

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

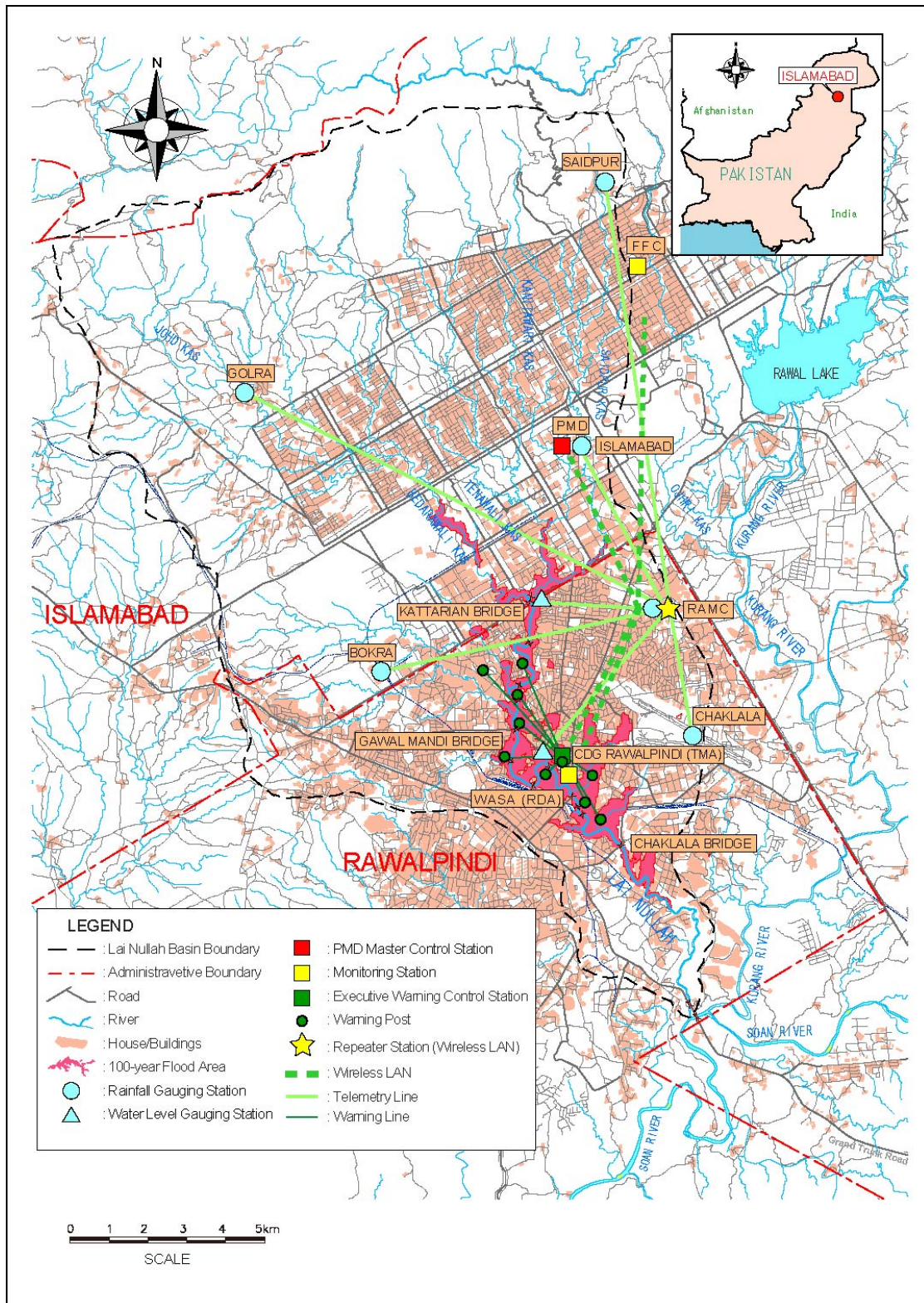
**AUTHORITIES CONCERNED OF
THE GOVERNMENT OF ISLAMIC REPUBLIC OF
PAKISTAN**

**THE PROJECT FOR STRENGTHENING
OF FLOOD RISK MANAGEMENT
IN LAI NULLAH BASIN**

INCEPTION REPORT

December 2007

JICA Expert Team



LOCATION MAP

Abbreviations

Abbreviation : English

ADB	:	Asia Development Bank
AFCC	:	Army Flood Control Center
CBFCC	:	Control Board Flood Control Center
C/D	:	Capacity Development
CDA	:	Capital Development Authority
CDG	:	City District Government of Rawalpindi
C/P	:	Counterpart
DF/R	:	Draft Final Report
DFCC	:	District Flood Control Center
DPCC	:	District Prevention Control Center
F/R	:	Final Report
FFC	:	Federal Flood Commission
FRC	:	Flood Relief Committee
FFWMC	:	Flood Forecast and Warning Master Control Center
IC/R	:	Inception Report
IT/R	:	Interim Report
JCC	:	Joint Coordination Committee
JICA	:	Japan International Cooperation Agency
LFCC	:	Local Flood Control Center
M/M	:	Minutes of Meeting
M/P	:	Master Plan
O/M	:	Operation and Maintenance
PDM	:	Project Design Matrix
PMD	:	Pakistan Meteorological Department
PO	:	Plan of Operation
PR/R	:	Progress Report
RCB	:	Rawalpindi Cantonment Board
R/D	:	Record of Discussion
TMA	:	Thesil Municipal Administration Rawalpindi
WASA	:	Water and Sanitation Agency of Rawalpindi Development Authority

Definition

Expert Team	:	JICA Expert Team
FFWS Project	:	The Project for the Improvement of the Forecasting and Waning System for Lai Nullah Basin
Project Team	:	C/P collaborate with Expert Team
The Project	:	The Project for Strengthening of Flood Risk Management in Lai Nullah Basin

Measurement Units

(Length)

mm : millimeter(s)
cm : centimeter(s)
m : meter(s)
km : kilometer(s)

(Time)

s, sec : second(s)
min : minute(s)
h, hr : hour(s)
d, dy : day(s)
y, yr : year(s)

(Area)

mm² : square millimeter(s)
cm² : square centimeter(s)
m² : square meter(s)
km² : square kilometer(s)
ha : hectare(s)

(Volume)

cm³ : cubic centimeter(s)
m³ : cubic meter(s)
l, ltr : liter(s)
mcm : million cubic meter(s)

(Weight)

g, gr : gram(s)
kg : kilogram(s)
ton : ton(s)

(Speed/Velocity)

cm/s : centimeter per second
m/s : meter per second
km/h : kilometer per hour

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Annex 2 :

Record of Discussions Between Japan International Cooperation Agency and Authorities Concerned of the Government of Islamic Republic of Pakistan on Japanese Technical Cooperation for the Project for the Strengthening of Flood Risk Management in Lai Nullah Basin

Annex 3 :

Proposed Expert team and C/P personnel in charging works.

Annex 4 :

Draft indicators for the project implementation

CHAPTER 1 OUTLINE OF THE PROJECT

1.1 Background of the Project

In response to the request from the Government of the Islamic Republic of Pakistan, the Preparatory Study Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), conducted the preparatory study from 13 August to 1 September, 2007, for the purpose of working out the details of the technical cooperation program concerning the Project for Strengthening of Flood Risk Management in Lai Nullah Basin (hereinafter referred to as the 'Project'), in the Islamic Republic of Pakistan. During the study, the Team exchanged views and had a series of discussions with the Pakistani authorities concerned with respect to desirable measures to be taken by JICA and the Government of the Islamic Republic of Pakistan represented by Federal Flood Commission (hereinafter referred to as 'FFC'), City District Government of Rawalpindi (hereinafter referred to as 'CDG'), Pakistan Meteorological Department (hereinafter referred to as 'PMD') and other organizations concerned, for the successful implementation of the above-mentioned Project. As a result of the discussions, the Team and the Pakistani authorities concerned agreed to recommend to their respective Governments the matters referred to in the documents attached hereto (see Annex 1 & 2). Minutes of Meeting was signed on 30 August 2007.

1.2 Overall Goal and Purpose of the Project

(1) Overall Goal

Flood damage and victims are mitigated in the target area.

(2) Project purpose

System and structure which enables mass evacuation at the event of floods is established in the target area.

1.3 Output of the Project

Output 1: Capacity of PMD is strengthened enough to utilize flood early warning system effectively and issue warning properly.

Output 2: Capacity of local authorities is developed enough to promote people's awareness and preparedness for the floods.

Output 3: Capacity of related organizations is strengthened enough to mitigate the damage offload.

1.4 Project Target Sites

The Project target sites will be the areas where had been affected by the flood in 2001 around the Lai Nullah river basin.

1.5 Project Design Matrix (PDM)

Project Title: The project for Strengthening of Flood Risk Management in Lai Nullah Basin

Period: 2008.1. ~ 2009.12(2years)

Implementing Organizations: FFC, PMD, CDG

Related Organizations: TMA, CDA, RCB, WASA

Target Group: Staffs in related organizations, people living in the target area

Project design matrix is shown Figure. 1.5.1.

Table 1.5.1 Project Design Matrix ver. 0

Narrative summary	Objectively Verifiable Indicators	Mean of Verification	Important Assumption
Overall Goal Flood damage and victims are mitigated in the target area.	- Number of human victims at the event of the flood	1. Report of FFC 2. Report of National Disaster Management Authority	
Project Purpose System and structure which enables mass evacuation at the event of floods is established in the target area.	1. Revised flood relief plan is authorized 2. Flood relief plan is used by related organizations 3. Hazard map and evacuation places are people among people 4. Continuity of evacuation drills with initiative of Pakistani side	1. Minutes of meetings of JCC 2. Questionnaire to the people 3. Hearing to the people in the pilot area	1. Flood situation in the target area will not get drastically worse.
Outputs 1. Capacity of PMD and CDG is strengthened enough to utilize flood early warning system effectively and issue warning properly. 2. Capacity of local authorities is developed enough to promote people's awareness and preparedness for the floods. 3. Capacity of related organizations is strengthened enough to mitigate the damage offload.	Indicators 1-1. Number of staff who understand runoff mechanism 1-2. Number of exercises conducted 1-3. Number of staff who can utilize flood simulation model 1-4. Revised criteria for the warning 2-1. Hazard maps prepared 2-2. Manual for evacuation drill prepared 2-3. Number of workshops and drills held 2-4. Number of people who participate in workshops and drills. 3-1. Revised flood relief plan for each year 3-2. Number of meetings held among flood relief committee	1-1. Record of the system operation 1-2. Report on the exercises 2-1. Progress Report of the Project 2-2. Report on workshops and drills 3-1. Progress report of the Project	1. Institutional and financial arrangements of the organizations concerned will be done as planned. 2. Mandate of each organization will not be changed.

Narrative summary	Objectively Verifiable Indicators	Mean of Verification	Important Assumption
<p>Activities</p> <p>1-1. Holding lectures on basic knowledge of runoff mechanism to engineers.</p> <p>1-2. Conducting exercises on operation of flood simulation model.</p> <p>1-3. Improving parameters of the flood simulation model.</p> <p>1-4. Accumulation of meteorological/hydrological data obtained from the warning system.</p> <p>1-5. Reviewing criteria for the warning.</p> <p>2-1. Conducting social survey.</p> <p>2-2. Preparing hazard maps.</p> <p>2-3. Select pilot areas.</p> <p>2-4. Developing manual for evacuation drill.</p> <p>2-5. Conducting awareness programs and evacuation drills in the pilot areas.</p> <p>2-6. Reflecting lessons learnt from activities in the pilot areas to the manual and plan.</p> <p>2-7. Holding workshops on how to facilitate awareness programs and drills for counterpart agencies</p> <p>2-8. Conducting trainings on how to facilitate awareness programs and drills for counterpart agencies.</p> <p>2-9. Conducting awareness programs and evacuation drills in other areas.</p> <p>2-10. Reflecting lessons learnt from activities in other areas to the manual and plan.</p> <p>3-1. Reviewing institutional structure of flood relief committee.</p> <p>3-2. Revising flood relief plan through flood relief committee.</p> <p>3-3. Conducting operational drills among related organizations based on the flood relief plan.</p> <p>3-4. Monitoring operation of related organizations during monsoon season.</p> <p>3-5. Reviewing response of related organizations to floods after monsoon season through flood relief committee.</p>	<p>Inputs</p> <p><u>Pakistani Side</u></p> <p>1. Personnel</p> <p>(1) Project Director from FFC</p> <p>(2) Project Manager from CDG</p> <p>(3) Flood Management Planner from FFC</p> <p>(4) Flood Management Planner from CDG</p> <p>(5) Flood Management Planner from PMD.</p> <p>(6) Community mobilizer from CDG (Civil Defense)</p> <p>(7) Community mobilizer from CDG (Rescue 1122) ,</p> <p>(8) Hydrologist from FFC</p> <p>(9) Hydrologist from PMD</p> <p>(10) Meteorologist from PMD</p> <p>(11) Assistants/ Supporting Staffs</p> <p>(12) Other personnel mutually agreed upon if necessary</p> <p>2. Provision of office spaces with basic office equipment</p> <p>3. Exemption from taxes and other charges for machinery, equipment and other materials supplied by JICA</p> <p>4. Budget for the workshops and drills for second year</p> <p>5. Salaries of counterparts</p>	<p><u>Japanese Side</u></p> <p>2. Experts</p> <p>(1) Leader/ Early Warning and Evacuation planner.</p> <p>(2) Flood forecasting and warning system.</p> <p>(3) Hydrologist</p> <p>(4) Community-based Disaster Management Planner.</p> <p>(5) Others if necessary</p> <p>3. Trainings for counterpart personnel in Japan and/or third countries</p> <p>4. Budget for hazard maps</p> <p>5. Budget for the workshops and drills in the first year</p>	<p>1. Institutional and financial arrangements of the organizations concerned will be done as planned.</p> <p>2. Mandate of each organization will not be changed.</p> <hr/> <p style="text-align: center;">Preconditions</p> <p>1. Security situation will not get worse.</p> <p>2. Equipments on the early warning system will be properly maintained and utilized</p>

1.6 Input of the Project

1.6.1 Inputs from the Government of Pakistan

1. Assignment of counterparts and administrative personnel
2. Provision of office spaces and basic office equipment
3. Exemption from taxes and other charges for machinery, equipment and other materials supplied by JICA.
4. Budget for the workshops and drills in the second year
5. Salaries of counterparts
6. Information and necessary assistance for the safety Experts

1.6.2 Inputs from JICA

1. Dispatch of Japanese expert
2. Training of counterpart personnel
3. Provision of equipment
4. Budget for hazard maps
5. Budget for the workshops and drills

1.7 Project Schedule

Project schedule is shown Figure 1.7.1. The Project execute among twenty-five (24) months from December 2007 to November 2009 is divided by two (2) Phases.

Phase I : Twelve (12) moths From December 2007 to November 2008

Phase II : Twelve (12) moths From December 2008 to November 2009

Term	07	2008												2009											
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Phase	← Phase I →												← Phase II →												
Report	▲ IR						▲ PR(1)						▲ IT						▲ PR(2)				▲ DF		

Legend: IC: Inception Report PR: Progress Report IT: Interim Report
DF: Draft Final Report F: Final Report

Figure 1.7.1 Project Schedule

CHAPTER 2 STRATEGY FOR THE PROJECT

2.1 Basic Understanding

Based on the achievements of previous studies, “The study on Comprehensive Flood Mitigation and Environmental Improvement Plan for the Lai Nullah Basin (the Master Plan Study)” and “Lai Nullah Flood Forecasting and Warning System Project (the FFWS Project), this project shall continue along the master plan and success to achieve the purpose.

2.1.1 Effective Use on the Achievements of the Master Plan Study and FFWS Project

Based on the results of the Master Plan Study, the FFWS Project was completed on March 2007. Operation and maintenance offices for the FFWS Project are selected in four offices which namely PMD, CDG, FFC and WASA. The relationship between the FFWS Project and this Project is shown in Fig. 2.1.1. Since the Operation and Maintenance Manual for FFWS was not implemented within one year, it will not conduct revision to the Manual. Shortage portion of the Manual, if any, will be added as a postscript.

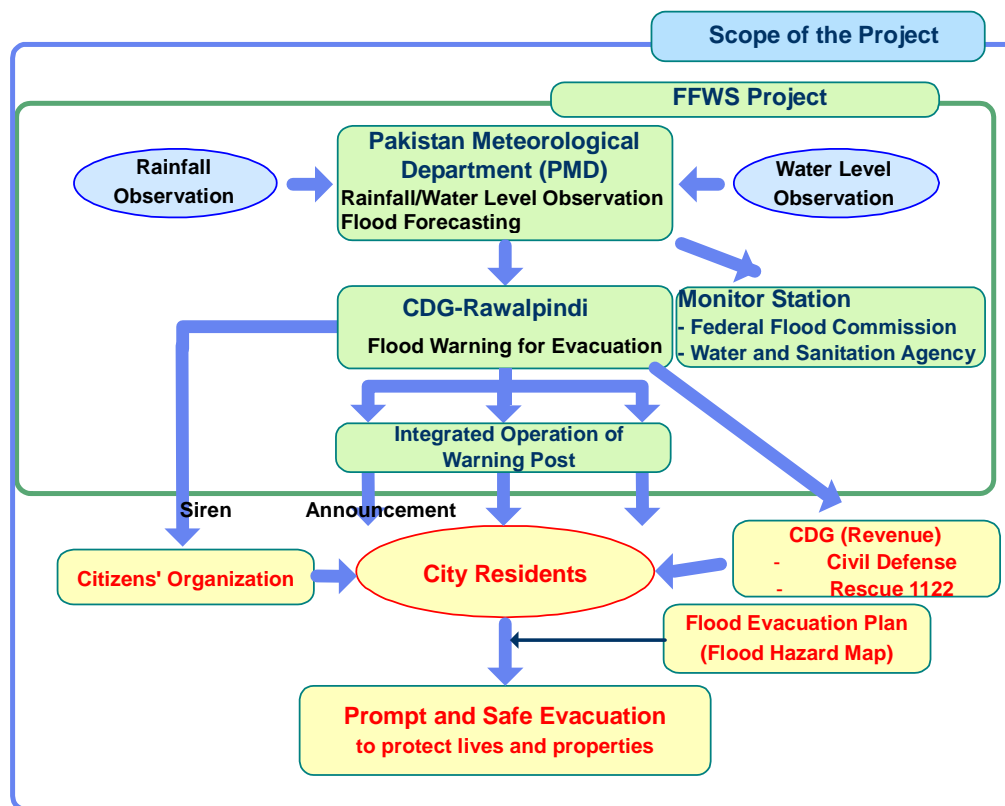


Figure 2.1.1 Instruction System Flood Forecasting and Warning

Based on the latest “Flood Relief Plan 2007”, flood warning posts are maintaining by the TMA. List of location, function and maintenance office for FFWS system is shown in table 2.1.1.

Table 2.1.1 System Summary

Station	Function	Organization in Charge
1. Master Control Station		
1.1 PMD, Islamabad	<ul style="list-style-type: none"> • Flood forecasting; data collection • Data processing • Dissemination of flood information to related agencies (Data transmission subsystem) 	PMD
2. Rainfall Gauging Station		
2.1 PMD, Islamabad	Automatic rainfall data observation (Telemetry subsystem)	PMD
2.2 Saidpur		
2.3 Gorla		
2.4 Bokla		
2.5 RAMC		
2.6 Cgajjala		
3. Water Level Gauging Station		
3.1 Kattarian Bridge	Automatic water level data observation (Telemetry subsystem)	PMD
3.2 Gawal Mandi Bridge		
4. Repeater Station		
4.1 RAMC Telemetry Repeater	<ul style="list-style-type: none"> • Repeater function for telemetry • Repeater function for wireless LAN 	PMD
4.2 RAMC Wireless LAN Repeater		
5. Monitoring Station		
5.1 FFC	Flood information monitoring (Data transmission subsystem)	FFC
5.2 WASA of RDA	Flood information monitoring (Data transmission subsystem)	WASA
6. Executive Warning Station		
6.1 TMA Rawalpindi:	Control and supervision of warning system	CDG/TMA
-- Warning Control & Supervision		
-- Flood Information Monitoring		
	Flood information monitoring (Data transmission subsystem)	
7. Flood Warning Post		
7.1 WP-1: TMA Rawalpindi	Flood evacuation warning by motor siren and loudspeaker	TMA
7.2 WP-2: Christian Colony		
7.3 WP-3: Water Treatment Facility adjacent to MC		
7.4 WP-4: Ratta Amral Bridge		
7.5 WP-5: Gunj Mandi Bridge		
7.6 WP-6: Pir Wadhai Bridge		
7.7 WP-7: Fire Station Pir Wadhai		
7.8 Sector IV-B, Khayaban Park		
7.9 WP-9: Gawal Mandi Children's Park		
7.10 WP-10: Gpvernment Middle School, Dhoke		

* Two (2) units of 4WD vehicles are required for emergency and operation/maintenance.

2.1.2 Sustainability of the Project

In order to maintain the sustainable development after the completion of the Project, it is necessary to develop the Engineer's ability, to maintain the human resources and to acquire the budget support from the concerned agencies. In this Project, Pakistani side will make effort to bear the budget for

second year's activities, which was agreed in MM, it is one of the key elements for the output of this Project.

In addition, a road improvement project is scheduled along the Lai Nullah River. This Project includes implementing revetment works for Lai Nullah River. Therefore, once the road Project starts, it is necessary to take a notice for the consistency of the flood warning code and hazard map.

2.2 Basic Policy of the Project

This project proposes three (3) outputs as following.

- Output 1: Capacity of PMD is strengthened enough to utilize flood early warning system effectively and issue warning properly.
- Output 2: Capacity of local authorities is developed enough to promote people's awareness and preparedness for the floods.
- Output 3: Capacity of related organizations is strengthened enough to mitigate the damage of flood.

In this section will discuss about a basic principle for each output.

2.2.1 Basic Principle of Output 1

Recognition of current status for output 1 and its response guideline and activities in the Project are shown in Table 2.2.1.

Table 2.2.1 Present Status, Response Guideline and Activities for Output 1

Present Status	Response Guideline	Activities
New Flood Forecasting and Warning System have been operating since last April 2007.	<ul style="list-style-type: none"> • To verify the past warning process • To confirm the collected observation data 	<ul style="list-style-type: none"> • Recognition of current FFWS • Training for O&M of FFWS
Rainfall and water level data on last monsoon season was collected and accumulated.	<ul style="list-style-type: none"> • To arrange and evaluate the observed data • To study the accuracy improvement of flood simulation model 	<ul style="list-style-type: none"> • Training for flood simulation model • Training for discharge observation and runoff analysis • Improvement of the parameter of flood simulation model • Review and improvement of warning code

During the latest monsoon season (from July 2007 to September 2007), warning system was working five (5) times. In order to support sustainable development of the flood forecasting and warning system, following activities are necessary.

- 1) Accumulation of data from water level gauging station and rainfall gauging station.
- 2) Verification of the last flood forecasting and warning activity
- 3) Evaluation of concerned agencies given the action of the evacuation stage.

Continuously implementing of above monitoring and evaluation procedure, forecast accuracy will be improved and contributed to mitigate flood damage and victims in the target area.

Based on the accumulation and verification of observed data, improving accuracy of flood simulation model, runoff analysis, review the parameter of model and improve the warning standard can be examined and excised. The Expert will conduct training about the above activities to the C/P Engineer and C/P will practice same methods by themselves in second years.

At the current status, improvement of FFWS System was confirmed in below.

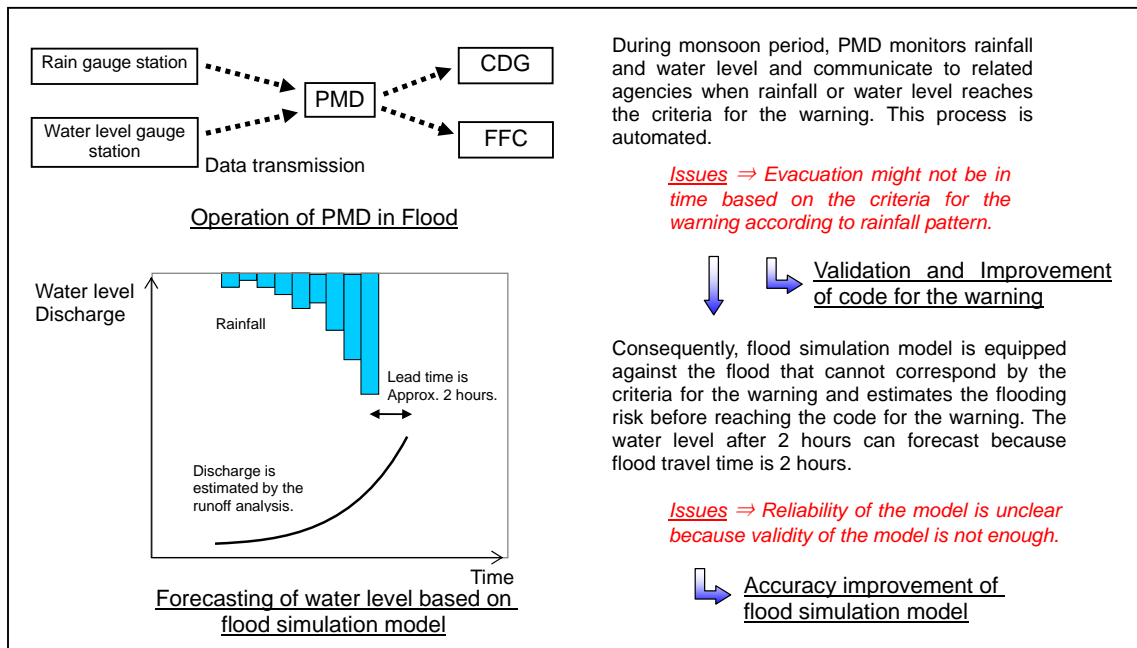


Figure 2.2.1 Improvement of FFWS System

2.2.2 Basic Principle of Output 2

Recognition of current status for output 2 and its response guideline and activities in the Project are shown in Table 2.2.2.

Table 2.2.2 Present Status, Response Guideline and Activities for Output 2

Present Status	Response Guideline	Work in Project
Residents in target area are not familiar with Warning system.	<ul style="list-style-type: none"> To promote people's awareness and preparedness for the floods To conduct evacuation drill 	<ul style="list-style-type: none"> Conduct a social survey Conduct awareness programs and evacuation drill in the pilot site. Reflecting lesson learnt from above activities to the manual and plan
Shortage of the local administration capacity for implementing an awareness and preparedness activities for residents in target area.	<ul style="list-style-type: none"> To conduct awareness activities to the counterpart agencies To conduct evacuation drills to the residents by the counterpart agencies. 	<ul style="list-style-type: none"> Prepare a Hazard Map Select the location of pilot side Prepare implementation procedure for evacuation drill Conduct awareness programs and evacuation drill to the counterpart agencies. Hold workshops with counterpart agencies. Conduct awareness programs and evacuation drill in other pilot sides by the counterpart agencies. Improve the implementation procedure manual based on the result of above activities.

As a result of operation of the FFWS on the last monsoon season, following problems were identified:

- Never heard about warning siren
- What is the meaning of warning siren?
- Where is the flood relief center?

- How to go flood relief center?

In this Project, Expert will conduct evacuation drills and awareness activities together with C/P and concerned agencies. Especially, the second years of the Project, C/P will conduct these activities by themselves and the Expert will act as an observer. In order to conduct a community-based evacuation drill, it is important to discuss with C/P adequately about the proper scale and time. In addition, it is also necessary to discuss with community leaders (school, mosque, church, NGO and volunteer etc.) about evacuation activities. Moreover, the implementation of above activities, it must respect the local customs and cultures.

Expert will be prepared an understandable handout for the participant in the awareness activities, which will be concerned following subjects;

- Mechanism of Flood
- Existing FFWS System
- Purpose and manner of utilization of a Hazard Map
- Dangers Zone for evacuation route
- Location of Flood relief center and way to the center

Above documents shall not use only one time, it can be show to the public through the C/P website. Furthermore, location of flood relief center and evacuation site shall be notified in the Public facilities, school and other gathering places. Radio program also one of the alternative for awareness activities.

2.2.3 Basic Principle of Output 3

Recognition of current status for output 3 and its response guideline and activities in the Project are shown in Table 2.2.3.

Table 2.2.3 Present Status, Response Guideline and Activities for Output 3

Present Status	Response Guideline	Activities
The flood relief plan needs modification	<ul style="list-style-type: none"> • To modify flood relief plan 	<ul style="list-style-type: none"> • Review institutional structure of flood relief committee • Revise flood relief plan through flood relief committee. • Review the response of related organizations based on the monitoring results through flood relief committee
Awareness of flood risk management to the related organizations is necessary.	<ul style="list-style-type: none"> • To conduct awareness of flood risk management for related organizations • To conduct the awareness activities for the Flood Relief Committee 	<ul style="list-style-type: none"> • Conduct operational drills with related organizations based on the Flood Relief Plan. • Monitor the operation of related organizations during monsoon season • Support the budget for Flood Risk Management activities.

Based on the Flood Relief Plan 2007, system of FFWS Project was adopted in the Plan. However, the previous warning system is also employed in the same Plan. It means the existing flood warning system has mixed system. Existing flood warning system will be shown in Fig. 2.2.2. Understanding exist problems at current status and proposed countermeasures are shown in Table 2.2.4.

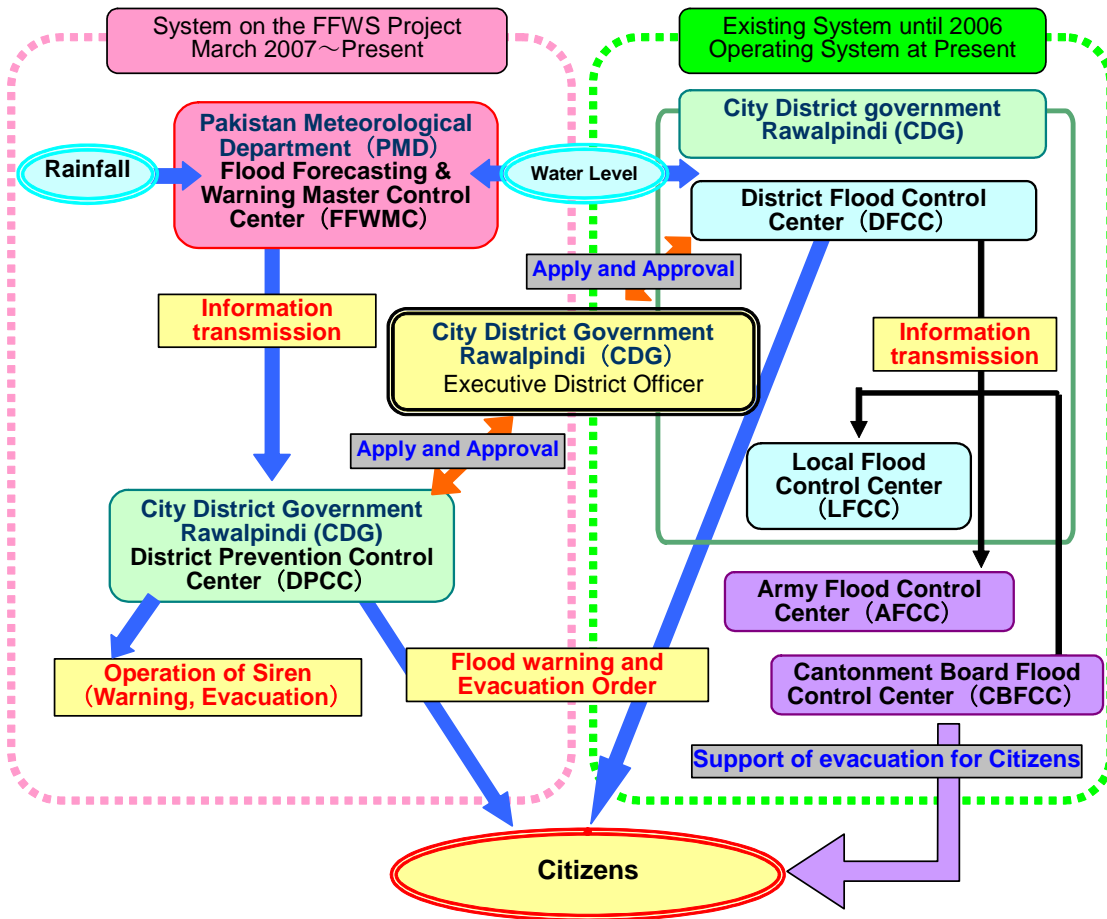


Figure 2.2.2 Present Flood Forecasting and Warning System based on the Flood Relief Plan-2007

Table 2.2.4 Presumable Problems and Proposed Response on Existing Flood Relief Plan

Items	Problems	Activities
Communication of flood warning and evacuation order	<ul style="list-style-type: none"> • Duplication of sections to issue warning and evacuation order • Duplication of systems which is installed in the FFWS project and the prior system 	<ul style="list-style-type: none"> • DFCC and DPCC in CDG are consolidated to one organization • Communication channel is illustrated and to be easy understood
Work procedure of related organizations at flood event	<ul style="list-style-type: none"> • Unclear work sharing • Only described upper organizations 	<ul style="list-style-type: none"> • Dispatching Work for related organizations • Flow chart will be attached
Evacuation Plan for inhabitant	<ul style="list-style-type: none"> • It is not described clearly 	<ul style="list-style-type: none"> • Guidance of activities will be prepared in time series.
Hard to understand flood relief plan	<ul style="list-style-type: none"> • The plan is mostly described in sentence and hard to understand 	<ul style="list-style-type: none"> • Illustration and flowchart will be inserted and it makes easy to understand
Evacuation center	<ul style="list-style-type: none"> • Number of evacuation center is a few and no map showing location. • Unclear operation policy and support of evacuation center 	<ul style="list-style-type: none"> • Consultation with related organizations about required number of evacuation centers and operation policy • The location of evacuation center will be shown in hazard maps
Work flow of flood relief plan (warning issue, transmission, evacuation promotion, rescue, rehabilitation, reconstruction, publicity, flood fighting)	<ul style="list-style-type: none"> • Unclear series of work flow about flood relief plan and organization to be participated in each activity • Shortage of damage mitigation plan 	<ul style="list-style-type: none"> • Review an activities, work sharing and organization in time series and reflecting lessons to improve the work flow of flood relief plan • Considering communal risk mitigation activities (flood fighting,, awareness activities in school, resident participation activities)

Modification for Flood Relief Plan-2007 will be based on the above problems and other newly identified problems, which is identified during the discussion with FRC and activities. Revised the Plan work will be carried out by FRC and other concerned agencies. The C/P and other concerned agencies shall be familiarized with the revised Flood Relief Plan. Therefore, map exercise is scheduled in this Project for all concerned organizations. Though the map exercises, the participants will understand not only his role and action but also other agency's activities. This is important to understand that the flood risk management cannot implement by alone (single office) and necessity to create a strengthening of lateral communication.

Information-sharing within the C/P agencies will be considering in the project. C/P will take a leading part of this activity to send out information, such as the present status of FFWS, regular newsletter and awareness activities. In the first phase information-sharing system will be on trial run and it will become operational on the second phase.

CHAPTER 3 PLAN OF OPERATION

3.1 Flow chart of the Project

Flow chart of the project is shown Figure 3.1.1.

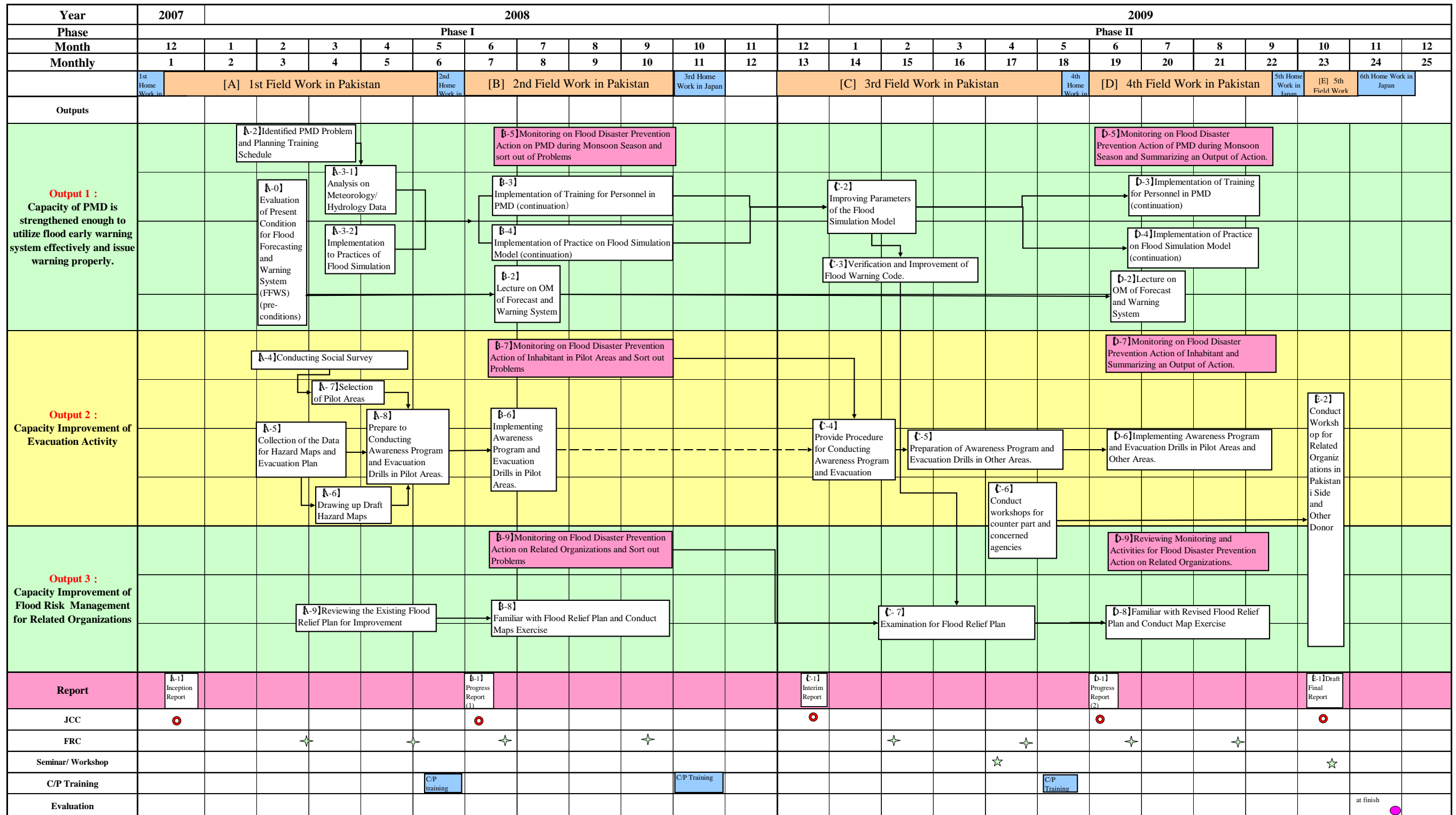


Figure 3.1.1 Implementation Flow Chart of the Project

3.2 Plan of Operation on Output 1

【A-0】 Evaluation of Present Condition for Flood Forecasting and Warning System (FFWS) (pre-conditions)

Expert Team will be examined about present condition and O/M of FFWS. If the system has problem for implementing, Expert Team have to inform the problems to C/P for taking any necessary countermeasures.

【A-2】 Identified PMD Problem and Planning Training Schedule

Training schedule will be planned by the comprehensive level of PMD Staff's. Based on the 2007 operation record of PMD, presumable problems occurred during the operation of PMD in 2007 and the following trainings are proposed.

(1) Training on review of the flood warning code

The Flood Warning Code is configured with utilization of the manual with consideration of channel characteristics of Lai Nullah River and social characteristics in the basin. The training will be processed from issuance of the warning to the completion of evacuation.

(2) Training for accuracy improvement of flood simulation model

To improve accuracy of flood simulation model, basic knowledge and skills on hydrology and the observed data with high reliability are indispensable. The following trainings will be conducted for improving accuracy of flood simulation model.

- 1) Training for reviewing meteorological-hydrological data
- 2) Training for discharge measurement
- 3) Training for runoff analysis
- 4) Training for flood simulation model

Meanwhile, Maintenance Expert will be dispatched to Pakistan for 10days in First Field Survey to inspect existing condition of flood warning system and actual performance during last flood season. Moreover, Expert will check the records and conduct a questionnaire survey from the Engineers.

【A-3-1】 Analysis on Meteorology/ Hydrology Data

Real time observation is operating at 6 rainfall stations and 2 water level stations in Lai Nullah River Basin. To evaluate and manage these data, technology transfer will be considered with following 3 subjects.

- 1) Guidance for evaluation error data
- 2) Guidance for data management
- 3) Guidance for discharge measurement

【A-3-2】 Exercise of Flood Simulation Model

Existing Flood Warning Code was prepared without enough rainfall and water level data. Therefore, water level might drastically rise before rain water reached the code for the warning. Based on the results of rainfall patterns and the issuing warning might be delay.

The activity to forecast flooding risk using flood simulation model is conducting but the accuracy of model is still low reliability because of the shortage of accumulated hydrological data. In consideration these points, technical knowledge is considered with following 3 subjects.

- 1) Identifying problems of existing flood simulation model
- 2) Issuance of warning due to flood simulation model
- 3) Drills on flood simulation model

【B-2】 Lecture on OM of Forecast and Warning System

In order to have an appropriate operation and maintenance for flood forecasting and warning system, Expert will be lectured on operating conditions of the system during the period of monsoon. Specific works are following.

- Confirmation of operating condition of flood forecasting and warning system and compliance of maintenance manual
- Training on operation of flood forecasting and warning system and improvement of maintenance manual
- Monitoring of operating condition of flood forecasting and warning system and sort out problems
- Proposal of improvement for the system maintenance

【B-3】 Implementation of Training for Personnel in PMD (continuation)

C/P is able to execute flood forecasting works using MIKE 11 of runoff model which is installed in the FFWS Project. However, C/P is still hard to modify and to revise the model by himself due to shortage of basic knowledge of hydrology. Technical transfer on basic hydrology is conducted to be able to modify and revise the model with considering the following 3 subjects.

- 1) Guidance for runoff mechanism
- 2) Guidance for characteristics of runoff model
- 3) Drills on discharge measurement

【B-4】 Implementation of Practice on Flood Simulation Model (continuation)

Practices on flood simulation models will be carried out by using the observed data. Expert will be evaluated the learning level for flood simulation model.

【B-5】 Monitoring on Flood Disaster Prevention Action on PMD during Monsoon Season and sort out of Problems

Flood disaster prevention activities conduct by PMD and CDG during the periods of warning issues in 2008, an interview survey to the Engineers of PMD and CDG will be conducted and the problems of flood disaster prevention action will be sorted out. The interview items are shown in follows.

- Attendance of personnel when warning issues (Did the personnel correspond even in night time?)

- Operating condition of real time observation (Did the equipment correctly function?)
- Simulation results of flood simulation model (Did the model utilize?)
- Taken time from communication with related agencies to issuing warning

Based on this interview survey, improvement plan for flood disaster prevention action on PMD will be improved for the action aiming at second phase.

【C-2】 Improving Parameters of the Flood Simulation Model

Based on the floods simulation results in 2007 and 2008, the parameters of flood simulation model will be improved.

【C-3】 Verification and Improvement of Flood Warning Code.

Verification and improvement of Flood Warning Code will be conducted based on the validation results of parameters of flood simulation model.

【D-2】 Lecture on OM of Forecast and Warning System

Controversial points of maintenance of flood forecasting and warning system is clarified and appropriated. Especially, actual performance of the system in 2008 is checked and validity of the records and controversial points are discussed during the lectures.

【D-3】 Implementation of Training for Personnel in PMD (continuation)

Based on the observed data in 2007 and 2008, runoff characteristics of Lai Nullah River can be arranged. The C/P will be more familiarized with runoff analysis. Discharge observation will be conducted when floods happen. At the same time, the level of C/P's proficiency of discharge observation will be evaluated.

【D-4】 Implementation of Practice on Flood Simulation Model (continuation)

Based on the observed data in 2007 and 2008, flood simulations are conducted and validity of code for the warning set in [C-3] is evaluated. The manual is also revised if necessary.

【D-5】 Monitoring on Flood Disaster Prevention Action of PMD during Monsoon Season and Summarizing an Output of Action.

Interview survey will be conducted to comprehend the situation of flood disaster prevention action of PMD when the warning issue in the year of 2008.

3.3 Plan of Operation on Output 2

[A-4] Conducting Social Survey

Social survey will be conducted in the target area in order to understand social and cultural background before implementing awareness program and evacuation drills. The survey items are mainly shown in Table 3.3.1.

Table 3.3.1 Outline of Social Survey

Items	Contents	Note
Work period and Schedule	Three months (including preparation and reporting) Start from January 2008	
Survey Items	<ul style="list-style-type: none"> Flood damage Action of inhabitant during flood Consciousness of inhabitant for flood and flood disaster prevention Response of inhabitant for political measure on flood disaster prevention Existence of community and community leader Consciousness of inhabitant and behavior characteristics for gender Disposal of household garbage and collection system 	<ul style="list-style-type: none"> Confirmation of family structure, person who requires nursing care Confirmation of the information source of inhabitant (Radio etc)
Survey object Area and Approach	Objective area: the target area (Number of Sample: 1,200 persons) Approach: Interview Survey by local consultant (Number of sampling is decided by the number of union and survey areas sectioned by road route)	

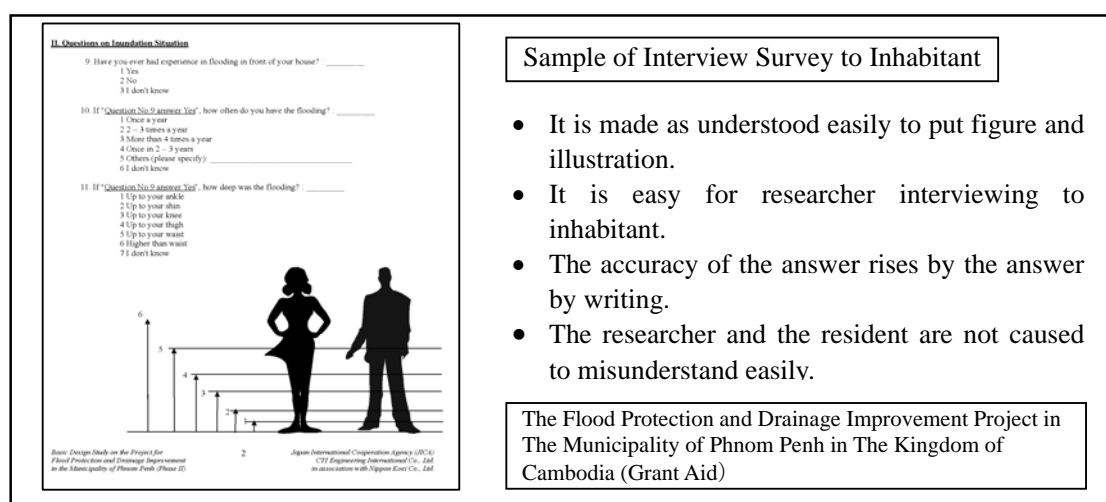


Figure 3.3.1 Sample of Social Survey Questionnaire

[A-5] Collection of the Data for Hazard Maps and Evacuation Plan

The results of field survey are examined for draw up hazard maps and to formulate evacuation plan.

Table 3.3.2 Conduct Field Survey for Draw up Hazard Maps and Formulate Evacuation Plan

Items	Contents	Note
Work period	Three months (including preparation works and reporting)	
Survey Items	<ul style="list-style-type: none"> • (1) Administrative area and evacuation zone, Evacuation center, population and population composition, industrial structure etc. • (2) Distribution of public facilities such as road, school, hospital, fire station, garden, public hall, police station etc. and Height of building, under path • (3) Distribution of places in which person gathers such as mosque, church, bazaar etc. • (4) detail road map, obstacles of traffic, contact information of community leader, NGO, volunteer 	<ul style="list-style-type: none"> • Road will be checked whether car can pass through or not. • Obstruction for the traffic will be checked
Survey Area	The target area	

[A-6] Drawing up Draft Hazard Maps

Draft hazard maps will be prepared by using the inundation map which is based on the flood on July 2001 and by the collected data in [A-4], [A-5]. The hazard maps are made without runoff calculation and two types of the maps are made as follows. Object area will be divided from the target area as based on the administrative boundary or other connivance factors for the Project.

- 1) Hazard map for the target area
- 2) Hazard map for each objective area

Purpose of utilization and descriptive contents of each map are shown in Table 3.3.3.

Table 3.3.3 Type, Purpose and Contents of Hazard Maps

Type of maps	Purpose of use and contents	Note
a) Hazard map for the target area	<p>Organization that use map</p> <ul style="list-style-type: none"> • Related organization, provincial and districts government concerned flood prevention activities <p>Contents of map</p> <ul style="list-style-type: none"> • The data of (1) to (3) collected in [A-5] • Evacuation center, rough evacuation route and direction, area of risk • Contact information of related organization and personnel • Extensive assistance network (Hospital, NGO etc.) 	<ul style="list-style-type: none"> • The roles of related organization • Information transmission, procedure and person in charge are specified
b) Hazard map for each objective area (the target area divided into several zones)	<p>Organization that use map</p> <ul style="list-style-type: none"> • Branch office, community, public facilities, mosque, church, NGO etc. <p>Contents of map</p> <ul style="list-style-type: none"> • The data of (1) to (4) collected in [A-5] • Evacuation center, rough evacuation route and direction, area of risk • Contact information of related organization and personnel • Land mark 	<ul style="list-style-type: none"> • People who requires nursing care should be considered • Parallel description of English and local language • Simple and easy to understood

a) Hazard map for the target area is used for map exercise for the Engineers who are in charge of planning of evacuation and operation during flooding. b) Hazard map for each objective area are decided appropriate scale and drawing area not to divide the union administration. The scales of the maps are assumed now that a) is 1/10,000, and b) is 1/2,500. Information described on the map is decided after due consultation with related personnel. Communication channel is also considered to approach small communities, which are of smaller than the union, such as organizations of the mosque and church.

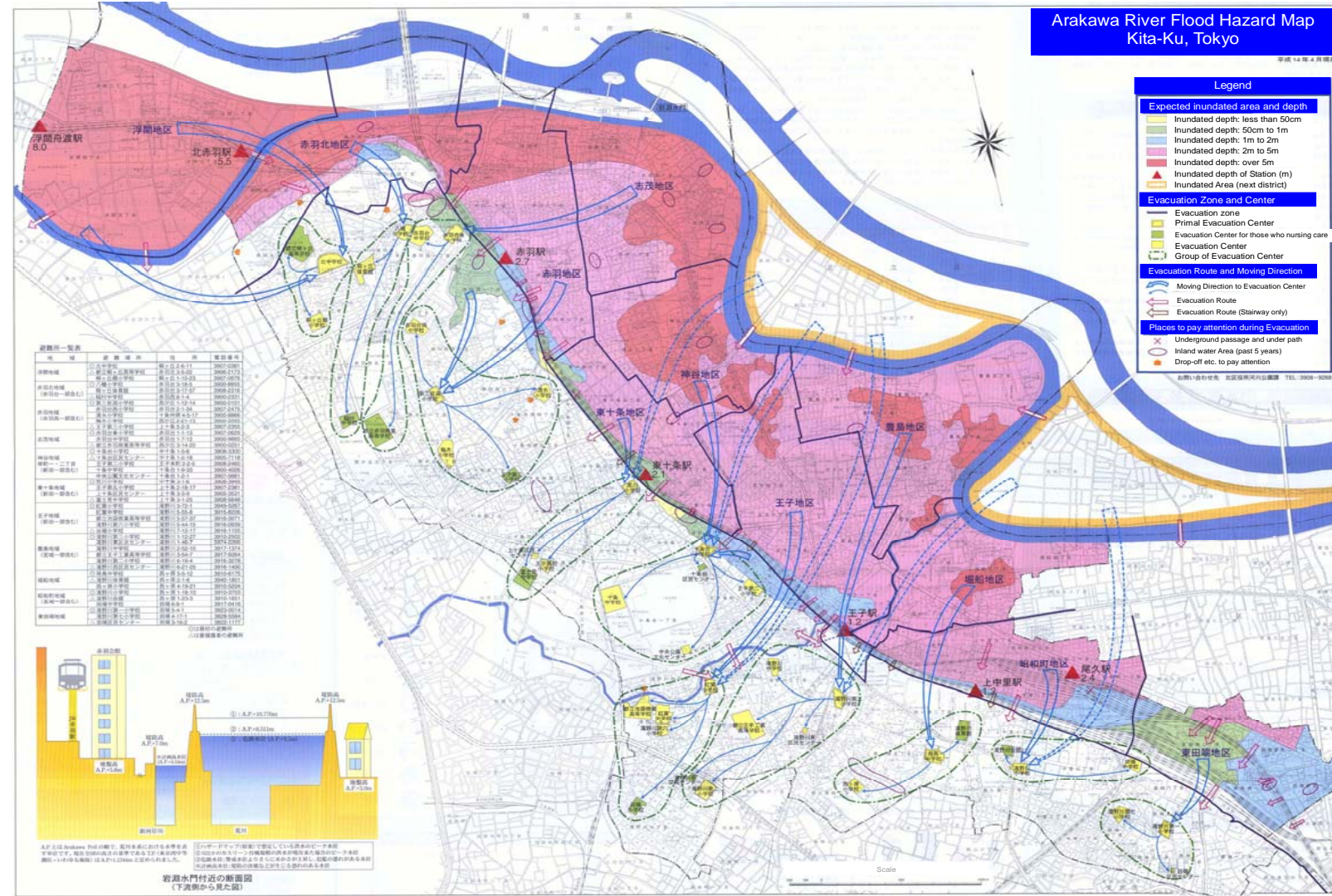


Figure 3.3.2 Example for Hazard map

【A-7】 Selection of Pilot Areas

Pilot area will be selected from the object area. The pilot area will be consulting with counter part agencies. The conditions for selecting Pilot Area are considering damaged area by flood, size of community and the results of the Social Survey. In addition, there are 11 vulnerable areas specified in existing flood relief plan and 8 vulnerable areas specified in the report of WASA. The proposed criteria of selecting Pilot area are shown in Table 3.3.4.

Table 3.3.4 Criteria for Selecting Pilot Areas (draft)

Items	Contents	Remarks
Reference resources	<ul style="list-style-type: none"> • 100 year and 25 year flood areas which are developed in the development study project. • Vulnerable areas specified in the existing flood relief plan and the report of WASA • The results of flood damage obtained from social survey • Industrial characteristics and cooperative structure of the area 	
Criteria of Selecting	<ul style="list-style-type: none"> • Area which is frequently flooded • Area where evacuation drill can be done in daytime • Area which not get into muddle by evacuation drill • Area which has school and public facilities • Understanding and cooperative structure of the area (NGO and volunteer) 	<ul style="list-style-type: none"> • 25 year flood area is targeted.

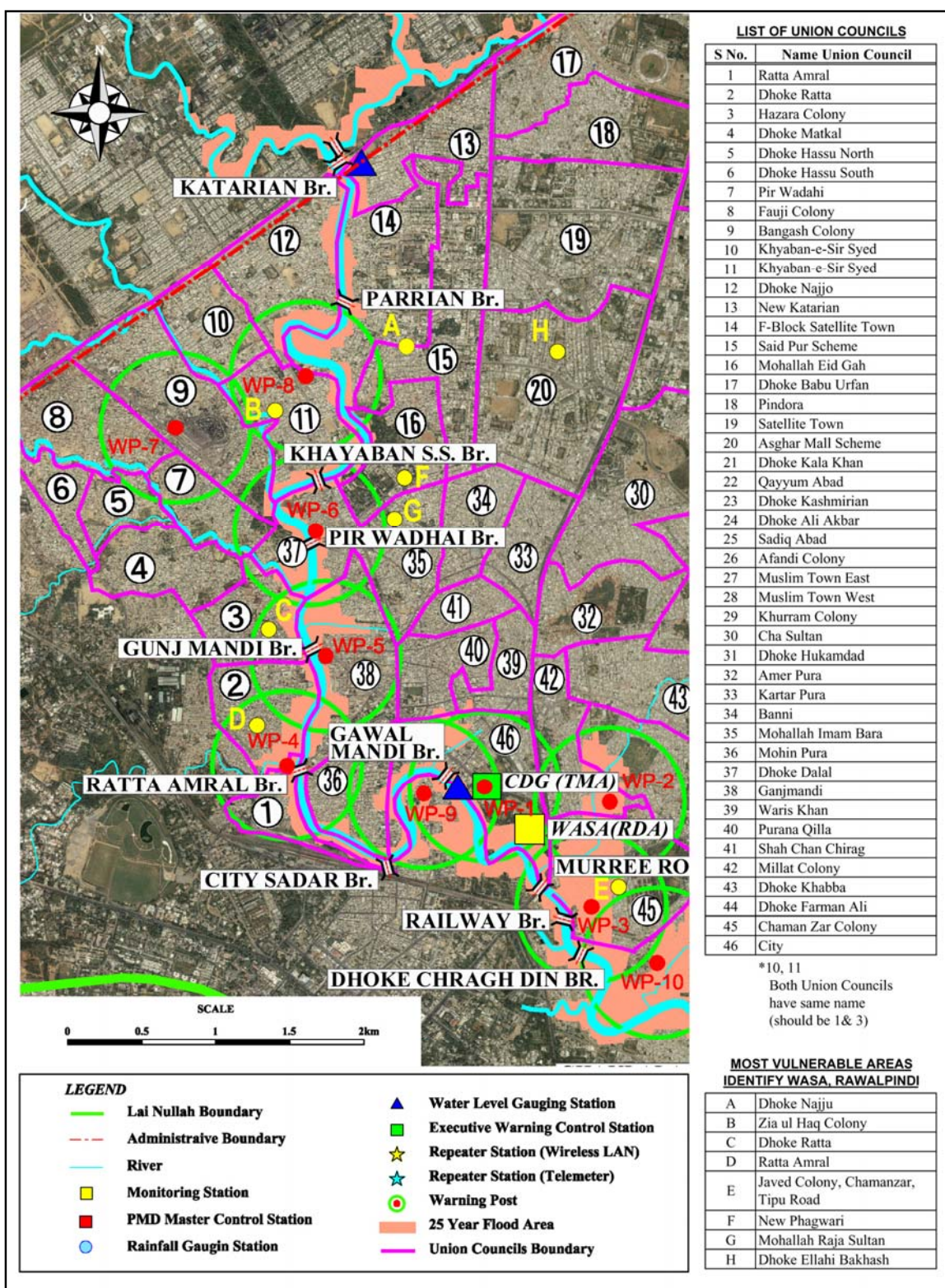


Figure 3.3.3 25 year Flood Area and Vulnerable Area Specified by WASA

【A-8】 Prepare to Conducting Awareness Program and Evacuation Drills in Pilot Areas.

The sufficient conference with C/P shall be carried out from the preparation stage and the roles of C/P will be given in order to have a positive participation. The procedure of awareness program and evacuation drills at Phase I will be improved C/P's skill for conducting same the activities in phase II.

Table 3.3.5 Preparation Works for Conducting Awareness Program and Evacuation Drills

Items	Preparation works	Remarks
Objective community	<ul style="list-style-type: none"> Approximately 5 communities or schools are selected as the objective areas for awareness program and evacuation drills. The community is assumed school, business association and the settlement referred to as colony and it will be decided based on social survey and consulting with counterpart agencies 	<ul style="list-style-type: none"> Decision based on the results of social survey and consultation with related agencies. Person who can participate in the activity in daytime. Voluntary participation
Schedule	<ul style="list-style-type: none"> 1 month, June – July 2008 (beginning of monsoon season) 	<ul style="list-style-type: none"> Confirmation of the school holidays and operable day Available time of participant
Program	<ul style="list-style-type: none"> Program is 1 or 2 days for each community and includes the description of flood mechanism, map exercise using hazard map, visiting vulnerable areas and evacuation center by walking. Program will be prepared easily to participate. 	<ul style="list-style-type: none"> Refer to Table 3.3.6
Tools	<ul style="list-style-type: none"> Brochure and hazard map will be prepared for distribution. These tools will coordinate with the level of participants. Tools for distribute to house and signboard for outdoor and public facilities are also prepared. 	<ul style="list-style-type: none"> Reflecting a regional characteristic Signboard installation place for outdoor and public facilities Installation of video and information booth Brochure, poster
Publicity	<ul style="list-style-type: none"> Effective publicity activity will be evaluated. Recruitment for the participant of evaluation drills is necessary. 	<ul style="list-style-type: none"> Require the cooperation with local school Local radio station Cooperation of community

Table 3.3.6 Awareness Program (Draft): 1 or 2 days for Each Community

Day, time	Contents	Remarks
First day (approx. 3 hours)	<p>Lecture to Participant (in a room)</p> <ul style="list-style-type: none"> Flood mechanism Existing flood forecasting warning system Purpose and manner of utilization of hazard map Map exercise 	<ul style="list-style-type: none"> Preparation of simple materials and draft hazard maps
Second day (approx. 3 hours)	<p>Site visiting</p> <ul style="list-style-type: none"> Confirmation of vulnerable areas using hazard map Confirmation of evacuation center and route, obstacle of traffic <p>Wrap up (in a room)</p> <ul style="list-style-type: none"> Reviewing hazard map Items to be added Problems of roles sharing, required time etc. 	<ul style="list-style-type: none"> Field works will be considered to participants for easily understand. Discussion with participants about Is there any questions, any defect and any improvement of hazard map

【B-6】 Implementing Awareness Program and Evacuation Drills in Pilot Areas.

Awareness program and evacuation drills will be conducted in pilot areas. When the evacuation drills are conducted not only C/P organizations but also the members of FRC are requested to be a participant.

The areas for conducting evacuation drills should include 5 communities where awareness program were conducted in first field survey. Before evacuation drills, the meeting with related governing agencies should be sufficiently conducted in order to decide schedule, time zone, scale, method and organization. And publicity activities with cooperating C/P are also conducted to the communities in advance.



Figure 3.3.4 Example of Evacuation drill

【B-7】 Monitoring on Flood Disaster Prevention Action of Inhabitant in Pilot Areas and Sort out Problems

At the pilot areas, where awareness program and evacuation drills are conducted, flood disaster prevention action of inhabitant will be monitored in monsoon season. Any changes of actions and problems due to the implementation of awareness program and evacuation drills will be evaluated.

Table 3.3.7 Outline of Monitoring and Identified Problem

Item	Contents	Remarks
Work period, number of times and person	<ul style="list-style-type: none"> • Evacuation drills 5 times, at flood event in monsoon: approx. 3 times • One group is two person (Expert team and C/P) 	
Study approach	<ol style="list-style-type: none"> (1) Video shooting from the beginning of evacuation to evacuation center (2) Recording of problems, photo shoot of obstacles (3) Recording of time required for evacuation, and number of people (4) Recording of actions and supports by related 	<ul style="list-style-type: none"> • Recording the actions of inhabitant along the evacuation route during the evacuation drills. These results will be reflected to phase II. • Extraction of problems • The differences of the action

	<p>organizations</p> <p>(5) Questionnaire survey to participants of evacuation drills</p> <p>(6) Monitoring the flood disaster prevention action taking by inhabitant and related organizations in monsoon</p>	<p>between drills and flood times are clarified</p>
Objective area	Pilot area, Area where evacuation drills was conducted	

【C-4】 Provide Procedure for Conducting Awareness Program and Evacuation Drills

Based on the problem, which is obtained in monsoon season, the program made in first field work will be reviewed. Implementing procedure will be improved for CDG and related organizations in order to conduct awareness program and evacuation drills voluntary and continuously in the second year.

【C-5】 Preparation of Awareness Program and Evacuation Drills in Other Areas.

In order to conduct awareness program and evacuation drills in other areas, preparation works are shown in Table 3.3.8. In Phase II, C/P takes a pivotal role of activities and expert team will back up C/P indirectly.

Table 3.3.8 Preparation for Awareness Program and Evacuation Drills in Other Areas

Items	Preparation Works	Remarks
Objective Community	<ul style="list-style-type: none"> Communities or schools are selected on 5 to 10 places in other areas, besides the pilot areas that evacuation drill was conducted in phase I. 	<ul style="list-style-type: none"> Based on the results of social survey and consultation with related agencies. Based on experiences in phase I
Implement Schedule	<ul style="list-style-type: none"> 1 month, June – July 2008 (it is ended by the beginning of monsoon) 	<ul style="list-style-type: none"> Based on experiences in phase I
Program	<ul style="list-style-type: none"> Program is 1 or 2 days for each community Applying program which is reviewed in item [B-4] 	<ul style="list-style-type: none"> Based on experiences in phase I
Role sharing	<ul style="list-style-type: none"> Role sharing of C/P is decided based on the procedure which is reviewed in item [B-4] 	<ul style="list-style-type: none"> Writing clearly in signboard at outdoor and public facilities
Publicity	<ul style="list-style-type: none"> Effective publicity activity will be studied. Participant of evacuation drills shall be recruited. 	<ul style="list-style-type: none"> Based on experiences in phase I

【D-6】 Implementing Awareness Program and Evacuation Drills in Pilot Areas and Other Areas.

Based on the procedure which is developed in 【C-4】 , C/P will conduct awareness program and evacuation drills independently in pilot area and other areas. The Expert Team will be monitored C/P's activities. When evacuation drills are conducted, the member of FRC and related organizations are requested to participate.

【D-7】 Monitoring on Flood Disaster Prevention Action of Inhabitant and Summarizing an Output of Action.

At the pilot areas where awareness program and evacuation drills are conducted, flood disaster prevention action of inhabitant will be monitored in monsoon season. Outputs of the actions are summarized and recommendation of improvement works for future will be proposed.

Table 3.3.9 Evaluation of Flood Disaster Prevention Action in Inhabitant

Items	Contents	Remarks
Work period, person in charge	<ul style="list-style-type: none"> • At evacuation drills • At flood events in monsoon • C/P and Expert Team 	
Survey approach	<ol style="list-style-type: none"> (1) Video shooting from the beginning of evacuation to evacuation center (2) Recording of problems during the evacuation, and photo shoot (3) Recording of time required for evacuation (4) Recording of actions and supports by related organizations (5) Questionnaire survey to participants of evacuation drills (6) Monitoring on flood disaster prevention action of inhabitant and related organizations in monsoon 	<ul style="list-style-type: none"> • Recording the action along the evacuation route at evacuation drills (on a timely basis)
Indicators	<ul style="list-style-type: none"> • Number of people evacuated and time required from the notice of evacuation information to evacuation center • Means of evacuation, change of evacuation route, improvement points • Support system of related organizations • Questionnaire survey to inhabitant 	<ul style="list-style-type: none"> • Recording achievement and reflection • Proposing improvement
Objective area	Pilot area, Area where evacuation drills is conducted	

3.4 Plan of Operation on Output 3

[A-9] Reviewing the Existing Flood Relief Plan for Improvement

Based on “Table 2.2.4 Presumable Problems and Proposed Response on Existing Flood Relief Plan” in section 2.2.3, Expert Team collaborate with FRC to improvement the flood relief plan. Case example of project is shown to Figure 3.4.1.

The participants and activities of FRC based on the flood relief plan in 2007 is shown to Table 3.4.1.

Table 3.4.1 Activities on FRC

Items	Contents
Purpose	<ul style="list-style-type: none"> • Improvement of existing flood relief plan • Confirmation of action taking by the related organizations based on evacuation drill and map exercise
Subject	<ul style="list-style-type: none"> • To arrange the activities and problems of the existing flood relief plan • To exchange opinions with related authorities • To improve the flood relief plan • To conduct a map exercise • To joint a evacuation drill
Participants	Zila Nazim (Chairman), District Coordination Officer, EDOs (Rev, MS, W&S, Edu, Health, CD and Agriculture), City Police Officer, Managing Director WASA, D.O Civil Defense, TMO Rawal Town, DO (Fire Fighting), DDO (Rev) Rawalpindi, Representatives of utility companies, Tehsildars / Naib Tehsildars
Holding term	<ul style="list-style-type: none"> • at the improvement of flood relief plan (Phase I, Phase II) • at implementation the evacuation drill (Phase I, Phase II) • Implementation of map training (Phase I, Phase II)

secretariat	CDG, (supported by expert team)
Chairman	Director (Zila Nazim)
Location	CDGoffice
Bear of cost	Phase I; JICA expert team, Phase II; CDG
The role of secretariat	<ul style="list-style-type: none"> • Information to participants • Coordination of the schedule • Production of distribution references • Record of Discussion
The role of expert team	<ul style="list-style-type: none"> • Support to production of hand out • Support to explanation of the project



Figure 3.4.1 Example of Awareness Flood Risk Management

【B-8】 Familiar with Flood Relief Plan and Conduct Maps Exercise

FRC will be held a map exercise together with CDG based on the revised flood relief plan. Refer to Figure 3.4.2. The participants for the map exercise are the personnel in the organizations of FRC and C/P. The exercise of transmission starts from issuing warning, evacuation order, rescue of inhabitant and opening and operation of evacuation center. The activities of related organizations are confirmed by the participants during the exercise. Expert Team prepares the scenario of the exercise in advance and facilitates the exercise.

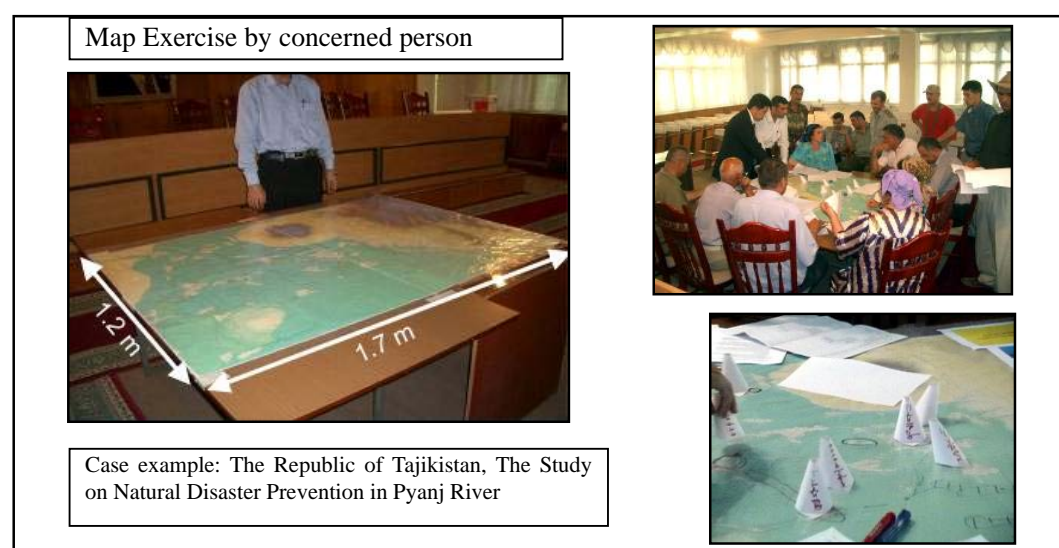


Figure 3.4.2 Example of Map Exercise

[B-9] Monitoring on Flood Disaster Prevention Action on Related Organizations and Sort out Problems

Expert Team will be monitored and conducted a questionnaire survey on flood disaster prevention action to related organizations in monsoon season and sorts out problems.

[C-7] Examination for Flood Relief Plan

Flood relief plan will be revised by CDG with backup of the Expert Team after the consultation with FRC, which regarding the flood disaster prevention action and problems on related organizations in Phase I.

[D-8] Familiar with Revised Flood Relief Plan and Conduct Map Exercise

FRC will be held a map exercise with CDG by using the revised flood relief plan.

[D-9] Reviewing Monitoring and Activities for Flood Disaster Prevention Action on Related Organizations.

Flood disaster prevention action on related organizations is monitored in monsoon season and the outcomes of flood disaster prevention activities are evaluated and recommendation for future improvement plan will be proposed.

3.5 Other Operation on the Project

[C-6] Workshops for Counterpart and Concerned Agencies

Workshop will be conducted for the capacity development of C/P and concerned agencies to implement awareness program and evacuation drills by themselves. The purpose, presentation and participants of the workshop are described in Table 3.51.

Table 3.5.1 Outline of Workshop

Items	Contents
Purpose	<ul style="list-style-type: none"> • C/P and Related organizations in Pakistan can implement awareness program and evacuation drills.
Publish contents	<ul style="list-style-type: none"> • Explanation of procedure of awareness program and evacuation drills based actual operation in Phase I • Play the video movie about the implemented evacuation drill in Phase I • Evaluation of awareness program and evacuation drills in Phase I
Participants	CDG, PMD FFC (C/P) WASA RCB, CDA, TMA, Ministry of Water and Power Other related organizations The number of participants plans around 50 persons.
Frequency of held	<ul style="list-style-type: none"> • Before conducting awareness program and evacuation drills in Phase II
Secretariat	C/P, JICA expert team
Location	Plan of Hotel in Rawalpindi city
The role of secretariat	<ul style="list-style-type: none"> • Information to participants • Coordination of the schedule • Production of distribution references • Record of Discussion

[E-2] Seminar for Related Organizations in Pakistani Side and Other Donor

A seminar for related organizations in Pakistani side and other donor will be hold. Achievement of the Project outputs will be presented. The outline of the seminar is shown in Table 3.5.2.

Table 3.5.2 Outline of Seminar

Items	Contents
Purpose	<ul style="list-style-type: none"> • Summary of outputs in the Project
Publish contents	<ul style="list-style-type: none"> • Explanation the Summary and Outputs of the Project • Evaluation of activities by JICA Expert Team • Evaluation and recommendation of activities by C/P
Participants	CDG, PMD FFC (C/P) WASA RCB, CDA, TMA, Ministry of Water and Power Other donor (related NGO, ADB, etc) Representative of citizen The number of participants plans around 100 persons.
Frequency of held	Before the submission of Final Repot
Secretariat	FFC, JICA Expert Team
Location	Plan of Hotel in Rawalpindi city
The role of secretariat	<ul style="list-style-type: none"> • Information to participants • Coordination of the schedule • Production of hand out • Record of Discussion

3.5.1 C/P Training in Japan

In this Project, two (2) types of training are scheduled for C/P and it aims to promote a project effect. The draft training programs for C/P is shown to Table 3.5.5.

Table 3.5.3 Training Program for C/P in Japan (Draft)

Term	Proposed Time	Status	Target Field	Number	Contents
Phase I	May, 2008 (about 2 weeks)	Training in Japan	Flood forecasting and Warning Evacuation plan and drill	7	<ul style="list-style-type: none"> • Explanation of O/M of Flood forecasting and warning system and inspection of rainfall and water level observation station • Inspection of warning system and explanation of the procedure and guideline. • Explanation of activities for awareness program by using district • Explanation of printed materials and method on hazard map and inspection of the site (hazard zone or evacuation center) • Inspection of evacuation drill, workshop of awareness program • Role of local government and coordination unit for flood risk management
Phase I	October, 2008(around 1 month)	Training in Japan	Hydrology	2	<ul style="list-style-type: none"> • Lecture for basic hydrology • Drill for runoff model
Phase II	May, 2009 (about 2 weeks)	Training in Japan	Flood forecasting and Warning Evacuation plan and drill	7	<ul style="list-style-type: none"> • Explanation of O/M of Flood forecasting and warning system and inspection of rainfall and water level observation station • Inspection of warning system and explanation of the procedure and guideline. • Explanation of activities for awareness program by using district • Explanation of printed materials and method on hazard map and inspection of the site (hazard zone or evacuation center) • Inspection of evacuation drill, workshop of awareness program • Role of local government and coordination unit for flood risk management

3.5.2 Reporting

In this Project, the Expert Team in cooperating with C/P will prepare and submit the following reports to the Pakistani side.

Table 3.5.4 Reports

Phase	Report	Timing	Number of Copies to the Pakistani side
Phase I	1. Inception Report	December, 2007	English 30
	2. Progress Report 1	June, 2008	English 30
	3. Interim Report	December 2008	English 30
Phase II	4. Progress Report 2	June, 2009	English 30
	5. Draft Final Report	October, 2009	English 30
	6. Final Report	December, 2009	English 30

CHAPTER 4 MANAGEMENT OF THE PROJECT

4.1 Administration of the Project

FFC will be responsible for administration and coordination of the project as a leading Counterpart organization. CDG and PMD will be principal counterparts which will accept technical transfers and primarily carry out the project in cooperation with Japanese experts and other related organizations.

Following organizations will be members of the Joint Coordination Committee (hereinafter referred to as "JCC"). Other eligible organizations will be notified to JICA by FFC before the commencement of the Project, if any.

C/P and JICA Expert Team will hold monthly meeting for smooth implementation of the Project. Moreover, C/P and JICA Expert Team should be evaluated the Project when the need arises. The role of C/P and JICA Expert activities are shown to attached "Annex 3".

4.2 Implementing Organization

Organization chart for the Project is shown to Figure. 4.2.1.

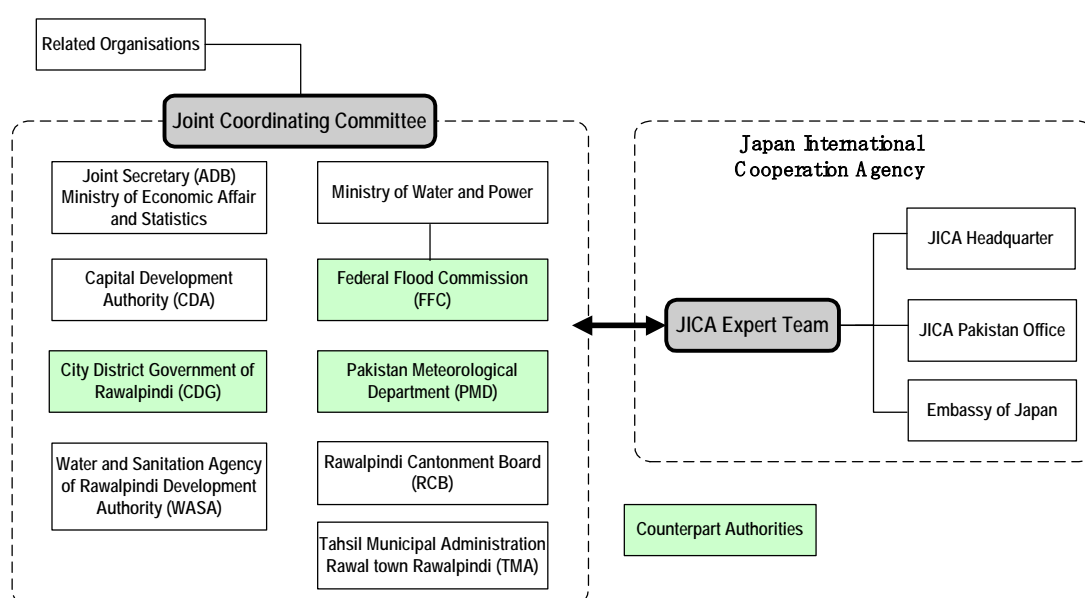


Figure 4.2.1 Organization Chart

4.3 Joint Coordination Committee (JCC)

For the effective and successful implementation of the Project, JCC will be established in order to fulfill the following function, with coordination and cooperation with flood relief committee;

1. To review the progress of the Project
2. To exchange views and ideas on major issues which arise during the implementation period of the Project.
3. To evaluate PDM during the course of the Project and suggest revision, if necessary.
4. Any other related issue

The chairperson will be Chief Engineer (Flood), Federal Flood Commissions and will bear overall responsibility for the administration and implementation of the Project

The members of the Joint Coordination Committee (JCC)

- Chairman of FFC
- Joint Secretary (ADB/Japan) / Representative of Economic Affairs Division, Ministry of Economic Affairs and Statistics.
- Deputy Secretary/ Representative of Ministry of Water and Power.
- District Coordination Officer/ Representative of City District Government
- Director General/ Representative of Pakistan Meteorological Department
- Tehsil Municipal Officer/ Representative of Tehsil Municipal Administration Rawal Town Rawalpindi
- Member Planning/ Representative of Capital Development Authority
- Chief Executive Officer/ Representative of Rawalpindi Cantonment Board
- Managing Director/ Representative of Water and Sanitation Agency of Rawalpindi Development Authority
- Representative of other related organizations.

Member on Japanese side

- Resident Representative/Representative of Pakistan Office, JICA
- JICA Experts
- Officials, Embassy of Japan (Observer)
- Other personnel recommended by JICA

JCC meeting will be held in the contents of Table 4.3.1.

Table 4.3.1 JCC Meeting

Item	Joint Coordination Committee: JCC
Purposes	<ul style="list-style-type: none"> • Confirmation of the progress of the Project • Discussion of implementation problems
Participants	CDG, PMD FFC (C/P) WASA RCB, CDA, TMA, Ministry of Water and Power
Frequency of held	• Submission of Project Report (IC/R, PR/R(1), IT/R, PR/R(2), DF/R)
Secretariat	FCC, JICA Expert Team
Chairman	Chairman of Federal Flood Committee (FFC)
Location	C/P office
The role of secretariat	<ul style="list-style-type: none"> • Coordination of agenda • Information/communication to participants • Coordination of the schedule • Production of distribution references • Record of Discussion

4.4 Collaborative Management with C/P

Basic police for the management of activities will be based on the approved PDM and it shall be managed by C/P and JICA. PDM will be modified, if any change of pre-conditions arises, with discussion the concerned organizations at once.

4.5 Pakistani Counterpart

1. Project Director: Chief Engineer (Flood) of FFC
2. Project Manager: District Coordination Officer of CDG
3. Counterpart staff
 - (1) Flood Risk Management Planner from FFC
 - (2) Flood Risk Management Planner from CDG
 - (3) Flood Risk Management Planner from PMD
 - (4) Community mobilizer from CDG (Civil Defense)
 - (5) Community mobilizer from CDG (Rescue 1122)
 - (6) Hydrologist from FFC
 - (7) Hydrologist from PMD
 - (8) Meteorologist from PMD

4.6 Schedule of JICA Expert

The member of JICA Expert and the assignment schedule is shown to follow;

Table 4.6.1 The Member of JICA Expert Team

Name	Person in charge
Mr. KAKU Shuji	Leader/Early Warning and Evacuation Planning
Mr. HAMADA Yuichiro	Community-Based Disaster Management
Mr. MITSUKURA Makoto	Hydrology
Mr. SASAHARA Takeshi	Flood Forecasting and Warning System
To be named	Flood Disaster Management Planning
Mr. ONUMA Takashi	Coordinator

Field	Name	Phase i												Phase ii												
		2007	2008											2009												
		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Leader/ Early Warning and Evacuation Planning	KAKU Shuji	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Community-Based Disaster Management	HAMADA Yuichiro		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Hydrology	MITUKURA Makoto			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Flood Forecasting and Warning System	SASAHARA Takeshi		■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Flood Disaster Management Planning	****						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Coordinator	ONUMA Takashi	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Figure 4.6.1 Assignment Schedule

CHAPTER 5 EVALUATION

At the finished the Project, JICA Expert Team collaborate with C/P in evaluation the outputs of technical transfer, extent of purpose achievement and performance of each activities with use PCM method.

5.1 Evaluation of Capacity Development on Overall Project

Capacity development (C/D) has been adopted in this Project. The process of evaluation method is based on 3 levels, which are individuals, organizations and institutions. Evaluation indicator will be based on the agreement of both parties (C/P and JICA Expert). A capacity assessment (draft) and proposed evaluation indicator will be shown in Annex 4. For the individual output, draft evaluation indicators will be listed and shown in next section.

5.2 Evaluation of Each Output

(1) Evaluation of Output 1

To achieve Output 1, the problem of flood forecasting and warning system related to PMD and CDG will be clear and it draw up a training plan for C/P personnel to improve the problem. At this moment, activities and draft indicators for C/D of PMD are shown in Table 5.2.1.

Table 5.2.1 Activities and Draft Indicators of Output 1

Activities	Working contents	Draft Indicators
1-1. Holding lectures on basic knowledge of runoff mechanism to engineers.	<p>【B-3】 Implementation of Training for Personnel in PMD (continuation)</p> <p>【D-3】 Implementation of Training for Personnel in PMD (continuation)</p>	<p>【B-3】 Did they understand the basic concept of the water circulation?</p> <p>Did they understand the runoff mechanism?</p> <p>【D-3】 The number of executed flow rate observation</p>
1-2. Conducting exercises on operation of flood simulation model.	<p>【A-0】 Evaluation of Present Condition for Flood Forecasting and Warning System (FFWS) (pre-conditions)</p> <p>【A-3-2】 Implementation to Practices of Flood Simulation Model</p> <p>【B-4】 Implementation of Practice on Flood Simulation Model (continuation)</p> <p>【C-2】 Improving Parameters of the Flood Simulation Model</p> <p>【D-4】 Implementation of Practice on Flood Simulation Model (continuation)</p> <p>【B-2】 Lecture on OM of Forecast and Warning System</p> <p>【D-2】 Lecture on OM of Forecast and Warning System</p>	<p>【A-0】 Did the accurate operation procedure is implemented?</p> <p>【A-3-2】 The number of re-simulation of flood in 2007 by C/P themselves.</p> <p>【B-4】 The number of re-simulation of flood in 2008 by C/P themselves.</p> <p>【C-2】 Did it understand the improvement of the parameter of flood forecasting model?</p> <p>【D-4】 Did it evaluate the appropriation of newly proposed warning criteria?</p> <p>【B-2】 Did it manage the O/M of flood forecasting and warning system? The number of inspection and items.</p> <p>【D-2】 Did it manage the O/M of flood forecasting and warning system? The number of inspection and items.</p>
1-3. Improving parameters of the flood simulation model.	<p>【A-3-1】 Analysis on Meteorology/ Hydrology Data</p> <p>【B-3】 Implementation of Training for Personnel in PMD (continuation)</p> <p>【D-3】 Implementation of Training for Personnel in PMD (continuation)</p>	<p>【A-3-1】 Did it correctly understand the purpose of observation? Did it understand the method of flow rate observation? The number of participants on lecture</p> <p>【B-3】 Did it execute the flow rate observation by C/P themselves under</p>

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		<p>lectured JICA Expert? The number of participants and executed time on practice of flow rate observation 【D-3】 The number of practice of flow rate observation by C/P themselves.</p>
1-4. Accumulation of meteorological/hydrological data obtained from the warning system.	【A-3-1】 Analysis on Meteorology/Hydrology Data	<p>【A-3-1】 Did it evaluate the data? Did it understand the factor of error? The number of participants on lecture</p>
1-5. Reviewing criteria for the warning.	<p>【A-2】 Identified PMD problem and planning training schedule 【A-3-1】 Analysis on Meteorology/Hydrology Data 【B-5】 Monitoring on Flood Disaster Prevention Action on PMD during Monsoon Season and sort out of Problems 【C-3】 Verification and Improvement of Flood Warning Code. 【D-5】 Monitoring on Flood Disaster Prevention Action of PMD during Monsoon Season and Summarizing an Output of Action.</p>	<p>【A-3-1】 Did it implement the announce of Warning based on operation manual produced by FFWS Project? 【B-5】 Did it implement the announce of Warning in flood terms of 2008 based on operation manual produced by FFWS Project? 【C-3】 Did it understand the differences between newly proposed warning criteria and present waning criteria? 【D-5】 Did it implement the announce of Warning in flood terms of 2009 based on operation manual produced by FFWS Project?</p>

Note : [] ; Working matter on Implementation Flowchart of the Project
 [] : Alphabet is shown to term of each activities. A: 1st, B; 2nd, C; 3rd, D; 4th Field Works in Pakistan

(2) Evaluation of Output 2

To achieve Output 2, activities and draft indicators of the flood risk awareness and C/D on evacuation for citizen and related authorities are shown in Table 5.2.2.

Table 5.2.2 Activities and Draft Indicators of Output 2

Activities	Working contents	Draft Indicators
2-1. Conducting social survey.	【A-4】 Conducting Social Survey	
2-2. Preparing hazard maps.	【A-6】 Drawing up Draft Hazard Maps	【A-6】 Did it understand a hazard map
2-3. Select pilot areas.	【A-7】 Selection of Pilot Areas	
2-4. Developing manual for evacuation drill.	【A-5】 Collection of the Data for Hazard Maps and Evacuation Plan 【C-4】 Provide Procedure for Conducting Awareness Program and Evacuation Drills	【C-4】 Produce of implement procedure conducting awareness program and evacuation drills
2-5. Conducting awareness programs and evacuation drills in the pilot areas.	【A-8】 Prepare to Conducting Awareness Program and Evacuation Drills in Pilot Areas.	【A-8】 Did it understand the contents of evacuation drill Did it organize to implementation organization for evacuation drill
2-6. Reflecting lessons learnt from activities in the pilot areas to the manual and plan.	【B-6】 Implementing Awareness Program and Evacuation Drills in Pilot Areas. 【B-7】 Monitoring on Flood Disaster Prevention Action of Inhabitant in Pilot Areas and Sort out Problems	【B-6】 Number of participants on awareness program Number of participants on evacuation drill
2-7. Holding workshops on how to facilitate awareness programs and drills for counterpart agencies	【C-6】 Conduct workshops for counterpart and concerned agencies	
2-8. Conducting trainings on how to facilitate awareness programs and drills for counterpart agencies.	【C-5】 Preparation of Awareness Program and Evacuation Drills in Other Areas.	【C-5】 Implementation of awareness program in out areas. Did it understand the contents of evaluation drill Did it organize to implementation organization for evacuation drill
2-9. Conducting awareness programs and evacuation drills in other areas.	【D-6】 Implementing Awareness Program and Evacuation Drills in Pilot Areas and Other Areas.	【D-6】 Number of participants on awareness program Number of participants on evacuation drill
2-10. Reflecting lessons learnt from activities in other areas to the manual and plan	【D-7】 Monitoring on Flood Disaster Prevention Action of Inhabitant and Summarizing an Output of Action.	【D-7】 Did it understand the contents of evaluation drill The number of person and reaching time until evacuation center

Note : 【 】 ; Working matter on Implementation Flowchart of the Project

【 】 : Alphabet is shown to term of each activities. A: 1st, B: 2nd, C: 3rd, D: 4th Field Works in Pakistan

(3) Evaluation of Output 3

To achieve Output 3, activities and draft indicators for C/D of flood risk management and awareness of related authorities are shown Table 5.2.3.

Table 5.2.3 Activities and draft Indicators of Output 3

Activities	Working contents	Draft Indicators
3-1. Reviewing institutional structure of flood relief committee.	【A-9】 Reviewing the Existing Flood Relief Plan for Improvement	【A-9】 To hold of FRC and the number of participants
3-2. Revising flood relief plan through flood relief committee.	【B-8】 Familiar with Flood Relief Plan and Conduct Maps Exercise 【C-7】 Examination for Flood Relief Plan	【B-8】 To hold of FRC and the number of participants 【C-7】 To hold of FRC and the number of participants
3-3. Conducting operational drills among related organizations based on the flood relief plan.	【D-8】 Familiar with Revised Flood Relief Plan and Conduct Map Exercise	【D-8】 The number of map exercise and the number of participants
3-4. Monitoring operation of related organizations during monsoon season.	【B-9】 Monitoring on Flood Disaster Prevention Action on Related Organizations and Sort out Problems	
3-5. Reviewing response of related organizations to floods after monsoon season through flood relief committee.	【D-9】 Reviewing Monitoring and Activities for Flood Disaster Prevention Action on Related Organizations.	

Note : 【 】 ; Working matter on Implementation Flowchart of the Project

【 】 : Alphabet is shown to term of each activities. A: 1st, B; 2nd, C; 3rd, D; 4th Field Works in Pakistan

ANNEX 1 Minutes of Meeting Between Japan International Cooperation Agency and Authorities Concerned of the Government of Islamic Republic in Pakistan for the Project for the Strengthening of Flood Risk Management in Lai Nullah Basin.

ANNEX 2 Record of Discussions Between Japan International Cooperation Agency and Authorities Concerned of the Government of Islamic Republic of Pakistan on Japanese Technical Cooperation for the Project for the Strengthening of Flood Risk Management in Lai Nullah Basin

Annex 3 Proposed Expert team and C/P personnel in charging works.

Phase	Speciality	Photo	Name	Affiliation	2007	2008												2009												
					12	Phase 1						Phase 2						12	Phase 1						Phase 2					
Phase 1	Leader/Early Warning and Evacuation Planning		KAKU Shuji	CTII	1.0	2.0	1.0	1.5	1.5		1.0	1.5	3.5	1.0																
	Community-Based Disaster Management		HAMADA Yuichiro	CTII		3.0	3.0					3.0	3.5																	
	Hydrology		MITSUKURA Makoto	CTII		1.0		1.0					1.0																	
	Flood Forecasting and Warning System		SASAHARA Takeshi					1.0																						
	Flood Disaster Management Planning																													
	1. Chief Engineer (flood) of FFC																													
	2. District Coordination Officer of CDG																													
	(1) Flood Risk Management Planner from FFC																													
	(2) Flood Risk Management Planner from CDG																													
	(3) Flood Risk Management Planner from PMD																													
(4) Community mobilizer from CDG																														
(5) Community mobilizer from CDG																														
(6) Hydrologist from FFC																														
(7) Hydrologist from PMD																														
(8) Meteorologist from PMD																														
Phase 2	Term				2007	2008												2009												
	Activities				12	Phase I						Phase II						12	Phase I						Phase II					
	1st Home Work in Japan																													
	Examination of Implementation plan																													
	Inception Report																													
	[A] 1st Field Work in Pakistan																													
	[A-0] Evaluation of Present Condition for Flood Forecasting and Warning System (FFWS) (pre-condition)																													
	[A-1] Inception Report																													
	[A-2] Identified PMD Problem and Planning Training Schedule																													
	[A-3-1] Analysis on Meteorology/ Hydrology Data																													
	[A-3-2] Implementation to Practices of Flood Simulation Model																													
	[A-4] Conducting Social Survey																													
	[A-5] Collection of the Data for Hazard Maps and Evacuation Plan																													
	[A-6] Drawing up Draft Hazard Maps																													
	[A-7] Selection of Pilot Areas																													
	[A-8] Prepare to Conducting Awareness Program and Evacuation Drills in Pilot Areas.																													
	[A-9] Reviewing the Existing Flood Relief Plan for Improvement																													
	Progress Report(1)																													
	2nd Home Work in Japan																													
	Progress Report(1)																													
	[B] 2nd Field Work in Pakistan																													
	[B-1] Progress Report(1)																													
	[B-2] Lecture on OM of Forecast and Warning System																													
	[B-3] Implementation of Training for Personnel in PMD (continuation)																													
	[B-4] Implementation of Practice on Flood Simulation Model (continuation)																													
	[B-5] Monitoring on Flood Disaster Prevention Action on PMD during Monsoon Season and sort out of Problems.																													
	[B-6] Implementing Awareness Program and Evacuation Drills in Pilot Areas.																													
	[B-7] Monitoring on Flood Disaster Prevention Action of Inhabitant in Pilot Areas and Sort out Problems																													
	[B-8] Familiar with Flood Relief Plan and Conduct Maps Exercise																													
	[B-9] Monitoring on Flood Disaster Prevention Action on Related Organizations and Sort out Problems																													
Interim Report/ Progress report of the Project																														
3rd Home Work in Japan																														
Interim Report/ Progress report of the Project																														
[C] 3rd Field Work in Pakistan																														
[C-1] Interim Report																														
[C-2] Improving Parameters of the Flood Simulation Model																														
[C-3] Verification and Improvement of Flood Warning Code.																														
[C-4] Provide Procedure for Conducting Awareness Program and Evacuation Drills																														
[C-5] Preparation of Awareness Program and Evacuation Drills in Other Areas.																														
[C-6] Conduct workshops for counter part and concerned agencies																														
[C-7] Examination for Flood Relief Plan																														
Progress Report(2)																														
4th Home Work in Japan																														
Progress Report(2)																														
[D] 4th Field Work in Pakistan																														
[D-1] Progress Report(2)																														
[D-2] Lecture on OM of Forecast and Warning System																														
[D-3] Implementation of Training for Personnel in PMD (continuation)																														
[D-4] Implementation of Practice on Flood Simulation Model (continuation)																														
[D-5] Monitoring on Flood Disaster Prevention Action of PMD during Monsoon Season and Summarizing an Output of Action.																														
[D-6] Implementing Awareness Program and Evacuation Drills in Pilot Areas and Other Areas.																														
[D-7] Monitoring on Flood Disaster Prevention Action of Inhabitant and Summarizing an Output of Action.																														
[D-8] Familiar with Revised Flood Relief Plan and Conduct Map Exercise																														
[D-9] Reviewing Monitoring and Activities for Flood Disaster Prevention Action on Related Organizations.																														
Draft Final Report																														
5th Home Work in Japan																														
Draft Final Report																														
[E] 5th Field Work in Pakistan																														
[E-1] Draft Final Report																														
[E-2] Conduct Workshop for Related Organizations in Pakistani Side and Other Donor																														
6th Home Work in Japan																														
Final Report/ Report of Completion Activities																														
Final Report/ Report of Completion Activities																														

Note : Works in Japan Works in Pakistan Report Main Sub JCC FRC Seminar/ Workshop

Figure Proposed Expert team and C/P personnel in charging works

Annex 4 Draft indicators for the project implementation

Draft check list for capacity assessment at the beginning of the project is shown in Table -1 and the assessment is divided into 3 hierarchies of individual level, organization level and social level. Based on this check list, actual conditions of the project in each hierarchy are understood and also capacities of C/P are evaluated. The capacity development is conducted with setting more concrete improvement (goals) at the next stage.

Table-1 Draft check list of capacity assessment of C/P

Hierarchy	Points of View	Assessment Items	Draft items to be confirmed
Individual	Individual's knowledge, ability, skill, intention and sense of duty	• Knowledge and ability concerning flood forecasting and warning system	• Knowledge level of personnel about flood forecasting warning system and evacuation procedure
		• Knowledge and ability concerning technology	• Knowledge and ability level of personnel about flood mechanism
		• Awareness and sense of duty on governmental roles (accountability)	• How much the problem consciousness and sense of duty of personnel about flood forecasting and warning
Organization	Organization structure, management, leadership, problem consciousness	• Strengthening total management	• Execution of total management of flood disaster prevention activities
		• Definition of segregation of duties	• Definitude of segregation of duties in the organization
		• Coordination with related organizations	• Existence of cooperation and coordination systems with related organizations concerned flood disaster prevention disaster
		• Improvement of communication channel with related organizations	• Definitude of communication channel between related organizations
		• Consciousness of decision maker	• Validity of consciousness of discussion maker and understanding of actual condition
	Manpower	• Understanding of manpower in the organization	• Number of personnel in the organization and adequacy of assignment
		• Understanding of manpower in the related organizations	• Existence of personnel who is familiar with flood disaster prevention activities (list etc.)
	Intellectual asset: information sharing for flood disaster prevention activity	• Management of observed data	• Manners of the management of observed data
		• Archiving observed data	• Items and contents of database
		• Arrangement and provision of vulnerable area information	• Situation on publicity and provision of flood information to the related organizations and inhabitants
		• Publicity of the procedure of evacuation and hazard maps	• Existence of evacuation procedure and hazard maps
	Physical asset: financial, facilities and equipment	• Financial measures (funds)	• Manners of decision on financial measures for flood disaster prevention activities in country, province and district
		• Maintenance of rainfall gauge, water level gauge and warning station	• Maintenance frequency of rainfall gauge, water level gauge and warning station
		• Maintenance of equipment of flood forecasting warning system	• Maintenance frequency of equipment of flood forecasting warning system

Hierarchy	Points of View	Assessment Items	Draft items to be confirmed
		<ul style="list-style-type: none"> Maintenance of the equipment of telecommunication and spare parts 	<ul style="list-style-type: none"> Maintenance frequency of the equipment of telecommunication and spare parts
Society	Legal framework, criterion	<ul style="list-style-type: none"> Effectiveness of legal framework 	<ul style="list-style-type: none"> Strategy to enhance effectiveness of legal framework
		<ul style="list-style-type: none"> Effectiveness of the criteria of warning and evacuation 	<ul style="list-style-type: none"> Existence of correct knowledge to set the criteria of warning and evacuation
	Policies, plan	<ul style="list-style-type: none"> Policies for flood disaster prevention activities 	<ul style="list-style-type: none"> Existence of effective policies in nation or capital region level for flood disaster prevention activities
		<ul style="list-style-type: none"> Flood relief plan (community level) 	<ul style="list-style-type: none"> Effectiveness of flood relief plan
Social organization	<ul style="list-style-type: none"> Capability of flood risk management of the community 	<ul style="list-style-type: none"> Existence of voluntary activities and systems in communities for awareness activities 	
	<ul style="list-style-type: none"> Education of awareness and flood fighting 	<ul style="list-style-type: none"> Existence of education system of awareness and flood fighting in community, private corporation and school 	

The items of concrete capacity development in Table-1 are regularly evaluated the progress with indicators in Table-2. The impeditive problems are found out on the project implement and the approach on capacity development is reviewed if there are controversial objects.

Table-2 Draft indicators on capacity assessment

Hierarchy	Points of View	Draft goals	Draft indicators
Individual	Individual's knowledge, ability, skill, intention and sense of duty	<ul style="list-style-type: none"> Improvement of knowledge and ability concerning flood forecasting and warning system 	<ul style="list-style-type: none"> Number of participation to the training on flood simulation model
		<ul style="list-style-type: none"> Improvement of knowledge and ability concerning technology 	<ul style="list-style-type: none"> Number of participation to the training on flood simulation model, criteria for the warning and hydrology
		<ul style="list-style-type: none"> Improvement of awareness and sense of duty on governmental roles 	<ul style="list-style-type: none"> Number of participation to evacuation drills
Organization	Organization structure, management, leadership, problem consciousness	<ul style="list-style-type: none"> Strengthening total management 	<ul style="list-style-type: none"> Revised flood relief plan Number of participation to evacuation drills
		<ul style="list-style-type: none"> Definition of segregation of duties 	<ul style="list-style-type: none"> Revised flood relief plan Number of participation to evacuation drills Number of FRC holding
		<ul style="list-style-type: none"> Coordination with related organizations and improvement of communication channel 	<ul style="list-style-type: none"> Revised flood relief plan Number of FRC holding
		<ul style="list-style-type: none"> Understanding of problems on system operation and the causes 	<ul style="list-style-type: none"> Revised flood relief plan Number of FRC holding
		<ul style="list-style-type: none"> Consciousness of decision maker 	<ul style="list-style-type: none"> Number of FFC and FRC holding
	Manpower	<ul style="list-style-type: none"> Understanding of manpower in the organization 	<ul style="list-style-type: none"> Number of personnel and assignments Number of implementation of evacuation drills Revised flood relief plan

		<ul style="list-style-type: none"> • Understanding of manpower in the related organizations 	<ul style="list-style-type: none"> • Number of participants from C/P and related organizations on evacuation drills and awareness activities
		<ul style="list-style-type: none"> • Understanding of condition on development of human resources and training 	<ul style="list-style-type: none"> • Number of implementation of various trainings and the participants
	Intellectual asset: information sharing for flood disaster prevention activity	<ul style="list-style-type: none"> • Management of observed data 	<ul style="list-style-type: none"> • Number of implementation of training of the criteria fro the warning and hydrology and the participants
		<ul style="list-style-type: none"> • Archiving observed data 	<ul style="list-style-type: none"> • Existence of database, • Number of implementation of training of hydrology and the participants
		<ul style="list-style-type: none"> • Arrangement and provision of vulnerable area information (publicity) 	<ul style="list-style-type: none"> • Developed hazard maps
		<ul style="list-style-type: none"> • Publicity of the procedure of evacuation and hazard maps 	<ul style="list-style-type: none"> • Developed hazard maps • Number of implementation of evacuation drills
	Physical asset: financial, facilities and equipment	<ul style="list-style-type: none"> • Net budget, Financial measures 	<ul style="list-style-type: none"> • Budget allocation, existence of subsidy and fund
		<ul style="list-style-type: none"> • Maintenance of rainfall gauge, water level gauge and warning station 	<ul style="list-style-type: none"> • Existence of O/M manual and revision • Number of equipment maintenance
		<ul style="list-style-type: none"> • Maintenance of equipment of flood forecasting warning system 	<ul style="list-style-type: none"> • Existence of O/M manual and revision • Number of equipment maintenance
		<ul style="list-style-type: none"> • Maintenance of the equipment of telecommunication and spare parts 	<ul style="list-style-type: none"> • Existence of O/M manual and revision • Number of equipment maintenance
Society	Legal framework, criterion	<ul style="list-style-type: none"> • Effectiveness of legal framework 	<ul style="list-style-type: none"> • Enforcement of concerned laws • Revised flood relief plan • Number of implementation of evacuation drills
		<ul style="list-style-type: none"> • Effectiveness of the criteria of warning and evacuation 	<ul style="list-style-type: none"> • Number of participation to the training on criteria for the warning • Revised flood relief plan
	Policies, plan	<ul style="list-style-type: none"> • Policies for flood disaster prevention activities 	<ul style="list-style-type: none"> • Revised flood relief plan
		<ul style="list-style-type: none"> • Flood relief plan (community level) 	<ul style="list-style-type: none"> • Revised flood relief plan
	Social organization	<ul style="list-style-type: none"> • Capability of flood risk management of the community 	<ul style="list-style-type: none"> • Developed hazard maps • Number of participation to evacuation drills
		<ul style="list-style-type: none"> • Education of awareness and flood fighting 	<ul style="list-style-type: none"> • Developed hazard maps • Number of participation to evacuation drills

