



Disaster Education System in Yunlin County, Taiwan

Qiru Gwee^{1,a}, Yukiko Takeuchi^{1,b}, Jet-Chau Wen² and Rajib Shaw^{1,c}

¹Kyoto University, Graduate School Global Environmental Studies, Yoshida Honmachi, Sakyo-ku, Kyoto 606-8501, Japan. E-mail: ^aqiru.gwee@kt2.ecs.kyoto-u.ac.jp, ^by.takeuchi@fw7.ecs.kyoto-u.ac.jp, ^cshaw@global.mbox.media.kyoto-u.ac.jp

²Research Center for Soil & Water Resources and Natural Disaster Prevention, National Yunlin University of Science & Technology, Taiwan, 123 University Road, Section 3, Douliou, Yunlin 64002, Taiwan, R.O.C. E-mail: wenjc@yuntech.edu.tw

Education has been widely acknowledged to have a critical role in disaster risk reduction (DRR) and this research aims to develop a holistic implementation of disaster education by applying the five priorities of actions mentioned in the Hyogo Framework for Action in the education sector. Yunlin county was selected as the field study area. Disaster education should not only focus on curricula but should also include structural, non-structural considerations, legislative basis and other supporting elements. A questionnaire survey targeting the public elementary and secondary schools was conducted, and actions and/or guidelines by the national government were studied so as to understand the overall disaster education in Taiwan. Data from 114 out of 184 schools was collected. Schools were classified into coastal, mountainous, rural plain land and urban to observe possible variations due to difference in location. However, observations were similar. Based on the findings, improvements are required in areas such as funding allocation, early warning, dissemination of DRR information, disaster recovery planning and preparation for emergency response are necessary.

Keywords: Disaster risk reduction education; Disaster prevention awareness; Yunlin County.

1. Introduction

Since the adoption and implementation of the Hyogo Framework for Action (HFA) 2005–2015, together with the United Nations Decade of Education for Sustainable Development 2005–2014, it has been widely agreed that education for disaster risk reduction (DRR) must become an integral part of any educational strategy aimed at promoting and achieving sustainable societies. Chapter 36 of Agenda 21 also states that 'Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential'.¹ The United Nations' World Disaster Reduction Campaign for 2006–2007 themed 'Disaster Risk Reduction Begins at School' was an initiative which aimed to trigger worldwide efforts on promoting the integration of DRR

education in school curricula as well as safe construction and retrofitting of school buildings to withstand natural hazards in countries vulnerable to natural hazards.²

It is widely acknowledged that school plays an important role in raising awareness among students, teachers and parents.³ The importance of DRR education at school is increasing because i) children are one of the most vulnerable groups in the society during a disaster, ii) they represent the future iii) school serves as a community's central location for meetings and group activities and iv) effects of education can be transferred to parents and community.^{1,4} Petal (2009) pointed out that DRR education should not be merely teaching 'natural hazards' or organizing 'campaigns for risk awareness' but should be guiding people towards the discovery of their own solution and their own power and suggested several school-based and community-based DRR education activities.⁵ In fact, community and social factors has been found to play a critical part in developing disaster preparedness in individuals.⁶⁻⁸

Therefore, in order to achieve disaster resilience, a holistic implementation approach is necessary. This involves not only disaster curricula and informal activities but also legislative basis (i.e. regulations and funding support), structural and non-structural considerations, community participation and other elements. This research seeks to integrate HFA into the education sector. Through such sectoral integration, the research aims to address the specific needs of the target sector (i.e. education sector) and derive appropriate indicative activities to aid in the implementation process. This paper provides an overview of the disaster profile, on-going DRR projects, DRR education materials and legislative measures in Taiwan, followed by the results from the questionnaire conducted at Yunlin county and discussion of the implications of the findings to HFA and DRR education in Yunlin county as well as in Taiwan.

2. Methodology

The methodologies used for this study are i) literature review of secondary materials from the Ministry of Education and other sources such as publications, policies, and national action agendas focusing on DRR education, ii) interview with key informants officials from the Ministry of Education, Education Department at Yunlin County Government as well as other related agencies and iii) questionnaire survey targeting all public elementary and secondary schools in Yunlin county.

Framework of the study and questionnaire was based on the HFA document, an instrument developed by UNISDR, which addresses 5 priorities for action namely: i) making DRR a priority, ii) improving risk information and early warning, iii) building understanding and awareness, iv) reducing risks and v) strengthening preparedness for effective response.⁹

A questionnaire survey was conducted in Yunlin county, southwest Taiwan, targeting all the public elementary and secondary schools, to understand the

disaster risk reduction initiatives and/or practices at the schools as well as guidelines set by the national government that gets implemented at the local level and at schools. Interviews with both national and local governmental officials in the education sector were conducted to understand the national DRR initiatives as well as local DRR practices. Schools were divided into four areas namely coastal, mountainous, rural plain land. Data were analyzed using statistical tools in Excel.

3. Study Area

Taiwan, located between Japan and the Philippines in the Western Pacific, has a total area of 36,000 km². Due to tectonic interaction and collision of the Eurasian and the Philippine Sea Plates, the seismicity in Taiwan is among the highest in the world with more than 200 earthquakes each year recorded in the past century.¹⁰ One of the most catastrophic earthquake events would be the 1999 Chi-Chi earthquake. Taiwan is also subjected to attacks of typhoons mostly from May to October at an average rate of 3.7 times a year with dominant routes from the northwestward direction. In the past decade, Taiwan suffered huge losses from severe typhoons such as Xangsane in 2000, Troaji and Nari in 2001 and Morakot in 2009. Taiwan topped in 'countries most exposed to multiple hazards (3 or more hazards)' with 73% of its total area exposed to multiple hazards and 'countries at relatively high mortality risk from multiple hazards' with 90% person of total area at risk.¹⁰

Yunlin County is located at the central-south part of western Taiwan, southern part of the Chou-Shui River alluvial fan, with the Taiwan Straits at its west (Figure 1). In addition, Chou-Shui and Pei-Kang river, the two major rivers that flow through the area, is on its north and south respectively.¹² It extends 50 km from east to west and 38 km from south to north, with a total area of approximately 1290 km² and total population of approximately 735,000.¹³

There are 20 townships with Douliu as the main city, 5 urban townships (Peigang, Dounan, Huwei, Tuku and Siluo) and 14 rural townships (BaoJhong, Cihong, Dabi, Dongshih, Erlun, Gukeng, Kouhu, Linnei, Lunbei, Mailiao, Shueilin, Sihhu, Taisi, Yuanchang).

Yunlin county has a sub-tropical climate with an annual average temperature of 22.6°C, with July being the hottest period and January being its coldest. During November to March, due to the seasonal wind from northeast direction, the wind is strong with high velocity and prevention measures needs to be taken to protect the agricultural plantations from being blown away. In summer, the county is affected by the southwest seasonal currents which results in the increase in the humidity.¹⁴ The primary source of revenue in Yunlin county comes from agriculture. On the plain lands, their main harvests are wheat, sugar cane, corn, peanuts, vegetables and sweet potato, and on its highlands, tea, bettle nuts and coffee plantations (Figure 2).

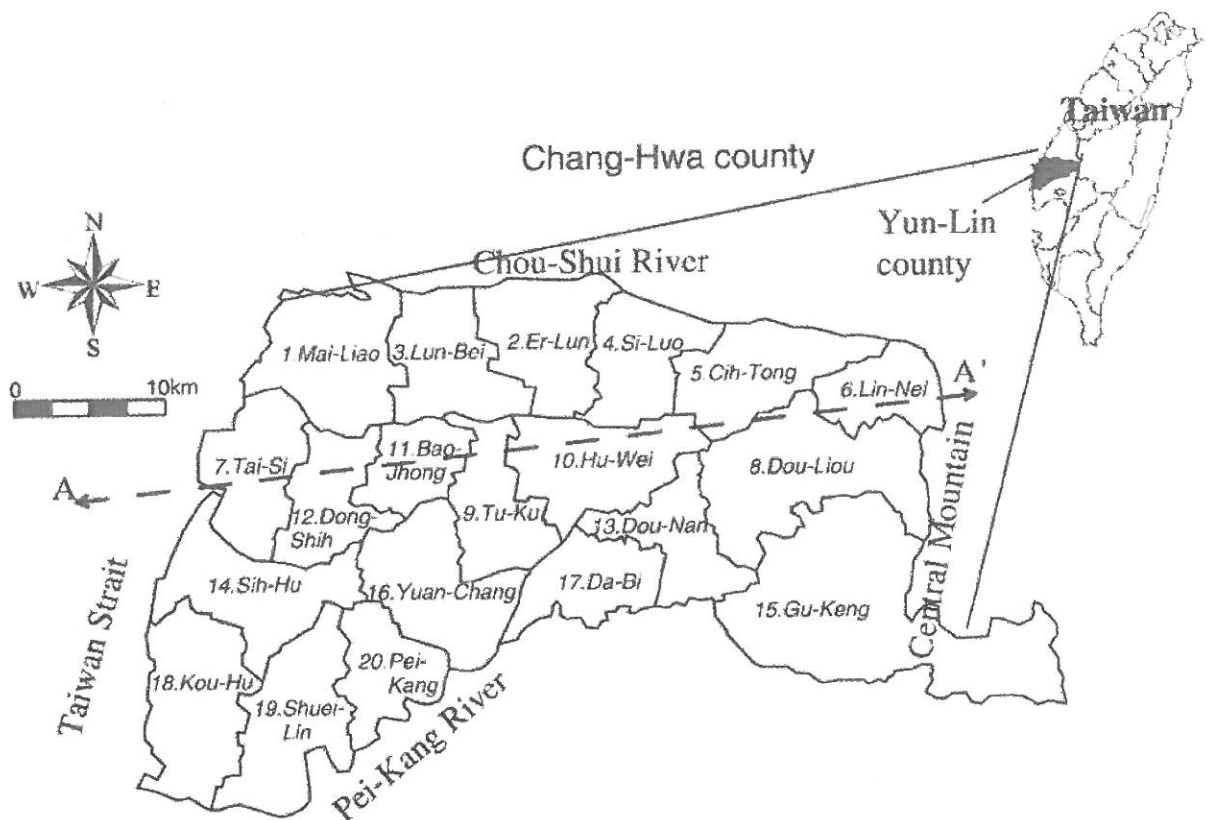
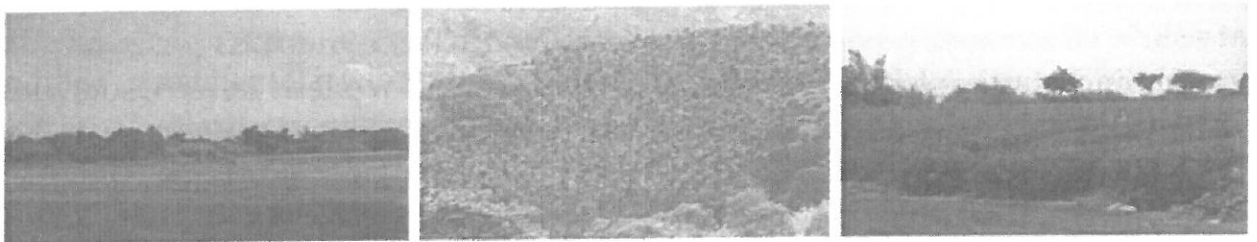
Figure 1 Map of Yunlin County.¹²

Figure 2 Vegetable plantations (left), bettle nuts plantations (middle) and tea plantations (right).

3.1. Disaster profile of Yunlin County

The main disasters occurring at Yunlin County are flooding and debris flow brought about by the typhoons. July to September is its typhoon season with August having the highest rainfall and the county's annual average rainfall is 1430.1 mm.¹⁴

Typhoon warning period is between May till September, alerting residents of possible flooding along the coastline and low-lying plains. Mailiao, Taisi, Sihhu, Kouhu, Tuku, Peigang, Shueilin townships, located at low-lying plains, are more vulnerable to flooding during heavy rainfall and typhoon season. In addition, flooding may also occur in certain urban townships due to lack of and/or inefficient drainage systems.¹⁵ The 2004 Mindulle typhoon resulted in severe flooding in Yunlin County with water level exceeding 400 mm, the highest rainfall record in the past 200 years. Mindulle typhoon occurred in July which coincided with the

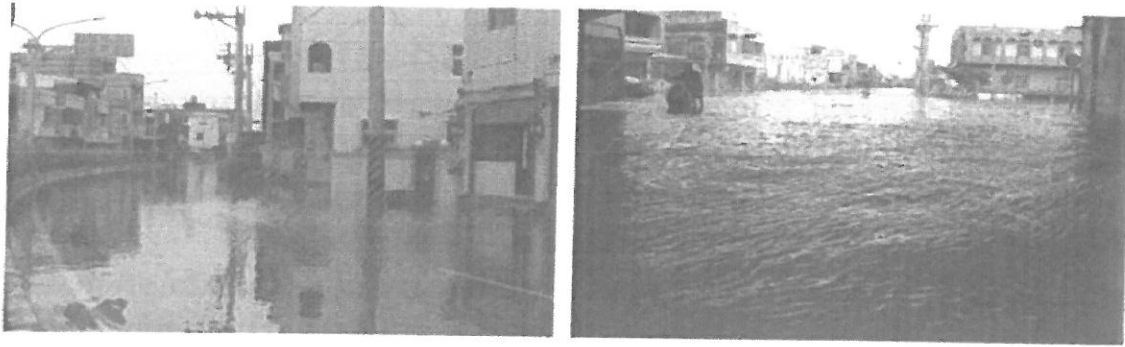


Figure 3 Flooding in Sihu township (left), flooding in Taisi township (right). Photos taken by M.F. Cai, 2008.

high-tide season at the rivers surrounding Yunlin County, and the sudden heavy rainfall added to the river load.¹⁵ Drainage systems at the low-lying townships, with severe land subsidence (ex Mailiao, Taisi, Sihu, Kouhu, Shueilin), were either not yet completed or not available when the typhoon arrived, thus the sudden downpour of rain could not be removed promptly, resulting in flooding in those townships.¹⁵ In 2008, Kalmaegi Typhoon caused severe flooding in 11 townships namely Sihu, Taisi, Mailiao, Kouhu, Huwei, Tuku, Dounan, Douliu, Gukeng, Cih-tong and Yuanchang (Figure 3). Land subsidence, poor drainage systems, blockage of river passage by construction materials were some of the underlying causes that exacerbated the flooding. Repair and improvement drainage system, training and risk assessments were conducted following the disaster to prepare for future floods.¹⁵

In recent years, severity of land subsidence problem is increasing.¹⁶ Being located next to the Straits of Taiwan, the county also has a long history of fish farming, as well as being a trading harbor. Since the free-trade port regulation was passed in 2003, the rapidly growing industrial sector affected the income of farmers and many farmers converted their croplands into fishponds to boost earnings. In order to supply these fishponds with sufficient water, large amount of groundwater has been extracted from the aquifer, resulting in severe land subsidence, seawater intrusion, flooding and deterioration of the surrounding environment.

3.2. Disaster education in Taiwan

With the increased severity of disasters and its resulting impacts to the natural environmental as well as social issues, Taiwan's governmental units and NGOs have become more aware of the importance of DRR education and therefore have increased investment in related activities to promote awareness of disaster prevention among the general public. They are described in the following.

3.2.1. Past and on-going DRR education projects

In 1997, the National Science and Technology Program for Hazards (NAPHM), aimed to reduce fatalities, loss of property and destruction of the environ-

ment caused by disasters, was proposed and implemented in two phases (Phase I: 1999–2001, Phase II: 2002–2006).¹⁷ As part of Phase II of NAPHM (2002–2006), Ministry of Education was enlisted to perform evaluation of the disaster reduction/relief system and strengthen strategies and key tasks included i) research and design of disaster mitigation education curricula for various types of schools, ii) implementation methods for these curricula, iii) support system of the education.¹⁷ To achieve its tasks, the Ministry of Education promoted implementation of 'Technological Disaster Prevention Education Training' (2003–2006) and 'Cultivation Plan of Disaster Education and Experiment' project (2007–2010). Figure 4 summarizes the significant milestones in developing disaster prevention education in Taiwan in the past decade.

In the 150th National Science Council meeting in 2000, designing disaster prevention education programs for schools at all levels and establishing supporting mechanisms. During the sixth National Conference on Science and Technology convened in January 2001, the discussion reached the consensus to suggest authorities 'take greater pains in compiling and publishing disaster reduction teaching materials and establish a system to promote related activities.'

The Government of Taiwan recognizes that education serves as a significant tool in solving problems at the fundamental level and disaster education is seen as a potential tool in enhancing disaster risk reduction. From acquiring theoretical knowledge and putting into practice in daily life, the skills are incorporated into each individual. Students get to learn theoretical knowledge and put them into actual practice in daily lives, in turn spreading the knowledge and practice among the family members and subsequently within the community. Thus school plays a significant role in promoting disaster education. In 2007, the Ministry of Education implemented the 'Cultivation Plan of Disaster Education and Experiment' project (2007–2010) which aims to i) establish process and support system, ii) develop and promote experimentation of program, iii) establish teachers' training system, iv) promote local implementation of program, v) promote learning and vi) estab-

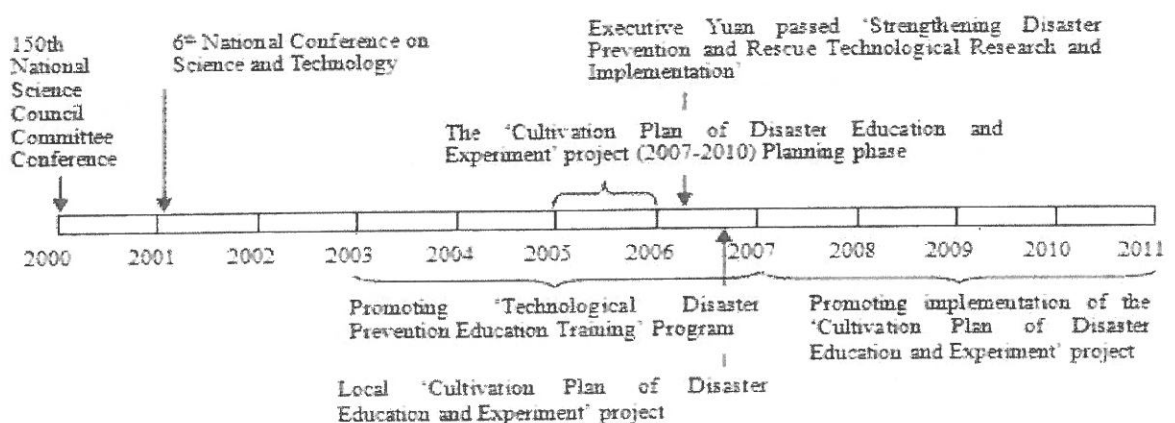


Figure 4 DRR education development and implementation in Taiwan (2000–2010). Source: Revised from Ref. 17.

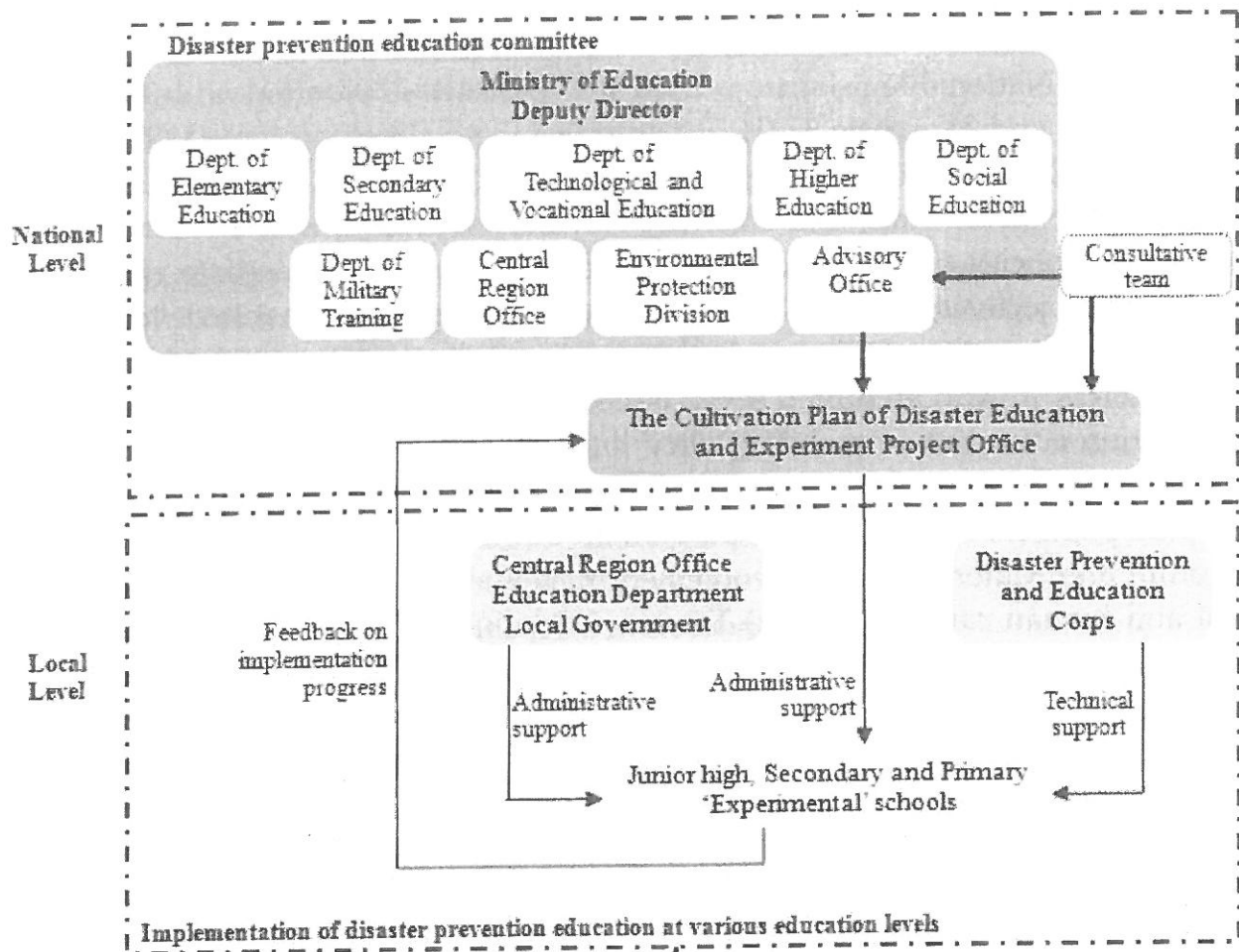


Figure 5 Mechanisms support the 'Cultivation Plan of Disaster Education and Experiment' Project.¹⁸

lish assessment system. Disaster prevention education promotion committee and 'Disaster Prevention and Education Corps' were established to provide schools with consultative services on technical aspects in disaster prevention education (Figure 5).

3.2.2. DRR education materials resources

A digital platform on DRR education, developed in collaboration between Ministry of Education and National Science and Technology Center for Disaster Reduction (NCDR), is another initiative for promoting disaster prevention education under the Cultivation Plan of Disaster Education and Experiment project. The digital platform provides educational learning resources on disasters such as earthquake, hydrological disasters (typhoon and flood), mass movement (ex. landslide and debris flow), man-made disasters as well as complex disasters. Each disaster consists of student workbook, teacher's guidebook, multimedia education resources such as interactive games.¹⁹ Furthermore, 'disaster recovery plan' templates for schools to refer to when developing their own disaster recovery plans as well as reports on progress status following implementation of the Cultivation Plan of Disaster Education and Experiment project are available as well.

3.2.3. Legislative measures on DRR education in Taiwan

In 2000, the National legislature passed the 'Disaster Prevention and Protection Act' (DPPA) and in Article 22, it clearly states the need to promote DRR education and training.²⁰ In 2004, the Ministry of Education of Taiwan proposed the White Paper on Education of Disaster Prevention, proposing the establishment of proper policies as well as planning the short term, intermediate range and long term objectives, which ultimately aims to achieve sustainable development of disaster prevention education in the country. In the document, the Ministry of Education of Taiwan identified seven issues that needs to be improved in disaster prevention education namely i) Policy integration—lack in systematic planning, ii) Administrative Authority—elementary and secondary schools are required to prepare plans for education and prevention but few take actual actions, iii) Curriculum and Materials—little involvement in the attitudes, skills and psychological and human care aspects, iv) Teachers' Qualifications—lack integral planning in teachers' qualifications, v) Social Education—media acts as a double-edged sword, though it allows fast circulation of information but may not guarantee accuracy which may lead to misconception, vi) Integration of Resources—effective use of the limited resources is necessary and vii) Psycho-rehabilitation.²¹ According to the White Paper, the disaster prevention education in Taiwan aims to i) raise awareness of disasters, ii) enhance attitude towards prevention, preparation and countermeasures, iii) conduct scheduled drills, iv) establish community based prevention units, v) encourage parental participation, vi) develop teachers training programs, vii) develop safety warning signs for public buildings and viii) promote research on disaster prevention and international collaboration, thereby embedding the 'Better Prevent than Rescue' concept among the people.

3.2.4. Hyogo framework for action in education sector

In the document 'Words into Action', published by the United Nations, 22 tasks were suggested to help address and guide the implementation of HFA's five priorities for action. In this research, the authors adopted the suggestions and proposed 16 tasks relevant in the education sector (Table 1).

Task 6 and Task 16 are combinations of two tasks from the original HFA document due to the similarity in purpose and output. One task in priority 2 was taken out as it involves technical and accurate data which may not be feasible for the education sector. Furthermore, other aspects of the task such as risk assessment and information dissemination are covered by other tasks in the same priority. Three tasks in priority 4 focusing on establishing mechanisms for increasing resilience of the poor and most vulnerable, production and service sectors and financial and economic instruments, were removed from the list as they were not directly related to education sector.

Table 1 Proposed 16 tasks for DRR in the education sector.

Priority 1: Developing institutional base for DRR in education

1. Engage in multi-stakeholder dialogue to establish the foundation for DRR education.
2. Create or strengthen mechanism for systematic coordination for DRR education.
3. Assess and develop the institutional basis for DRR education.
4. Prioritize DRR and allocate appropriate resources for DRR education.

Priority 2: Identifying, assessing and monitoring disaster risks in the education sector

5. Establish risk assessments for the education sector
6. Strengthen early warning in the education sector through effective communication and dissemination mechanism.

Priority 3: Building a culture of safety through DRR education

7. Develop public programme to raise awareness of DRR
8. Include DRR in the education system
9. Develop DRR training and learning at community level
10. Enhance dissemination of DRR information

Priority 4: Reducing the underlying risk factors in the education sector

11. Environment: Understand sustainable ecosystem, environmental and natural resources management
12. Establish measures to incorporate disaster risk reduction in urban and land-use planning
13. Structures: Strengthen mechanisms for improved building safety and protection of critical facilities in the education sector
14. Disaster recovery: Develop a recovery planning process that incorporates disaster risk reduction

Priority 5: Preparing for effective emergency response and recovery in education

15. Build on disaster preparedness capacities and mechanisms in the education sector
16. Assess disaster response preparedness capacities and mechanisms through strengthened planning

Source: Revised from Refs. 22 and 23.

Questions were asked relating to each task and each question seeks to find out whether an activity, related to the task, has been performed or not. The number of questions may differ among the tasks depending on the necessity (i.e. HFA 1 has four tasks with one question for each task. HFA 2 has two tasks; task 5 has one question while task 6 has four questions).

3.3. Source of data

A questionnaire survey was conducted at Yunlin county during between 01 August to 30 August 2010. Questionnaires were sent to all elementary and secondary public schools in Yunlin and the completed forms were returned through fax, mail or digital mail. 123 out of 184 schools replied (67% of total sample), of which 114 questionnaires were fully completed (93% of collected sample) and used for data analysis. The questionnaire was designed to understand the disaster risk reduction initiatives taken in the education sector and consisted of questions based on the HFA's five priorities for actions.

4. Results and Discussion

Data were analyzed using Excel. Schools were classified into four regions; coastal, mountainous, rural, plain land and urban to observe if DRR education differs between the locations. Responses to the questions for its respective tasks were collated accordingly to their locations.

From the data collected, 56 schools (51%) answered that they do not have specific funds for DRR activities and responded that it was mainly due to 'lack of funding' (Figure 6). Currently, in Taiwan, annual budget for education are for general purposes with no specific amount set aside for DRR. Therefore, usage is dependent by the recipient (i.e. education department, schools). With limited funding, schools would have a tendency to allocate the funds on other aspects rather than DRR related issues.

There were four questions asked regarding task 6 of HFA 2. From the other three questions, it was found that most of the schools (99%) practices early warning and majority of them (99%) are equipped with public address system to warn students in times of emergency. Furthermore, 92% of the schools coordinate with county education and/or fire departments on DRR information dissemination. These activities were mainly done at a school level and 'disaster calendar' (HFA 2 task 6, question 4) was an activity suggested by the authors that could be used as a form of early warning practiced by the students, which could also cultivate a sense of disaster awareness within the individuals. On the calendar, teachers and/or students may mark the disaster season such as typhoon season) and list the pre-disaster preparations (ex. ensure windows are strongly fixed) and post-disaster activities (ex. clearing of debris) to remind the students of the precautions and prepare them for the disaster. Non-seasonal disasters such as earthquakes will not be applicable. Of the 95 schools that answered 'No', majority gave the reason that there was 'no such practice' at their schools (Figure 7).

HFA 3 task 10 describes the necessity to include DRR information into the school syllabus. In addition to incorporating DRR into the school curricula, regular school publications (ex. newsletter) could serve as an information source for students. Majority of the schools (98%) have included some form of DRR

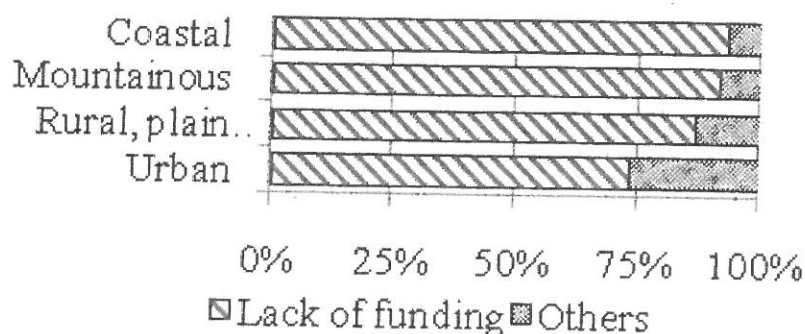


Figure 6 Reasons of not having DRR funds.

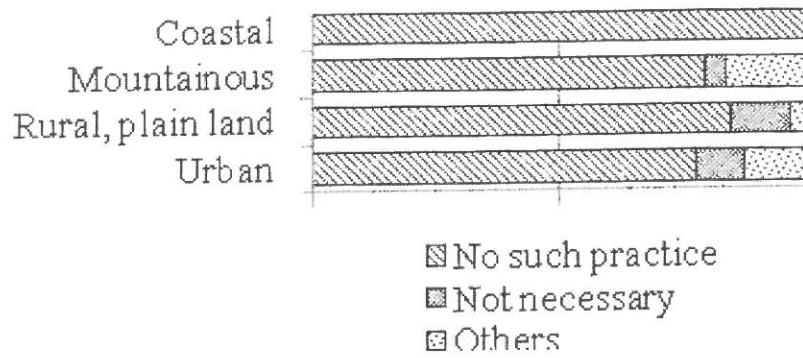


Figure 7 Reasons for not having disaster calendar.

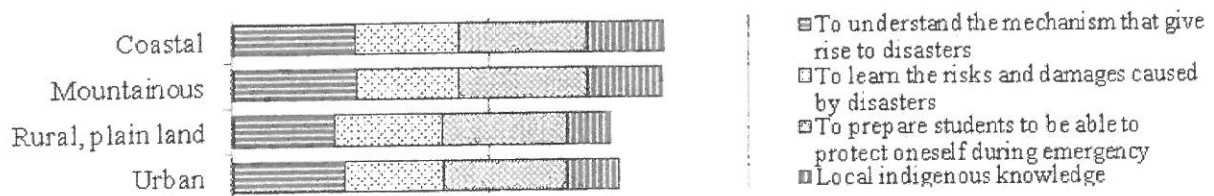


Figure 8 Type of DRR information emphasized in school.

information into the school curricula. From the responses, type of DRR information emphasized by the schools were 'Disaster preparedness to protect oneself', followed by 'Mechanisms that give rise to disasters' and subsequently 'Risk and damages caused by disasters' (Figure 8). Responses also showed schools are active in promoting DRR through activities. However, most of these activities are held in collaboration with government departments such as Yunlin county education department, Yunlin county fire department or by the township office. In other words, the schools take on a passive role in that they participate in activities but rarely take the initiative in organizing them. Nonetheless, as active participants, it could still help promote DRR awareness. Regarding DRR information in school publications, 82 out of the 114 schools (72%) did not have such a practice.

Following a disaster, recovery and ensuring class continuity is essential and this aspect is addressed by HFA 4 task 14. 67 out of 114 schools (59%) did not have post-disaster recovery plans and only 20 out of 114 schools (18%) took measures to ensure class continuity which includes i) using temples and community centers as temporary classes, ii) continue classes via internet (i.e. online lessons), iii) remedial classes provided in teachers room and iv) teachers would help in contacting students/parents to ensure their safety and report accordingly. As part of the Cultivation Plan of Disaster Education and Experiment' project, the Ministry of Education has provided a rather comprehensive template that can be downloaded from the digital platform to provide a reference for teachers to create the disaster prevention plan specific for their schools. Currently, it is voluntary for schools to develop disaster recovery plans. From next year onwards, it would become a necessary requirement and schools would have to create suitable plans.

As part of preparing for effective emergency response (HFA 5), the authors looked at evacuation-related issues such as evacuation shelter (task 15) emergency supplies and evacuation route (task 16). 64 out of 114 schools (56%) responded that their schools are used as evacuation shelters. 37 out of 114 schools (32%) have the practice of keeping stock of necessary supplies which were mainly medical supplies, water, blankets and sleeping bags. Due to lack of storage space and expiration issues, it is not a common practice to keep stocks in schools. In addition, following disaster, national government and social sponsors will help provide the necessary supplies. Furthermore, in some cases, county and/or township office may have agreements with companies whereby these companies would help provide necessity goods in times of emergency. Majority of the schools (99%) answered having hazard maps available in their schools which shows information such as the school building layout, route to evacuation area, dangerous locations with schools and high risk areas surrounding the schools. These maps are mostly located in public spaces (ex. concourse), followed by teachers' room and subsequently in classrooms.

Figure 9 shows the overall findings from the questionnaire. Upper and lower column implies that suggested indicative activity was and was not performed respectively. Number of columns varies depending on the questions that were asked on the indicative activity. Each column represents a question asked on the

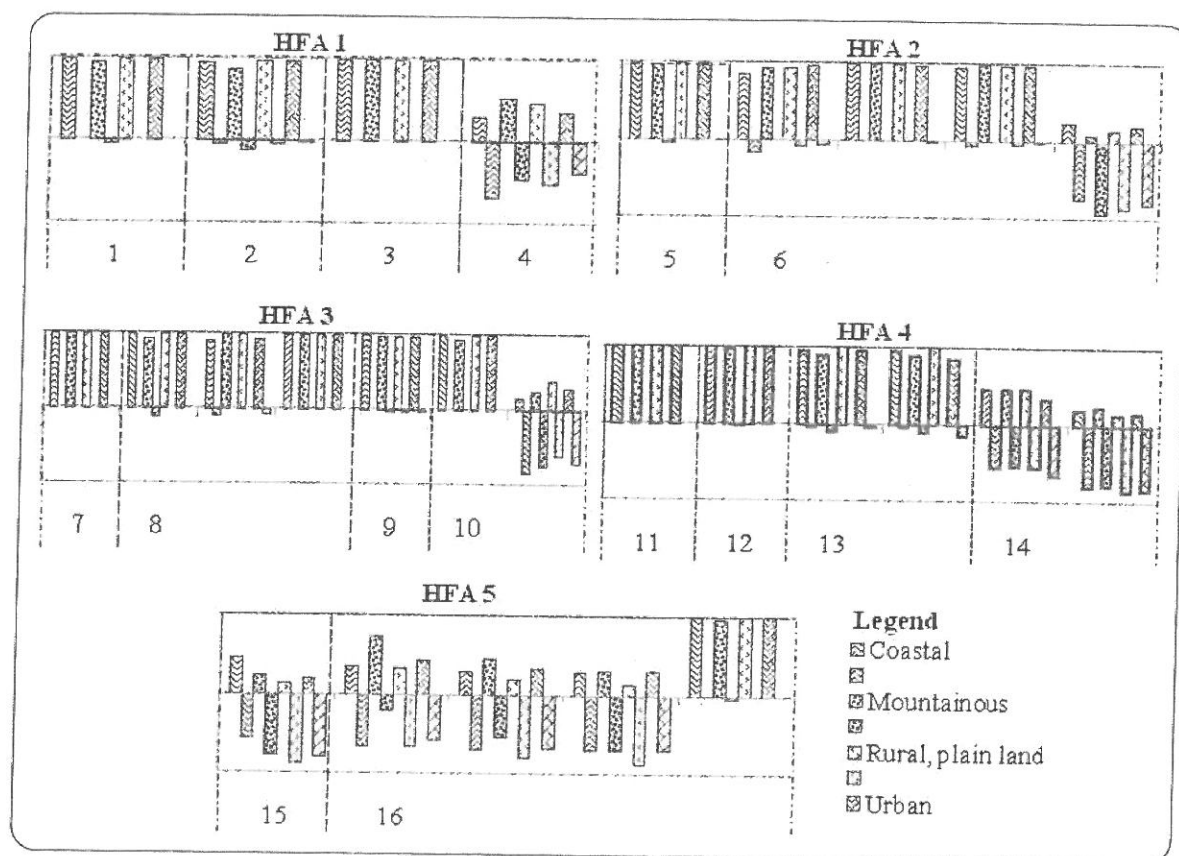


Figure 9 Key Findings from questionnaire survey.

activity for the task. Similar observations were seen in the four areas with HFA 5 being weak in general and the following areas were found to be weak i) funds allocation for DRR activities (HFA 1 task 4), ii) use of disaster calendar as a form of early warning practice (HFA 2 task 6, question 4), iii) dissemination of DRR information (HFA 3 task 10, question 2), iv) disaster recovery (HFA 4 task 14) and v) preparedness for emergency response (HFA 5 task 15 and 16) (Figure 9).

5. Conclusion

In order to achieve disaster resilience, DRR education should not be limited to just the educational curriculum but should consider other supporting elements. For example, safe school buildings for students to attend classes and adequate funding for development of curriculum and non-formal activities. The authors suggested several indicative activities that aimed to achieve the respective tasks of each HFA priorities for action as one of the approaches in of achieving DRR in the education sector.

The Chi-chi earthquake alerted the Government of Taiwan the importance of DRR education and has been putting strong efforts in promoting DRR as well as developing DRR education as discussed in section 3. With the DDPA and White Paper, it sets the legislative basis and guidelines for DRR education. If well-enforced and properly implemented, it could help improve the disaster resilience in the education sector.

However, actual implementation occurs at the local level and schools. Thus, active implementation at the local level and emphasis on DRR education at schools are critical. From the findings schools tend to take on a passive approach in promoting DRR, mostly by request of local government or participating in activities organized by local government. Schools should take on a more active role in promoting DRR awareness. Inadequate funding was found to be a major issue and the reason to lacking preparedness, disaster recovery and response planning. Restructuring funding allocation is necessary. In addition, disaster education was expected to differ depending on local context, however, all four areas in the study area showed similar practices in their DRR education. Further studies would be required to find out the differences and necessary elements in DRR education in different locations.

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