CHAPTER 3 GOLESTAN FOREST PARK DISASTER MANAGEMENT PLAN

3.1 Improvement Plan on Flood Forecasting and Warning System

3.1.1 Identification of High Risk Areas

The Madarsoo basin extends from the North Khorasan Province to the Golestan dam, covering a total of 2,340 km^2. There are hundreds of villages scattered over the river basin, and thousands of tourists visit in the Golestan Forest National Park in summer. There are many passengers are passing through the National Park Road toward Mashhad. On the other hand, a considerable number of villages, the roads along the Madarsoo River and the tourist spots are exposed to a rain-induced disaster such as flood, due to its topographical, geological and meteorological conditions.

The purpose of Flood Forecasting and Warning System (FFWS) is to evacuate those inhabitants and tourists in the potential disaster areas safely during such disasters. However, the problem is how to deal with those potential disaster areas scattered all over the basin within a limited investment. Therefore, prioritization is inevitable to maximize the benefits from the master plan by investing more to high-risk areas that is named priority project in the feasibility study. In this sense, such high-risk areas must be identified through a comprehensive examination in the past disasters and damage potentials comprehensively.

Therefore the Golestan Forest Park was selected as high-risk area that will be targeted for the priority project because of the most serious damages of human lives in the past floods and the most effective and suitable by means of early flood warning and evacuation system.

3.1.2 Improvement Plan

Proposed Flood Information Flow

To reinforce the existing flood information dissemination organization, the following flood information organization is proposed. Main points of reinforcement are:

(1) Reinforcement of data collection network,

(2) Establishment of Flood Forecasting and Warning Center (FFWC),

(3) Improvement of the data processing system,

(4) Establishment of the flood information monitoring network, and

(5) Installation of the flood warning posts.

To consider the abovementioned indispensable points, flood information flow is proposed as presented in Fig. PII.17.

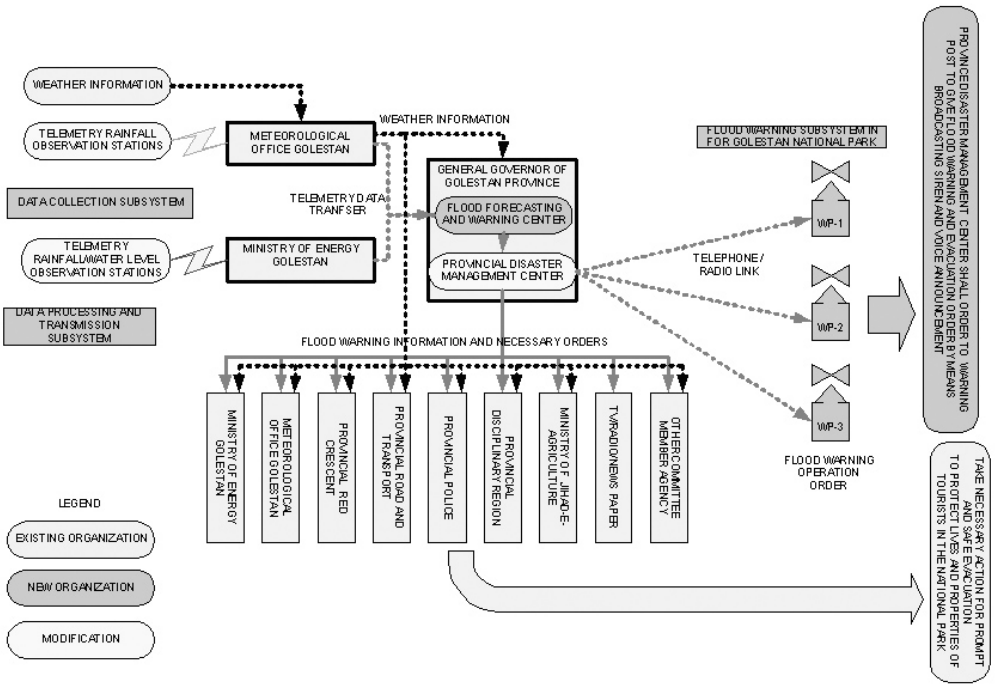


Fig. PII.17 Proposed Flood Information Flow

Establishment of Flood Forecasting and Warning Center (FFWC)

There are two online operational systems for different purposes. In view of the FFWS establishment, integration of collected data is urgently needed. In this connection, establishment of FFWC is proposed at PDMC. Main purpose of FFWC is to disseminate reliable flood warning information to the public and related agencies as earlier as possible. FFWC shall receive telemetry rain gauge data from MET and MOE and shall conduct data processing, editing, and storing the processed data into the Web server for disseminating flood information for concerning agencies.

Improvement of Telemetry Gauging Station Network

There are generally two directions towards improvement of the present online data collection system. The first one is extension of the covering area, which will be attained by adding rainfall and water level gauging stations. The second one is modernization of equipment including telemetry system.

(1) Installation of New Gauging Stations

Installation of new gauging stations is essential to minimize the blind areas. It brings more flood information and leads to enhancement of reliability of the system. However, the more stations will be installed, the more cost will increase. The new stations should be limited in minimum number, considering hydrological requirements and locations of the selected high-risk areas. There was no rain gauge station in the Upper Madarsoo River and its tributaries. At least 4 new gauging stations are necessary to ensure more accurate FFWS operation. These are Sefid Dally, Haghaikhajeh, Nardin and Soodaghlan.

Regarding water level stations, tow water level stations must be installed upstream of every high-risk area for floods. These are located along the Gelman Darreh and Ghiz Ghaleh. A new water level station along the Gelman Darreh must be installed at least 10 km upstream from the corresponding high priority area to ensure minimum lead-time of one hour that allows consecutive actions from observation and data collection to evacuation.

(2) Modernization of Equipment

Existing online data collection system is one of the telemetry data collection system. However, a big gap still exists between the present manual online system and the fully automatic system in terms of technology and cost. The present system has commenced in the Madarsoo River basin just a few years ago, and it seems to be very early to introduce a fully automatic system. In this context, three options upgrading from the existing manual system to fully automatic system are conceived and compared for determining the development level of the hydrological observation, data collection and flood warning subsystem in this section.

Information Exchange between Related Organizations

MOE and MET have their own meteo-hydrological observation networks, telecommunication measures and/or technology and equipment for data analysis. These organizations could provide to FFWC useful information on weather, rainfall, river condition and disaster so that it helps FFWC forecast floods very much.

(1) Collaboration with MET

MET is only one organization that is responsible for weather forecasting in the country. The information from this organization is very precious for FFWS. In this context, collaboration with MET should be strengthened to collect more information including satellite pictures. In return, FFWC can provide their real-time hydrological data that must be valuable to MET as well.

(2) Information Exchange with Related Organizations

Traffic Police, Red Crescent Society, DOE National Park Office and Ministry of Road and Transport can possibly play a role of telemetry gauging function. They equip with a VHF radiotelephone. These organizations shall exchange the river and road conditions including flood information with FFWC each other in the flood time.

FFWC shall prepare the flood information and distribute it to the abovementioned organizations via Internet or suitable media.

Data Analysis and Forecasting

According to the MOE guideline, MOE Golestan is to make hydraulic and hydrological analysis to interpret rainfall and water level data, and then to distribute flood information/ notices to PDMC. The present early flood warning system could not reach the satisfactory level, and no scientific analysis other than conversion from water level to discharge has been done. Thus, upgrading of this subsystem is of first priority.

(1) Data Analysis

Rainfall data are automatically processed into accumulated rainfalls, rainfall intensities and basin mean rainfalls, and water level data are also automatically converted to discharges based on the Manning's Formula. The processed data are automatically stored in a database together with the observed data. The database is renewed every time when new data are collected from the stations.

The processed data are automatically visualized in a variety of maps, graphs and tables. In these maps and graphs, the processed rainfalls and discharges are compared with two alert levels categorized by seriousness of the flood in terms of magnitude of rainfall. The two levels are pre-alert and alert rainfalls that are used for judgment of announcement of the flood notices.

(2) Flood Forecasting

In the Madarsoo basin, rainfall is so intensive in space and time, and a phenomenon is changeable so fast. Available data is also very scarce. Under these circumstances, a forecasting model can be elaborated for the flood. However, there might be possible

risk to rely on the forecasting models so that the actual observed data (not forecasted results) should be used for decision-making such as announcement of flood notices.

Setting of Warning Level and Relevant Activities

(1) Setting of Warning Level

The setting of warning level is a basic issue of the FFWS. Warning water level and rainfall can be detected through the telemetry data and give alarm on the display and sound. Gelman Darreh, Dasht Bridge and Tangrah water level gauging stations provide information on water level. However, flood-traveling time from Gelman Darrh to Dasht Bridge (2.5 hours) and to Tangrah (around 4 hours) is short. It is not enough time for evacuation operation. Therefore, warning rainfall level shall be employed for flood forecasting.

(2) Distribution of Flood Information/Notice

Processed flood information and flood notice is basically distributed to related organizations in accordance with the authorized routes as shown in Table PII.13.

Table PII.13 Flood Information/Notices Distribution

Information/Notice	Content	Recipient
Flood Notice	Pre-flood Notice, Flood Notice, and Cancellation of Notices	PDMC, MOE, MET, Red Crescent Society, Traffic Police, MORT, DOE, MOJA, etc.
Flood Information	Visualized Information	

Processed flood information is very helpful to understand the flood notices for the related organizations. Sharing of the same information among these executive organizations contributes to more effective interventions against flood disaster. The reason why the flood information is given directly to PDMC members is that utilization of a computer network is considered as a communication measure to ensure prompt and accurate transmission of enormous graphic data. The chief of PDMC is to issue flood warnings mainly based on the flood notices.

Flood Warning Issuance

PDMC is responsible for security of inhabitants and tourists in his jurisdiction. PDMC finally presses the button of flood warning for evacuation, based on collected information including the flood notices.

(1) Definition of Flood Warnings

Three kinds of warnings, Flood Caution, Direction of Evacuation, and Cancellation of Evacuation are defined below.

Table PII.14 Definition of Flood Warning

Flood Warning	Definition
Flood Caution	To warn inhabitants and tourists that a flood is expected.
Direction of Evacuation	To direct inhabitants and tourists to evacuate to designated places immediately.
Cancellation of Evacuation	To notice inhabitants and tourists that the Direction of Evacuation has been cancelled.

(2) Issuance of Flood Warnings

To judge the issuance of the warnings, technical information is indispensable. In addition, the judgment must be made appropriately and promptly. In this context, the

flood notices announced by FFWC should be referred and connected to the flood warnings as illustrated in the following figure.

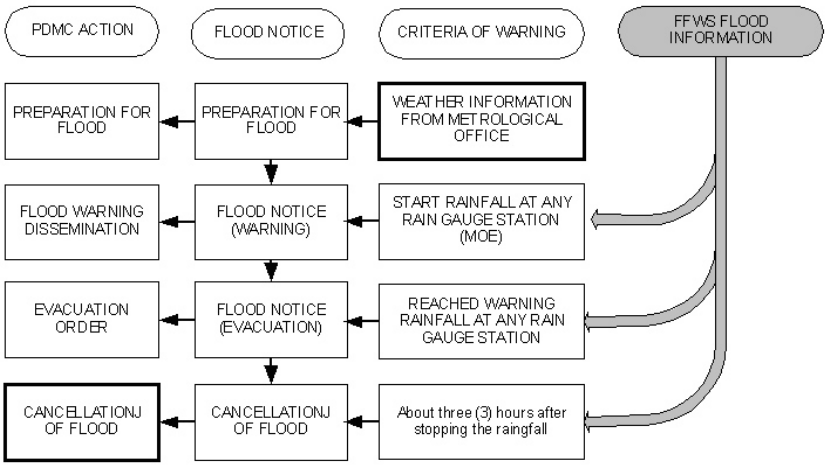


Fig. PII.18 Issuance of Flood Warning

With the above relation, PDMC will be able to judge the issuance of the warnings promptly based on the flood notices. For example, upon receiving flood notice, PDMC can issue Direction of Evacuation to the relevant high-risk areas immediately.

Flood Warning Dissemination

Flood warning shall be promptly and precisely disseminated to inhabitants and tourists in the areas at risk. At the same time, the warning shall be distributed to relevant organizations that might be involved in relief activities.

Mass media such as TV and radio is very effective to disseminate information to numerous individuals at once. FFWC should release necessary flood information to the Medias to be involved in the warning dissemination.

Ordinary telecommunication measures such as telephone and fax and mobile telephone can be applied for the related governmental organizations and mass media that are far from the disaster areas. For the local authorities, the relevant villages, the police, Red Crescent Society and DOE Park office may give them flood information using their VHF radiotelephone network.

An appropriate communication measure including a voice amplifier with a loudspeaker (Warning Post) to disseminate warning to inhabitants and tourists shall be introduced to the selected high-risk areas.

3.1.3 Comparative Study

Comparative study on conceivable equipment options was made for selection of suitable sub-systems: the hydrological observation and data collection sub-system, the data analysis, forecasting, transmission sub-system, and the flood warning sub-system.

In this comparative study, three different development levels are basically considered: namely Option-A is a manual system, Option-B is a semi-automatic system and Option-C is a fully automatic system. For each of the three sub-systems of the proposed FFWS, three options of different development level are comparatively studied.

Alternative Set-up

There might be several alternatives of combinations of the three options conceived for each of the three sub-systems. To facilitate selection of the optimum one, four typical alternatives are set up and presented in summary below.

Table PII.15 Comparison of Four Alternatives

Subsystem / Alternative	Data Collection Sub-system Option			Data Processing Sub-system Option			Flood Warning Sub-system Option			Cost (million Rials)	Warning Accuracy
	A	B	C	A	B	C	A	B	C		
Alternative-1	◎			◎			◎			1,450	Low
Alternative-2		◎			◎			◎		5,000	Medium high
Alternative-3			◎			◎			◎	5,912	High
Alternative-4		◎				◎	◎			2,360	Medium

Selection of Optimum System

It is preferable to select the optimum plan from various aspects as well as the economic aspect. Based on the following reasons, alternative-4 of semi-automatic system is selected as an optimum plan for the priority project.

(1) Alternative-1 based on manual operation is not preferable since the necessary time for system operation from observation to evacuation is limited. However, warning system has a big gap in cost between manual operation and remote control systems.

(2) It may be first time to introduce the flood warning post for the basin. The number of warning post is only three (3). Therefore, manual operation system is most suitable from the economic and technical viewpoints.

(3) As for the alternative-4, there is much gap in the cost in comparison with alternative-2, while there will not be much differences in accuracy and necessary time for system operation. Especially, the necessary time for operation can be remarkably shorten, so that effectiveness of flood forecasting and warning system can be enhanced by both alternatives.

(4) Alternative-4 is regarded as the most economic improvement way through utilization of existing facilities at the maximum.

The components of the selected alternative-4 are briefly explained below.

Data Collection (Hydrological Observation and Data Collection) Sub-system

Existing on-line manual data collection system shall be reinforced as automatic data collection system. Automatic fixed time interval polling system for data collection shall be adapted in addition to the existing system. One-hour rainfall and water level observation shall be made during normal period. Once flood is foreseen, ten minutes observation can be started automatically for the flood analysis purpose. Necessary modification on the data collection software shall be adopted on the existing software. Conceptual network of the proposed data collection sub-system is shown in Fig. PII.19.

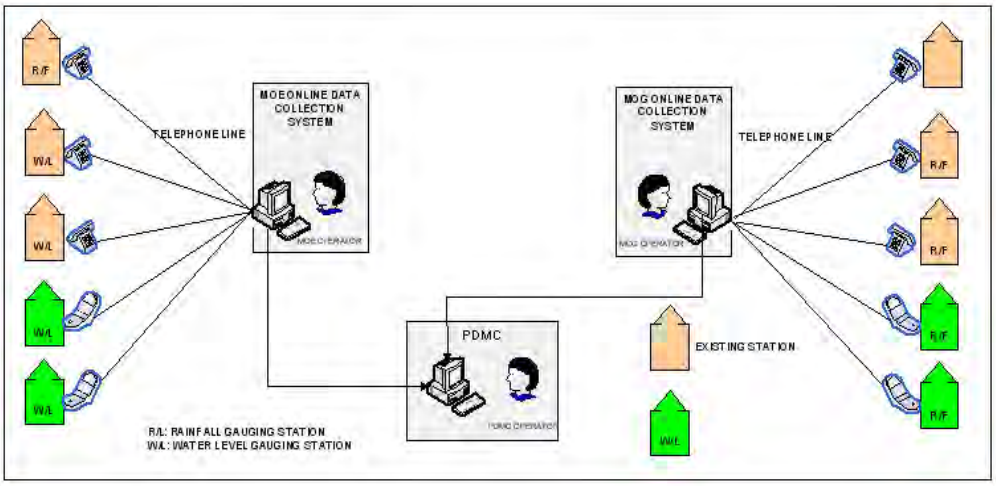


Fig. PII.19 Conceptual Network for Proposed Data Collection Sub-system

Data Processing (Data Analysis, Forecasting and Distribution) Sub-system

A computerized system is introduced to speed up the data processing and to avoid human errors. Regarding equipment for data analysis and forecasting, the following criteria are assumed for designing of the configuration of equipment:

- Data storage capacity for two year hydrological data,
- Operation system of Windows 2000 and XP Professional,
- Installation of application software for hydrological data processing and visualization and forecasting,
- Dual mode operation of PC servers for the backup purpose,
- Display and print distribution in Web style,
- Ethernet LAN network, and
- Easiness of future expansion.

A LAN is established in FFWC for data exchange among the computers. This total computer network consists of one set of PC for telemetry gauging station data collection, data analysis and processing as telemetry control, second PC for the data display and Plasma display panel and peripheral equipment. An UPS is provided to every server and PC against sudden interruption of the commercial power supply.

FFWC and the members will connect through the Internet to deal with many monitoring data/information. A homepage of FFWC is open through a reliable provider. Reliability of Internet providers is still doubtful at present, but it can be optimistically anticipated that the remarkably developing Information Technology can overcome this problem very soon. The related agencies can access the FFWC homepage through the Internet when necessary.

Fig. PII.20 shows the hardware configuration of the proposed network.

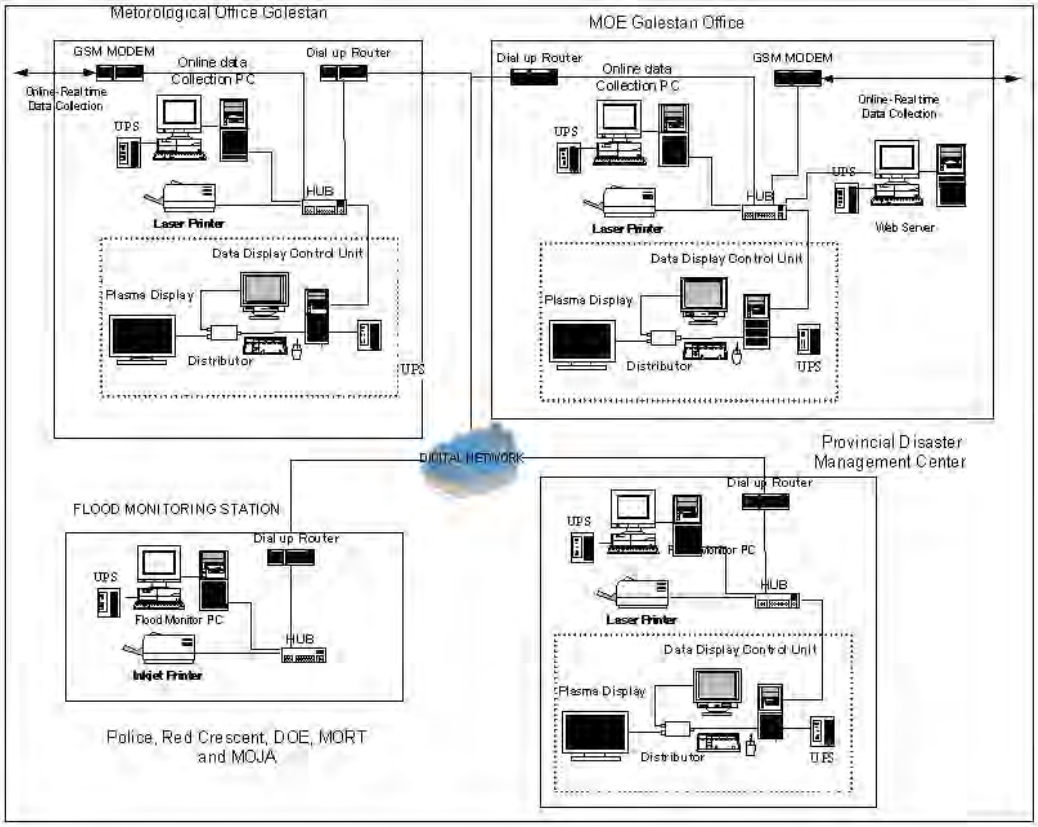


Fig. PII.20 Schematic Diagram for Proposed Data Processing Sub-system

Warnings Dissemination Sub-system

The selected sub-system is manual operation warning post equipment including a voice amplifier with a loudspeaker for broadcasting warnings that is installed at three (3) locations in the Golestan Forest Park. Receiving a flood warning from PDMC through the existing telephone and radiotelephone network to the police and DOE, relevant offices are to broadcast the warning message to inhabitants and/or tourists. Fig. PII.21 shows conceptual network for the proposed sub-system.

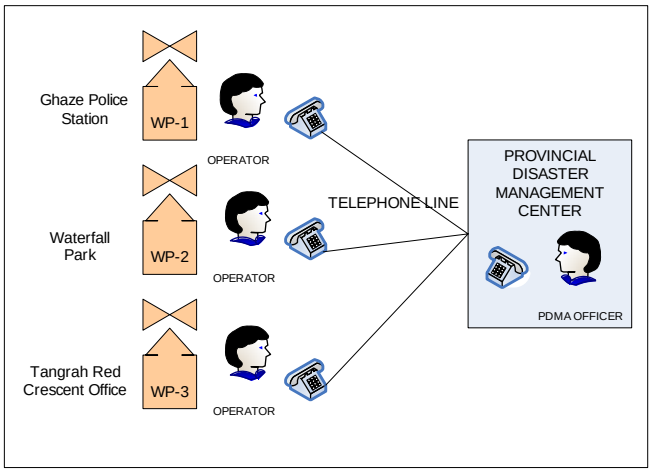


Fig. PII.21 Conceptual Network for Proposed Warning Dissemination Sub-system

3.2 Equipment Plan

3.2.1 System Summary

Based on the selection of optimum system, proposed system for the priority project is summarized in Table PII.16 including functions of stations and the responsible agencies for the improving Flood Forecasting and Warning System Project. Schematic diagram of the total system is shown in Fig. PII.22. The hardware configuration of the system for the data process, analysis and data distribution is already shown in Fig. PII.20.

Table PII.16 System Summary

Station	Function	Organization in charge
1. MET data collection Station		
1.1 Telemetry real time data collection equipment	- Real time data collection - Data processing - Transmit collected data to MOE system - Access the MOE Web server to receive flood information	MET
1.2 Flood monitoring equipment		
2. MET data gauging station		
2.1 Golestan Forest National Park	Automatic rainfall data observation	MET
2.2 Nardin		
2.3 Soodaghlan		
2.4 Haghaikhajeh		
2.5 Sefid Dally		
3. MOE data collection station		
3.1 Telemetry real time data collection equipment	Real time data collection	MOE
3.2 Data display equipment	Display flood information on plasma display	
4. MOE hydro data gauging station		
4.1 Tangrah water level	Automatic real time gauging station including 2 new water level gauging stations	MOE
4.2 Dasht water level		
4.3 Dasht rainfall		
4.4 Dasht-e-Shad rainfall		
4.5 Gelman Darreh water level		
4.6 Ghyz Galeh water level		
5. PDMC-FFWC Equipment		
5.1 Flood forecasting & warning center equipment	Receive telemetry data from MOE and MET data processing	PDMC (FFWC)
5.2 Web server equipment	Dissemination of flood information to related agencies through Internet	
5.2 Data display equipment	Display flood information on the Plasma Display	
6. Flood monitoring Station		
6.1 PC and peripherals	Access to MOE Web server to receive flood information	Related five agencies.
7. Flood warning post		
7.1 WP-1: Ghazel Police	Flood warning equipment by loudspeaker	Police
7.2 WP-2: Waterfall Park		DOE
7.3 WP-3: Tangrah		Police

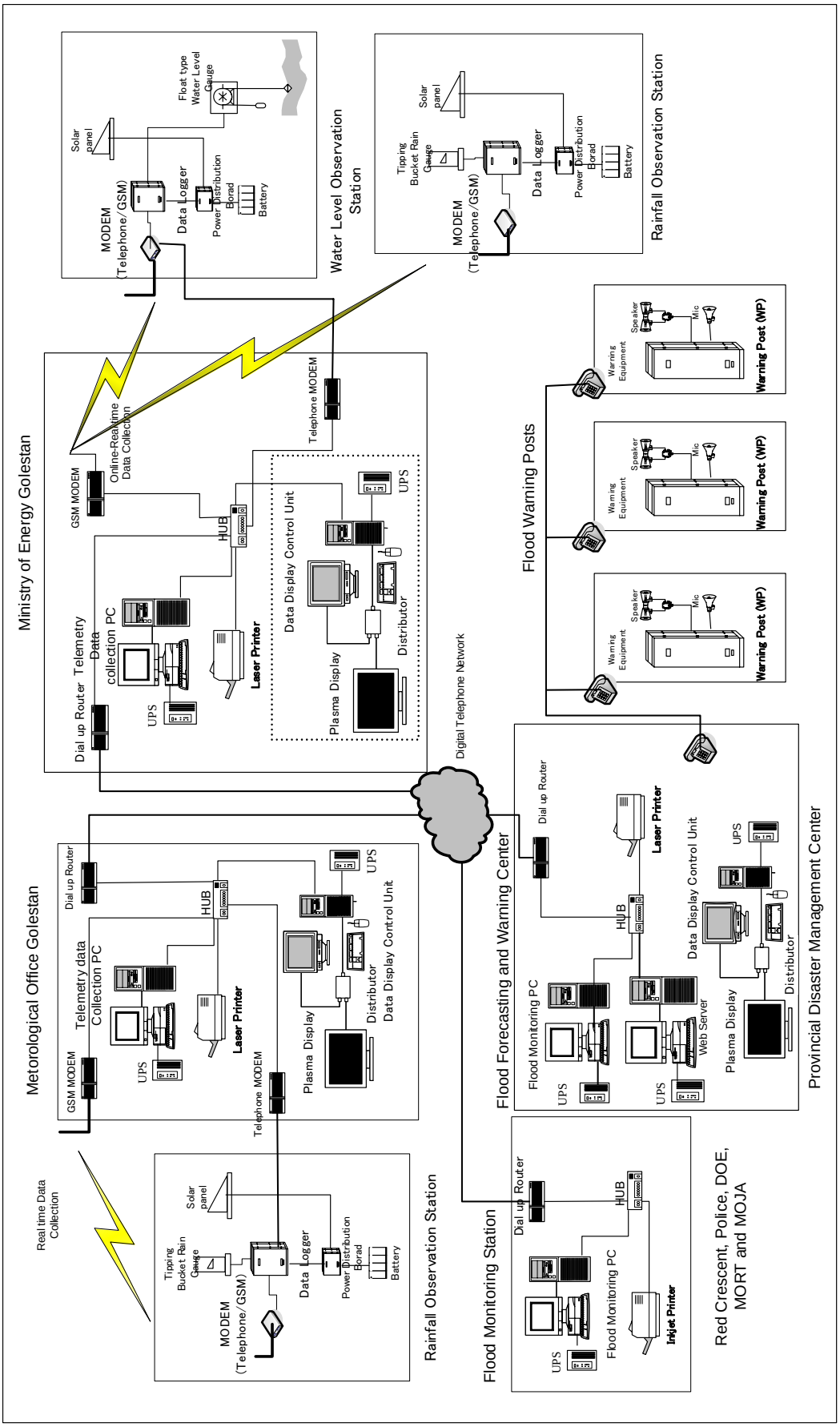


Fig. PII.22 Overall Schematic Diagram for Priority Project

3.2.2 System Configuration

Telemetry Data Collection Sub-system

The data collection sub-system consists of two (2) groups, MET and MOE systems as described system summary. In total seven (7) rainfall gauging stations and four (4) water level gauging stations will be operational. Data collection PC at MET and MOE will collect data automatically from each rainfall and water level gauging station. The data collection PC at MET and MOE provides automatic observation of meteo-hydrological data in the intervals of 10 min, 30 min and/or one hour. The gauging equipment is not only capable of transmitting observed data in response to the observation command, but also has an event-actuated function to automatically send a start request signal to the data collection PC at the start of rainfall or at the water level reaching to the caution or warning levels. When MET and MOE receive the start request signal, the start command is sent to all the gauging stations, which start observations. The data collection PC calculates the hourly and 3-hour rainfall data and checks the correlations between rainfall and water level data. If the data reaches to a warning level, the PC issues a warning. The warning display will be installed in MET, MOE and PDMC in order to display the same information on the PC display.

Data Processing and Monitoring Sub-system

The data processing/transmission sub-system consists of data processing equipment to be installed at FFWC, the flood information monitoring equipment to be installed at PDMC and five related agencies being connected to the above equipment through digital telephone network.

Flood Warning Sub-system

Warning post will equip the voice amplifier, loudspeakers and tape recorder. Recorded tape contains artificial siren sound, announcement for flood warning and evacuation instruction. In addition, necessary information for flood will be broadcasted through microphone.

Power failure on commercial power line may occur during floods. Therefore, voice amplifier shall be backed up with DC power supply unit. It can be operated around two (2) days without power supply. Sound reach distance of the loudspeaker is more or less 300 m radius.

3.3 Cost Estimate

The direct cost estimate for the improvement of the flood forecasting and warning system for Golestan Forest National Park Disaster Management Plan is made in the following manner. (1) Basically, equipment will procure from Iranian market as much as possible. (2) Equipment made in foreign countries will be purchase from authorized dealer in Iran. (3) Land acquisition for gauging station housing is not required. (4) All gauging station will be installed at existing area or within government properties. (5) Two new water level gauging wells and steel cabinets will be constructed. (6) All taxes are not included. (7) Such cost will be quoted separately.

Table PII.17 presents cost estimate for Golestan Forest National Park Disaster Management Plan.

Table PII.17 Cost Estimate for Priority Project

Work Item	Quan -tity	Unit	Unit Price (Rials)	Amount (1,000 Rials)
Construction Base Cost				
1. Preparatory Work	1	L.S		215,000
2. Equipment				
a Additional Rain Gauge Equipment	4	set	63,595,000	254,380
b Additional Water Level Gauge Equipment	2	set	83,720,000	167,440
c Improvement work for Existing Rain Gauge Equipment	3	set	78,890,000	236,670
d Improvement work for Existing Water Level Gauge Equipment	2	set	83,720,000	167,440
e Improvement of Data Collection Equipment at MOE	1	set		304,290
f Improvement of Data Collection Equipment at MET	1	set		203,665
g PDMC Flood Monitoring Equipment	1	set		82,110
h Flood Monitoring Equipment for five Agencies	5	set	22,057,000	110,285
i Flood Warning Posts	3	set	96,600,000	289,800
j Miscellaneous (Installation materials, Spares)	1	L.S		545,720
Total for Equipment				2,361,000
3. Equipment Installation Work	1	L.S		363,000
4. Water Level gauging Well and Cabinet	2	ST	80,100,000	160,200
GRAND TOTAL				3,103,000

3.4 Implementation Plan

Priority project will be implemented for 26 months tentatively. Engineering work including detailed design and preparation of tender documents will be conducted first. It will take about 8 months. Tender process, contract, purchase, and manufacturing of equipment will be taken about 9 months. Construction and installation work for water level gauge and all equipment will be taken around 8 months. Finally, on-the-job training for system operation will take one month prior to system operation.

Table PII.18 Implementation Plan for Priority Project

Work Item	1st Year	2nd Year	3rd Year
Total period			
1.Detailed design and preparation of tender documents	8 months		
2.Tender and equipment purchase	9 months		
3.Ancillary work and equipment installation		8 months	
4. On-the-job training			1 month
5.Commencement of operation			▽

3.5 Operation and Maintenance

Necessity of Operation and Maintenance

Establishment of the maintenance organization is indispensable for continuous operation of FFWS. The telemetry equipment has much longer durable period by the technical innovation in recent years. However, the durable period will changes by the operation environment. Generally, system lifetime will be around 10 years in Japan. Nevertheless, if the user gives efficient preventive maintenance, the system lifetime can be extended to about 15 years. It is necessary to establish efficient organization having enough maintenance budgets to keep system at least 10 years long operational condition.

Maintenance for the System

Maintenance of the system shall be conducted by each agency responsible for system operation. Table PII.19 shows contents of maintenance and period.

Table PII.19 Summary of System Maintenance

Service	Station	Contents	Period
Daily maintenance	FFWC	Clean and outside view test	Flood period
Periodical maintenance (3-month interval)	Telemetry gauging station, Warning post	Clean and outside view test	Non-flood period
Overhaul maintenance (1 year interval)	Telemetry gauging station, Warning post, Monitoring station	Clean and outside view test and detailed test by professionals	Non-flood period
Trouble maintenance	Telemetry gauging station, Warning post, Monitoring station	Repair and detailed test by professionals	When necessary

The maintenance work can be divided into two categories, namely in-house maintenance and professional maintenance. The in-house operation and maintenance staff of each agency shall conduct maintenance works, while the professional maintenance means to invite the system specialists from the supplier or maintenance companies.

The staff at the FFWC and MET will conducts daily maintenance in the flood season and periodical maintenance every three months in non-flood season. Once a year, the specialists who require high technical skill will conduct overhaul and troubleshooting maintenance.

CHAPTER 4 FLOOD PREPAREDNESS PLAN

4.1 General Concept of Flood Preparedness Plan

4.1.1 Principle of Community-based Disaster Management

In order to mitigate flood and debris flow disaster, structural measures as engineering intervention has been generally planned. However, there may be always limitation of such mitigating measures for overwhelming level of hazards. To mitigate only by structural measures is unrealistic in respect to cost and duration of construction.

To prepare for such overwhelming disasters that mitigation measures cannot completely prevent, it is necessary to establish risk management system under which villagers and passengers can access to appropriate information about floods and debris flows and immediately evacuate in coordination with the concerned public authorities.

The mitigation measures of structures and such community resilience are the two major components of the holistic disaster risk management, and they are complimentary to each other for establishing safer community. For this reason, establishment of village-based risk management system, which is autonomously conducted by villagers are essential.

Actors at each level, such as public officials, village community, and individuals are all responsible for disaster risk management. Actions by public sector, community, individuals are called public help, mutual help, and self-help. Public sectors give support the activities of village community and individuals. Village community and individuals cooperate with public officials. Through these activities, capacity of disaster management can be enhanced.

Fig. PII.23 Collaboration among Public, Community and Private

4.1.2 Strategy

Encourage Self-help

To establish village-based risk management system, it is important for villagers and tourists to understand the basic concept that each individual has to have self-help attitude that they should protect their lives by themselves. It is also important that everyone has to have proper knowledge about disaster risk management, identify the risk judging from information of mass media such as TV and radio, and decide evacuation actions accordingly. Such information and evacuation system need to be established.

Enhance mutual Help and Cooperation Network

To establish such system, it is important to develop the system not only by self-help endeavor but also by mutual help, in cooperation with local communities, such as village council, non-governmental organizations, village-based organizations, and local public authorities. The role of the public authorities is to give necessary support to the village community. Major role of the public authorities is to establish systems of proper information distribution and evacuation order within public authorities and to village council. Disaster risk management is not enough just at village level so that it is necessary to have joint efforts, among villagers, local communities, and public authorities.

Step-by-Step Approach

It is time taking process to establish this system in the communities. Thus things that can easily be accomplished may conduct first as step-by-step approach.

4.2 Hazard Map Preparation

4.2.1 Processes of Hazard Map Generation

Hazard Map

The team prepared the hazard map for keeping or recalling the past disasters in people's mind. In the long run, people could learn how to protect against the future disaster utilizing the hazard map.

Simulation of Past Flood

To utilize meteo-hydrological data observed in the 2001, 2002 and 2005 floods, the team conducted model construction and parameter identification. Based on the results, flooding simulation was made using 100-year flood. The result of the flooding simulation shows in Fig. PII.24 as flood extent over the riparian areas.

Fig. PII.24 Simulation Result of 100-Year Flood in the Madarsoo River

Engineering Field Adjustment

With the simulation result, JICA team implemented the field survey to check the accuracy of flood extent and to make engineering adjustment of the extent along the river course.

4.2.2 Hazard Map Description

The Madarsoo River could be categorized into four parts from geomorphologic features; (1) Gorgan Plain, (2) Valley-bottom Plain, (3) Mountain Gorge and (4) Dasht basin.

From the viewpoints of hazard map preparation, the characteristics of each part are briefly described below.

Gorgan Plain

Through the hazard map, the villages can be found to be located in the Gorgan Plain, which is flood-free area from the Madarsoo floodwater, since the Madarsoo runs forming lower terraces with about 10 m lower than the plain. People who live in the area during flood time should only keep one thing in mind; "do not come nearby the river course for a curiosity

looking", because the flood sometimes rushes the riverbank and make it collapse. To keep away from river is an important rule for flood preparedness against flood disaster.

Fig. PII.25 Hazard Map in 100-Year Flood between Golestan Dam and Kalaleh Bridge

Valley-bottom Plain

The valley-bottom plain extends from Kalaleh Bridge to Tangrah village. Usually, the river did not form clear natural levee, and the floodwater easily overflows along the river course. People are living near the water, and it is the hazardous area to be flooded. Besides the debris flow occurred in some mountain streams in the 2001 Flood.

To refer to the hazard map, the villages of Gharavol Haji Tajy and Ghoghor Shirmelly are all inside of the flooding area. However it was verified that the floodwater velocity was not so fast and the water level increased slowly in the 2001 Flood.

Ejen Ghareh Khoojeh village has two parts. The northern part of the village is on the top of hills, and it is the safer area. On the other hand the southern part is located in the flooding zone and is near to the river, so that people living in this area should escape to northern part immediately when flooding occur.

From Agh Ghamish to Tangrah village, the floodwater velocity is fast so that people should keep far away from the river. People should use much more caution to the debris flow from the mountain streams.

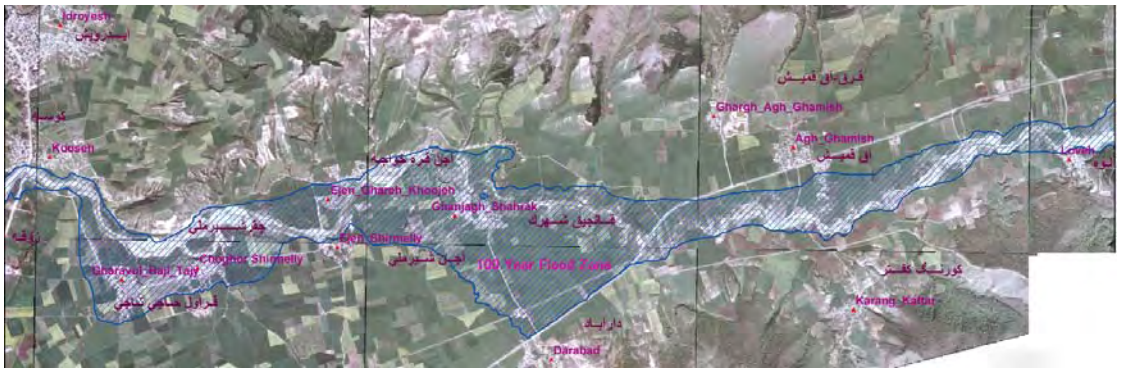


Fig. II.26 Example of Hazard Map in 100-Year Flood between Kalaleh Bridge and Loveh Village

Mountain Gorge

From Tangrah village to Dasht Bridge, the Madarsoo runs through mountain gorge of the Golestan Forest National Park. There are no resident inside the park, but there are many campers and visitors in summer season.

The floodwater rushes down very fast in the flood time due to the narrow gorge and steep riverbed slope. It is only way to force the people into going out of the park before flood comes. Thus establishment of early flood forecasting and warning system is indispensable to save the visitors in the park from the floods.

Dasht Basin

Agricultural land widely extends in the Dasht basin, and Dasht village is located in the downstream end of the basin. The three river systems join together near Dasht village, namely Gelman Darreh, Dasht-e-Sheikh and Ghyz Ghaleh rivers. Thus the village is situated in the center of flood-prone area.

4.2.3 Evacuation Route

Based on above considerations, the residents in Terjenly, Tangrah and Dasht villages should take refuge from both flood and debris flow when an evacuation order is announced. The team prepared the evacuation route maps for these three areas by using GIS tools.

Terjenly Village

Terjenly village is developed on the alluvial fan, which is flood- and debris-prone area from its origin. Two mountain streams divide the village into three parts. In torrential downpour, the residents shall take evacuation route towards the higher terraces so that the areas can be regarded as flood-free zones.

Tangrah Village

Tangrah village is also developed on the alluvial fan. Tangrah River divides the village into two parts. In torrential downpour, the residents shall take evacuation route towards the higher terraces so that the areas can be regarded as flood-free zones.

Dasht Village

Dasht village is located in the downstream part of the Dasht basin. There are three floodwater and sediment runoff sources joining around the village. After the 2001 Flood, the polder diking system was constructed and protected the village from the floods of the said three river systems as illustrated in Fig. PII.27.

There is a hill southwest of the village, and the polder diking system anchors to the hill. It could be used as evacuation place. The evacuation rule for Dasht village may be enumerated below.

(1) In the flood time, people should evacuate to the mosque that is located in village center, or stay in their own houses. At the same time some young and strong villagers shall be dispatched to two flood-watch sites on the top of polder dike to keep watching floodwater of three streams.

(2) If floodwater of the Gelman Darreh increases and village starts to be inundated with floodwater, people should follow the green direction to evacuate to the safer zone. The direction of evacuation route is toward higher and farther place from the Gelman Darreh River course, and the route on the dike is protected by the hill against the Ghyz Ghaleh flood.

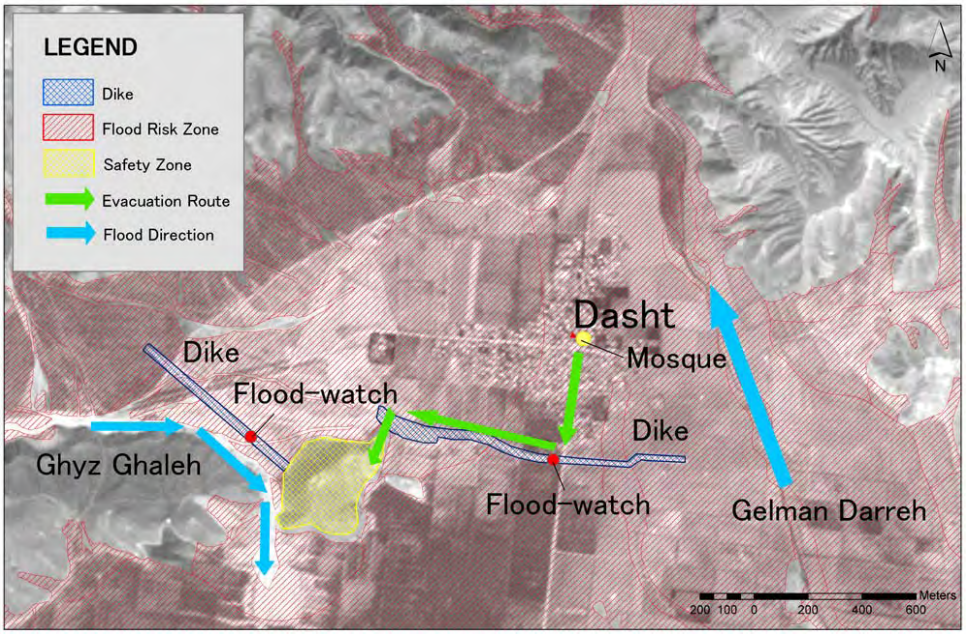


Fig. PII.27 Example of Evacuation Route (Dasht Village)

4.3 Pilot Activities

Aim

Pilot activities are conducted to examine the plan of village disaster risk management activities on site, get feedback and revise the original plan. This plan aimed to be served as a template for other vulnerable villages.

Formation

Dasht and Terjenly villages were selected as pilot activity sites. Pilot villages serve as demonstration sites of activities that are observed by other vulnerable village councils. Advisory committee was held among related public organizations and Red Crescent Society to share the experiences in the pilot villages and lessons learned, and to review master plan and action plans of village disaster risk management. The team has assisted to such activities.

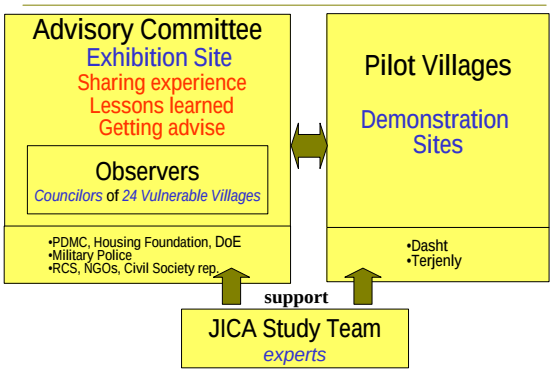


Fig. PII.28 Formation of Implementing Pilot Activities

Sequence of Activities and Schedule

Model activities are summarized in Fig. PII.29. A series of pilot activities were conducted as (1) Vulnerability and capacity assessment; January to May 2005, (2) Village watching and mapping in two selected villages; August to September 2005, (3) Workshops in each village; February to March 2006.

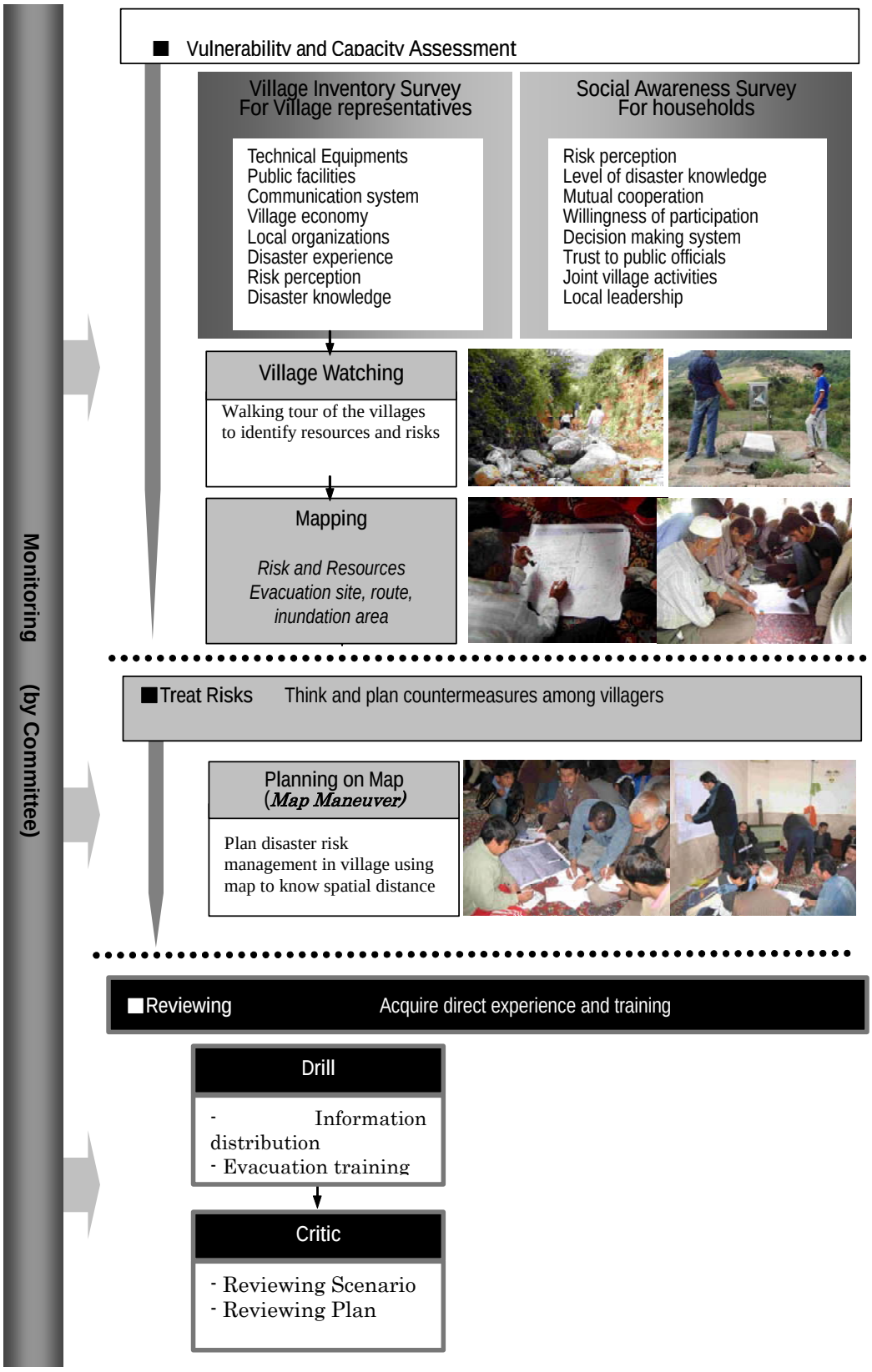


Fig. PII.29 Pilot Activities

4.4 Framework of Village Disaster Risk Management

Framework of village disaster risk management has been briefly delineated below.

(1) Risk communication: to disseminate accurate weather information, to understand distributed hazard map, and to prepare village watching and risk/resources map.

(2) Public awareness uplift: public information dissemination, school education, signboard and notice board of flood risk for tourist and passengers, and holding seminars/workshops.

(3) Human resources development: administrator training, training of local leaders, conducting village workshops by village leaders, and conducting annual drill.

(4) Organizational capacity development: formulation of disaster management committee, emergency response, and strengthening coordination.

(5) Preparation of equipment and construction: preparation of equipment, construction of shelter cum village cultural center, and construction of mitigation measures.

To implement village activities, Red Crescent Society is the focal organizations to train villagers. Following figure shows steps of village training and workshops.

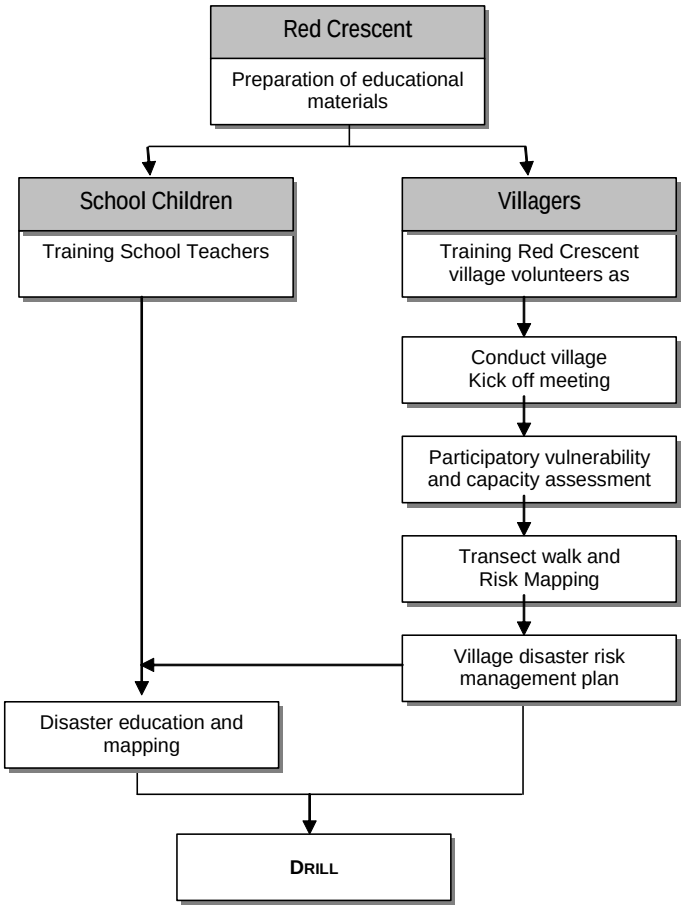


Fig. PII.30 Village Training Steps and Activities

CHAPTER 5 COST ESTIMATE AND IMPLEMENTATION PROGRAM

5.1 Cost Estimate of Priority Projects

5.1.1 Project Cost for River Restoration Plan

Summary of Project Cost

The construction cost based on the preliminary design is estimated at 11,890 million Rials for the riverbank stabilization works and 12,060 million Rials for the sediment control dam works. The project cost for the river restoration plan totals 23,950 million Rials including indirect cost.

The respective structural measures are set on the public land such as river courses of the Madarsoo and the Ghyz Ghaleh. Therefore, it is not necessary to execute the private land acquisition under the preliminary design stage. The project cost for respective construction works is summarized below.

Table PII.20 Summary of Project Cost for Riverbank Stabilization Works

Work Item	Quantity	Unit	Amount (1,000 Rials)
I. Construction Base Cost			**8,611,000**
1. Preparation Works	1	l.s.	783,000
2. Riverbank Stabilization Work	1	l.s.	7,828,000
II. Land Acquisition Cost			**0**
III. Administration Cost (5% of Item I)	1	l.s.	**431,000**
IV. Engineering Cost (10% of Item I)	1	l.s.	**862,000**
V. Physical Contingency (20% of Item I + II + III + IV)	1	l.s.	**1,981,000**
VI. Total			11,885,000
Round Total			**11,890,000**
in accordance with (as of August 2005)			US$1,322,000

Table PII.21 Summary of Project Cost for Sediment Control Dam Works

Work Item	Quantity	Unit	Amount (1,000 Rials)
I. Construction Base Cost			**8,739,000**
1. Preparation Works	1	l.s.	795,000
2. Sediment Control Dam	1	l.s.	7,944,000
II. Land Acquisition Cost			**0**
III. Administration Cost (5% of Item I)	1	l.s.	**437,000**
IV. Engineering Cost (10% of Item I)	1	l.s.	**874,000**
V. Physical Contingency (20% of Item I + II + III + IV)	1	l.s.	**2,010,000**
VI. Total			12,060,000
Round Total			**12,060,000**
in accordance with (as of August 2005)			US$1,341,000

Establishment of Construction Time Schedule

(1) Construction Time Schedule for the Riverbank Stabilization Works

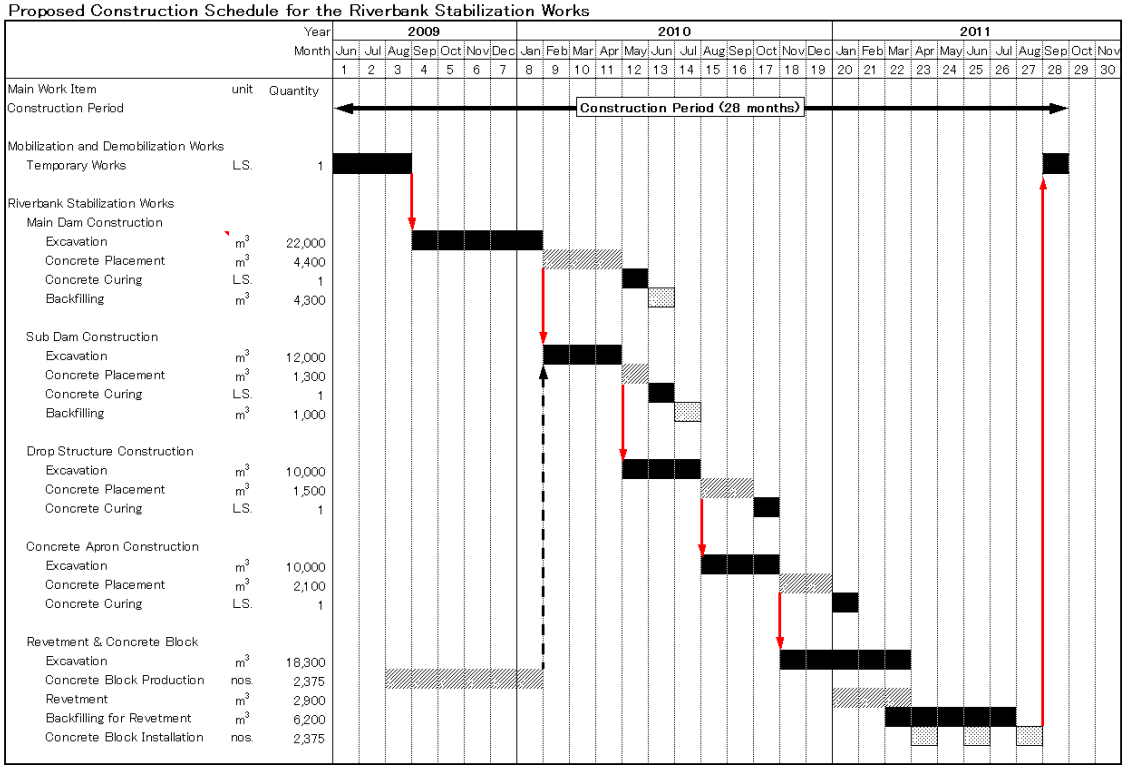
In consideration of construction work ability, construction time schedule shall be drawn up, generally finding out the critical path, which causes the overall construction period to significantly spend the longest construction time, from the work quantities.

Excavation work with the amount of 72,000 m^3 is assumed to be the critical path in this works, and the adverse progress of excavation works might affect the construction time schedule extension, directly. The construction site dose not have the sufficient open space to employ several construction parties including back hoe and dump truck since the construction site is located in the narrow pass of the river.

Therefore, it is assumed that the number of construction parties for excavation works is two parties in maximum, which are individually arranged in the upstream and downstream of the nick point for the early period of the construction stage.

The construction time schedule is estimated for 28 months from June 2009 to September 2011. The proposed construction time schedule is shown in the following figure, taking into account the excavation work formation as the critical path.

Fig. PII.31 Construction Time Schedule for Riverbank Stabilization Works



(2) Construction Time Schedule for the Sediment Control Dam Works

The construction works for the sediment control dam is proposed to execute the phased construction divided into two stages. One is the new floodway construction, the other is rehabilitation of existing earth dam breached by the 2001 Flood since the construction site is protected from the floods with the new floodway as temporary diversion channel after completion of 1st stage.

Excavation work with the amount of 92,000 m^3 and embankment works including the upstream soil blanket construction are assumed to be the critical path in this works

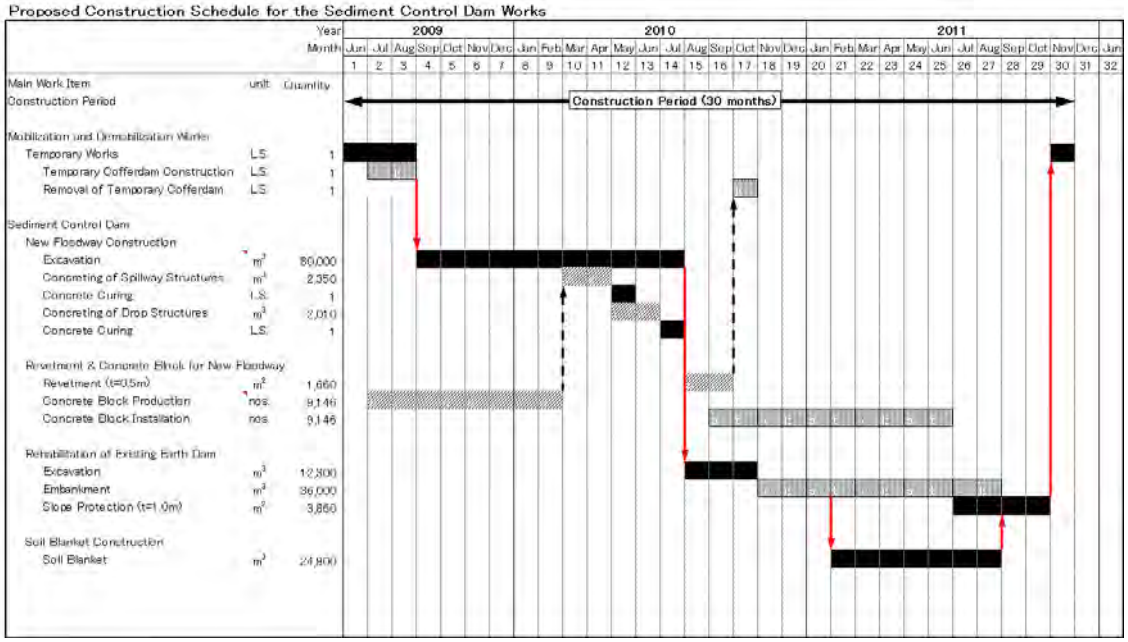
and the embankment materials acquisition is planed with excavation of the surplus section on existing earth dam. Therefore, it is difficult that the excavation works parallel the embankment works for the rehabilitation of the existing dam and upstream soil blanket construction.

Furthermore, the floodway construction needs being prior execution in order to prepare the flood damage prevention during the new earth dam construction.

It is assumed that the number of construction parties for excavation works is two parties in maximum, which are individually arranged in the right and left sides of the existing earth dam for the early period of the construction stage.

The construction time schedule is estimated for 30 months from June 2009 to November 2011. The proposed construction time schedule is shown in the following figure, taking into account the formation based on the relation between excavation works and embankment works.

Fig. II.32 Construction Time Schedule for Sediment Control Dam Works



Establishment of Disbursement Schedule for the River Restoration Plan

Assuming an annual progress of construction works from the implementation schedule based on the construction time schedule, disbursement schedule of project cost is produced as shown in Table PII.22.

Table PII.22 Disbursement Schedule for River Restoration Plan

(Unit: x 1,000 Rials)

Item	Total Cost	2007	2008	2009	2010	2011
I Construction Cost						
1 Riverbank Stabilization Works	8,611,000	0	0	2,497,190	4,133,280	1,980,530
				0.29	0.48	0.23
2 Sediment Control Dam Works	8,739,000	0	0	3,408,210	2,971,260	2,359,530
				0.39	0.34	0.27
II Land Acquisition and Compensation Cost	0	0	0	0	0	0
III Administoration Cost	868,000	303,800	173600	130,200	130,200	130,200
(5 % of Item I)		0.35	0.20	0.15	0.15	0.15
IV Engineering Cost	1,735,000	607,250	347,000	260,250	260,250	260250
(10% of Item I)		0.35	0.20	0.15	0.15	0.15
V Physical Contingency	3,991,000	199,550	119,730	1,277,120	1,516,580	878,020
(20% of Item I + II + III + IV)		0.05	0.03	0.32	0.38	0.22
VI Total (I to V)	**23,944,000**	**1,110,600**	**640,330**	**7,572,970**	**9,011,570**	**5,608,530**

5.1.2 Project Cost for Golestan Forest National Park Disaster Management Plan

The project cost based on the preliminary design is estimated at 4,282 million Rials. The system building works are set on the public land such as existing gauging stations and the main waterway. Therefore it is not necessary to execute the private land acquisition. The project cost for the system building work is summarized below.

Table PII.23 Summary of Project Cost for Golestan Forest National Park Disaster Management Plan

Work Item	Quantity	Unit	Amount (1,000 Rials)
I. Construction Base Cost			**3,103,000**
1. Preparation Works	1	l.s.	218,000
2. Observation Equipments	1	l.s.	2,361,800
3. Equipment Installation Cost	1	l.s.	363,000
4. Water Leve Gauging Station	2	S/T	160,200
II. Land Acquisition Cost			**0**
III. Administration Cost (5% of Item I)	1	l.s.	**155,000**
IV. Engineering Cost (10% of Item I)	1	l.s.	**310,000**
V. Physical Contingency (20% of Item I + II + III + IV)	1	l.s.	**714,000**
VI. Total			4,282,000
Round Total			**4,282,000**
in accordance with (as of August 2005)			US$476,000

In Addition, based on the construction cost, the government administration cost, engineering service cost and physical contingency cost are calculated as a lump sum basis. Assuming an annual progress of construction works from the implementation schedule, disbursement schedule of project cost is produced as shown in Table PII.24.

Table PII.24 Disbursement Schedule for Golestan Forest National Park Disaster Management Plan

(Unit: x 1,000 Rials)

Item	Total Cost	2007	2008	2009	2010	2011
I Construction Cost						
1 Flood Forecasting and Waning System	3,103,000	0	0	2,544,460	558,540	0
				0.82	0.18	
II Land Acquisition and Compensation Cost	0	0	0	0	0	0
III Administoration Cost	155,000	0	0	69,750	62,000	23,250
(5 % of Item I)				0.45	0.40	0.15
IV Engineering Cost	310,000	0	0	139,500	124,000	46500
(10% of Item I)				0.45	0.40	0.15
V Physical Contingency	714,000	0	0	549,780	149,940	14,280
(20% of Item I + II + III + IV)				0.77	0.21	0.02
VI Total (I to V)	**4,282,000**	**0**	**0**	**3,303,490**	**894,480**	**84,030**

5.2 Implementation Program

Fig. PII.33 shows the proposed implementation schedule for the priority projects, for which the feasibility study has been conducted, excluding flood preparedness plan. The implementation period for these priority projects is set for five (5) years, taking into account the additional survey and investigation for detail design, detail design execution, tendering and other preparatory activities.

Riverbank Stabilization Works

The riverbank stabilization works is scheduled to commence in the middle of 2009 for the construction work, which is set taking into consideration of the lead time for the pre-construction activities such as pre-qualification for contractors, tendering, its evaluation and conclusion of contract agreement between MOJA and selected contractor. The required construction period is estimated for 28 months and overall project period is for 50 months.

Sediment Control Dam Works

The sediment control dam works is scheduled to commence in the middle of 2009 for the construction work, in the same manner of riverbank stabilization works. The required construction period is estimated for 30 months and overall project period is for 52 months.

Flood Forecasting and Warning System

The establishment of Flood Forecasting and Warning Center (FFWC) as the executing agency is proposed before the commencement of this execution. It is assumed that the executing agency establishment period might be required for two (2) years including concurrence among the agency concerned, the personnel arrangement, the budget arrangement, etc.

The detail design stage for flood forecasting and warning system building is scheduled to commence in the middle of 2009, succeedingly, tendering stage including the required equipments procurement in the early of 2010. The required installation period is estimated for 8 months and overall project period is for 26 months.

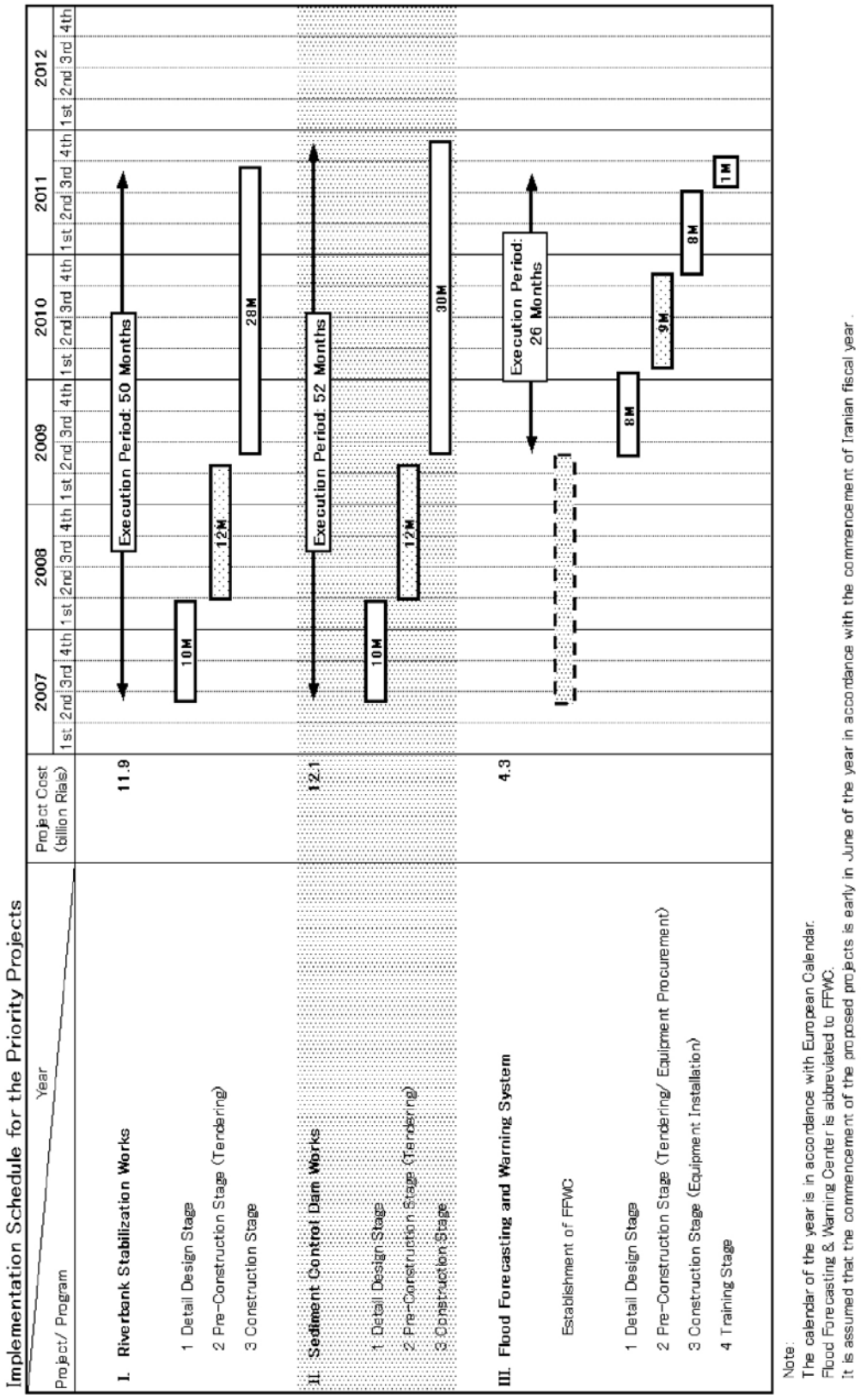


Fig. PII.33 Implementation Schedule for Priority Projects

CHAPTER 6 PROJECT EVALUATION

6.1 Economic Evaluation

The adopted priority project consists of 3 components as (1) river restoration plan, (2) Golestan Forest Park disaster management plan, and (3) flood preparedness plan. Results of the economic evaluation are given by each component hereunder.

6.1.1 River Restoration Plan

The river restoration plan consists of three works as (1) the watershed management plan (WMP), (2) the sediment control works (SCD = sediment control dam works) and (3) the erosion control works (ECD = erosion control dam works).

Works for WMP

The planned areas for WMP consist of (1) Dasht-e-Sheikh area with 120 ha for terracing works and 1,360 ha for banquette works both for farmland and with 17,534 ha for rangeland, and (2) Ghiz Ghaleh area with 125 ha for terracing works and 180 ha for banquette works for farmland and 6,350 ha for rangeland.

The works for WMP are human voluntary works to execute under the certain schedule. Thus full execution may not be expected because there will be several hurdle to be cleared as endless maintenance for terraces and banquettes and so on. From this viewpoint, rather conservative execution rate of 75 % is assumed to execute. And, the area for the works for WMP broaden out of the targeted catchments, so that it is also assumed that the benefit will accrue one fourth (1/4) for Dasht-e-Sheikh basin, and one third (1/3) for Ghiz Ghaleh basin.

Based on the above mentioned assumptions, the annual average benefits derived from the works for WMP in the Dasht-e-Sheikh and Ghiz Galeh basins are calculated as Rials 21,229 million and Rials 5,403 million from farm land, and Rials 707 million and Rials 377 million from rangeland, respectively.

Works for SCD

As mentioned above, the annual average economic benefit for the works for SCD is estimated by means of Probability Analysis. In this case, the works for WMP is contributed a little bit because that the works for WMP has also a capability of sediment control. The following table shows its result.

Table PII.25 Estimation of Annual Average Economic Benefit Due to Execution of SCD

WMP and SCD under the Present Condition (Million Rials)

Return Period (Year)	Under the Witout Project Condition	Under the Condition with WMP		Under the Condition with WMP + SCD	
		Remaining Damages	Benefit	Remaining Damages	Benefit
1	0	0	0	0	0
5	1,361	1,361	0	0	1,361
10	1,905	1,905	0	0	1,905
25	2,517	2,497	20	0	2,517
50	2,796	2,762	34	0	2,796
100	**2,956**	**2,915**	**41**	**0**	**2,956**

WMP and SCD under 2025 Year Condition (Million Rials)

Return Period (Year)	Under the Witout Project Condition	Under the Condition with WMP		Under the Condition with WMP + SCD	
		Remaining Damages	Benefit	Remaining Damages	Benefit
1	0	0	0	0	0
5	1,944	1,944	0	0	1,944
10	2,722	2,722	0	0	2,722
25	3,597	3,567	29	0	3,597
50	3,995	3,946	49	0	3,995
100	**4,224**	**4,165**	**58**	**0**	**4,224**

(Note) WMP: Contribution from the works on Watershed Management Plan.
SCD: The works on Sediment Control Dam.

Works for ECD

Also as mentioned above, the annual average economic benefit for the works for ECD is estimated by means of probability analysis. The following table shows its result. The target year is set at 2025. The benefit (= the amount of damages expected to be decreased with the Project) is estimated under both of the present and the 2025-year conditions.

Table PII.26 Estimation of Annual Average Economic Benefit Due to Execution of ECD

ECD under the Present Condition (Million Rials)

Return Period (Year)	Under the Witout Project Condition	Under the Condition with ECD	
		Remaining Damages	Benefit
1	0	0	0
5	1	0	1
10	2	0	2
25	3	0	3
50	4	0	4
100	**5**	**0**	**5**

ECD under 2025 Year Condition (Million Rials)

Return Period (Year)	Under the Witout Project Condition	Under the Condition with ECD	
		Remaining Damages	Benefit
1	0	0	0
5	3	0	3
10	5	0	5
25	7	0	7
50	8	0	8
100	**10**	**0**	**10**

(Note) ECD: The works on Erosion Control Dam.

Summary of financial and economic costs and their annual disbursement is showing in the following table.

Table PII.27 Summary of Project Cost and Annual Disbursement

(Million Rials)

Item	Total Cost	Disbursement							
		2007	2008	2009	2,010	2011	2012	2013	2014
Financial Cost in Total	79,415	19,291	8,694	18,228	16,086	14,039	2,717	180	180
Economic Cost Converted	68,860	17,414	7,843	15,467	13,335	12,022	2,453	163	163

The annual operation and maintenance cost (OM Cost) is applied at 3 % of the initial investment cost for the WMP, and 0.5 % of the direct construction cost is applied for the other two works. The amount of OM Cost is a sum of Rials 1,936 million per annum after completion of both the works.

Using a cash flow of the said cost and benefit, the economic evaluation is made. For evaluation, the Net Present Value (NPV, i.e. B-C in terms of the present value), the Economic Internal Rate of Return (EIRR) and the Benefit-Cost Ratio (B/C Ratio) are applied as evaluation indicators. The discount rate is applied at 10 % taking similar projects in developing countries into account.

The results are summarized as shown in the following table.

Table PII.28 Summary of Economic Evaluation Result

Evaluation Indicator	Under Present Condition	Under 2025-year Condition
NPV	81,207	85,754
EIRR	18.74 %	19.18 %
B/C Ratio	2.89	2.99

Note: NPV is expressed by million Rials

As shown in the above table, the project indicates a quite high viability to execute by showing the 18.74 % of EIRR under the present socio-economic condition (hereinafter referred to as "at present condition") and 19.18 % under the socio-economic condition of the year 2025.

EIRR changes its value depending on the parameters employed for the calculation. Out of these parameters, the construction cost of the project and its benefit are the most important determinants of the economic analysis. Sensitivity analysis of EIRR of the project at 2025-Year condition is made in various combination cases for all alternatives.

The most pessimistic one among them is a case of 50 % of execution rate in WMP under the condition of cost increase of 20 % and benefit decrease of 10 %. Even in this case the EIRR is estimated at 12.26 %. It means that the project of river restoration plan has enough viability to execute. Accordingly it is strongly requested to promote the implementation of the watershed management plan prior to realization of the river restoration plan.

6.1.2 Golestan Forest Park Disaster Management Plan

The estimation process of flood damages and project benefits is same manner in the master plan as described in sub-section 3.10.1 Economic Evaluation in Part I of this report. The amount of annual average damages to expected income in total is estimated at the same amount of Rials 669 million per annum as tabulated in Table PI.50 in Part I.

A systematic flood warning system is one of the effective flood loss mitigation measures. This component is a plan to establish a suitable flood forecasting and warning system. Annual cost disbursement is planned as follows:

Table PII.29 Annual Cost Disbursement for Golestan Forest Park Disaster Management Plan

(Million Rials)

Item	Total Cost	Disbursement				
		2007	2008	2009	2,010	2011
Financial Cost in Total	4,282	0	0	3,303	894	84
Economic Cost Converted	3,359	0	0	2,548	727	84

Using a cash flow of the said cost and benefit, the economic evaluation is made with the same manner of the above "river restoration plan". Also for evaluation, the NPV (i.e. B-C in terms

of the present value), the EIRR and the B/C Ratio are used as evaluation indicators in this component too. The discount rate is applied at 10 % taking similar projects in developing countries into account.

The results are summarized as shown in the following table.

Table PII.30 Summary of Economic Evaluation Result for Golestan Forest Park Disaster Management Plan

Evaluation Indicator	Economic Conditions	
	under the Present	under 2025-Year
NPV	1,367 million Rials	2,899 million Rials
EIRR	7.21 %	13.70 %
B/C Ratio	1.67	2.42

As shown in the above table, the estimated EIRR of 10 % at present condition is lower than the applied discount rate of 10 %, while the one at 2025-Year condition of 13.7 % is higher than 10 %. The result under 2025-year economic condition shows the project has economic viability.

The sensitivity analysis is made in the same manner as conducted in the river restoration plan. In a case that the benefit will decrease by 10 % together with 20 % increase of the cost, the EIRR is estimated at 9.19 %, and it is considered that the project may not economically feasible. However, It is suggested by several international financing institutions as the World Bank that an EIRR should be kept at least 5 % for project formation from the viewpoint of basic human needs. Furthermore this project is a pure public one. From this viewpoint, the project has cleared such hurdle of minimum EIRR with enough rooms. Thus the evaluation result shows the project may be sound with the EIRR being high enough from the viewpoint of basic human needs even in the most pessimistic case.

6.1.3 Flood Preparedness Plan

The qualitative economic evaluation is the same as described in sub-section 3.10.1 Economic Evaluation in Part I of this report.

If the flood preparedness system could be practically realized and successfully functioned, social effects (or socio-economic effects) derived from such system and functions will be great with a little fund of the Government because the said systems could be operated by the Government's daily works.

6.2 Social and Environmental Evaluation

6.2.1 Initial Environmental Examination

This social and environmental evaluation is based on the results of Initial Environmental Examination (IEE) prepared as part of Feasibility Study (F/S) on the priority projects. Generally IEE is carried out over a short period with a limited budget and use of existing data coupled with simple field surveys.

The proposed projects are classified into Category B based on output of Environmental Scoping and result of Initial Environmental Examination for the Master Plan, which revealed that all probable impacts could be mitigated by adopting proper construction methods and precautionary measures. Moreover careful examination of the projects components indicates that all of them are environment-friendly, contributing to sustainable utilization of natural resources and ensuring safety of inhabitants.

6.2.2 Impact Evaluation

The proposed projects are:

(1) Project 1: Restoration of Breached Dam and Channel Stabilization (Erosion Control) Works in Dasht Area,

(2) Project 2: Flood Forecasting, Warning and Evacuating System for Golestan National Park, and

(3) Project 3: Publication of Flood and Debris Flow Hazard Maps.

Negative (Adverse) Impacts by Project 1

Among these three projects only Project 1 involves significant construction work, and it is obvious that any construction activity insert some negative impacts (adverse) on social, natural, and cultural environments. As movement of machinery to carry equipment and materials, as well operation of machinery to fulfill construction tasks, these activities generates noise, smoke and dust, bringing-about noise and air pollutions, as well produce vibration. As a result of construction activities, amount of soil particles in water will increase, affecting the turbidity and quality of water. Discarded oil and fuel leakage from machinery will also cause soil contamination and land deterioration. Construction crew would generate solid waste and sewage. These wastes usually produce odor, attract insects (mosquito/parasites) and serve them as a breeding ground, thus leading to air, soil and water contaminations in the area. Natural vegetation in construction sites is removed to create space for establishment of construction camp, structures and relevant facilities, affecting the natural environment.

Positive (Beneficial) Impacts by Project 1

Regarding positive impacts (beneficial) of project 1, it should be mentioned that with restoration of the breached dam, movement of soil materials will decrease. Thus sediment damage to lands and infrastructures such as road, bridge, and dam at downstream will be reduced. This will contribute in public safety, and longevity of infrastructures, offering socio-economic benefits.

If no dam, sediment is spread by floodwater in the area, and blown up by wind in dry season, creating a dusty atmosphere with polluted air. Dust in the air not only insert negative impact on human health, but also in windy hours will cause reduction in vision of vehicle drivers leading to traffic accident and human causality.

Impacts by Project 2

With availability of an accurate and efficient forecasting and warning systems, being realized through execution of project 2, people gain more confidence to stay in the area and undertake various economic activities. Further a larger number of tourists is encourage to visit the area, contributing to its economic status.

Impacts by Project 3

Project 3 is highly beneficial and efficient in enriching public knowledge on natural disasters at normal condition and saving their lives in disastrous situation. It is of preparatory, advisory and precautionary type, inform the residents on extent of flood inundation zone, and shows them proper routes for evacuating to safe places during the disaster (flood) time. At normal situation hazard map could be used as a guide for urban development and land use planning, which reflects its multipurpose nature and economic efficiency.

Overall Impacts of the projects

Based on impact evaluation discussed above, and considering the opinion of inhabitants of the area, known during the field village surveys and through holding public consultation meeting, it can be mentioned that the priority projects formulated by the study team, have some negative (adverse) impacts on socio-economic, natural, and cultural environment. But these impacts are temporary, mostly at construction phase, and reversible. Therefore projects are realized as environmentally sound, and socially acceptable.

6.2.3 Alternatives

After careful environmental examination and analysis of social situation, two options, namely without project (no action) and relocation of village threaten by flood disasters, are identified as discussable alternatives.

In case of without project (no action) option, the natural, socio-economic, and historic cultural environments are remained subjected to damages of disasters. While protecting entire citizens against disasters and caring for the natural resources are among tasks (actions) of the government, being opposite to "no action" option.

Relocation is an expensive, complicated undertaking not involving only technical but also legal, political (administrative), social, environmental, religious and even spiritual (emotional) issues. With relocation the spiritual (emotional) contact will be disturbed, bringing-about an adverse impact, which could be termed as spiritual impact of the project. Since it is difficult to grasp and extent/severity of this impact for mitigation, avoiding its occurrence is much wised.

Ultimately the "with project" option is judged as rational and acceptable for realization.

6.2.4 Impact Mitigation

Since negative impacts of the project with structural measures prevail only in construction phase, and upon the completion the impacts are nullified, mitigation measures/precautions should mainly be considered during the construction phase. These include:

- To dispose waste materials in designated "Dumping Sites".
- A concrete receptacle should be constructed below ground surface for depositing used oil generated by machineries operating in construction sites. Then material is collected and disposed in suitable places in an appropriate manner.
- To avoid construction work at windy hours to minimize air pollution by dust/smoke.
- To moisten the area before starting works to reduce dispersion of dust in the area.
- Not to remove much material (sand/gravel) from riverbed for use in establishment of structures, because this may cause changes in hydro-morphology of the area.
- Some fast growing plants should be grown around the structure sites not only to replace the vegetation destroyed as a result of construction works, but also to improve the overall status of natural environment.

6.2.5 Public Consultation

The public consultation meeting was held in Dasht village on 30 January 2006. The participants are members of the study team, counterpart personnel of MOJA Golestan and North Khorasan, around 40 villagers. After presentation on the proposed projects, discussion among the team, counterparts and villagers were made in a manner of question and answer. The major discussion points are summarized below.

- In general, people in the area are interested in the projects proposed by the team and wish for their early realization. However, some of them are anxious about fate of agricultural land, which could be affected as a consequence of construction of structures, but disagree with no action and relocation of village alternatives.
- They recognized the importance of projects of flood warning and hazard map for evacuation during the disaster, as well as their merit in normal time.
- Project for stabilization of riverbank was attractive to them, since further expansion of gully may lead to land deterioration.
- The villagers suggested construction of large reservoir dam, because they like to have irrigated agriculture, and thereby more income.

- They understood the negative (adverse) and positive (beneficial) impacts of the projects, and felt with project alternative is rational.

6.2.6 Conclusion

With project alternative was realized much environmentally sound and socially acceptable, as compared to without project (no action), and relocation of village, thus endorsed for execution. Iran is included in world's 10-top disastrous countries, as 70% of the country is prone to earthquake, and 50% to floods. In total 90% of population is subjected to cumulative disasters of natural events (earthquake and floods). Furthermore in this fragile circumstance the status/responsibility of people in disaster management/mitigation is not defined. Therefore systematic and realistic disaster management/mitigation approaches need to be established, involving coordination of state agencies and participation of local people. The captioned project could pave foundation for such activities, and serve as a road map to conservation and enhancement of socio-economic, natural, and cultural environments in the country over a long time period.

CHAPTER 7 CONCLUSIONS

Three master plan components were selected as the priority projects for urgent implementation. These are (1) river restoration plan in Dasht area, (2) Golestan Forest Park disaster management plan, and (3) flood preparedness plan. Viability on these priority projects was verified in the feasibility study. Brief summery is described below.

(1) River Restoration Plan in Dasht Area

Proposed river restoration plan is composed of two components, namely sediment control dam and river stabilization works.

Sediment control dam is planned to rehabilitate the earth dam breached in the 2001 Flood, to consolidate the stored sediment in the basin of the earth dam, and to stabilize the lower part of the Ghyz Ghaleh River channel. Through comparative study among dam type and location of floodway, earth dam type with floodway on the left bank was selected as optimum plan. The construction cost was estimated at 12,060 million Rials.

Meanwhile, river stabilization works is planned to consolidate the valley-head erosion downstream of Dasht village, to stabilize the both sides' channel of the structure, and to protect the farmland from progressive gulley erosion. Through comparative study among concrete dam type and hydraulic drop structure type, concrete dam and hydraulic drop of a compromise type was selected as optimum plan. The construction cost was estimated at 11,890 million Rials.

Implementation of construction in both works is planned for about two and half years. From the economic viewpoints, the EIRR (economic internal rate of return) shows 18.7 % under the present conditions and 19.2 % under the future (year 2025) conditions. These figures mean the projects have high economic viability.

From the environmental and social viewpoints, the identified negative impacts are temporary, mostly limited to appear during construction phase, and reversible. Thus these projects are recognized as controllable and socially acceptable.

(2) Golestan Forest Park Disaster Management Plan

In the past two floods, 2001 and 2002, casualties concentrated in the Golestan Forest Park, and most of them were visitors and tourists. In order to save their lives from disastrous floods, early and reliable flood forecasting and warning system is indispensable.

The study point aimed at was how to improve the present situation of flood forecasting and warning system including meteo-hydrological observation network. The alternatives were derived from the three conceptual improvement; namely, (1) manual system, (2) semi-automatic system, and (3) full-scale automatic system. Comparative study sought best combination of data collection, processing and warning sub-systems among the above improvement steps. Finally optimum combination was selected as semi-automatic data collection, full-scale automatic data processing, and manual warning system.

The installation cost was estimated at 4,282 million Rials, and system installation work required about 2 years. From the economic viewpoints, the EIRR shows 7.2 % under the present conditions and 13.7 % under the future (year 2025) conditions. These figures mean the project has high economic viability. From the environmental and social viewpoints, the project is recognized as environmentally sound and socially acceptable since construction works are limited in a few spots and minimal.

(3) Flood Preparedness Plan

Flood preparedness is a generic term including activities on knowledge building, training on evacuation and rescue assuming disaster situations, improvement of disaster management units at community level. In the course of the feasibility study, the study team prepared

hazard map and issued newsletter containing hazard map and evacuation route. On the other hand the team conducted a series of workshops in Terjenly and Dasht villages selected for pilot activities.

Good combination with structural and non-structural measures could realize safer situation in the river basin from flood disasters. The first project, river restoration, is purely one of the structural measures. The second one, Golestan Forest disaster management, is likely in between both measures. The third one, flood preparedness, is purely one of the non-structural measures. Thus such combination between top-down measures (structural measures) and bottom-up measures (non-structural or community-based measures) could produce the most effective management frame against flood disaster, as a whole.

APPENDIX

Scope of Work

Minutes of Meetings

SCOPE OF WORK
FOR
THE STUDY
ON
Flood and Debris Flow in the Caspian Coastal Area Focusing on the flood-hit Region in Golestan Province

AGREED UPON BETWEEN

Ministry of Jihad-e Agriculture

AND

Japan International Cooperation Agency

Tehran, September 3, 2003

Forood Sharifi

Dr. Forood Sharifi
Deputy for Watershed Management,
Forest, Range and Watershed Management
Organization,
Ministry of Jihad-e-Agriculture

原 義文

Mr. Hara Yoshifumi
Leader of the Preparatory Study Team
Japan International Cooperation
Agency (JICA)

Ⅰ. INTRODUCTION

In response to the official request of the Government of the Islamic Republic of Iran (hereinafter referred to as "Government of Iran"), the Government of Japan decided to conduct the Study on Flood and Debris Flow in the Caspian Coastal Area Focusing on the flood-hit Region in Golestan Province (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.
Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Iran.

The present document sets forth the Scope of Work with regard to the Study and will be valid after exchanging Verbal Notes between Government of Iran and Government of Japan concerning implementation of the Study.

Ⅱ. OBJECTIVES OF THE STUDY

The objectives of the Study are:
1. To formulate a master plan up to the target year 2025 for prevention of flood and debris flow disaster in the Madarsoo River Basin,
2. To create a manual for planning and designing of flood and debris flow countermeasures, and
3. To pursue technology transfer to counterpart personnel in the course of the Study.

Ⅲ. STUDY AREA

The Study will cover Caspian Coastal Area, mainly focused on the Madarsoo river basin.

Ⅳ. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study will cover the following items:

Phase I: Basic Study and Analysis for formulation of master plan

1. Collection and analysis of existing information (documents, materials, and data)
   a. natural conditions (topography, geology, meteorology, etc.)
   b. national and regional socio-economic conditions, financial conditions
   c. river and slope condition
   d. existing facilities and measures related to flood and debris flow control including emergency works plan for the fast track implementation (dam, sabo dam, shore protection, etc.)
   e. infrastructure (road, bridge, etc.)
   f. relevant legislation/ organizations/ institution
   g. present watershed management, etc.

2. Review of foregoing, ongoing and prospective plans, studies and projects

3. Field survey
   1) Madarsoo River Basin
   2) Flood and Debris flow hit area
   3)Other Caspian Coastal Area(two or three rivers)

4. Socio-cultural survey(Madarsoo River Basin)
   a. population
   b. settlement and community
   c. property
   d. life-style
   e. industry
   f. public education
   g. awareness of flood and debris flow prevention
   h. awareness of law or regulation

5. Analysis
   a. hydrological analysis
   b. sediment loads analysis
   c. debris flow analysis
   d. flood run-off analysis
   e. inundation analysis
   f. damage analysis
   g. flood root causes analysis

6. Evaluation of facilities for disaster prevention of flood and debris flow
   a. allocation
   b. location
   c. type
   d. scale
   e. materials

7. Socio economical prediction

<u>Phase II: Formulation of Master Plan</u>

<Countermeasure for Debris flow>

1. Criteria for site selection of structural measure for debris flow
   a. area
   b. population
   c. property
   d. effectiveness of structural measure
   e. geographical and soil condition
   f. hydrological condition, etc.

2. Site Selection of structural measure

3. Alternative analysis

4. Environmental Impact Analysis, Social Impact Analysis

5. Design and Cost estimation

6. Non structural measure (warning and evacuation)

<Countermeasure for Flood>

1. Plan of River Scale

2. Structural measure for planned flow

3. Alternative analysis

4. Environmental Impact Analysis, Social Impact Analysis

5. Design and Cost estimation

6. Non structural measure (warning and evacuation)

<Combination>

1. Organizational and Institutional Plan
   a. implementation organization
   b. demarcation of responsibilities among the relevant authorities
   d. regulatory and institutional arrangements
   e. enforcement of law and regulations

2. Capacity Development Plan
   a. capacity building of the organizations concerned
   b. human resource arrangement and development
   c. training plan of the staff of the organizations concerned

3. Education and Extension Plan of Local People
   a. education plan of the local community and people
   b. enlightenment plan of the local people and visitors
   c. plan of disaster prevention drill for the local communities and people

4. Implementation Plan
   a. implementation schedule
   b. budget allocation
   c. monitoring and evaluation plan of the implementation

5. Evaluation
   a. Financial and economic analysis
   b. Technical evaluation
   c. Social impact evaluation and
   d. Environmental impact assessment

<u>Other activities</u>

1. Pilot project
   a. debris flow disaster warning and evacuation, etc.

2. Manual Creation

a. study plan
b. criteria for site and facility type selection
c. design and calculation

3. Technology Transfer Seminar

4. Public Hearing

5. Publication of Newsletter of the Study

6. Setting up of web-site

V. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule as attached in the annex. The schedule is tentative and subject to be modified when both parties agree upon any necessity that will arise during the course of the Study.

VI. REPORTS

JICA will prepare and submit the following reports in English to Iran.

1. Inception Report:
Twenty (20) English copies at the commencement of the first field work in Iran

2. Progress Report:
Twenty (20) English copies at the end of the first field work in Iran

3. Interim Report:
Twenty (20) English copies at the commencement of Phase II study

4. Draft Final Report:
Twenty (20) English copies at the end of Phase II study
Iran side shall submit its comments within one (1) month after the receipt of the Draft Final Report.

5. Manual
Twenty (20) English copies at the end of Phase II study

6. Final Report:
Final Report will consist of Executive Summary, Main Report, Supporting Report, and/or Data Book. Twenty (20) English copies will be submitted within one (1) month after the receipt of the comments on the Draft Final Report.

Ⅶ. UNDERTAKINGS OF THE GOVERNMENT OF IRAN

1. To facilitate the smooth conduct of the Study, the Government of Iran shall take the following necessary measures:

(1) To permit the members of the Team to enter, leave and sojourn in Iran for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;

(2) To exempt the members of the Japanese study team (hereinafter referred to as "the Team") from taxes, duties, and any other charges on equipment, machinery and other materials brought into Iran for the implementation of the Study;

(3) To exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study; and

(4) To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Iran from Japan in connection with the implementation of the Study.

2. The Government of Iran shall bear claims, if any, against a member(s) of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Team.

3. Ministry of Jihad-e Agriculture shall act as a counterpart agency to the Team and also as a coordinating body in relation with other governmental and non-governmental organizations for the smooth implementation of the Study.

4. Ministry of Jihad-e Agriculture shall, at its own expense, provide the Team with the following, in cooperation with other organizations concerned:

(1) Security-related information as well as measures to ensure the safety of the Team;
(2) Information on as well as support in obtaining medical service;
(3) Available data and information related to the Study;
(4) Counterpart personnel;
(5) Suitable office space with necessary office equipment (telephone etc.) and furniture;
(6) Credentials or identification cards; and
(7) Appropriate numbers of vehicles with drivers.

Ⅷ. CONSULTATION

JICA and Ministry of Jihad-e Agriculture shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Annex I

Tentative Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Work																								
Phase																								
Report	IC/R		P/R(1)						P/R(2)					IT/R					DF/R			F/R		
Seminar / Workshop								▲					▲							▲				

IC/R: Inception Report, P/R: Progress Report, IT/R: Interim Report,
DF/R: Draft Final Report, F/R: Final Report

MINUTES OF MEETINGS

on

the SCOPE OF WORK

for

THE STUDY

on

Flood and Debris Flow in the Caspian Coastal Area

Focusing on the flood-hit Region in Golestan Province

AGREED UPON BETWEEN

Ministry of Jihad-e Agriculture

and

Japan International Cooperation Agency

Tehran, September 3, 2003

Dr. Forood Sharifi
Deputy for Watershed Management,
Forest, Range and Watershed Management
Organization,
Ministry of Jihad-e-Agriculture

Mr. Hara Yoshifumi
Leader of the Preparatory Study Team
Japan International Cooperation
Agency (JICA)

In response to the official request of the Government of Islamic Republic of Iran (hereinafter referred to as "the Government of Iran"), the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the preparatory study team (hereinafter referred to as "the Team"), headed by Mr. Hara Yoshifumi, to Iran from August 25 to September 3, 2003 to discuss the Scope of Work (hereinafter referred to as "S/W") for the Study on Flood and Debris Flow in the Caspian Coastal Area Focusing on the flood-hit Region in Golestan Province (hereinafter referred to as "the Study").

During the period of the preparatory study, the Government of Iran and the Team held a series of meetings and conducted field survey. The list of those who attended these meetings is shown in the Annex.

As a result of the discussions, Ministry of Jihad-e-Agriculture (hereinafter referred to as "MOJA"), which is the counterpart organization, and the Team came to an agreement on S/W which was signed on September 3, 2003.

The Minutes of Meetings have been prepared for the better understanding of the S/W. Both sides (MOJA and the Team) agreed and confirmed the following points for the smooth implementation of the Study.

Implementation Framework for the Study

1. Establishment of Committees

Considering the importance of cooperation among the relevant Iranian organizations and involvement of them in the Study, both sides agreed that the MOJA would establish two committees: Steering Committee and Technical Committee, before starting of the Study. These two committees shall undertake the following responsibilities, respectively.

(1) Steering Committee (ST/C)

The Steering Committee (ST/C) should guide the Study to the proper direction as a national level committee, covering various aspects on debris and flood disaster prevention and control. The ST/C should be chaired by Deputy for Watershed Management, Forest, Range and Watershed Management Organization, Ministry of Jihad-e-Agriculture. In principle, the ST/C should be held around three times a year and when MOJA and/or the Japanese side request.

The ST/C would be composed of representatives of the following organizations:

- Ministry of Jihad-e-Agriculture
- Ministry of Energy

- Ministry of Interior (including from Provincial Governments)
- Ministry of Road and Transportation
- Ministry of Foreign Affaires
- Department of the Environment
- Management and Planning Organization
- Other related organizations

(2) Technical Committee (T/C)

The Technical Committee (T/C) should be organized under the ST/C to provide the JICA study team of the Study (hereinafter referred as to "the Study Team") with instructions and/or information relating to the Study and advice on appropriate technologies to be applied in the Study. The T/C should be chaired by General Director of Study and Evaluation Department, Ministry of Jihad-e-Agriculture. In principle, the T/C should be held around once per two months and when MOJA and/or the Study Team request.

The T/C would be composed of the following members:

- Representatives of related sections of Ministry of Jihad-e-Agriculture
- Representatives of related sections of Ministry of Energy
- Representatives of related Provincial Authorities
- Representatives of related research institutes and universities

2. Counterpart Organization

Both sides agreed that MOJA should act as the counterpart organization to the Study Team and also as the coordination body to obtain close cooperation from the relevant organizations, especially Ministry of Energy, throughout the Study, since the Study would include various fields relating to the other organizations.

3. Counterpart Personnel

The Team requested and MOJA agreed to assign counterpart personnel to each expert of the Study Team and to submit the list of them by the end of November. In order to assign each counterpart personnel, the Team agreed to inform the number and field of experts when decided.

Contents of the Study

4. Countermeasures

Both sides agreed that short term and long term countermeasures would be considered in the Study and biological measures such as forestation and range management would be studied briefly as one of long term countermeasures by reviewing the existing plan and information to

be provided by the Iranian side.

5. Manual Creation

Both sides agreed that the manual shall be composed of planning for non-structural and structural measures, and designing for structural measures.

6. Study Area

Both sides agreed that concrete countermeasures would be proposed to the Madarsoo River Basin, which catchments area is approximately 2,300 sq km, while an overview of the situations based on data and information to be provided by the Iranian side would be carried out for the other Caspian coastal areas in order to create the above mentioned manual appropriately.

7. Urgent Measures

MOJA explained that MOJA had obtained necessary budget of the fiscal year 2003 to conduct urgent measures against debris flow and flood at the Madarsoo River Basin, and requested supports such as detailed design of the structural measures.

The Team answered that there was a possibility Study Team could provide technical advice during the Study if the schedule permits and the design and its implementation will be conducted under the Iranian side's responsibility. The team also promised to convey this request to JICA Headquarters.

8. Simulation

MOJA requested that the Study Team should clarify effects of projects, which will be proposed by the Study, by using a simulation model in order to explain the effects to inhabitants, NGOs, and central and local governments.

The Team answered that type of the simulation model as well as criteria and indicator to be adopted in the Study should be determined between the MOJA and the Study Team in the course of the Study because these matters depended on availability of data and projects to be proposed.

9. Manner of Analysis

MOJA asked that what kind of methodologies would be used for each analysis described on Scope of Work and what criteria would be used for the alternative analysis. MOJA also requested JICA to consider flood routing in the alternative analysis.

The Team answered that the methodologies and criteria to be adopted in the Study mainly depended on availability of data and they would be decided in the course of the Study. The

Team also explained that the idea, criteria and procedures to reach the conclusion would be described in the manual so that the results of the Study could be adapt to other Caspian coastal areas by the Iranian side, and flood routing should be considered in the Study.

10. Pilot Activity

The Iranian side asked that what would be the contents of pilot activity and what kind of instruments would be used for the pilot activity. The Team answered that the pilot activity would be a local debris flow forecasting and warning system and kind of instrument to be used would be informed at the commencement of the Study or during the Study. The Team also answered that one or two rainfall gauges with alarm would be considered for the pilot activity as a temporary idea, and result of pilot activities should be reflected on the master plan.

11. Counterpart Training in Japan

MOJA requested that Iranian counterpart personnel take advantage of training in Japan related to the Study to promote an effective technology Transfer.

The Team promised to convey this request to JICA Headquarters.

12. Workshop and Seminar for Technology Transfer

The Iranian side requested that the Study Team should provide training to staff of MOJA. The Team understood importance of training and proposed that workshops would be held during the Study as part of technology transfer. The workshops would include lecture, field training, practice and presentation regarding debris flow and flood prevention and control.

13. Evaluation of Implementation

MOJA requested to include evaluation of the implementation of projects to be proposed by the Study. The Team answered that the evaluation methods should be proposed based on the discussions between MOJA and the Study Team during the Study.

14. Public Hearing

MOJA asked the meaning about the "Public hearing" described on Scope of Work. The Team answered that there were two meanings in it. One was to give enough information of the Study to the local people and visitor in the Study area (Madarsoo River Basin), and the other was to hear opinions of them.

15. Report

MOJA agreed that all of the report of the Study would be open to the general public.

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MOJA requested that JICA prepared the Final Report, manual, materials for workshop and so on in Persian as well as in English to make effective technology transfer to staff of Government of Iran.

The Team promised to convey this request to JICA Headquarters.

Undertakings of the Iranian Side

16. Vehicle

MOJA promised to provide one 4WD vehicle, which was transferred to MOJA after the study of watershed management for Karoon river, to the Study Team.

17. Office Space

MOJA promised to provide the Study Team with enough office spaces for the member of the Study Team both in Tehran and Gorgan.

18. Data and Information

MOJA promised that necessary data and information, which MOJA had such as maps, GIS data, satellite images, aerial photographs, hydrological and meteorological so on, should be provided to Study Team.

ANNEX

LIST OF PARTICIPANTS

Iranian Side:

Forest, Range and Watershed Management Organization (FRWO), Ministry of Jihad-e-Agriculture (MOJA)

Dr. Forood Sharifi	Watershed Management Deputy (WMD)
Mr.Reza Sohrabi	Director General of Study & Evaluation Department, WMD
Mr.Ali Chananeh	Director General of Planning and Coordination Department, WMD
Mr.S.A.Mirghasemi	Vice Director of Planning and Coordination Department, WMD
Mr.Nader Senoubar	Director General of Watershed Executive Affairs Department, WMD
Mr.Hamid Reza Zakizadeh	Chief of Land Evaluation Group, Study & Evaluation Department, WMD
Mr.Ali Akbar Mooshivand	Chief of Flood Group, Study & Evaluation Department, WMD
Mr.M.R.Shojaei	Director of General of Planning and Coordination Department, WMD
Mr.Mohamnad Sabouri	Senior Expert of WMD
Mr.Behbahani	Senior Expert of WMD
Mr.R.Roshani	Expert of WMD
Mr.Abolghasem Zinali	Vice Director of Planning and Coordination Department, WMD
Mr.Eskanderi	Director of General of Range Department, Range Management Deputy (RMD)
Mr.Parvis Salehi	Expert of Forest, Forestry Affairs Deputy (FAD)
Mr.Moeteza Ebrahimi	Expert of Forest, FAD
Mr.Javad Mojtahed	Expert of Horticulture Deputy
Mr.Jahangir Arab	Team Manager of Golestan Project, Horticulture Deputy

International and Regional Organizations, Ministry of Jihad-e-Agriculture (MOJA)

Mr.M.R.Shariaty	Vice Director General for International and Regional Organizations

Golestan Provincial Office, Ministry of Jihad-e-Agriculture (MOJA)

Mr.Jamshid Gafari	Vice Head of Provincial Jihad-e- Agriculture Organization
Mr.Kambiz Alipoor	Chief of Evaluation and GIS Office
Mr.Ali Salmany	Chief of Study Management
Mr.Rojabaliz Salmani	Chief of Study Management
Mr.Reza Ahmadi	Expert of Watershed Management Office
Mr.Mohammad Reza Montazerion	Expert of Watershed Management Office

Mr.Mohammad Reza Parsamshr	Expert of Watershed Management Office

Ministry of Foreign Affairs (MOFA)

Mr.Hojat Moghadam

Management Planning Organization (MPO)

Mr.Adl Hamid Reza	Senior Expert of Agriculture and Natural Resource Department
Mr.Hosseinpoer Hamid	Expert of Agriculture and Natural Resource Department

Ministry of Energy (MOE)

Mr.Jabar Vatan Fada	Director General of River and Coastal Engineering Department

Ministry of Interior (MOI)

Mr.Jazaieri	Director General of Natural Disaster Prevention Department

Golestan Provincial Office, Ministry of Roads and Transportation,

Mr.Ali Lotfi	Director General of Road and Transportation

Government Office of Semnan Province

Mr.Hasan Akbarpoor	Director General of Planning of Natural Resources
Mr.Hooshang Heidari	Deputy of Planning of Natural Resources
Mr.Hamid Nasiri	Expert of Planning of Natural Resources

JICA Experts

Mr.Takayuki Nagai	Expert on Watershed Management, MOJA
Mr.Seigo Furudono	Expert on Agricultural Development, MOJA

Japanese Side:

Preparatory Study Team (Team)

Mr.Yoshifumi Hara	Leader, Disaster Prevention Planning
Mr.Tomoyuki Okada	Member, Countermeasure for Flood
Mr.Hideaki Matsumoto	Member, Study Planning / Preparatory Evaluation
Mr.Yukishi Tomida	Member, Disaster Prevention Operation
Mr.Toshiyuki Ujiie	Member, Environment and Social Impact Assessment / Organizational Analysis

Embassy of Japan

Mr.Tomomasa Onomi	Second Secretary

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