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DEVELOPMENT OF DISASTER REDUCTION PLANNING FRAMEWORK FOR ASIA-PACIFIC REGION: CASE STUDY IN MARIKINA CITY, METORO MANILA, PHILIPPINES

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SUMMARY

This paper propose framework of disaster reduction planning in Asia-Pacific Regions, which was developed from a case study in Marikina City, Metro Manila, Philippines. The city is located in a valley that was created by two active faults and has the potential of an M 7.0 earthquake. In collaboration with city administrators, who served as local stakeholders, a three-layered hierarchical earthquake disaster reduction plan for Marikina City, Marikina City Comprehensive Earthquake Disaster Reduction (CEDR) Program and Action Plan was formulated over a 12-month period. In this paper, 1) planning process of a comprehensive earthquake disaster reduction plan focusing on stakeholder involvement, 2) techniques and tools for stakeholder involvement in a earthquake disaster reduction planning, and 3) contents and characteristics of the CEDR Program and Action Plan are introduced.

INTRODUCTION

A lot of engineers and natural scientists struggle to elaborate the method for estimating earthquake damage. Numerous engineers also work to develop effective countermeasures to reduce physical damage

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while natural scientists work to disseminate the information about mechanisms that cause earthquakes and the risks of an earthquake. Countermeasures to reduce damage and losses from an earthquake consist of preparedness, mitigation, response, and recovery. Proper coordination of these countermeasures is important for establishing effective disaster reduction. Therefore, in addition to the work by engineers, cooperation with social scientists and planners is essential to establish an effective disaster reduction scheme. Planning is an essential tool for coordinating these countermeasures and establishing a disaster reduction plan is critical for implementing disaster reduction activities.

Engineers and natural scientist have difficulties conducting risk assessments in the Asia-Pacific Region since numerous developing countries lack detailed inventory data. Obviously, a proper earthquake risk assessment is necessary to develop an earthquake disaster plan. Then the question becomes if it is necessary to conduct a complicated analysis that engineers prefer to develop a comprehensive earthquake disaster reduction plan. The primary goal of disaster research is to minimize or eliminate losses of human lives, properties, and human activities. Risk assessment is just one component in disaster reduction planning. Thus, a coherent framework for disaster reduction planning, which is simple, but adequately assesses quality seismic risk, can be the basis for a disaster reduction planning.

This paper propose framework of disaster reduction planning in Asia-Pacific Regions, which was developed from a case study in Marikina City, Metro Manila, Philippines. The city is located in a valley that was created by two active faults and has the potential of an M 7.0 earthquake. In collaboration with city administrators, who served as local stakeholders, a three-layered hierarchical earthquake disaster reduction plan for Marikina City, Marikina City Comprehensive Earthquake Disaster Reduction (CEDR) Program and Action Plan was formulated over a 12-month period.

PLANNING PROCESS DEVELOPMENT FOR MARIKINA CITY EARTHQUAKE DISASTER REDUCTION (CEDR) PROGRAM AND ACTION PLAN

Basic Consideration on Disaster Reduction Planning

"Sustainability" has become a key concept in environmental management and development. Disaster reduction is closely related to those fields and "Sustainable Hazard Mitigation" has become a key phrase, which reflects the "Sustainability" issue, in disaster reduction. Dennis S. Mileti (Mileti 1999) elaborated six components to be considered for accomplishing sustainable hazard mitigation and were summarized as follows.

1) Maintain and, if possible, enhance environment quality,
2) Maintain and, if possible, enhance people's quality of life,
3) Foster local resiliency to and responsibility for disasters,
4) Recognize sustainable, vital local economies are essential,
5) Identify and ensure inter- and intergenerational equity,

And 6) Adopt a consensus-building approach, starting at the local level.
(Mileti [1])

In addition to these new components, proper coordination of the four disaster reduction components, preparedness, mitigation, response, and recovery, also need to be considered in developing the planning process.

Based on those considerations, following three basic principles for disaster reduction planning framework were develop: 1) Coordination with future development plan, 2) Comprehensive disaster reduction plan that includes the four phases of disaster reduction, and 3) Stakeholder participation.

Strategic Planning and Disaster Reduction Planning

Three basic principles, 1) coordination with Marikina future development plan, 2) comprehensive disaster reduction plan that included the four phases of disaster reduction, and 3) stakeholder participation, were used in developing the planning process. To accomplish these principles, a planning process was developed according to a strategic planning framework, which is dominant in the field of planning. **Fig.1** shows a proposed planning process for strategic planning. "SWOT" analysis, which evaluates the internal resources (Strengthen and Weakness) and studies the external factors (Opportunity and Threat), is point of strategic planning.

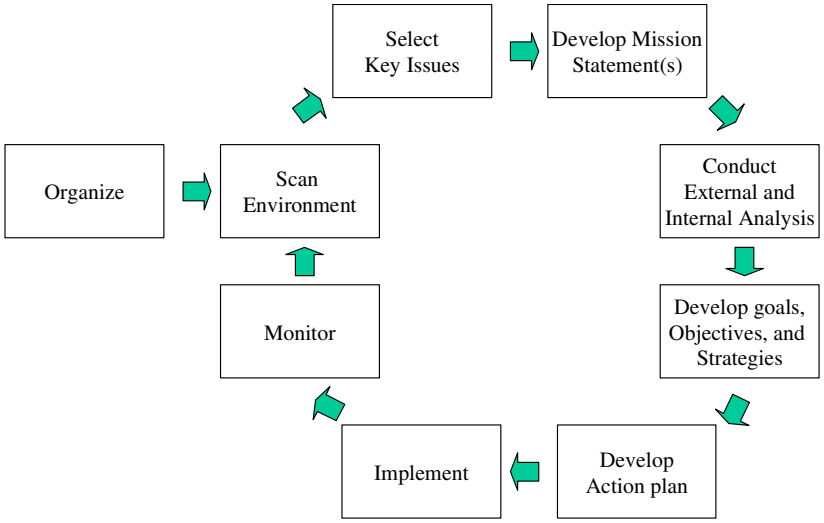


Fig.1 Strategic development and implementation (Source: Hoch, J. Charles ed. [2])

Fig.2 shows the planning process of a disaster mitigation planning proposed by the Federal Emergency Management Agency (FEMA). The US Federal government established Disaster Mitigation Act in 2000, and according to this act, all local governments must establish Disaster Mitigation Plan in order to receive federal support after a disaster. This planning process was developed to support a disaster mitigation planning at a local government. The FEMA planning process that contains the process of internal and external analysis can be said that it follows a strategic planning framework. A Disaster reduction planning that begins with risk assessment (studying threat) is inherently characteristic of a strategic planning.

Fig.2 Disaster Mitigation Planning by FEMA (Based on FEMA [3])

Planning Process Development for Marikina City Earthquake Disaster Reduction (CEDR) Program and Action plan

The working plan, which identified four tasks, 1) Stakeholder User Needs Assessment, 2) Data Inventory and Risk Assessment, 3) Prepare Conceptual Earthquake Disaster Plan, and 4) Plan Refinement and Implementation, was set in advance. A planning process that started with Problem Identification and ended in Resource assessment and Prioritization was developed according to the strategic planning framework. **Fig.3** shows the planning process for Marikina City Earthquake Disaster Reduction (CEDR) Program and Action plan development.

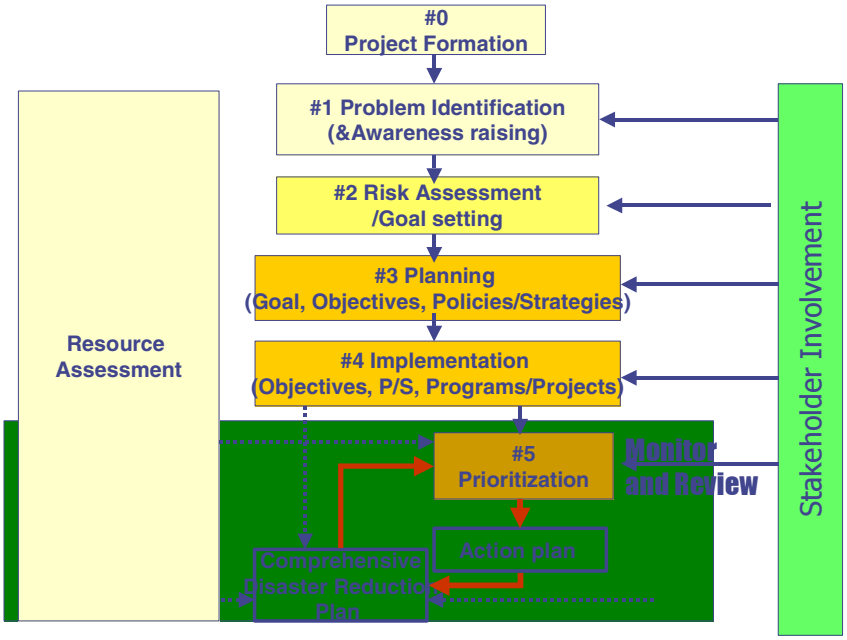


Fig.3 Planning process of Marikina City Earthquake Disaster Reduction (CEDR) Program and Action plan development.

The disaster reduction planning project team identified Marikina City administrators as a key group of stakeholders. The project team also determined the Marikina City administrators were the most influential group of stakeholders for disaster reduction policy in Marikina City. The prime objective of the project team was to build the capacity of the Marikina City administrators to develop their own earthquake disaster reduction plan. The project team members, researchers and experts in the field of disaster reduction focused on empowering the Marikina City stakeholders throughout the project.

Workshops were used for the planning process with plenary sessions for general information sharing and discussion and small group sessions, employing various facilitation techniques, used to generate and refine ideas. A goal was set for each workshop, and tasks were designed to achieve outputs related to the goal. Two kinds of plan were created as an output of this project. One is the CEDR program that contains all the ideas generated through a series of workshops, and the other is Marikina City Earthquake Disaster Reduction Action Plan that is a plan prioritized according to present resources availability. So the Action Plan can be easily revised when the situation of available resources is changed based on the CEDR program. It means that it is not necessary to repeat the entire planning process to establish a new Action Plan. **Fig. 4** shows the detailed process of the planning.

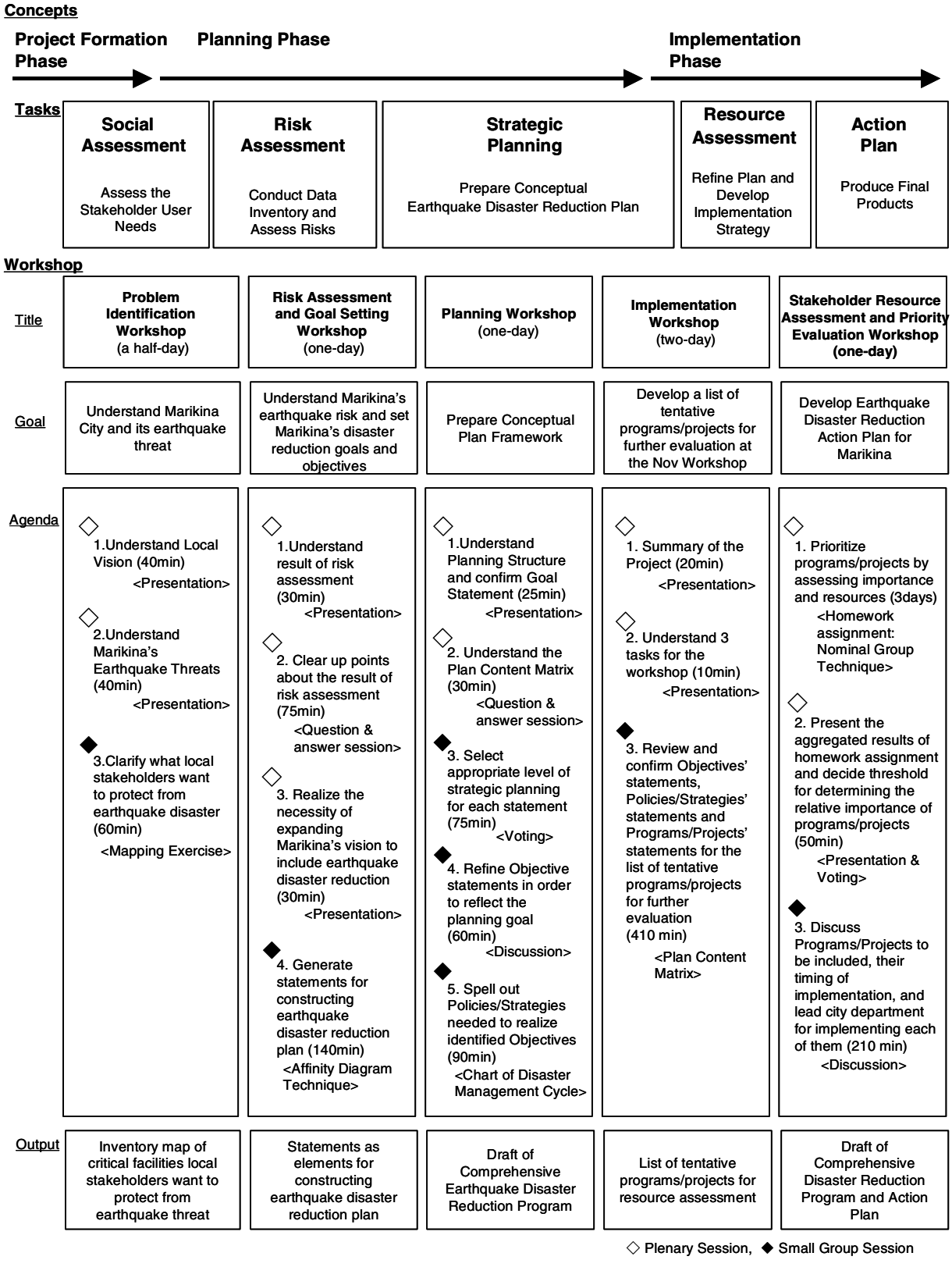


Fig.4 Detailed Process of Planning (Source: Tamura, K. et.al. [4])

TECHNIQUES AND TOOLS FOR EARTQUAKE DISASTER REDCUTION PLANNING FOCUSING ON STAKEHOLDER INVOLVEMENT

Workshop-based approach

The workshop-based approach was chosen for stakeholder involvement scheme according to the following two reasons. First, the series of workshops can be managed through an agenda carefully planned to accomplish the project goals. The agenda is designed with three important points in mind: (1) how to give participants information as inputs which are transformed or consumed to produce outputs, (2) what kind of techniques should be used to best support the execution of the activity, and (3) how to manage the conditions required for the activity to produce appropriate outputs. The design of workshop agenda is unique to the project. Second, workshops can facilitate collaborative decision-making stakeholders come together to assess issues and develop projects. Workshops where trained facilitators guide stakeholders through a series of activities to promote shared learning and problem solving have proven a particularly powerful technique for generating a sense of ownership among the stakeholders.

Workshops

Problem Identification Workshop (January 27, 2003)

The goal of Problem Identification Workshop was to share information about risks, the present situation, and future visions of Marikina City. Three tasks, increasing public awareness on disasters, gathering information on Marikina City, and mapping assets, were set to accomplish the workshop goal. The first two tasks were conducted by lecture and third task was accomplished by a small group exercise.

In the small group sessions, a map exercise technique was used for organizing ideas. Stakeholders were asked to mark assets, which they wanted to protect from earthquake disasters on the map with sticky dots. The mapping exercise has two advantages. The map is a good tool for exchanging ideas about the community, and the map resulting from the exercise will provide an inventory of assets to be protected in Marikina City. Member of each small group is decided not concerning about their expertise.

Risk Assessment and Goal Setting Workshop (May 7, 2003)

The goal of the Risk Assessment and Goal Setting Workshop was to understand Marikina's earthquake risk and to outline Marikina's disaster reduction goals and objectives. Damage estimation results on critical facilities, which were listed in the asset map, were disseminated and the consensus to establish an earthquake disaster reduction plan of Marikina City was reached in the plenary session. Following to the plenary session, a question and answer session was conducted. And in a small group format, ideas were generated on how to prevent or minimize the damage or social disruption in event of an earthquake. Member of each group is consisted not concerning about their expertise.

For stakeholder involvement, two techniques were used. One is for the question and answers session and the other is for a small group exercise. In the question and answer session, all the participants from Marikina City were asked to make at least one question card to make a sense of involvement. Japanese experts categorized those question cards into six groups and answered to questions category by category. In the small group exercise, the affinity diagram technique was used for categorizing responses into goals and objectives. This method is good for organizing ideas about complex issues into logical categories. The outputs were 162 ideas about reducing earthquake disaster losses in Marikina. These ideas were expressed in the form of charts, which were the result of each group's effort to organize and categorize their ideas into a logical order.

Planning Workshop (July 29, 2003)
The goal of the Planning Workshop was to prepare a conceptual plan framework. Before the Planning Workshop, an exhibition to learn and disseminate the information about the earthquake risk in Marikina City and countermeasures to reduce their losses was held at City Hall (Horie, K. et.al. [5]). At the workshop, the goal statement was confirmed and then a four-layered planning structure, which was adopted from Marikina Comprehensive Land Use Plan, was introduced.

In the small group exercise, the generated ideas were then classified into categories, 1) Objectives, 2) Polices/Strategies, and 3) Programs/Projects. A majority vote was the technique used to classify ideas into three layers; however, in this case voting was not the final opportunity to decide. After assigning the ideas to the three levels by majority vote, the participants worked to revise the statements in order to make them more suitable for each level. The majority vote was used to create an opportunity for participants to share their ideas about the three levels of the strategic planning framework.

Implementation Workshop (October 8, 9, 2003)
The goals of the Implementation Workshop were to develop a list of tentative programs/projects for further evaluation and to review and confirm the generated statement from 1) Objectives, 2) Polices/Strategies, and 3) Programs/Projects level. Prior to this workshop, the Japanese expert team edited and polished the generated ideas. At the end of this workshop, the CEDR program, which consisted of one goal statement, ten objective statements, 54 policy/strategy statements, and 216 program/project statements, was completed. From this workshop, each group is composed according to the expertise in the city government, for example the group discussing about physical countermeasures were composed from the officials of engineering department of Marikina City Government.

In the small group exercise, ideas on the Polices/Strategies and Program/Project categories were fulfilled using a Planning Matrix as a catalyst of idea generation. The Planning Matrix was developed as a tool to support idea generation concerning about the four phases of disaster reduction. The matrix is composed from the four phases of disaster reduction and ten areas of expertise on disaster reduction. **Fig.5** shows the Planning Matrix.

	OBJECTIVES	Mitigation	Preparedness	Response	Recovery
1	Land Use Planning				
2	Critical Facilities				
3	New Buildings				
4	Existing Buildings				
5	Education				
6	Research & Technology				
7	Public Information				
8	Institutional Initiatives				
9	Economic Development				
10	Sources of Finance				

Fig.5 Planning Matrix

Stakeholder Resource Assessment and Priority Evaluation Workshop (November 26, 2003)
The goal of the Stakeholder Resource Assessment and Priority Evaluation Workshop was to develop the Marikina Earthquake Disaster Reduction Action Plan. The questionnaire surveys about program importance and available resources both internal and external were conducted prior to the workshop. Rating sheets were distributed to the local stakeholders to do the following: 1) prioritize programs/projects of the CEDR program by their importance, 2) give your opinion on how available City resources might be to implement each program/project, 3) give your opinion on how available external resources might be, 4) estimate how soon each program/project should be implemented, and 5) identify which department should take the lead for each program/project.

Overall results of the resource assessment were presented in the plenary session along with the suggestion that a tentative decision be made about how many programs/projects should be included in the action plan to reduce the number of programs/projects for review. Participants decided to take the top-ranked 60 programs/projects out of the total of 216. This threshold became the guideline for discussion in the small group sessions.

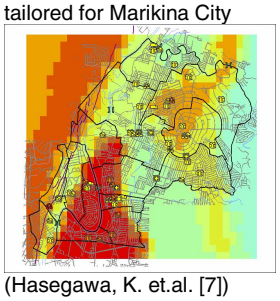
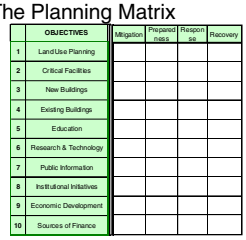
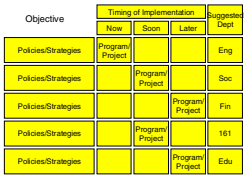
In the small group sessions, final prioritization on the programs/project was conducted. They had the right to restore programs/projects excluded in the plenary session back into the Action Plan. A tool for prioritization is shown in **Fig.6**. All the 216 generated programs/projects printed in a card were arranged into this format. Using this tool, the participants finalized their action plan on 1) whether a program should be included in the Action Plan, 2) time of implementation, and 3) leading department. As a result, the participants decided to include 113 programs/projects in the final Action Plan. The output of the workshop was the Action Plan, together with revisions to the CEDR program.

Objective	Timing of Implementation			Suggested Dept
	Now	Soon	Later	
Policies/Strategies	Program/ Project			Eng
Policies/Strategies		Program/ Project		Soc
Policies/Strategies			Program/ Project	Fin
Policies/Strategies		Program/ Project		161
Policies/Strategies			Program/ Project	Edu

Fig.6 Prioritization tool

Local inputs, experts inputs, deliverables
As a results of the series of workshops, the steps for an earthquake disaster reduction planning has been identified which may be applicable in many future planning effort. Table 2 summarizes 1) the key local inputs, expert inputs, and deliverables for each step, 2) techniques and tools for a disaster reduction planning.

Table 1 Steps for a earthquake disaster reduction planning (Source: Hayashi, H. et.al. [6])

Steps	Local Inputs	Expert Inputs	Deliverables
Learning about earthquakes and damage they can cause	Lack of understanding of earthquake damage	Visual Images of major earthquakes such as Baguio, Kobe, Turkey and Taiwan 	Clear understanding about earthquake damage among core stakeholders
Assessing earthquake risk locally and interactively	Assets stakeholders want to protect from earthquakes 	Risk Assessment method (GESI method by UN) that can provide the estimate of damage state for individual structure	Risk Assessment results tailored for Marikina City  (Hasegawa, K. et.al. [7])
Project Goal Setting	Marikina Comprehensive Land Use Plan: CLUP (2000) Marikina Vision (2002) 	Linkage between earthquake disaster reduction and sustainable economic development Earthquake Risk Management Risks Exist Risks Can be Assessed Risks Can be Reduced Risks Can be a Chance	Decision to develop Marikina comprehensive earthquake disaster reduction program Goal To protect human safety, property, and activities
Policy & Strategy Program & Project Identification	Planning structure used in CLUP 	The Planning Matrix 	Comprehensive Earthquake Disaster Reduction Program consists of 1 goal, 10 objectives,
Resource Assessment	Individual Evaluation of 216 policies	Nominal Group technique	Evaluation results of 216 programs/projects in terms of internal and external resource availability
Action Plan Formation	Feasibility check of prioritized policies	Prioritization method 	Action plan consists of 113 programs/projects for the achievements of 10 objectives

CONTENTS OF MARIKINA CITY COMPREHENSIVE EARTHQUAKE DISASTER REDUCTION (CEDR) PROGRAM AND ACTION PLAN

Marikina City Earthquake Disaster Reduction Program Policy Framework

Through five workshops with administrators of Marikina City Government, Marikina City Comprehensive Earthquake Disaster Reduction (CEDR) Program and Action Plan was successfully established. It has both 1) the CEDR Program and 2) Action Plan. CEDR program is one of the most comprehensive Earthquake disaster reduction plans ever compiled (Kondo T. et.al. [8]). CEDR program is consisted from one goal statement, ten objective statements, 54 policy/strategy statements, and 216 program/project statements. The comprehensiveness of CEDR program can be supported that it is consisted from three kinds of countermeasures such as 1) Physical countermeasures, 2) Informational countermeasures, and 3) Strategic Countermeasures.

Physical Countermeasures, comprised of Critical Facilities, New Buildings, and Existing Buildings, is a policy of the City of Marikina to protect the lives, property, and activities of the people by ensuring that infrastructure facilities and buildings throughout the city are disaster-resistant through use of safe construction and strengthening methods. Informational Countermeasures, comprised of Education, Research and Technology, and Public Information, represents a policy to raise the level of preparedness of all stakeholders through education, timely information, evaluation of hazards, and implementation of mitigation technologies. Strategic Countermeasures, comprised of Land Use Planning, Institutional Initiatives, Economic Development, Sources of Finance, represent a policy to combine economic development and disaster management programs through the use of a well-defined comprehensive land use plan and through organizational initiatives to build the capacity of the City to generate financial resources enabling the City to fully implement earthquake disaster reduction programs. The Marikina City Earthquake Disaster Reduction Program Policy Framework (Earthquake Disaster Mitigation Research Center [9]) is a summary of the CEDR program.

Marikina City Earthquake Disaster Reduction Program
Policy Framework

November 26, 2003

GOAL:
The City of Marikina is committed to accomplishing the following goal: to protect human safety, property, and activities.

GENERAL POLICY SUMMARY:
To accomplish this goal we will implement the following policies through informed and effective disaster mitigation, preparedness, response, and recovery programs and projects.

Policy on Physical Countermeasures
It is the policy of the City of Marikina to protect the lives, property, and activities of the people by ensuring that infrastructure facilities and buildings throughout the city are disaster-resistant through the use of safe construction and strengthening methods.

Policy on Informational Countermeasures
It is the policy of the City of Marikina to raise the level of preparedness of the all the stakeholders through education, timely information, evaluation of hazards, and implementation of mitigation technologies.

Policy on Strategic Countermeasures
It is the policy of the City of Marikina to combine economic development and disaster management programs through the use of a well-defined comprehensive land use plan and through organizational initiatives to build the capacity of the City to generate financial resources enabling the City to fully implement earthquake disaster reduction programs.

Our program is comprehensive and action-oriented. Our approach is to work with the people of the community and the surrounding region. Our commitment is complete and long-lasting.

Marikina City Earthquake Disaster Reduction Action Plan
Marikina Earthquake Disaster Reduction Action Plan is established going through the stakeholder resource assessment and discussion at Stakeholder Resource Assessment and Priority Evaluation Workshop based on the CEDR program. The Action Plan is consisted from 113 programs/projects with the timing of implementation and leading department. The timing of implementation is comprised from three layers, now (within 1-2 years), soon (with in 5 years), and later (with in 10 years) and stakeholders decided those timing according to the resource assessment results such as importance, available internal resources and external resources.

Table 2 shows 113 Programs/Projects selected as the Action Plan out of 216 Programs/Projects, which we developed as the CEDR program. When looking at the popularity of each objective, you find the percentage of the originally proposed Programs/Projects selected was as follows: Research and Technology, 75%: Education, 71%; and Public Information, 67%. These were all informational countermeasures. The percentage of adopted Programs/Projects varies between the three groups (Group1: Objectives 1-3, Group 2: Objectives 4-6, Group 3: Objectives 7-10). However, it is true that stakeholders in Marikina city put high priority on Education to get started on disaster reduction activity. Also, there already are some ongoing Research and Technology Programs/Projects. This seems to be one of the reasons that Education and Research and Technology scored as highly popular.

Table 2 Contents of Marikina Earthquake Disaster Reduction Action Plan

#	OBJECTIVE	now (with in 1-2 years)	soon (with in 5 years)	later (with in 10 years)	SUM	% of selected P/P	All Programs /Projects
1	Critical Facilities	8	5	0	13	(52%)	25
2	New Buildings	4	4	0	8	(44%)	18
3	Existing Buildings	7	3	0	10	(38%)	26
4	Education	11	4	0	15	(71%)	21
5	Research & Technology	2	9	4	15	(75%)	20
6	Public Information	7	3	0	10	(67%)	15
7	Land Use Planning	8	1	0	9	(36%)	25
8	Institutional Initiatives	16	0	0	16	(59%)	27
9	Economic Development	11	1	0	12	(55%)	22
10	Sources of Finance	1	3	1	5	(29%)	17
	SUM	75	33	5	113(52%)		216

CONCLUSIONS

The goal of this project is to develop a framework of disaster reduction planning in Asia-Pacific Regions. We plan to disseminate the framework we developed from the case study in Marikina City to other municipalities, regions, and countries. As an information dissemination tool, five CD-ROMs that contain all the materials such as PowerPoint files, handouts, participant lists for each workshop, and video that explains how each workshop was preceded, was developed. In addition to the CD-ROMS, all the information will be available through the Internet, http://eqtap2.edm.bosai.go.jp/phase2/project/section5/3/. This web page also contains 1) WORK PLAN that is a basic outline of the entire project, final report, 2) Marikina City Comprehensive Earthquake Disaster Reduction (CEDR) Program and Action Plan Final Report that include all the contents of this project such as the results of risk assessment, the contents of the CEDR program and Action Plan, the record of exhibition held in July, and public information kit that is a set of posters or flyers for public awareness raising on a earthquake disaster reduction.

The case study in Marikina City has successfully established the CEDR program and Action Plan and the effectiveness of the standardized method have been demonstrated. However, we have several future challenges. The following issues are the future challenges need to be addressed.

Applicability in another case
Applicability of this framework in 1) another level of organizations such as community, municipal, regional, and country and 2) another location need to be clarified.

Evaluation of output
The quality of the CEDR program has yet to be evaluated thoroughly in terms of effectiveness, merits, and functions of the Policies/Strategies and Programs/Projects in the CEDRP. The contents of the CEDR program need to be evaluated.

Monitoring the Implementations
Marikina City has successfully established the CEDR program and Action Plan. But it is just a plan. The point in a disaster reduction is how the plan is implemented to achieve earthquake safety. So it need to be monitored how the CEDR program and Action Plan implemented in Marikina City.

ACKNOWLEDGEMENT

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