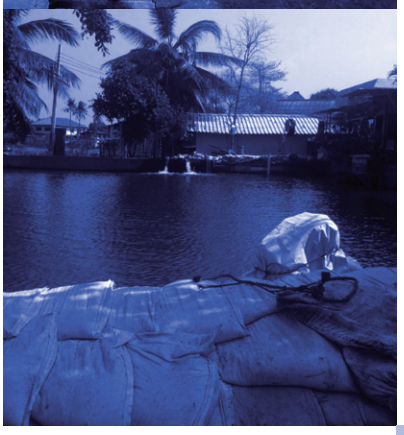

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Development of Flood Disaster Preparedness Indices (FDPI)

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INCORPORATED ADMINISTRATIVE AGENCY
PUBLIC WORKS RESEARCH INSTITUTE

1-6, Minamihara, Tsukuba-shi, Ibaraki-ken, 305-8516 JAPAN

Technical Note of
PWRI No. 4 2 4 7

Development of Flood Disaster Preparedness Indices (FDPI)

by

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and
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Synopsis :

For effective water-related disaster management, it is important to exercise well-balanced structural and non-structural measures. However especially in developing countries, while strengthening of disaster preparedness at local community/municipality level is critically important, established disaster preparedness plans or future targets for improvement rarely exist. Therefore this research intends to develop a well-balanced set of flood disaster preparedness indices that can be applied as commonly and as widely as possible to various localities in the world. Examination of the indices, field survey to communities in the Metro Manila, Philippines, Ubon Ratchathani and Hat Yai, Thailand, and Hanoi, Vietnam including creation of indices diagram, and analyses of the field survey results were proceeded. This research is also one of the projects for Working Group of Hydrology of Typhoon Committees (UN/ESCAP and WMO) from 2009 to 2012.

Key Words : community, self-evaluation, disaster preparedness, Philippines, Thailand, Vietnam

Development of Flood Disaster Preparedness Indices (FDPI)

Contents

Development of Flood Disaster Preparedness Indices (FDPI)

1. Introduction

Although the strengthening of local government and regionally-centered community-based disaster management is of general importance in developing countries; at present, disaster response-related guidelines and indices detailing the kind of preparedness required before a disaster occurs, etc. have not been developed in the communities of flood-prone developing countries. In particular, there is a need to comprehensively prepare both hard countermeasures such as levees and drainage facilities, etc. as well as soft countermeasures such as disaster response capacity to facilitate rapid decision-making in the acute phase following a flood disaster. Given this reality, the Working Group of Hydrology of The Typhoon Committee AOP4 has been engaged in the development of Flood Disaster Preparedness Indices (FDPI) that can be shared by local communities in developing countries from 2009 to 2012. Through use of this standardized indices and periodic evaluation, local communities can understand and evaluate their own flood preparedness and international organizations can also recognize the situation of local communities. As a result, local disaster preparedness progress can be visualized and the relative positioning of target areas can be made clear.

This paper reports on the information gathering and examination the authors have conducted for the development of indices and discusses the field survey results and the relevance of the community[1)] knowledge obtained from the field surveys as well as challenges for the future.

2. Research method

The research method involved an examination of FDPI through research of literature and questionnaires and interviews conducted in field surveys. Literature concerning both foreign and domestic regional disaster management plans was reviewed in order to conduct an appropriate examination of indices.

Field surveys were conducted in the Philippines, Thailand and Vietnam. Pre-testing and pilot surveys were conducted in the Philippines and Thailand and the actual surveys reflecting these results were conducted in Marikina City, Metro Manila, Philippines, Ubon Ratchathani and Hat Yai, Thailand and Hanoi, Vietnam.

In Thailand, ICHARM has gained a cooperation from Department of Disaster Prevention and Mitigation (DDPM), Royal Irrigation Department (RID) and Ubon Ratchathani DDPM branch, and conducted pre-testing and pilot surveys including community(tambon [sub-district]) leaders in Ubon Ratchathani Province. The pretest and pilot surveys were conducted in the Philippines with

cooperation from the National Disaster Risk Reduction and Management Council (NDRRMC). Metro Manila Quezon City, Pasig City, Makati City, Marikina City, and Muntinlupa City with some barangays in the cities were visited.

As actual surveys concerning FDPI in the Philippines became impossible due to the impact of the Great East Japan Earthquake, ICHARM asked local city officials in Marikina City and a Japanese associate professor at Ateneo de Manila University to conduct the survey in Marikina City on our behalf. As local city officials in Marikina City were aware of the importance of FDPI, they were able to collect information on all barangays.

The Thai field surveys were conducted over two one week periods in February and December 2011 on each community (thesaban [sub-district municipality] and tambon representatives) with cooperation from various organizations. The places visited in these field surveys included the Thai DDPM(Department of Disaster Prevention and Mitigation) in Bangkok, RID(Royal Irrigation Department), Ubon Ratchathani DDPM branch, Ubon Ratchathani University MSSRC(Mekong Sub-regional Social Research Center), Songkhla Hat Yai DDPM branch and Institute of Research and Development for Health of Southern Thailand (RDH) of Prince of Songkhla University.

The Vietnam field surveys were carried out in August 2012 in cooperation with Vietnam National University in Hanoi and targeted 13 communes in five regions in Hanoi.

3. FDPI examination

In preparing indices, ICHARM collected and analyzed relevant materials as well as examined previous research. This allowed us to examine the challenges of adapting the initiatives that had been developed so far, primarily in developed countries, to the flood-prone regions in Asian countries.

3.1. Material analysis

ICHARM collected and analyzed existing materials concerning initiatives to improve regional disaster management capabilities. While such initiatives were only found in developed countries such as Japan and the United States, in this stage, ICHARM exacted useful information and issues in order to facilitate the adaption of these indices to any other country as a reference. In particular, ICHARM examined case studies of regional disaster management plans and measures developed primarily in Japan and the United States. While regional disaster management plans are mandated by the Disaster Countermeasures Basic Act in Japan, regional disaster management plans equivalent to this level could not be found in other Asian countries. Below is an outline of the analysis and examination of the primary materials.

(1) Disaster Management Capacity Checklist (Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications) 2003

This checklist is composed of 700-800 questions (the number of questions differs at prefectural and municipal levels) that evaluate items ranging from general natural disaster and accident countermeasures to terrorism response systems. This checklist poses operational problems in that the large volume of questions is cumbersome for respondents. However, examined from a broad perspective, it is helpful in setting a standpoint for the content of FDPI.

(2) Disaster Management Capacity Evaluation Guidelines (Mie Prefecture) 2004

These guidelines are composed of approximately 700 questions. They have adopted similar questions to the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications' Disaster management capacity checklist as well as strengthened evaluation indices concerning Mie Prefecture's tsunami disaster management capacity. Although there are a large number of questions similar to the above checklist, the questions are written in an easy-to-understand manner and these guidelines are helpful from the perspective of a local government.

(3) Disaster Management Capacity Evaluation Indices (Kinki Association of City Mayors) 2005

These indices are composed of approximately 120 questions concerning general natural disasters. As these indices are compact and impose a relatively small burden on respondents and evaluators, they are helpful from an operational aspect. However items concerning hard countermeasures and budgets, etc. are not included.

(4) Crisis Management Capabilities (FEMA) 1997

These are evaluation criteria that have been used by the U.S. Federal Emergency Management Agency (FEMA) to diagnose disaster management capacity on a state level. While the content does not significantly differ from the three Japanese materials mentioned above with respect to items concerning preventive measures, emergency measures and recovery measures, these materials are characterized by items devised during normal periods concerning financial support to citizens affected by disasters such as insurance schemes and subsidy programs, etc. – something not seen in the Japanese materials.

(5) Fukae-cho Regional Disaster Management Plan 1991

As this is a disaster management plan for a small municipality, it is compact, easy to read and therefore helpful from an operational aspect. However, it assumes that hard countermeasures and budgets, etc. will be formulated in accordance with the National Basic Disaster Management Plan and Prefectural Regional Disaster Management Plan and accordingly does not include such items.

(6) Louisiana, USA “Operational Plan for Crisis Management” 1997

This is a state-level operational plan for crisis management and its content is equivalent to the content of Japanese regional disaster management plans. Japanese regional disaster management plans often describe disaster management planning items as a municipality; however these materials tend to take the form of manual for personnel in charge. Similarly to Japanese regional disaster management plans, there is no mention of hard countermeasures and budgets, etc.

(7) U.S. National Fire Protection Association “Standard on Disaster/Emergency Management and Business Continuity Programs 2007 edition” 2007

These are guidelines that indicate the typical disaster management measure items to be implemented by disaster management departments of local governments in the U.S. It is configured similarly to the Operational Plan for Crisis Management mentioned above, however due to its nature as a guideline, it only describes the main points.

After organizing and analyzing the characteristics of existing materials as described above, the next step was clarifying the challenges. First of all, there are no evaluation criteria with respect to hard countermeasures. The disaster management capacity evaluation checklists and evaluation indices created by the Ministry of Internal Affairs and Communications (2003), Mie Prefecture (2004) and Kinki Association of City Mayors (2005) primarily concern disaster management systems of the disaster management sections of municipal’s internal affairs department (i.e. local municipality disaster management systems as prescribed in the regional disaster management plan) and do not include evaluation indices with respect to hard countermeasures which are necessary for a flood disaster management system such as the type ICHARM wish to create in this study. Accordingly, ICHARM examined new evaluation indices concerning hard countermeasures.

Secondly, the disaster management plans of Japan and the U.S. suggest different kinds of social capital, which is considered to play a major role in flood disaster management systems. For example, the following two types of social capital[2)] are considered in Japan; 1) regional bond-based communities of voluntary disaster management organizations, neighborhood associations, community associations and fire brigades and 2) NGO, NPO and volunteer-related organizations. In the U.S. on the other hand, NGO, NPO and volunteer-related organizations are considered, but no particular assumptions are made concerning regional bonds, etc. Accordingly, the need to examine evaluation indices that take into account cultural and social background and can be shared was confirmed.

The third challenge was the lack of budget-related evaluation indices. In evaluating the disaster management systems of each country, it was assumed that disaster management-related budgetary systems would play a major role; however, there were no past examples for the evaluation of

budgetary systems themselves. There was also no mention of disaster management-related budgetary systems in regional disaster management plans, etc. For this reason, ICHARM also decided to examine budget-related evaluation indices.

3.2. Examination of evaluation criteria categories and creation of a draft

ICHARM then examined evaluation criteria in accordance with the disaster management cycle (damage suppression, damage mitigation, emergency response, rehabilitation and reconstruction) while considering the matters described so far. ICHARM referred to the Japan International Cooperation Agency “Disaster Management Matrix”[3] in this respect.

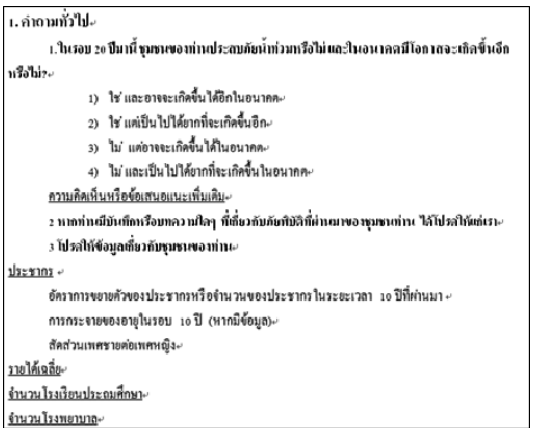
When formulating draft questions, ICHARM aimed to repeatedly ask concerned government agencies and municipal disaster management personnel in as many countries as possible to provide us with trial responses with the aim of incorporating their opinions in order to produce effective evaluation items. During this process ICHARM paid attention to the expression used in the evaluation items to ensure they could be objectively compared without being affected by the subjectivity of respondents and tried to avoid including items that couldn’t be answered by all countries as much as possible. In these early stages, the questions were prepared in English and Japanese. Thai and Vietnamese questions were added at a later stage.

4. Examination and creation of a group of indices from a regional disaster management capacity perspective

ICHARM then examined each question created through the process described above from a regional disaster management capacity perspective. ICHARM commenced with examination of the five main indices in accordance with the disaster management management cycle. More specifically, ICHARM considered whether leaders of the local community or disaster management personnel would be able to evaluate their own communities and looked at the structure of the questions in terms of which would serve as main indices and which would serve as a group of indices as a component of the main indices (detailed indices). The main indices created in accordance with the disaster management cycle were “basic stance”, “damage suppression”, “damage mitigation”, “emergency response” and “rehabilitation and reconstruction”; however these were changed to "hard counter measures", "flood disaster mitigation plans and standards", "flood disaster mitigation systems", "evacuation plans and systems", "emergency and recovery plans and systems", "leadership and collaboration between organizations", "information and education for local residents" and "community strength" to make them easier to understand for local stakeholders. The related groups of indices were also adjusted accordingly[4]. Next, each question item was changed with cooperation from Typhoon Committee member countries. National level questions and questions not suitable or

that could be difficult to answer for local communities, etc. were omitted and social capital-related questions were also added as new items.

Below is an overview of "hard counter measures", "flood disaster mitigation plans and standards", "flood disaster mitigation systems", "evacuation plans and systems", "emergency and recovery plans and systems", "leadership and collaboration between organizations", "information and education for local residents" and "community strength". “Hard counter measures” indicates primarily infrastructure-based flood preparedness including the inspection of equipment of medical facilities and schools, presence or absence of levees, levee construction plans and levee construction, management and maintenance plans, etc. “Flood disaster mitigation plans and standards” includes regulations on land use and building standards as well as budgets and planning. “Flood disaster mitigation systems” looks at whether matters necessary for flood prevention such as the education and training of disaster management personnel and have been institutionalized as well as cost-effectiveness, etc. “Evacuation plans and systems” covers matters necessary for evacuation such as warnings, guidance and the safety of evacuation sites. “Emergency and recovery plans and systems” checks whether matters required from the system at times of emergency such as the behavior of disaster management officials, etc. until recovery and reconstruction have been planned and institutionalized. “Leadership and collaboration between organizations” looks at the stance of local government leaders and the status of collaboration between other government agencies, NPOs and NGOs. “Information and education for local residents” looks at the provision of disaster management education in schools and the degree of disclosure of information such as hazard maps, etc. to the public. “Community strength” primarily illustrates social capital. Part of the Thai questionnaire is displayed in table 1 and the English questionnaire has already been published on the website[5]. A summary of questionnaire items can also be seen in table 2.



1. คำถามทั่วไป

1.ในรอบ 20 ปีมานี้ชุมชนของท่านประสบภัยน้ำท่วมหรือไม่และในอนาคตมีโอกาสจะเกิดขึ้นอีกหรือไม่?

1) ใช่ และอาจจะเกิดขึ้นได้อีกในอนาคต
2) ใช่ แต่เป็นไปได้ยากที่จะเกิดขึ้นอีก
3) ไม่ แต่อาจจะเกิดขึ้นได้ในอนาคต
4) ไม่ และเป็นไปได้ยากที่จะเกิดขึ้นในอนาคต

ความคิดเห็นหรือข้อเสนอแนะเพิ่มเติม

2 หากท่านมีบันทึกเรื่องบทความใดๆ ที่เกี่ยวข้องกับภัยพิบัติที่ผ่านมาของชุมชนท่าน ได้โปรดให้แก่เรา

3 โปรดให้ข้อมูลเกี่ยวกับชุมชนของท่าน

ประชากร

อัตราการขยายตัวของประชากรหรือจำนวนของประชากรในระยะเวลา 10 ปีที่ผ่านมา

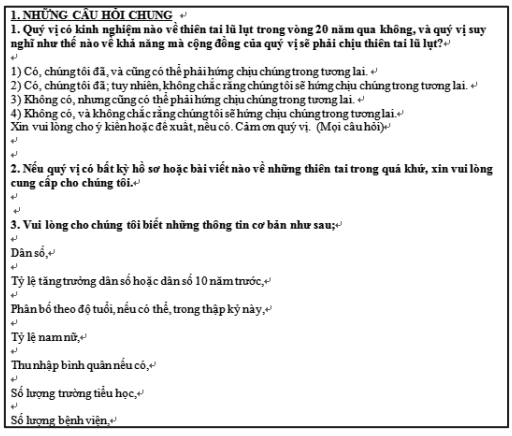
การกระจายของอายุในรอบ 10 ปี (หากมีข้อมูล)

สัดส่วนเพศชายต่อเพศหญิง

รายได้เฉลี่ย

จำนวนโรงเรียนประถมศึกษา

จำนวนโรงพยาบาล



1. NHỮNG CÂU HỎI CHUNG

1. Quý vị có kinh nghiệm nào về thiên tai lũ lụt trong vòng 20 năm qua không, và quý vị suy nghĩ như thế nào về khả năng mà cộng đồng của quý vị sẽ phải chịu thiên tai lũ lụt?

1) Có, chúng tôi đã, và cũng có thể phải hứng chịu chúng trong tương lai.
2) Có, chúng tôi đã; tuy nhiên, không chắc rằng chúng tôi sẽ hứng chịu chúng trong tương lai.
3) Không có, nhưng cũng có thể phải hứng chịu chúng trong tương lai.
4) Không có, và không chắc rằng chúng tôi sẽ hứng chịu chúng trong tương lai.
Xin vui lòng cho ý kiến hoặc đề xuất, nếu có. Cảm ơn quý vị. (Mọi câu hỏi)

2. Nếu quý vị có bất kỳ hồ sơ hoặc bài viết nào về những thiên tai trong quá khứ, xin vui lòng cung cấp cho chúng tôi.

3. Vui lòng cho chúng tôi biết những thông tin cơ bản như sau;

Dân số,

Tỷ lệ tăng trưởng dân số hoặc dân số 10 năm trước,

Phân bố theo độ tuổi, nếu có thể, trong thập kỷ này,

Tỷ lệ nam nữ,

Thu nhập bình quân nếu có,

Số lượng trường tiểu học,

Số lượng bệnh viện,

1. GENERAL QUESTIONS

1 What do you think about the possibility that your community will suffer flood disasters?

1) We have experienced flood disasters in the past 20 years, and may also suffer them in the future.
2) We have experienced flood disasters in the past 20 years; however, it is unlikely that we will suffer them in the future.
3) We have not experienced flood disasters in the past 20 years, but may also suffer them in the future.
4) We have experienced few flood disasters and it is unlikely that we will suffer them in the future.

For future improvement please give comments or suggestions, if any. Thank you.

2 If you have any records or articles on past disasters, please provide those for us.

3 Would you tell us about your community?

Population,

Population growth rate or the population of 10 years ago,

Age distribution, if possible, by decade,

Male-to-female ratio,

Average income if available,

Number of the elementary schools,

Number of the hospitals

Table 1: Questionnaire (English, Thai, Vietnamese)

5. Examination of evaluation method

A survey concerning coefficients (weighting) which express the importance of each detailed indices was conducted on municipal level disaster management personnel, who may also be potential FDPI users, and national government disaster management personnel in order to obtain the formula to calculate the each of the basic indices. In this survey, the importance of each item in the questionnaire was rated on a 5-point scale and these ratings were applied to the coefficients of each detailed indices in table 2[6].

These weightings were reflected in the coefficients for the main indices “hard counter measures”, “flood disaster mitigation plans and standards”, “flood disaster mitigation systems”, “evacuation plans and systems”, “emergency and recovery plans and systems”, “leadership and collaboration between organizations”, “information and education for local residents” and “community strength” as seen in table 2. The calculation formula can be expressed as <main index score = 1 (base score) ＋Σ (each detailed index [factor] score (0-1) x each detailed index [factor] coefficient [weight])>. A higher score of each main index indicates greater preparedness (minimum value = 1, maximum value = 10). Visualizing the evaluation results on a radar chart is aimed to make it easier to extract and confirm bottlenecks.

6. FDPI survey

6.1. FDPI survey outline

The following is a summary of the FDPI survey.

1) Pretesting and pilot survey conducted in the Philippines and Thailand (2011.1.30-2.14)

2) Survey of all barangays with the full cooperation of Marikina City, Philippines (2011.8)

<Because field survey was impossible due to the Great East Japan Earthquake>

3) Thailand field survey (2011.12.6-14)

11 tambons [subdistricts] of Ubon Ratchathani (OBT) and 11 tambons (OBT) or thesabans [subdistrict municipalities] of Hat Yai, Thailand

4) Vietnam field survey (Hanoi) (2012.8.5-10)

13 communes in five regions in Hanoi

Until now, field surveys have been conducted in three countries (the Philippines, Vietnam and Thailand) with communities either visited directly or with cooperation at the municipal level in assembling community leaders in one place.

The first field survey was conducted from January 30 to February 14, 2011, the second field survey was carried out thanks to local contributors in the Philippines, the third field survey was conducted from December 6 to December 14, 2011 and the fourth field survey was conducted from August 5 to August 10, 2012. The survey areas were selected in consultation with national governments, local governments and local universities as regions where flooding frequently occurs and in which local cooperation could be easily obtained at the time of survey. Regions currently responding to a disaster were excluded as targets for the survey in consideration of ethical aspects. In Hanoi, both communities greatly affected as a result of the 2008 floods as well as communities only slightly affected or not affected were selected for the purpose of comparison.

More specifically, the first survey was conducted on the Bangkok Metropolitan Region and Ubon Ratchathani and the second survey was conducted on the Bangkok Metropolitan Region, Ubon Ratchathani and Hat Yai. The third survey was conducted in the southern and northwestern areas of Hanoi, Vietnam. Ubon Ratchathani was also selected again for the third survey as the region had, to an extent, recovered from the 2011 floods, had systems in place to accept the survey team, and was an area in which progress could be seen following the improvement of the questionnaire.

The first field survey was focused on pre-testing and the pilot survey. In pre-testing, the Thai national government disaster management organization DDPM and its regional branch (Ubon Ratchathani) cooperated in actually answering the questionnaire and providing advice. Various opinions from researchers at Ubon Ratchathani University MSSRC and NGO members were also obtained. The pilot survey was conducted on the targets of the actual survey: leaders and disaster response personnel of the smallest administrative units with a budget and dedicated staff. The questionnaire questions were improved based on the results of this first field survey and subsequent field surveys were then conducted. As described above, the survey areas were selected in consultation with national governments amongst regions plagued by flood damage while considering the needs of the region. Hat Yai, a target of the second and subsequent surveys, was officially

designated a pilot city for the Urban Flood Risk Management (UFRN) project of the Typhoon Committee organized by the UN / ESCAP and WMO after it was severely damaged by a typhoon in 2010 and were also received requests from the international community.

Table 2: Main indices, detailed indices and score calculation formula

Indices	No.	Factors	Weight	Total
1 Hard counter measures	15	Schools and Health Facility Safety Inspection	1	9
	32	Existence of Levee Construction	1	
	33	Requirement of Levee Construction	1	
	34	Levee Construction/Maintenance Plans	1	
	35	Levee Management Organizations	0.8	
	36	Existence of Drain Pump Stations	0.2	
	37	Requirement of Drain Pump Stations	1	
	38	Construction Plan for Drainage Facilities	1	
	39	Existence of Drainage Facilities	1	
	40	Drainage Facility Management Organizations	1	
	(Score[Hard counter measures])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
2 Flood disaster mitigation plans and standards	4	Budget	1.4	9
	7	Consistency of Disaster Management Plans	1.4	
	8	Past records	1.4	
	12	Flood management plans	1.2	
	14	Restrictions on land use and development	1.2	
	16	Building Codes/Laws or Guidelines	1.4	
	17	Restrictions on Dangerous/Toxic materials	1	
	(Score[Flood disaster mitigation plans and standards])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
3 Flood disaster mitigation systems	9	Government officers education and training	1.2	9
	11	Framework of effective technologies	0.8	
	13	Cost-effectiveness	1	
	31	System for Recording Disaster Experience	1.2	
	49	Damage Estimation and Response Measures	1.2	
	56	Flood fighting supplies and equipment	1.2	
	57	Stockpiling of daily commodities	1.2	
	66	Response measures for illegal settlers	1.2	
	(Score[Flood disaster mitigation systems])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
4 Evacuation plans and systems	51	Emergency communication plans	1.1	9
	58	Criteria for evacuation	0.8	
	59	Evacuation guidance plans	0.9	
	60	Evacuation shelters	1.1	
	61	Shelter capacity	1.1	
	62	Evacuation routes	1.1	
	63	Evaluation and update of evacuation plans	1.1	
	64	Cross-border evacuation plans	1.1	
	65	Information for evacuation support systems	1.1	
	(Score[Evacuation plans and systems])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			

5 Emergency and recovery plans and systems	44	Disaster Management Personnel Responsibilities	0.7	9
	45	Disaster Management Plan Procedures	0.7	
	50	Communication channels	0.7	
	67	Emergency rescue and search plans	0.7	
	68	Emergency medical plans	0.7	
	69	Emergency supplies plans	0.7	
	70	Emergency response plans for public infrastructure	0.7	
	71	Livestock management plans	0.7	
	75	Disease control plans	0.7	
	76	Recovery plans	0.7	
	77	Temporary housing plans	0.7	
	78	Financial assistance	0.7	
	79	Mental care services	0.6	
	(Score [Emergency and recovery plans and systems])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
6 Leadership and collaboration between organizations	5	Community Leader's Attitude towards Disaster Management	1.1	9
	6	Main Policy for Disaster Management	1.1	
	29	Disaster Management Organizations Supports	1.1	
	30	Joint Drills Activities	1.1	
	41	Disaster Management Meetings	1.1	
	42	Participation in Disaster Management Meetings	1.1	
	43	Emergency Management Headquarters	1.1	
	73	Cooperative relationships with public organizations	1.1	
	74	Public organizations, residents, and NPOs relationships	0.6	
	(Score [Leaderships and collaboration between organizations])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
7 Information and Education for Local Residents	10	Community residents education and training	0.9	9
	18	Flood Hazard Map	0.7	
	19	School Disaster Management Drills	0.9	
	20	School Education	0.6	
	21	Flood Fighting/Evacuation Drills	0.9	
	46	Rainfall Information	0.9	
	47	Water Level Information	0.9	
	48	Weather Information	0.9	
	52	Emergency communication tools	0.9	
	53	Information on water levels, facility operation, etc.	0.9	
	54	Form of information	0.6	
	55	Tools of information	0.3	
	(Score [Information and Education for Local Residents])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			
8 Community Strength	22	Relationships with Neighbors	1.2	9
	23	Participation in Local Activities	1.2	
	24	Festivals, Sports Meets, and Other Activities	1.2	
	25	Hobby circles and groups of sports enthusiasts	1.2	
	26	Cooperation in Case of Disaster	1.4	
	27	Involvement in Disaster Management Organizations	1.4	
	28	Mutual Help Culture	1.4	
	(Score [Community Strength])=1(Basic Point)+Σ(Factor Point (0-1))×Weight)			

6.2. FDPI survey method and results

1) Thailand

As the target areas (communities) in Thailand were the smallest administrative units, they were selected in consultation with DDPM, a national government organization, as described above. More specifically, tambons of Ubon Ratchathani and tambons or thesabans of Hat Yai in which local systems concerning flood damage and informants could be secured were selected while also taking into account the needs for FDPI.

In the survey of Hat Yai, thesabans were too large geographically and too highly-populated, making them unsuitable as target regions. While strictly speaking not the smallest administrative unit, mubans, which are subdivisions of tambon, were also adopted as target regions in Hat Yai in consultation with the DDPM Songkla branch and Prince of Songkla University. Accordingly, it must be noted that Mubans cannot be directly compared with the tambon municipal level.

In all surveys, referrals were obtained in a top-down manner starting with national government disaster management organizations to local ones which allowed the survey of local communities and their representatives to be carried out relatively smoothly. Hat Yai is composed of 13 tambons and 98 mubans and actual data from disaster management personnel or leaders of the local government was obtained from 10 mubans in 7 tambons or thesabans. Ubon Ratchathani is composed of 25 amphoe, 219 tambons and 2469 mubans and data was obtained from disaster management personnel or leaders of the local government in 4 amphoe and 7 tambons. Sufficient time was provided for the completion of surveys, even taking into account time for discussion and, accordingly, the response rate was almost 100%.

2) Philippines

Pilot surveys were conducted in the Philippines in consultation with the NDRRMC (National Disaster Risk Reduction and Management Council) and OCD (Office of Civil Defense. Subsequently, the survey target was narrowed down to Marikina City and survey results were collected from all 16 barangays in Marikina City with the full cooperation of Marikina city officials and local contributors. Thanks to the city's cooperation, the survey response rate was 100%.

3) Vietnam

Following formal approval from Hanoi City, ICHARM visited five regions in Hanoi to conduct surveys with the cooperation of Vietnam National University. After further discussion and approval for the commune survey from district office, ICHARM surveyed a total of 13 communes.

Although the surveys were checked as they were completed, there were still instances of omissions or multiple answers, etc. which brought the response rate down to around 90%.

The names of the communities surveyed in each nation will not be published in this report in accordance with the principle of not disclosing names without consent.

7. Analysis of field survey results: A case study of two regions in Thailand

A diagram of the main indices in each target area was obtained from analysis of the questionnaire survey results. From these diagrams, it is possible to visualize the preparedness of each local community. Principal component analysis and cluster analysis of the survey results were also carried out in an attempt to elucidate potential factors.

More specifically, the results and corresponding diagrams obtained from three communities from Hat Yai were selected at random (figure 1) and the results and corresponding diagrams obtained from three communities from Ubon Ratchathani were selected at random (figure 2) and superimposed over one another. The names of the communities will not be published in this report in accordance with the principle of not disclosing the names without consent. Instead, they are indicated with a number.

7.1. Diagram

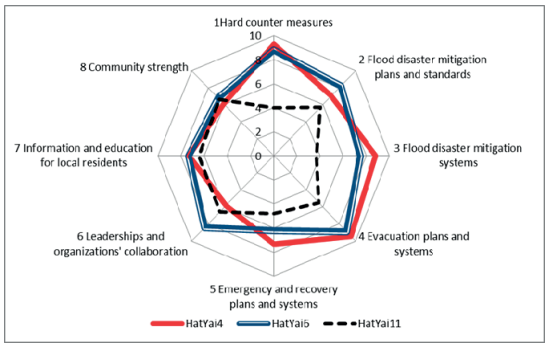


Fig.1 HatYai Diagram

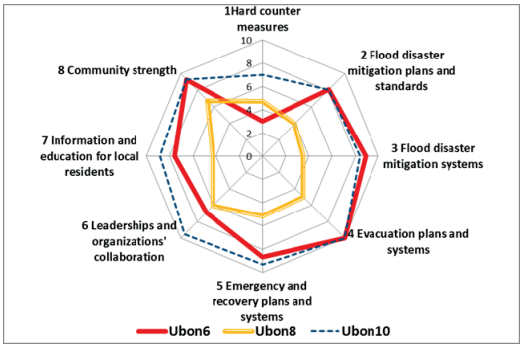


Fig. 2 Ubon Ratchathani Diagram

The following is an outline of these three communities of Hat Yai and Ubon Ratchathani. The data of the three Hat Yai communities is shown in figure 1, which can be interpreted as follows: Overall there is weakness in 5. “Emergency and recovery plans and systems”, Hat Yai (H4) is weak with regards to 6. “Leadership and collaboration between organizations”, Hat Yai (H6) is comparatively weak with regards to 5. “Emergency and recovery plans and systems” and Hat Yai (H11) is weak overall, most noticeably in relation to 1. “Hard counter measures”, 3. “Flood disaster mitigation systems” and 5. “Emergency and recovery plans and systems”. Incidentally, ICHARM

has received reports from locals that H11 was damaged once again by flooding from January 1, 2012. The data of the three Ubon Ratchathani communities is shown in figure 2, which can be interpreted as follows: Overall there is weakness in 1. “Hard counter measures” with UBON6 (U6) particularly weak in this area, UBON8 (U8) is weak with regards to 3. “Flood disaster mitigation systems” and 7. “Information and education for local residents” and UBON10 (U10) is strong in all areas except for 1. “Hard counter measures”. By looking at the diagrams in this way, the strength or weakness of a community’s flood disaster preparedness can be visualized and self-evaluation by leaders of the local community and regional disaster management personnel can be carried out. Issues become further apparent by looking at the detailed indices.

7.2. Examination through principal component analysis, cluster analysis

Principal component analysis was performed on the obtained survey results in an attempt to further derive the potential elements behind the indices of regional disaster management capability. Here, “community strength”, the main index considered the most difficult to objectively quantify, was taken as an example and an attempt was made to visualize its constituent factors and the position of the community. The same process was also carried out on other main indices, however analysis of this content has been omitted from this paper due to a lack of space and will be published at another opportunity. In addition, two regions of Thailand were used in this case study, with results and analysis focused on Ubon Ratchathani and Hat Yai.

Table 3 shows the results of principal component analysis. Three principal components with eigenvalues of 1 or greater were extracted and their cumulative contribution ratio was about 80%. In analysis of the first principle component, the activity with the highest negative coefficient was "participation in local activities" followed by “cooperation in case of disaster”, “festivals, sports meets, and other activities” and “hobby circles and groups of sports enthusiasts”. On the other hand, positive coefficient values were generally low with the highest positive values observed under the items of “cooperation in case of disaster”, “involvement in disaster management organizations” and “relationships with neighbors”. Looking at these trends, the first principal component can be understood, from the negative coefficients, to be “organized community activities”. The second principal component was determined to be “sense of mutual assistance” which is characterized by the negative “cooperation in case of disaster” and “relationships with neighbors” values and positive values only under the items of “festivals, sports meets, and other activities” and “participation in local activities”. The third principle component was wall-balanced in terms of positive and negative coefficients with “relationships with neighbors” standing out with highest negative value. On the other hand, high positive values were observed under the items of “hobby circles and groups of sports enthusiasts" and “participation in local activities”. Judging from this, the third principle component was interpreted to be “everyday connection between people”

Cluster analysis was also performed on principal component scores and six clusters were created after the creation of a dendrogram graph shown in figure 3. Figure 4 is a figure that imposes the clusters over a scatter plot of the principal component scores of the first and second principal components.

Through this analysis, the overall trends in “community strength” could be visualized. More specifically, communities could be broadly classified into (1) groups weak with respect to both “organized community activities” and “sense of mutual assistance” (U1,U3,U6,U10,U11), (2) groups with moderate levels of “organized community activities” but with a weak “sense of mutual assistance” (U5,H3), (3) groups that are strong with respect to “organized community activities” but somewhat weak with respect to a “sense of mutual assistance” (U2,U4,H6,H8), (4) groups weak with respect to “organized community activities” but with a strong “sense of mutual assistance” (U7,H2,H5,H9), (5) groups with moderate levels of both “organized community activities” and “sense of mutual assistance” (H1,H4) and (6) groups strong with respect to both “organized community activities” and “sense of mutual assistance” .

As a result, the position of each community became clear guided by “organized community activities” and “sense of mutual assistance” and a bird’s-eye view of “community strength” could be achieved from this perspective.

In addition, as an overall trend seen in figure 4, Hat Yai communities tended to be strong and have good balance with respect to “organized community activities” and “sense of mutual assistance” while Ubon Ratchathani communities tended to be divided into groups strong with respect to both “organized community activities” and “sense of mutual assistance” and groups weak in both these areas.

Table 3: Community strength principal component analysis

Detailed index (question) item:	Principal component		
	1	2	3
22. Relationships with neighbors	0.09	-0.10	-0.77
23. Participation in local activities	-0.66	0.19	0.11
24. Festivals, sports meets, and other activities	-0.44	0.24	-0.23
25. Hobby circles and groups of sports enthusiasts	-0.44	-0.25	0.47
26. Cooperation in case of disaster	0.16	-0.67	-0.46
27. Involvement in disaster management organizations	0.16	-0.65	0.09
28. Mutual help culture	-0.51	-0.16	0.05
Cumulative contribution ratio	37.7%	63.7%	79.5%

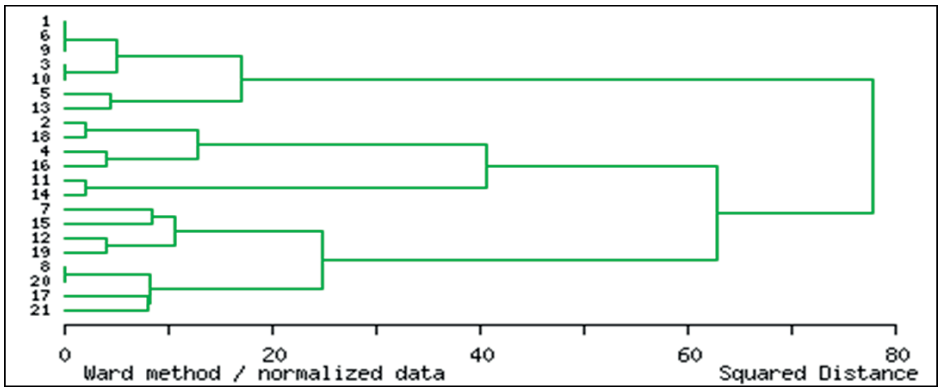


Figure 3: Cluster analysis. dendrogram graph[7)]

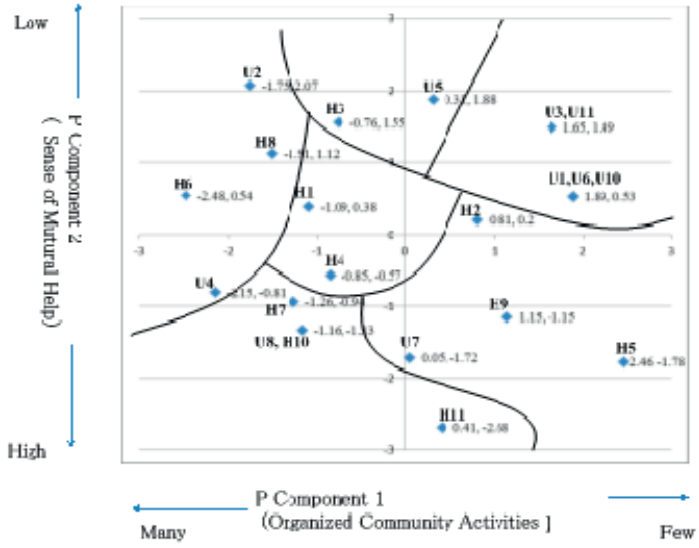


Figure 4. Principal component analysis and cluster analysis results

8. Summary and future challenges

It is necessary to develop and implement a wide range of hard and soft measures at each stage - preparation, response and restoration - for effective flood disaster management. However, in developing countries where it is difficult to implement such measures at a national level, strengthening of local government and regionally-centered community-based disaster management is important. Disaster plans are in place at the municipal level in some developed countries and have

contributed to the improvement of regional disaster management; however, in many developing countries there are currently no indices such as regional disaster plans, etc. available to facilitate a comprehensive and objective understanding of the current situation and the objectives at each stage of the flood disaster management system.

Against this backdrop, the flood preparedness of local communities can be clarified through the use of standardized indices and periodic evaluation. Standardized indices significantly contribute to the understanding of regional vulnerability towards disasters and disaster management capacity and can also be expected to stimulate efforts to improve disaster management. This paper aimed to improve flood response capacity at a municipal and community level in each country and develop widely applicable standardized flood disaster preparedness indices. Below are five points that were clarified through the surveys carried out in the development of these indices.

First, there is a need to understand regional diversity and adaptation of the indices. The main thing that became clear during the field surveys was the social background of regional diversity. For example, the target community's difference between old-styled farming areas and area where urbanization is progressing. It is necessary to continuously improve the questionnaire to further take into account the actual realities of each community. This, as well as being something that needs to be understood in the creation of indices, indicates that it is desirable for users to customize indices according to their region. This was knowledge obtained in field surveys. There were many local community leaders and disaster management personnel who were able to notice and report something previously unnoticed in the question items of the indices during surveys and there were also local community leaders who requested to return to their community with the survey and put it to use. This shows the potential of these indices and also demonstrates the limitations and challenges.

The second point that was clarified regarded the survey method which utilized a website. Requests to complete surveys were made via the internet, however only limited results were obtained and, in reality, the survey of local communities mainly became a paper-based exercise. Through this process, ICHARM could gain an understanding of the significant effect of the internet usage situation and infrastructure. The internet became an effective medium for seeking advice from national government agency staff and leaders that had been already been surveyed. The survey medium needs to be considered on an ongoing basis in accordance with the spread situation of the internet.

Thirdly, there is a need for consideration of regional disparities and appropriate countermeasures. There are large regional disparities in the education levels of regional representatives and disaster response personnel and the fact that this was directly connected with disparities in the level of understanding of the questionnaire was discovered during discussion on-site while the questionnaires were being completed. There were many points that were improved from the first round of surveys.

It is necessary to make question items as simple as possible and, depending on the respondent, conduct surveys while providing an explanation. In interviews, ICHARM also found that it was necessary to place heavy consideration on the national language including dialects.

Fourthly, ICHARM clarified an effective method of making survey requests. For surveys on disaster response similar to the FDPI survey where subjects are assumed in advance, it is effective to make top-down requests, i.e. by being introduced to local organizations by a central organization. Conversely, as well as cooperation from the subject being difficult to obtain from pin point survey requests, it is difficult for them to gain a comprehensive understanding about the purpose, meaning, position and future of the survey which may lead to confusion.

Finally, ICHARM clarified the analysis method. The content of the questions can be analyzed in detail through multivariate analysis, etc. of the survey results. This allows for the various factors hidden in the background to be visualized as well as analysis of the main indices. In this paper, the urbanization of Ubon Ratchathani and the floods experienced by Hat Yai in 2010 are considered to be reflected to an extent in the index of "community strength".

Based on the above findings, the following three points can be cited as challenges for the future. First, it is necessary to examine the characteristics of each region. It is difficult to compare the flood preparedness of two communities with differing levels of risk for example. Accordingly, ICHARM did not dare put a diagram of the "average" community in this paper. These indices can be utilized in a way which allows communities to evaluate their situation on their own and see progress on a regular basis; however it is necessary to understand their limitations in that they do not allow for a sweeping comparison of the situation of a certain community at the present time with the situation of another community. ICHARM would like to add, once again, that analysis was carried out in this paper in light of these limitations. However, there are also question items in the survey that cover past disaster experience, population density, population growth rate, gender ratio, the number of schools and medical facilities, etc. that are not shown as indices from which information is gathered which allows for consideration of the characteristics of the region to an extent. In the future ICHARM aim to be able to uniquely visualize the approximate magnitude of the risk in each region utilizing these question items. ICHARM believe that comparison of the main indices will become possible by comparing the degree of potential risk in each region. In other words, an approach where some indices are customized for each region and some indices are common and comparable between regions is possible.

The second challenge concerns the sharing of experiences. ICHARM continues to collect information about each country in field surveys and ICHARM will examine how flood experiences can be effectively shared with other regions including regions in other countries. ICHARM will also develop a prescription which allows for interpretation of evaluation and reference to the experiences of other countries, etc. as mentioned above. ICHARM wants to implement this over the internet.

The third challenge involves further examination of evaluation and analysis methods and operational aspects. Currently there is a focus on self-evaluation, however ICHARM continues to conduct more extensive field surveys and incorporate a broad range of opinions and perspectives to develop the indices on an ongoing basis. ICHARM are also making improvements to the evaluation method to allow for more effective and objective evaluation by other parties. Furthermore, there have been reports of flood damage in the community of H11 following the completion of this survey; while it has been proved that FDPI shows a certain degree of reality, operational challenges still remain. Future examination on how actual challenges can be broken down in the operation of these FDPI will be required.

This paper has provided an overview of the survey and analysis of the survey results conducted for the purpose of developing FDPI. The discussion in this paper was primarily focused on the development of indices and, in the future, ICHARM will develop more applicable indices by effectively utilizing the experience gained from these surveys and expanding target areas as much as possible with an emphasis on local communities greatly affected by floods.

Acknowledgments

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Notes:

1) In this paper, “communities” means “the people living within the smallest administrative unit”. The smallest administrative unit means the smallest administrative organization with its own organization and staff. Communities are therefore defined in this paper as the people living within this organization. Based on this definition, Thai communities can be defined as people living within a thesaban or tambon municipality. There are, however, some exceptions to the definition of “community” as described in the paper.

2) Putnam (2000=2006:19) defines social capital as “the connection between individuals, or in other words, social networks, and the norms of reciprocity and trustworthiness that arise from them”.

3) It is considered necessary for the evaluation criteria to be consistent with the so-called disaster management cycle of damage suppression, damage mitigation, emergency response, rehabilitation and reconstruction. The Japan International Cooperation Agency “Disaster Management Matrix” was suggested as a past case study in this respect and draft evaluation indices based on these “Disaster Management Matrix” were examined.

4) Each index was selected to reflect each stage of the disaster management cycle; however, main index categories were reconfigured to make it easier for the local stakeholders to understand. This is the reason why the questions in table 2 are not listed in order from #1. In addition, questions 1-3, which are descriptive format questions, cover items such as past disaster experience, population density, population growth rate, age structure, gender ratio, the number of elementary schools and medical facilities, etc. that are not taken into account in the FDPI.

5) The public URL is as follows: http://www.fdpi.jp/fdpi/

At present, a system that automatically generates a matrix containing an evaluation table and prescription is being developed.

6) The average scores were obtained from the survey results of 20 disaster management personnel. Answer items (detailed indicators [factors]) with a higher level of relative importance were adapted so they would have a high coefficient (weight) in Table 2 while items with a lower level of relative importance were adapted so they would have a low coefficient (weight) in Table 2.

7) The numbers on the left in the cluster analysis correspond to the community numbers as follows. U = Ubon Ratchathani and H = Hat Yai. As the answers from U9 were illegible, U9 was excluded from this analysis.

Numbers 1-8: Ubon Ratchathani U1 - U8

Numbers 9, 10: Ubon Ratchathani U10, U11

Numbers 11-21: Hat Yai H1-H11

Reference