

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
EARTHQUAKE RECONSTRUCTION AND REHABILITATION AUTHORITY (ERRA)

# **THE URGENT DEVELOPMENT STUDY ON REHABILITATION AND RECONSTRUCTION IN MUZAFFARABAD CITY IN THE ISLAMIC REPUBLIC OF PAKISTAN**

**FINAL REPORT I  
VOLUME 1 : SUMMARY**

January 2007

**PACET** Corp.  
 **NIPPON KOEI CO.,LTD.**

## Report Organization

This report consists of the following volumes:

### Final Report I

- Volume 1 : Summary**
- Volume 2 : Main Report**
- Volume 3 : Sector Report**

### Final Report II

#### Urgent Rehabilitation Projects

In Final Report I, **volume 1 Summary** contains the outline of the results of the study. **Volume 2 Main Report** contains the Master Plan for rehabilitation and reconstruction in Muzaffarabad city, Pakistan. **Volume 3 Sector Report** contains the details of existing conditions, issues to overcome, and proposals for future reconstruction by sector.

Final Report II deals with the results and outcomes on **the Urgent Rehabilitation Projects** which were prioritized and implemented in parallel with master plan formulation work under the supervision of JICA Study Team.

The exchange rate applied in the Study is:

(Pakistan Rupee)		(Japanese Yen)
Rs.1	=	¥1.91

(Pakistan Rupee)		(US Dollar)
Rs.60.30	=	US\$ 1

## PREFACE

In response to the request from the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct a Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City in the Islamic Republic of Pakistan and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched the Study Team headed by Mr. Ichiro Kobayashi of Pacet, consisted of Pacet and Nippon Koei, to the Islamic Republic of Pakistan from February 2006 to August 2006. JICA set up an Advisory Committee chaired by Dr. Kazuo Konagai from the University of Tokyo, which examined the study from the specialist and technical points of view.

The Study Team held discussions with the officials concerned of the Government of the Islamic Republic of Pakistan and conducted the Study in collaboration with the Pakistani counterparts. Upon the last return to Japan, the Study Team finalized the study results for delivery of this Final Report.

I hope that this report will contribute to rehabilitation and reconstruction of Muzaffarabad city and to the enhancement of friendly relationship between the two countries.

Finally, I wish to express my sincere appreciation to all the officials concerned of the Government of the Islamic Republic of Pakistan for their close cooperation extended to the Study.

January 2007

Kazuhisa Matsuoka  
Vice President  
Japan International Cooperation Agency

Mr. Kazuhisa Matsuoka  
Vice President  
Japan International Cooperation Agency  
Tokyo, Japan

January 2007

### **Letter of Transmittal**

Dear Mr. Kazuhisa Matsuoka,

We are pleased to formally submit herewith the final report entitled “The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City in the Islamic Republic of Pakistan”.

This report compiles the results of the study, which was undertaken in the Islamic Republic of Pakistan from February 2006 to August 2006 by the Study Team organized jointly by Pacet and Nippon Koei under the contract with the JICA

The Final Report is composed of the “Executive Summary”, “Main Report”, and “Sector Report”. In the Main Report, the emphasis was given that Muzaffarabad City should be reconstructed with strong urban structure against natural disaster as primary policy, including project long list for early implementation of the rehabilitation and reconstruction. In addition, the Sector Report compiles overall policies and procedures of rehabilitation and reconstruction in each sector. It is truly hoped that the outcomes of the Final Report will contribute to enhance rehabilitation and reconstruction of Muzaffarabad City and victims of earthquake will back to normal life soon.

Finally, we would like to express our sincere gratitude and appreciation to all the officials of your agency, the JICA advisory Committee, the Embassy of Japan in the Islamic Republic of Pakistan, and Ministry of Foreign Affairs. We also would like to send our great appreciation to all those who have extended their kind assistance and cooperation to the Study Team, in particular, relevant officials of Earthquake Reconstruction and Rehabilitation Agency (ERRA) and Azad Jammu Kashmir (AJK) Government.

Very truly yours,

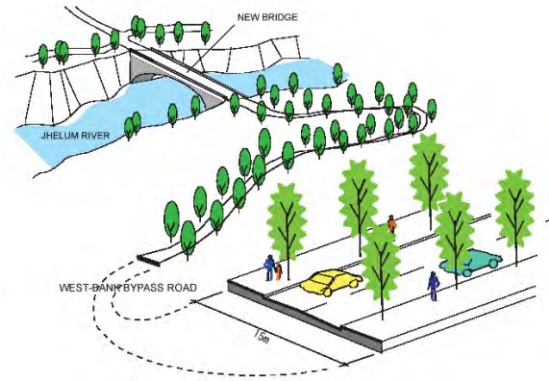
Ichiro Kobayashi  
Team Leader, JICA Study Team  
The Urgent Development Study on Rehabilitation and  
Reconstruction in Muzaffarabad City in the Islamic  
Republic of Pakistan

## Images of Proposed Project

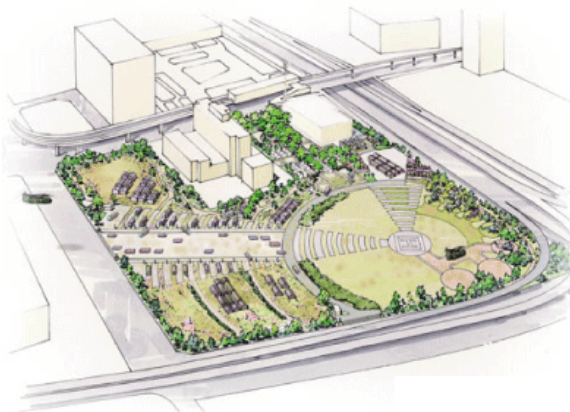
The following pictures illustrate some of action plan projects (see page 57) which were selected in view of urgency and effectiveness among the entire long list of projects and programs. (Under the supervision of JICA study team experts, Sathi Bagh Government Girls High School was successfully constructed, and West Bank By-pass road was studied on preliminary design.)



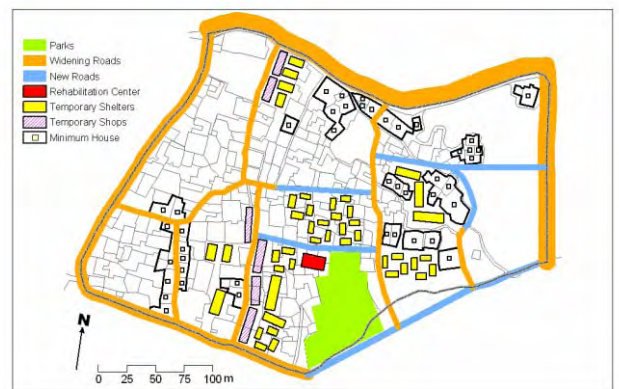
**Image of Satellite Town**



**Image of West Bank By-pass Project**



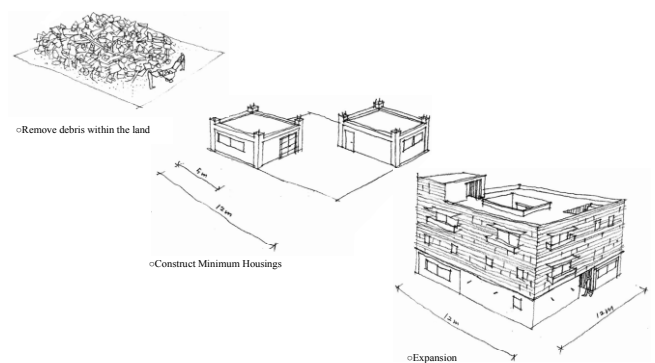
**Disaster Management Park View**



**Temporary Urban Area**



**Sathi Bagh Government Girls High School**



**Construction of Minimum House**

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### List of Abbreviations

Abbreviation	Name
AJK	Azad Jammu and Kashmir
CBO	Community Based Organization
ERRA	Earthquake Reconstruction and Rehabilitation Authority
F/R	Final Report
GIS	Geographic Information System
GOAJK	Government of Azad Jammu and Kashmir
GOJ	Government of Japan
GOP	Government of Pakistan
GSP	Geological Survey of Pakistan
HFT	Himalayan Frontal Thrust
IC/R	Inception Report
IT/R	Interim Report
JICA	Japan International Cooperation Agency
LOC	Line of Control
MBT	Main Boundary Thrust
MCM	Municipal Corporation Muzaffarabad
MCT	Main Central Thrust
MDA	Muzaffarabad Development Authority
NGO	Non Governmental Organizations
NESPAK	National Engineering Service Pakistan
PR/R	Progress Report
USGS	US Geological Survey
WTP	Water Treatment Plant

The Urgent Development Study on  
Rehabilitation and Reconstruction in Muzaffarabad City in  
the Islamic Republic of Pakistan

**EXECUTIVE SUMMARY**

**1. GENERAL**

**1.1. Background of the Study**

Earthquake and Damages

An earthquake measuring 7.6 on the Richter scale occurred at 8:50 a.m. October 8, 2005 (Pakistani Standard Time). The seismic center was reported at 90 km north-northeast from Islamabad, at 34.493 degrees north latitude, and 73.629 degrees east longitude. The epicenter was 26 km below ground level. Muzaffarabad city, the capital of AJK, is located close to the epicenter of the earthquake. Government buildings in the area were heavily damaged mainly in the northern part of the city. Moreover, the road network was cut due to landslides caused by the earthquake, and this worsened earthquake damages.

Background of the Formulation of Rehabilitation and Reconstruction Plan of Muzaffarabad City

Since the northern part of Muzaffarabad city is located close to the epicenter and dislocation, many buildings and structures were heavily damaged. Many government buildings have been damaged as well. The government, therefore; has not been functioning well since the event and this has caused difficulties in formulating rehabilitation and reconstruction plans.

Furthermore, taking into consideration the present situation of the affected people and their hopes toward immediate reconstruction, it is needed to formulate a rehabilitation and reconstruction master plan in a short period. It is also urged to implement some immediate countermeasures, which are a matter of urgent need.

In line with these backgrounds, Japan International Cooperation Agency (JICA) dispatched the study team of this project.

**1.2. Objective of the Study**

The Study aims at achieving the following two objectives:

- 1) Formulation of Rehabilitation and Reconstruction Master Plan (Target year: 2016)
- 2) Implementation of Pilot Rehabilitation Project, if necessary

**1.3. Study Area**

The Study area is Muzaffarabad city, covering 17 sq.km, and its surrounding areas.

#### **1.4. Counterpart Agency**

The Counterpart agency for the Study is Earthquake Reconstruction and Rehabilitation Authority (ERRA). Pakistani and Japanese sides have agreed to set up the Steering Committee under the initiative of ERRA for effective study implementation. Reports that include progress of the study will be presented and discussed at Steering Committee meetings at each stage of the Study.

#### **1.5. Priority Rehabilitation Project**

JICA Study Team conducted five “Priority Rehabilitation Projects” simultaneously with formulation of Master Plan.

- i) Community Empowerment Project on Debris Removal
- ii) Landslide measuring Device Installation and Disaster Education Activities Project
- iii) School Rehabilitation Project
- iv) Promotion of Disaster Management Education Project
- v) West Bank Bypass Construction Study Project

## **2. HAZARD ASSESSMENT AND ZONINGS**

### **2.1. Hazard Evaluation (Landslide)**

Landslide hazard assessment has the following aims: i) to identify active and highly potential areas of landslide, ii) to make preliminary hazard and risk assessment of identified landslide areas, iii) to prepare a landslide hazard map covering Muzaffarabad city and its surroundings, and iv) to make suggestions of countermeasures.

#### Methodology

The evaluation was based on topographical interpretation and the field investigations.

#### Landslide Hazard Areas and Evaluation

Landslide survey targeted 40 km<sup>2</sup>. Of a total 71 landslide areas identified by interpretation of topographical map, satellite image and field check of which 18 areas are identified as high risk land slide areas, where it will affect human activities or cause a great damage to lives and properties. Additionally, as an output of the landslide survey, the team prepared the landslide hazard map, classified by the colors of hazard levels A, B, and C.

Further, not many locations seem to have experienced landslides after the earthquake, yet as the landslide hazard map suggests, there are many potential hazardous areas distributed along the east slope of Muzaffarabad. These are a threat for this coming rainy season.

## **2.2. Hazard Evaluation (Earthquakes and Buildings)**

The 2005 Kashmir earthquake was evaluated to be caused by a part of Tanda fault, which is a part of Himalayan Frontier Thrust (HFT). The return period of the earthquake that would rupture around here is assumed to be 1000 - 2000 years. The length of the fault, which moved at this time, was approximately 70-100 km. The magnitude was M 7.3 to M 7.6. It can be thought of that this earthquake is the *maximum credible earthquake* in this region. Thus, the target of disaster mitigation plan of this region can be set to this level as a standard. While, an immediate risk of flooding is a break in a natural levee made by the landslide caused by the earthquake. The natural levee made of deposited sand would be easily broken by overflow of river water. There is the potential threat that the flood caused by the break of levee will affect Muzaffarabad city.

## **2.3. Zoning for Urbanized Area**

The objective of the land suitability assessment for Muzaffarabad city is to formulate a zoning for the urbanized area that would have the capacity to support future growth. This was done by splitting the land area comprising Muzaffarabad city and the surrounding districts into three zoning categories for future development.

For assessing land suitability of Muzaffarabad, the JICA Study Team paid special attention to natural hazards, such as landslides, mudflows, and relative displacement of the ground surface that are caused by ground movement near active faults. The results of the land suitability assessment presented in this report can be used as a base for preparing land use plans for Muzaffarabad city.

## **2.4. GIS Database**

Study Team produced Geographic Information System (GIS) database covering Muzaffarabad city and its vicinity totaling about 70 km<sup>2</sup>.

## **3. TOWARD RECOVERY OF MUZAFFARABAD CITY**

### **3.1. Cores for the Recovery of Muzaffarabad**

For the recovery of Muzaffarabad city, this study suggests to include the following four components in the process.

- 1) Self-help, mutual-help, and official Assistance
- 2) Redevelop urban structure that is resistant to natural disasters
- 3) Three phases in recovery and reconstruction process

Phase 1 : Rehabilitation Period involves evacuation and formation of temporary planned urban area,

Phase 2 : Initial reconstruction period involves transforming temporary planned urban to permanent urban area, and

Phase 3 : Full-scale reconstruction period involves completing the permanent urban area.

- 4) Minimize the number affected from relocation and dislocation

### **3.2. Muzaffarabad Recovery and Rehabilitation Master Plan**

#### Vision 2016

The master plan aims at providing policy guidelines in rehabilitation and reconstruction of Muzaffarabad city from the devastating earthquake disaster. The provision of master plan is essential in effective implementation of recovery works. The target of the master plan is 2016 for the next 10 years.

Vision of Muzaffarabad City toward 2016. “Muzaffarabad City will recover from the damages of earthquake disaster over the next 10-years and be reconstructed as modern capital city of Azad Jammu and Kashmir (AJK). The city will be reconstructed with strong urban structure against recurrent natural disaster, and it will function as a gateway city and a regional development center in Kashmir.”

#### Framework of Master Plan

The master plan aims at providing policy guidelines in rehabilitation and reconstruction of Muzaffarabad city from the devastated earthquake disaster. The provision of master plan is essential in effective implementation of recovery works. The target of the master plan is 2016 for the next 10 years.

#### Development Scenarios

Based on the current land use as well as the results of the hazard assessment, the areas designated as suitable and secure lands for future urban development amount to about 900 ha in the city. Using this suitable land for recovery and rehabilitation is essential, however; it cannot accommodate the expected population growth. Even if accommodating the maximum population, 20,000 are expected to be pushed out from the suitable areas. The Study Team recommends three options for future development of the city. The satellite town development outside the city is the best option in terms of seismic perspective.

#### Basic Policies for Urban Structure

The urban planning framework is guided by a set of basic policies for creating safe and strong urban structures against natural disaster. These include five policies: develop a multi-core urban structure, restrict new construction in potential hazardous areas, implement special measures in reconstruction on the potential faults, establish a network of parks and open spaces, and reduce flood risk.

#### Basic Scheme for Reconstruction in Urban Areas

Reconstruction includes four types of approaches:

- 1) Self-help, mutual-help, and public assistance
- 2) Promoting transitional reconstruction of urban areas
- 3) Developing Individual Reconstruction Programs by Ward
- 4) Promoting rehabilitation in an integrated way

#### Reduction of Natural Hazard and Risk

The building codes and regulation of local government does not exist in AJK. Therefore, it is indispensable to enact regulation of local government with the compulsion power in the AJK government. Evacuation procedure has been discussed with the residents of the target area and drills have been conducted. It is pointed out that the debris flow and mudflow should be stopped before reaching the urbanized area by constructing check dams or other temporary structures.

### **3.3. Implementation Plan**

#### Implementation Strategy

The Study Team examines the measures to achieve the vision and objectives and selected four implementation strategies as shown below.

- 1) Rehabilitation and reconstruction of urban areas
- 2) Provision of appropriate shelter and housing
- 3) Recovery of citizen's life to the normal situations
- 4) Reduction of natural hazard risk

#### Implementation Schedules

Proposed development scheme is in three phases: rehabilitation period, initial reconstruction period and full-scale reconstruction period. Past experience in Japan shows that the intermediate phase takes a considerable time, and from that, the Study is expected to need three years. The whole project implementation period is 11 years from 2006 and divided into three phases, short-term, intermediate term and long term.

#### Long List

The long list prepared in this study includes all projects aiming to achieve the goal and objectives of the rehabilitation and reconstruction master plan. The projects and programs are identified to fill the gap between existing situations and future rehabilitation and reconstruction of Muzaffarabad city.

#### Urgent Project

There are two urgent projects: provision of temporary shelter and debris flow countermeasures project for early implementation.

### Selected Action Plans

Selected action plans currently are nine as shown in the table below: The projects are implemented in early stage.

Rehabilitation and Reconstruction Strategies	Code	Name
A. Provision of shelter and housing	A-1	Preparation of micro town planning and its implementation
	A-2	Development of transitional housing schemes and Its Implementation
	A-3	Development of financial assistance scheme for housing reconstruction
B. Recovery of urban function	B-1	Construction of the west bank by-pass road
	B-2	Development of satellite town
	B-3	Development of central park with the function of disaster management
	B-4	Recovery of Infrastructure and basic urban service facilities
C. Recovery of citizen's life	C-1	Reconstruction of shopping complex
	C-2	Reconstruction of government facilities
	C-3	Development of skill training center for a casualty of the earthquake
D. Reduction of recurrent natural hazard risk	D-1	Establishment of land use and building control measures
	D-2	Establishment of building Permission and Inspection System
	D-3	Construction of Debris and Mud Flow Risk Reduction Facilities

Note: The project code does not mean the priority.

## **4. RECOMMENDATIONS FOR MUZAFFARABAD**

This Study mainly discusses on regional reconstruction plans as for recovery and rehabilitation, which includes structure plan of the city of Muzaffarabad.

Further, in the process of recovery, it is hoped that projects shown in the long list should be shared with donor community as well as relevant institutions of the government for early implementation. The projects and programs in the long list were prepared from a wide variety of concepts and suggestions explained in the report.

On the other hand, the government needs to put effort in improving their capacities as well. Studies on responses to this earthquake incident clarified that the government could not respond in a sufficient manner.

Lastly, governments are responsible for providing information on their activities as well as possible assistantships that are given to the residents. Such effort is expected to develop trust between the government and the affected in the community which will significantly increase the reconstruction process.

# 1. GENERAL

## 1.1. Background of the Study

### 1.1.1. Earthquake and Damages

An earthquake measuring 7.6 on the Richter scale occurred at 8:50 a.m. October 8, 2005 (Pakistani Standard Time). The seismic center was reported at 90 km north-northeast from Islamabad, at 34.493 degrees north latitude, and 73.629 degrees east longitude. The epicenter was 26 km below ground level<sup>1</sup> (see Figure.).



Source: Pakistan Earthquake Seismic Events Map, Ref. No X-26, created on 14 Oct. 2005 by MapAction ([www.mapaction.org](http://www.mapaction.org))

**Figure.1 Location of the Seismic Center**

Muzaffarabad city is located close to the epicenter of the earthquake; thus, government buildings in the area were heavily damaged mainly in the northern part of the city. Moreover the road network was cut due to landslides caused by the earthquake, and this worsened earthquake damages.

### 1.1.2. Background of the Formulation of Rehabilitation and Reconstruction Plan of Muzaffarabad City

Since the many buildings and structures including government buildings were heavily damaged, the government has not been functioning well since the event and this has caused difficulties in formulating rehabilitation and reconstruction plans.

Furthermore, taking into consideration the present situation of the affected people and their hopes toward immediate reconstruction, it is needed to formulate a rehabilitation and

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<sup>1</sup> United States Geological Study Reports (USGS).



reconstruction master plan in a short period. It is also urged to implement some immediate countermeasures, which are a matter of urgent need.

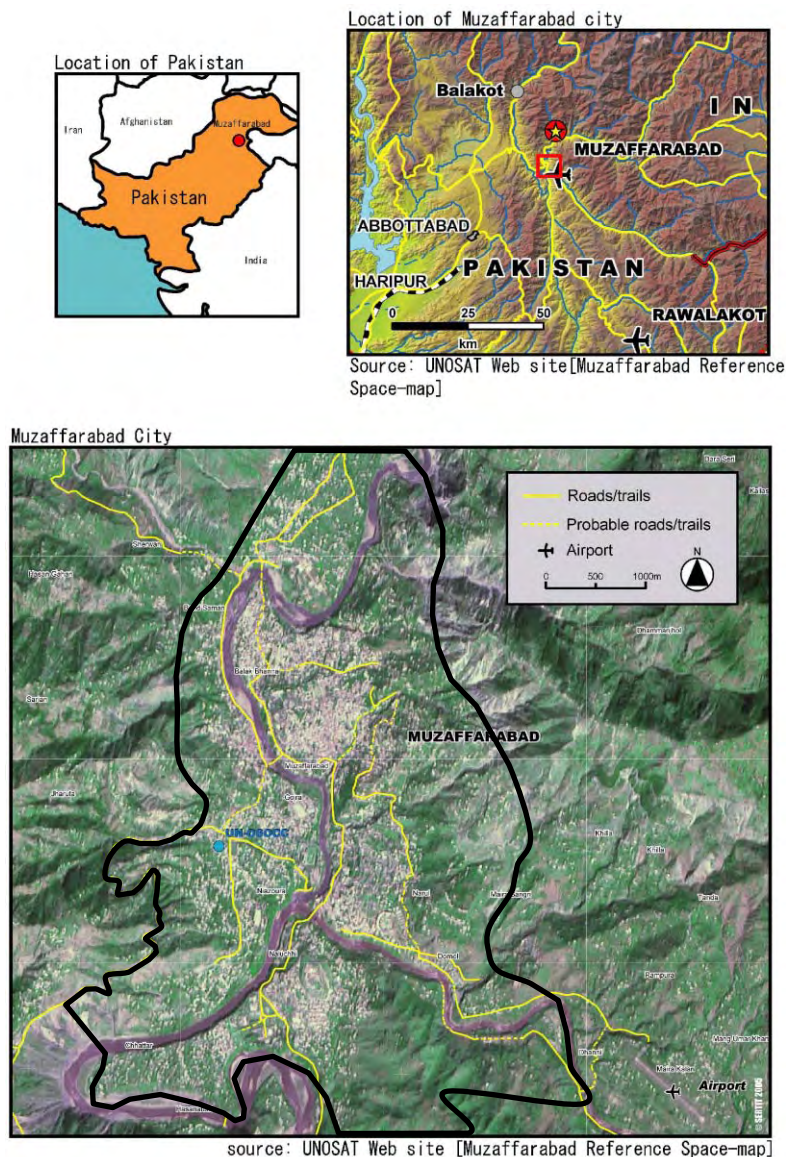
## 1.2. Objectives of the Study

The Study aims at achieving the following two objectives:

- 5) Formulation of Rehabilitation and Reconstruction Master Plan (Target year: 2016)
- 6) Implementation of Pilot Rehabilitation Project, if necessary

## 1.3. Study Area

The Study area is Muzaffarabad city, covering 17 km<sup>2</sup>, and its surrounding areas.



**Figure.2 Study Area Location Map**

Azad Jammu and Kashmir (AJK) is an autonomous state, with its own elected President, Prime Minister, Legislature, and High Court. Azad Jammu and Kashmir (AJK), termed

‘Switzerland of the East’, has an estimated population of about 4 million. The official language of AJK is Urdu, with local languages of Kashmiri, Pahari, Gojri, Hindko and Kohastani. The state is divided into two administrative regions, i.e. Azad Kashmir and Jammu Kashmir. Muzaffarabad city locates in Azad Kashmir. Azad Kashmir covers an area of 13,297 km<sup>2</sup> (5,135 sq. miles), with its capital in Muzaffarabad. Azad Kashmir is a cold, mountainous region that boasts some of the most scenic mountains and river valleys. The region includes a significant part of the Himalayas. Elevation above sea level ranges from 350 m in South to 6,325 m in North. Snowline in winter is at a height of 1,200 m, whereas in summer it moves up to a height of 3,300m. The climate is sub-tropical highland type with average monthly rainfall of 150 mm.

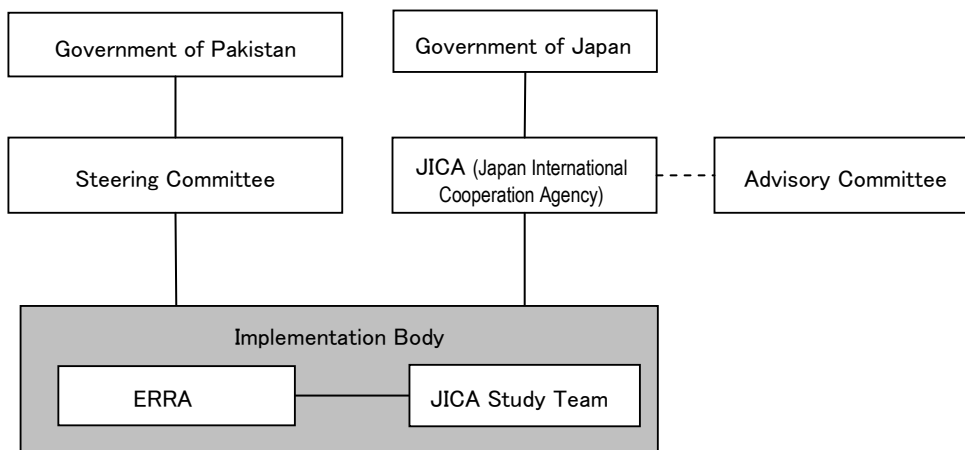
#### **1.4. Counterpart Agency**

The Counterpart agency for the Study is Earthquake Reconstruction and Rehabilitation Authority (ERRA).

Pakistani and Japanese sides have agreed to set up the Steering Committee under the initiative of ERRA for effective study implementation. Reports that include progress of the study are presented and discussed at Steering Committee meetings at each stage of the Study. The Committee consists of the following authorities and organizations:

- 1) Earthquake Reconstruction and Rehabilitation Authority
- 2) Economic Affairs Division, Ministry of Economic Affairs and Statistics
- 3) Planning and Development Department, Government of AJK (GOAJK)
- 4) Central Design Office Works Department, GOAJK
- 5) Public Works Department, GOAJK
- 6) NESPAK
- 7) Representation of Planning Division
- 8) Any other member appointed by ERRA

The study is implemented under the following cooperation structure:



**Figure.3 Cooperation Structure for Study Implementation**

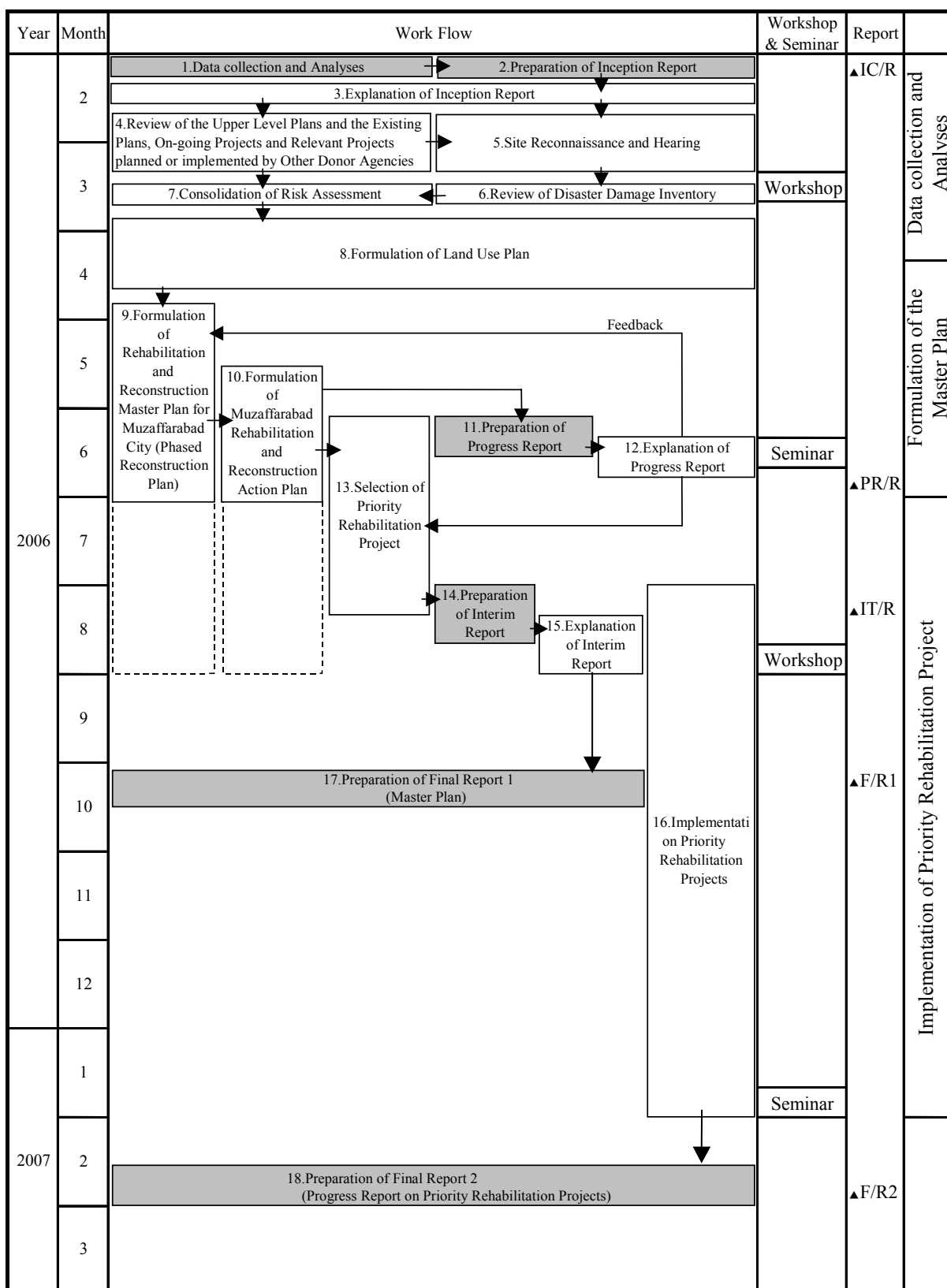
The work schedule of the tasks, interrelations among the tasks, and logical flow of the Study are shown in Figure.4.

### **1.5. Priority Rehabilitation Project**

As shown in the work item “No.16” in Figure.4, JICA Study Team conducted five “Priority Rehabilitation Projects” simultaneously with formulation of Master Plan.

- i) Community Empowerment Project on Debris Removal
- ii) Landslide measuring Device Installation and Disaster Education Activities Project
- iii) School Rehabilitation Project
- iv) Promotion of Disaster Management Education Project
- v) Preliminary Study for West Bank Bypass Project

The details of these rehabilitation projects are compiled in a separate volume, “Final Report II”.



Legend:  Work in Pakistan     Work in Japan  
 IC/R Inception Report    PR/R Progress Report    IT/R Interim Report    F/R Final Report  
 Source: JICA Study Team

**Figure.4 Work Flow of the Study**

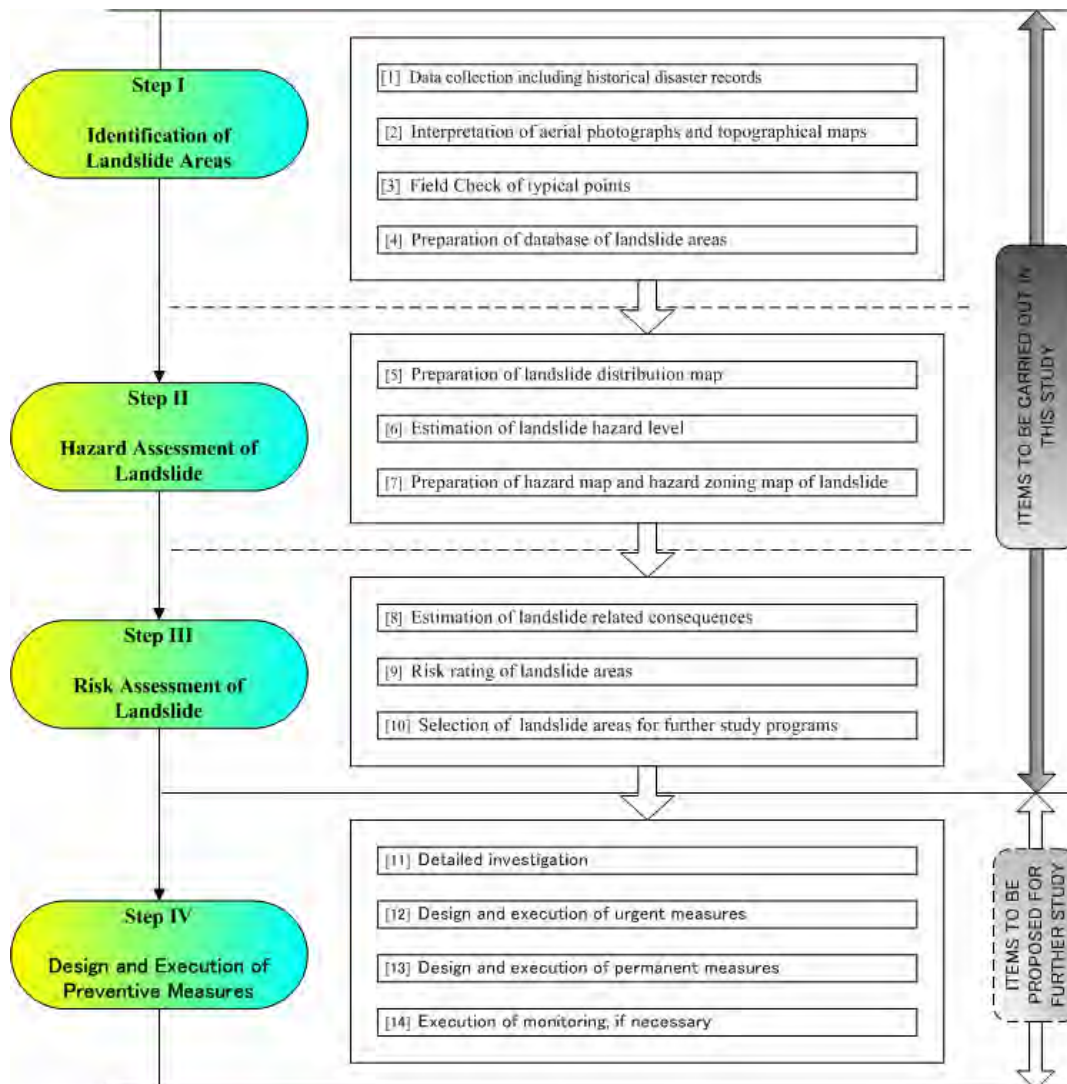
## 2. HAZARD ASSESSMENT AND ZONINGS

### 2.1. Hazard Evaluation (Landslide)

Landslide hazard assessment aims at i) identifying active and highly potential areas of landslide, ii) making preliminary hazard and risk assessment of identified landslide areas, iii) preparing a landslide hazard map covering Muzaffarabad city and its surroundings, and iv) making suggestions of countermeasures.

#### 2.1.1. Methodology

The evaluation was based on topographical interpretation and the field investigations. Figure.5 gives the general workflow of the hazard risk assessment of landslides, including the performed works in this study and the proposed additional work to be done in the future.



Source: JICA Study Team

**Figure.5 Flowchart of Risk Assessment and Selection of Landslide Areas for Further Study Programs**

## 2.1.2. Landslide Hazard Areas and Evaluation

Landslide survey targeted 40 km<sup>2</sup>. Of a total 71 landslide areas identified by interpretation of topographical map, satellite image and field check, 18 areas are identified as high risk land slide areas, where it will affect human activities or cause a great damage to lives and properties (see Table.).

**Table.1 Summary of Hazard and Risk Assessment Results**

Level of Hazard and Risk		Landslide Areas	
		Number	Percentage
Hazard Level of Landslides	A	22	31.0
	B	31	43.7
	C	18	25.3
Risk Level of Landslides	I	18	25.3
	II	12	16.9
	III	13	18.3
	IV	28	39.5

Source: JICA Study Team

Additionally, as an output of the landslide survey, the team prepared the landslide hazard map, classified by the colors of hazard levels A, B, and C.

Further, not many locations seem to have experienced landslides after the earthquake, yet as the landslide hazard map suggests, there are many potential hazardous areas distributed along the east slope of Muzaffarabad and these are a threat for this coming rainy season.

## 2.2. Hazard Evaluation (Earthquake and Flooding)

### 2.2.1. Earthquake

The presence of two major active faults near Muzaffarabad city has been suggested by geologists and seismologists. These active faults have been named the Tanda fault and the Jhelum fault. The devastating earthquake that occurred on October 8, 2005 is considered to have been induced by reverse faulting of the Tanda fault.

#### (1) Tanda Fault

Tanda fault is a part of Himalayan Frontier Thrust (HFT). The return period of the earthquake that would rupture around here is assumed to be 1000 - 2000 years. The length of the fault, which moved at this time, was approximately 70-100 km. The magnitude was M 7.3 to M 7.6. It can be thought of that this earthquake is the *maximum credible earthquake* in this region.

#### (2) Jhelum fault

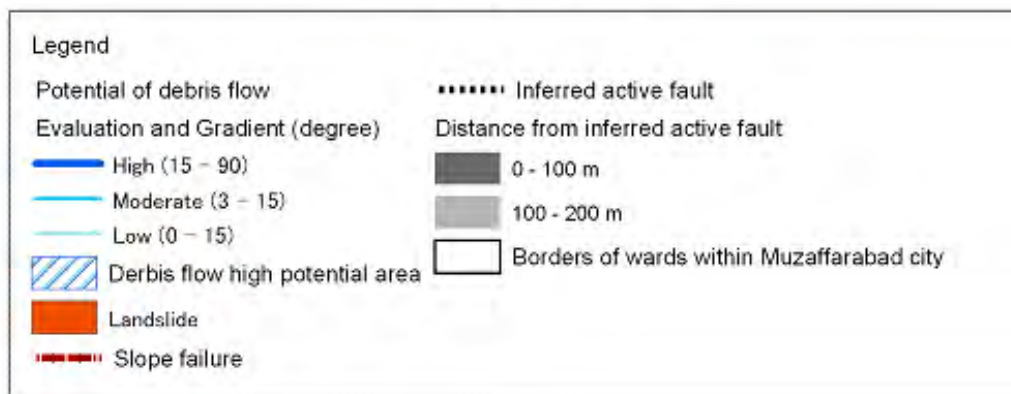
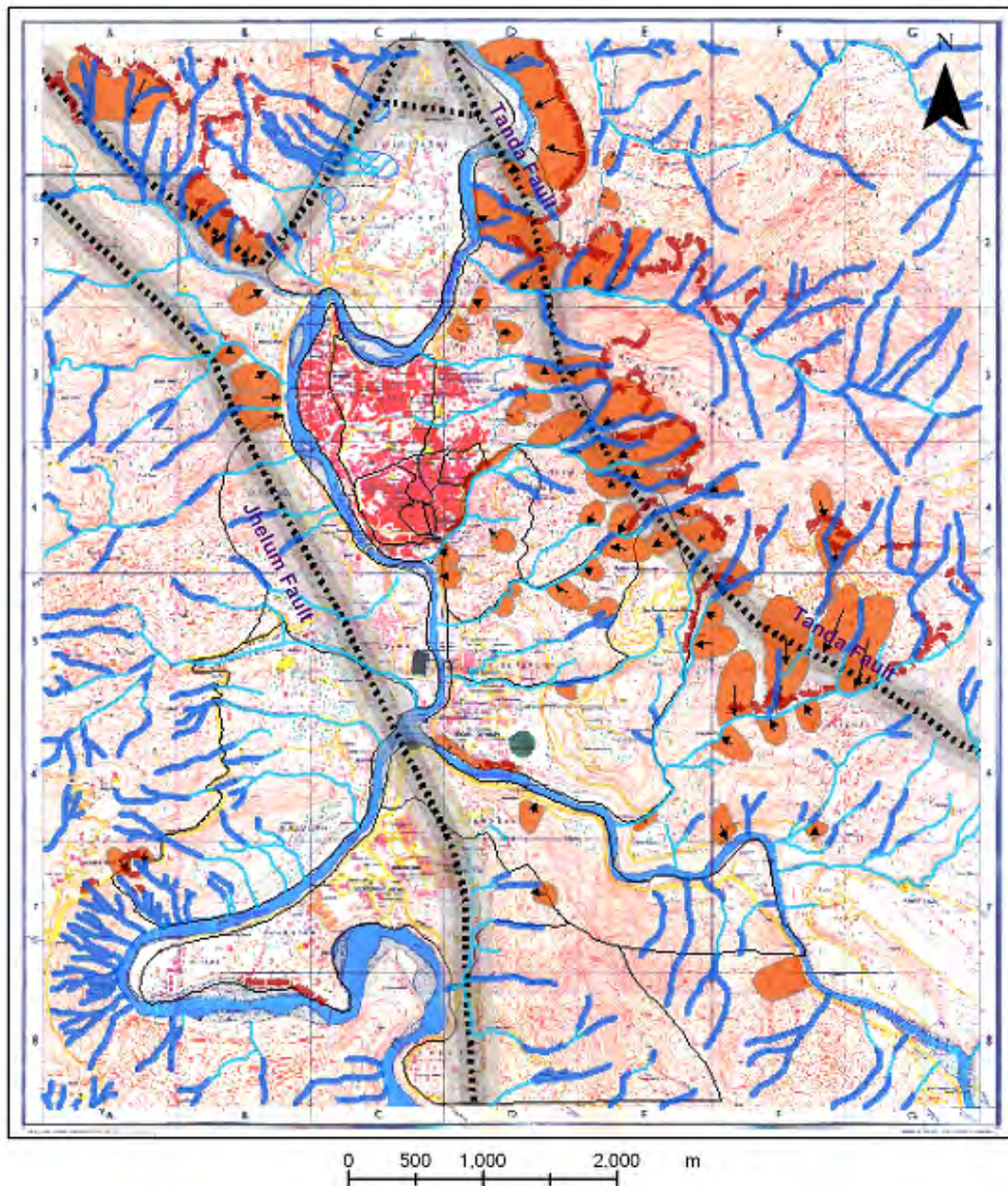
The Jhelum fault, a sinistral (left-lateral) slip fault, is inferred to run through the western part of Muzaffarabad city, extending from the northwest to the southeast, or from the north to the

south. The Jhelum fault is considered to have been formed in the last stage of activity of the MBT (Main Boundary Thrust). However, the MBT itself is considered to be inactive today.

### **2.2.2. Flooding**

An immediate risk of flooding is a break in a natural levee made by the landslide of Hattian in the 2005 Kashmir earthquake. The natural levee made of deposited sand would be easily broken by overflow of river water. There is a potential threat that the flood caused by the break of levee will affect Muzaffarabad city.

The hazard map, prepared by the Study identifying high risk areas for landslides, flooding and earthquakes with location of faults, is shown in Figure.6.



Source: JICA Study Team

**Figure.6 Geo Hazard Map**



## 2.3. Zoning for Urbanized Area

### 2.3.1. Land Suitability Assessment

The first objective of the land suitability assessment is to identify possible natural hazards in and around Muzaffarabad city. The second objective is to formulate suitable land for urban planning that has relatively low potential of natural hazards in Muzaffarabad city and its vicinities. When implementing the land suitability assessment, the Study Team gave special consideration to the mitigation or avoidance of natural hazards such as landslides, mudflows, and relative displacement of the ground surface that are caused by ground movement near active faults.

### 2.3.2. Land Use Zones and Defining Urbanized Areas

Land use zones are defined into primary urban zone, secondary urban zone, and rural zone, based on the results of the land suitability assessment. Three land zones by usage are shown in Table.2.

**Table.2 Land Use Zones and Its Characteristics**

	Primary Urban Zone	Secondary Urban Zone	Rural Zone
Priority to Urbanize	Primary areas for urban development	Secondary areas for urban development	Not for urban development
Slope gradient	0°-7°	8°-20°	20°-90°
Location	Along Nilam and Jhelum Rivers	Suburbs of Primary Urban Zone	Areas outside of Primary Urban Zone and Secondary Urban Zone
Land Suitability	City	City	Rural
Development Priority	Primary	Secondary	-
Possible City Functions	Important and main city-core functions including: general hospitals, high education facilities, big parks, main commercial centers	Residential areas including: community parks, small shops for communities, light industries, clinics, low grade schools	Areas for small-scale agriculture, or conservation areas with natural conditions set aside for disaster management

Source: JICA Study Team

#### a. Primary Urban Zone

Primary Urban Zone is suitable for the area that includes important city-core functions such as general hospitals, main government offices, schools, universities and technical colleges, large parks, and the commercial and business district, as well as high-density housing. This zone comprises the majority of Muzaffarabad city, as it existed prior to the earthquake that occurred on October 8, 2005.

**b. Secondary Urban Zone**

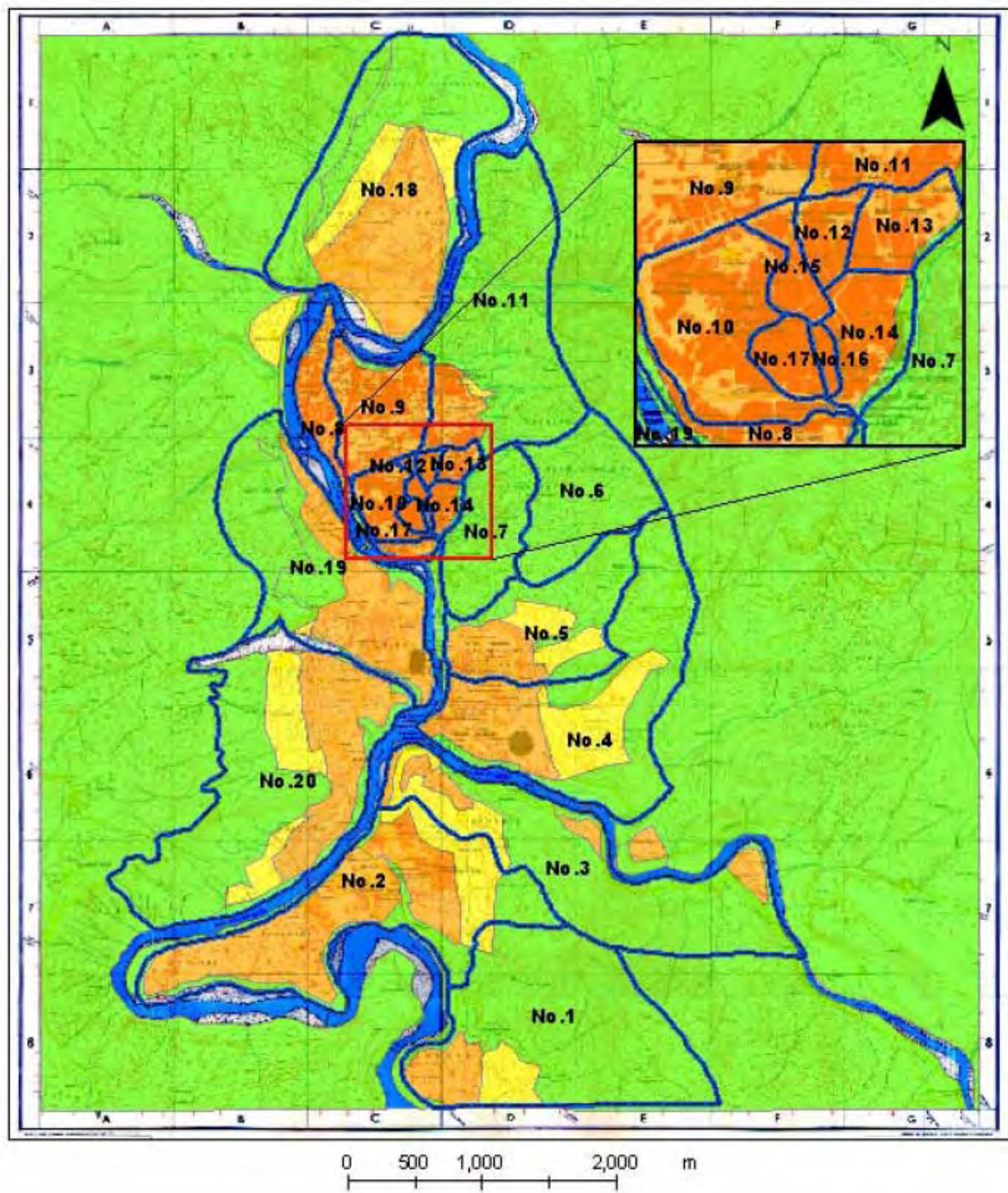
Secondary Urban Zone is considered to be suitable for the area that is generally outside of the Primary Urban Zone. Most of this zone has not been developed at the moment. This area is designated to allow Muzaffarabad city to expand when the need arises in the future. This zone shall include medium-density residential buildings and subsidiary city-core functions, such as community parks, shopping centers, light industrial areas, medical clinics, and schools.

**c. Rural Zone**

Rural Zone is the mixed area of rural settlement, agricultural land, forest land, and land set aside for nature conservation. The area will not be urbanized in general. However, some infrastructure still needs to be developed to support the smaller communities living in this zone.

Rural Zone includes areas that have been set aside to mitigate or avoid future disasters. These areas include areas that are potentially hazardous, such as landslide or slope failure zones, which should not be used for urban development.

Based on the definition of zones as described above, areas for urbanization are proposed in Figure.7.



**Legend**

- Borders of wards within Muzaffarabad city
- Potential land for urbanization
- Primary urban zone
- Secondary Urban Zone
- Rural Zone

Source: Planning and Development Department of AJK Government, Survey of Pakistan, Compiled by JICA Study Team

**Figure.7 Proposed Urbanized Areas in Muzaffarabad City**

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## 2.4. Preparation of GIS Database for Muzaffarabad City

The GIS (Geographic Information System) database prepared in the Study targeted an area of about 70 km<sup>2</sup> that includes Muzaffarabad city and its suburbs, which almost coincides with the extent of the Muzaffarabad Guide Map (Second Edition) published by the Survey of Pakistan. A nominal scale of the GIS layers was planned at 1:10,000, the same scale as the Muzaffarabad Guide Map.

### (1) Base Map/Image

Base maps and base images as described below were produced and compiled into GIS database.

#### a. Muzaffarabad Guide Map

First of all, Guide Map was created for land suitability assessment. This map is made based on “the Muzaffarabad Guide Map (Second Edition)”. The contour interval shown in the map is 10 meters.

#### b. QuickBird satellite image

On October 22, 2005 the QuickBird satellite acquired an image of Muzaffarabad city. The date of acquisition was just two weeks after the disastrous earthquake that occurred on October 8, 2005. This satellite image which is a pan-sharpened natural color image with a resolution of 0.6 m was useful for the land suitability assessment, urban planning and other planning for Muzaffarabad city.

### (2) Thematic Map/Image

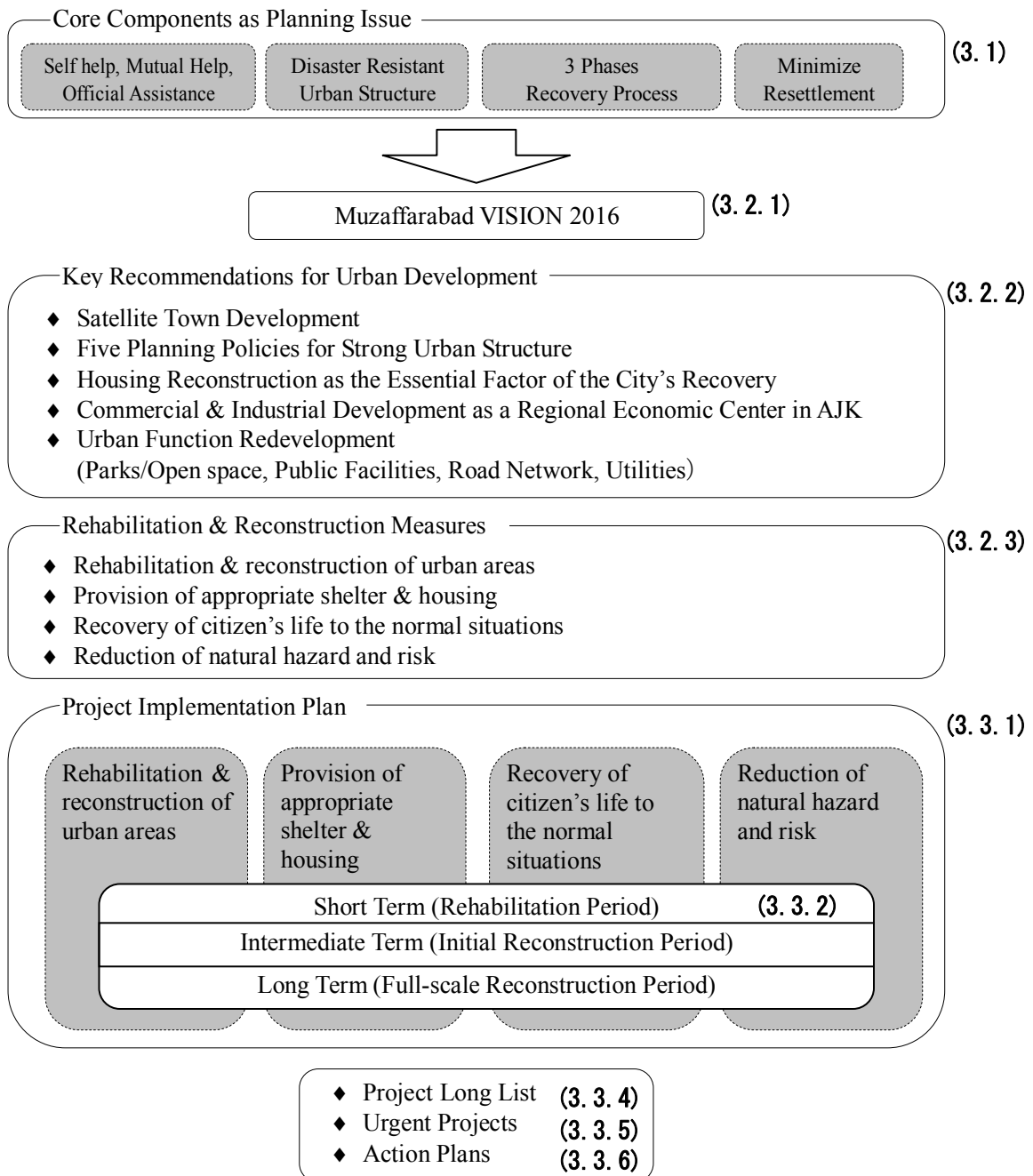
A thematic map illustrates the spatial pattern of a theme or series of attributes. In contrast to reference map which show many geographic features (forests, roads, political boundaries) in one sheet, thematic map emphasize one or a few specific spatial attributes. GIS database which is structured by digital data can easily produce a map by the choice of combination among various thematic maps. This is the strongest advantage of digital GIS compared to paper map. In the study, more than 30 thematic maps on Muzaffarabad city such as slope map, geological hazard map, building damage assessment map, urban planning map, seismic hazard micro-zoning map, etc. were produced.

### (3) Utilization of GIS Database

The GIS database was used as a planning tool for the Study Team to assist with the planning process. The GIS enables the planners of the JICA Study Team to consider and solve spatial and non-spatial problems relevant to rehabilitation and reconstruction.

### 3. TOWARD RECOVERY OF MUZAFFARABAD CITY

The master plan is explained in this chapter as outlined in the figure below.



Note : Figures in parentheses means headline numbers of each section in this report.  
Source: JICA Study Team

**Figure.8 Component of Master Plan on Rehabilitation and Reconstruction in Muzaffarabad City**

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### 3.1. Cores for the Recovery of Muzaffarabad

For the recovery of Muzaffarabad city, this study suggests to include the following four core components in the process.

- 1) Introduction of Self-help, Mutual-help, and Public Assistance principles
- 2) Formulation of strong urban structure against natural disaster
- 3) Three phased rehabilitation and reconstruction process
- 4) Minimum relocation and dislocation

#### (1) Self-help, Mutual-help, and Public Assistance

Principles of self-help, mutual-help, and public assistance are the basic concepts that will be applied for rehabilitation and reconstruction process in Muzaffarabad city. It is important to involve affected people and community organization in the whole rehabilitation and reconstruction process.

#### (2) Formulation of Strong Urban Structure against Natural Disasters

The ultimate goal of the rehabilitation and reconstruction plan is to formulate strong urban structure against natural disaster. This concept includes both aspects of rebuilding a city physically and socially that is resistant to earthquakes. It also includes capacity building of residents against natural disasters.

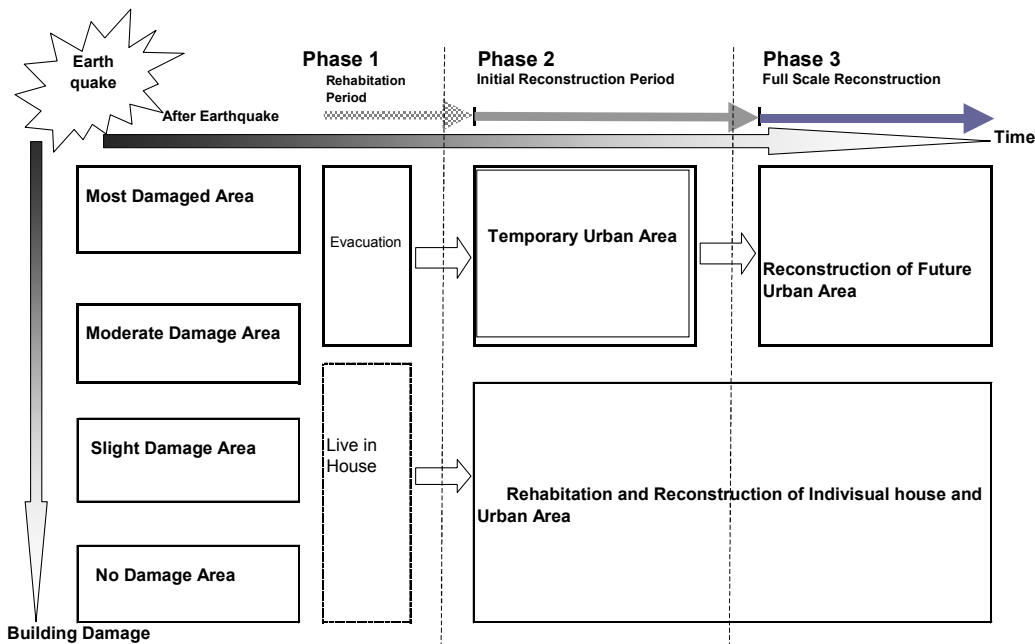
#### (3) Three Phases in Rehabilitation and Reconstruction Process

Earthquake rehabilitation and reconstruction can be divided into three phases as shown below:

Phase 1: Rehabilitation Period involves evacuation and formation of temporary planned urban area

Phase 2: Initial Reconstruction Period involves transforming temporary planned urban to permanent urban area

Phase 3: Full-scale Reconstruction Period involves completing the permanent urban area. Some urban areas will directly shift to the reconstruction, by skipping Phase 2, based on the levels of damage



Source: JICA Study Team

**Figure.9 Time Schedule of the Rehabilitation and Reconstruction Process**

**(4) Minimize the Number Affected from Relocation and Dislocation**

In the process of the rehabilitation and reconstruction, however; some of the residents would be forced to relocate from original place because formulation of new urban structures resistant to future natural disasters requires spatial change from past land use. It is essential to minimize the number of residents who would be affected by the project implementation.

**3.2. Muzaffarabad Rehabilitation and Reconstruction Master Plan**

**3.2.1. Planning Conditions**

**(1) Vision of the Muzaffarabad City**

In the process of preparing the rehabilitation and reconstruction master plan in Muzaffarabad city, it is important to share a common vision of the city among various stakeholders. Vision of the City is not a static picture but a policy statement to show how the city will be recovered from the earthquake disaster and what functions and roles the city will establish in the future. Without a common vision, the master plan cannot be prepared properly nor be used after its preparation.

Since February 2006, the Study Team has conducted field investigations and a series of meetings and discussions with relevant agencies, such as Earthquake Reconstruction and Rehabilitation Authority (ERRA), AJK government and Municipal Corporation Muzaffarabad (MCM), as well as CBOs and citizens of Muzaffarabad city. Through the intensive discussions, the following vision of the city toward 2016 was prepared:

**Vision of Muzaffarabad City toward 2016**

*“Muzaffarabad City will recover from the damages of earthquake disaster over the next 10-years and be reconstructed as modern capital city of Azad Jammu and Kashmir (AJK). The city will be reconstructed with strong urban structure against recurrent natural disaster, and it will function as a gateway city and a regional development center in Kashmir.”*

**(2) Master Plan**

A main objective of this study was to prepare a rehabilitation and reconstruction master plan for Muzaffarabad. The term “master plan” sometimes causes misunderstanding and confusion, because each individual and society has different perceptions regarding the meaning of master plan. Therefore, a clarification of the meaning of master plan is provided here.

The traditional urban master plan is a planning approach to the control of physical growth of the city in terms of comprehensive (multi-sectoral) and long-term (20- to 30-years) perspectives. That is, the traditional urban master plan shows long-term goals and end-state of physical structure of the city. This master plan approach has been criticized in the planning field, giving the argument that the master plan is too idealistic and gives a static picture of the long-term future and is sometimes divorced from real issues and the people<sup>2</sup>.

The master plan in this study is not the same as the traditional approach of urban master plan mentioned above. Rather, it focuses on process of recovery and reconstruction of the city from damages of the earthquake disaster. In this context, the time frame of the master plan in this study is not a long-term future nor end-state but a process to recover the city for the next 10-years targeting the year 2016. That is, the master plan aims at providing a comprehensive guideline of rehabilitation and reconstruction efforts to be implemented by government agencies and people in Muzaffarabad. The master plan includes not only physical aspects of the city’s reconstruction but also social and institutional aspects of recovery of people’s lives.

**(3) Muzaffarabad City in Regional Context**

Muzaffarabad city is the capital of the Azad Jammu and Kashmir (AJK) state and it is a gateway city from other parts of Pakistan, connected by roads to Islamabad in the south and to Abbotabad and Mansehra in the west. The city is also a gateway from Indian side of

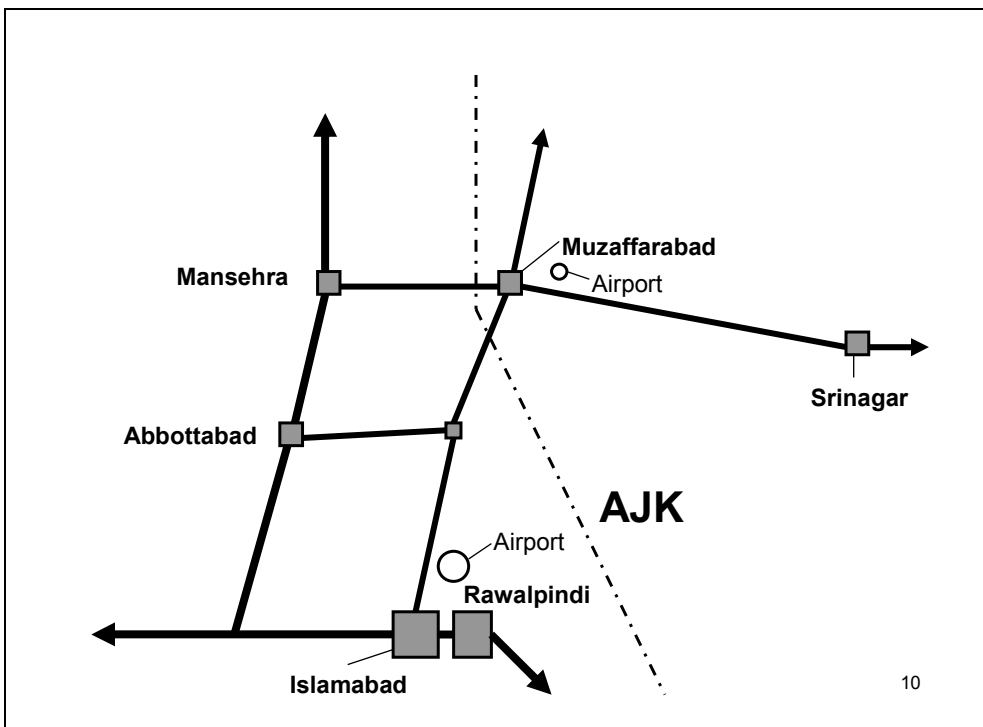
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<sup>2</sup> International City Management Association, “The Practice of Local Government Planning”, 1988, Washington DC, p. 75.



Kashmir, connected by road to Srinagar in the east. If the border, or so called Line of Control, is opened in a near future, Muzaffarabad city would be an important trading center between Pakistani and Indian sides of Kashmir. The city has a small airport, which is one of two airports in AJK<sup>3</sup>. Figure.10 illustrates the regional network.

The city has functioned as political and administrative centers in the AJK; the secretariat of the AJK state government and Muzaffarabad district headquarters are both located in Muzaffarabad city. The official residences of Prime Minister and President of the AJK government are located in the city. In addition, higher education, such as university and colleges, and major medical facilities (Combined Medical Hospital) are concentrated in the city. Accordingly, Muzaffarabad city is characterized as a regional center with the functions of transportation hub as well as administrative, political and economic centers in the AJK.



Source: JICA Study Team

**Figure.10 Regional Network**

<sup>3</sup> There are two airports in AJK: one is in Muzaffarabad and the other is in Rawalacot. The flight service is presently suspended at both airports.

### 3.2.2. Urban Framework

The master plan classifies the lands in Muzaffarabad into two zones<sup>4</sup>: one is *urban promotion zone* and the other is *preservation zone*. The urban promotion zone is the areas designated as suitable and secure land for future urbanization, and its total land areas amount to about 905 ha in the city. The preservation zone is, on the other hand, the areas designated as unsuitable land for future urbanization due to potential hazard risk, such as landslides, and its total areas amount to about 1,350 ha.<sup>5</sup> Figure.11 illustrates the locations of urban promotion zone (yellow color) and preservation zone (green color).

Existing built-up areas are mostly located in the urban promotion zone. However, some densely populated settlements are located in the preservation zone, especially in the areas of Tariqabad (Wards 6 and 7) and Dherian (Wards 11). In our estimation, there were some 85,900 habitants in the urban promotion zone and about 28,900 habitants living in the preservation zone in the pre-earthquake period of 2005<sup>6</sup>.

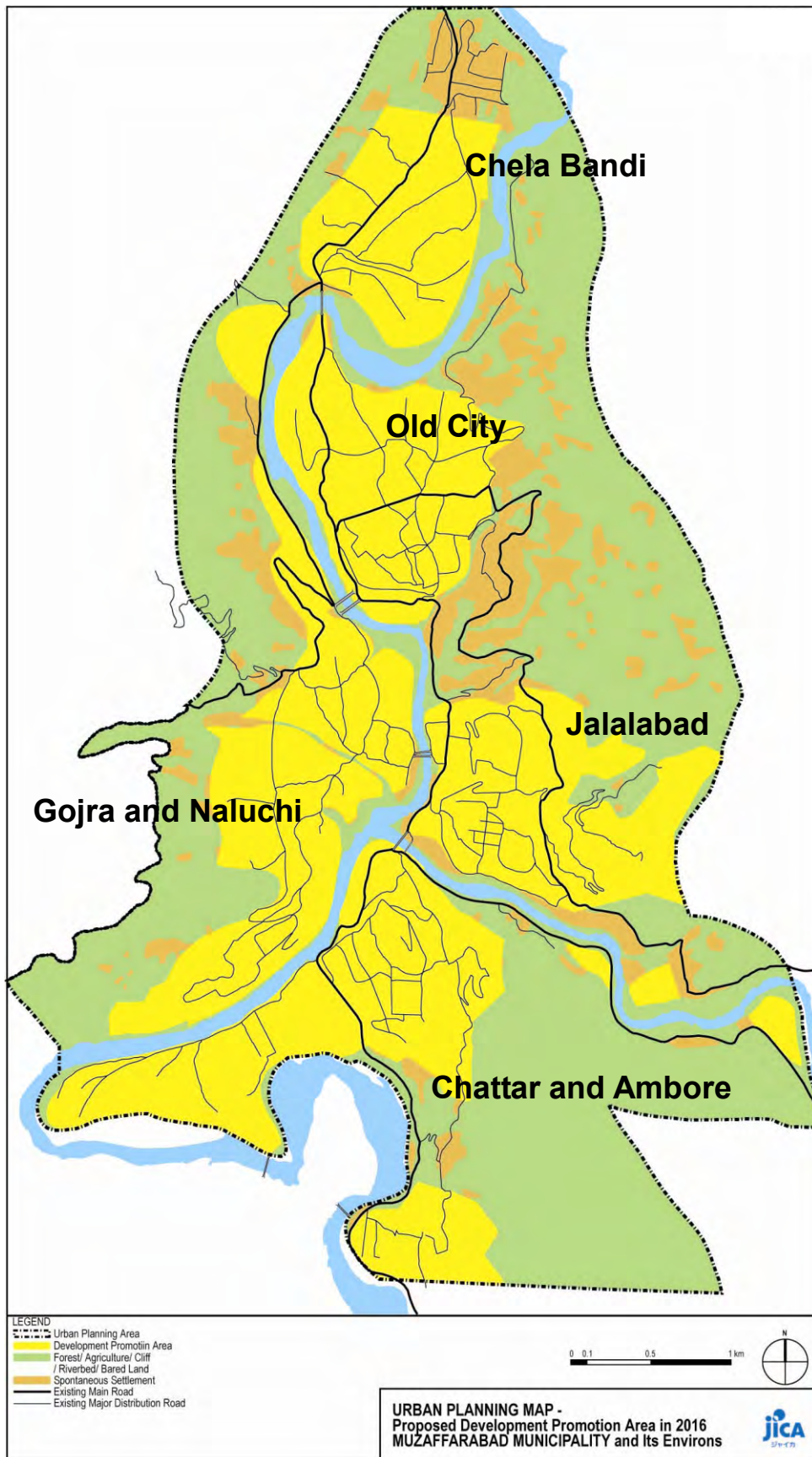
Future directions of urban development will be different in each zone. The urban promotion zone will become a major urban area and intensive rehabilitation and reconstruction works should be implemented. It is recommended that future population should be accommodated mainly in the urban promotion zone. In the preservation zone, on the other hand, new construction should be limited and strong earthquake resistance measures must be applied in rehabilitation and reconstruction of damaged buildings. Table.3 summarizes the pre-earthquake conditions and future development directions in the urban promotion and preservation zones.

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<sup>4</sup> As described in page 1 “2.3.2 Land Use Zones and Defining Urbanized Areas”, the lands are classified into three zones: primary urban zone, secondary urban zone and rural zone in terms of hazard assessment. Here in terms of urban planning perspective, the primary and secondary urban zones are designated as urban promotion zone, and the rural zone is designated as preservation zone in the master plan.

<sup>5</sup> The total area of urban promotion and preservation zones is 2,255 ha, which is bigger than the area of the city (2,133 ha). The master plan includes some areas with a total of 122 ha adjacent to the city.

<sup>6</sup> The city’s total population in 2005 was divided into two categories: population in the urban promotion and population in the preservation zones, based on number of buildings in each zone. The Study Team used data of number of buildings prepared by NESPAK.



Source: JICA Study Team

**Figure.11 Urban Promotion and Preservation Zones**

**Table.3 Pre-Earthquake Conditions and Future Development Directions in Urban Promotion and Preservation Zones**

	Urban Promotion Zone	Preservation Zone
Pre-Earthquake Conditions	Total area is about 905 ha About 85,900 habitants lived in this zone in 2005 The zone is located along the Neelum and Jhelum rivers Agglomeration of existing residential area	Total area is about 1,350 ha About 28,900 habitants lived in this zone in 2005 The zone is mainly occupied by steep slope area with more than 20% degree or flood-prone area Hazardous area of potential land slide
Rehabilitation and Reconstruction Directions	Promote urban development and new construction of buildings Promote rehabilitation and reconstruction of damaged buildings. Increase population density except in old city	Restrict new construction of buildings. Allow rehabilitation of damaged buildings with strong hazard resistance structure Promote agricultural development.

Source: JICA Study team

### (1) Capacity of Population in the City

In 2006, population is estimated to be 103,487 based on data provided by Municipal Corporation Muzaffarabad. The Study Team made an analysis of future population within the city. It is expected to increase by 73,000, to 176,750 by 2016 (see Table.4).

**Table.4 Population Projection: 2006-2016**

Year	Population	Average Annual Growth Rate
2006	103,490	-
2011	138,490	6.0% from 2006 to 2011
2016	176,750	5.0% from 2012 to 2016

Source: JICA Study Team

Based on the current land use as well as the results of the hazard assessment, the areas designated as suitable and secure lands for future urban development amount to about 900 ha in the city. The Study Team forecasted capacity of population based on following conditions and assumptions:

- 1) The increased population from 2006 to 2016 will be mainly concentrated in the urban blocks in the promotion zone. Since Old City is already over concentration of population, further accommodation of population should be restricted.
- 2) New development in the preservation zone should be restricted, but reconstruction of damaged buildings in this zone can be allowed with strong earthquake

resistance structures. Thus, the population in the preservation zone is estimated to increase only by the natural growth<sup>7</sup>.

- 3) The future population density is estimated taking into account the pre-earthquake population densities and geographical conditions. Generally, future population density in the city is classified into three categories:
- high density (over 180 persons/ha);
  - medium density (120-180 persons/ha); and
  - low density (80-120 persons/ha).

Based on these assumptions, the capacity of population in urban promotion zones and preservation zones was estimated as shown in Table.5. According to the estimation, the total capacity of population within the city will amount to 154,870 persons in 2016. The average population density in the urban promotion zone will increase from 95 persons/ha in 2005 to 131 persons/ha in 2016. In the preservation zone, the average population density will increase from 22 persons/ha in 2005 to 27 persons/ha in 2016.

Accordingly, it can be said that there is lack of space within the city to accommodate the future population of 176,750 persons in 2016. It will need some measures to accommodate another 21,880 persons by 2016.

**Table.5 Capacity of Population in 2016 by Zone**

Zone and Urban Block	Land Area (hectare)	2005 (pre-earthquake)		2016	
		Population	Population Density (person/ha)	Estimated Population	Estimated Population Density** (person/ha)
Urban Promotion Zone	905	85,934	95	118,510	131
Preservation Zone	1,350	28,930	22	36,360*	27
Total	2,255	114,864	51	154,870	69

Note: \* The population in the preservation zone is estimated to increase by the natural growth rate of 2.1%.

\*\* The future population density of each urban zone in 2016 was estimated based on the population density in 2005 and geographical conditions.

Source: JICA Study Team

## (2) Urban Development Scenarios

### a. Alternatives of Future Urban Structure

As seen in the previous section, there is a shortage of urban land to accommodate a population of nearly 22,000 persons in 2016. There are three types of development

<sup>7</sup> Since there is no data available in AJK, the Study used the natural growth rate of 2.1% in 2000 in Pakistan based on Pakistan Demographic Survey.

scenarios to accommodate this population: (1) higher-density and high-rise development in the urban promotion zone; (2) intensive residential development in the preservation zone; and (3) new satellite town development outside Municipal boundary. These three development scenarios are summarized as follows:

**Option-1: Higher-density and high-rise development in the urban promotion zone**

In this scenario, urban development will further concentrate in the urban promotion zone, which will absorb another 21,880 persons in 2016. The population in the urban promotion zone will increase from 85,934 in 2005 to 140,390 in 2016 and the population density will become 155 persons/ha in 2016. In this scenario, more and more high-density and high-rise development will be needed in the urban promotion zone.

**Option-2: New residential development in the preservation zone**

In this scenario, urban development will extend to some areas in the preservation zone and it will absorb nearly 58,240 persons in total in 2016. Large-scale of hazard protection measures will be needed in development of the preservation zone.

**Option-3: Development of satellite town outside the city**

In this scenario, a new satellite town will be developed outside the municipal boundary and it will absorb the population of 21,880 persons by 2016. Potential site for satellite town is the area near airport. Future urbanization of the city will extend to the east along the Jhelum River.

**b. Recommendation of Future Urban Structure**

The Study Team recommends the satellite town development outside the city (option-3) is the best option in terms of seismic perspective.

Table.6 shows a comparison of three development scenarios. The higher-density and high-rise development in the urban promotion zone (option-1) is not suitable, because higher population density in the urban promotion zone causes further traffic congestions and deterioration of urban environment. In order to accommodate increased population, the construction of multi-story buildings will be essential, which needs strong earthquake resistance measures. Additionally, land use regulation and building code must be applied in the development of urban promotion zone. The AJK government also mentioned that the lifestyle living in multi-story buildings is not common in Kashmir including Muzaffarabad city.

The intensive residential development in the preservation zone (option-2) is also not suitable because new development in steep slope area will cause high risk to the residents by the natural hazard. With such hazardous land condition, large scale of civil works would be

necessary to minimize the potential hazard risk. In case of promoting this option, strong engineering measures must be applied in development of preservation zone.

The satellite town development outside the city (option-3) is the best option, because the potential site near the airport has more than 300 ha of land with moderate slope and it is just outside of municipal boundary, about 3-5 km from Jalalabad. Although further studies are needed, the area seems to be quite suitable for future extension of the city. Additionally, this option (satellite town development) is more feasible in further growth of the city beyond 2016.

**Table.6 Comparison of Three Development Scenarios**

Item	Option-1:	Option-2:	Option-3:
Urban Structure	High-density and high-rise development in urban promotion zone	Intensive residential development in the preservation zone	Development of new satellite town outside the municipal boundary
Seismic Perspective	Need strong earthquake resistance structures in the construction of high-rise buildings	Need large-scale of civil works to protect from natural disaster	Relatively secure from natural disaster, but need further study
Possibility of Further Expansion	No sufficient space for further expansion in the urban promotion zone	No sufficient space for further expansion in the preservation zone	Possible for further expansion
Necessity of Infrastructure Development	Need upgrading of existing infrastructure	Need development of large-scale infrastructure to protect against natural hazard	Need development of access road and new infrastructure
Issues in Implementation	Enforcement of building code for design and construction of high-rise buildings	Enforcement of building code for strong earthquake-resistant structure in new building construction	Need hazard assessment study in potential site
Social and Institutional Issues	Lifestyle living in multi-story building is not common in Kashmir	Need development of strong land use regulation	Need expansion of municipal boundary
Investment Cost by Government	Moderate of public investment cost	Relatively large amount of investment, including infrastructure development	Large amount of investment, including land acquisition and infrastructure development

Source: JICA Study Team

**c. Discussion about Shifting Some Urban Facilities to Outside the City**

During the course of this master plan study, there have been discussions between ERRRA and AJK government about shifting some urban facilities damaged by the earthquake to outside the Muzaffarabad city. Recently, it was made an agreement that old and new University campuses located in Old City and Chela Bandi respectively would be transferred to and

integrated at Chatter Kalas, about 20 km south from Muzaffarabad city. Chatter Kalas has flat land with more than 60 ha (1,200 kanal). The shift of the university campuses will encourage decentralization of population to a certain extent. Furthermore, the former sites of the university campuses can be used for other urban purposes, such as park, residential and commercial area, vocational center, and so on.

More recently, there have been some discussions between ERRRA and AJK government about relocating some of the government facilities including district headquarters to outside the city. The potential new sites for relocation are Rawani area near airport (just outside of city boundary and about 3 km from Jalalabad), Langarpura (about 16 km in the east from the city), and Garhi Dopatta (about 25 kilometer in the south-east from the city).

### **(3) Basic Planning Policies for Strong Urban Structure**

Urban planning is a key component of the rehabilitation and reconstruction master plan, and it focuses on physical aspects of recovery of the city. The urban planning framework is guided by a set of basic policies for creating safe and strong urban structure against natural disaster. These include five policies and summarize below:

- a) To develop a multi-core urban structure,
- b) To restrict new construction in potential hazardous areas,
- c) To implement special measures in reconstruction on the potential faults,
- d) To establish a network of parks and open spaces, and
- e) To reduce flood risk.

#### **a. Develop a multi-core urban structure:**

Old City was a densely populated and congested urban area without sufficient road network and open space. This situation caused heavy damages and large number of casualties in the earthquake disaster. It is recommended that the city be reconstructed with a multi-core urban structure to be safer and stronger against natural disaster. Further concentration of population in Old City should be restricted and new development should be directed toward the south and the west bank of the Neelum River and the east along the Jhelum River. New development of satellite town near the airport will strengthen a multi-core urban structure.

#### **b. Restrict new construction in potential hazardous areas:**

New constructions in the preservation zone should be restricted to avoid recurrent disaster. Particularly, the northern Chela Bandi and Tariqabad had heavy damages because of seismic vulnerability and landslides. It is recommended that new constructions in the potential hazardous areas should be extremely limited, but that rehabilitation and reconstruction of damaged buildings in the preservation zone can be allowed with strong earthquake resistance structures.



**c. Apply special land use control and building construction measures in reconstruction on the areas of potential faults:**

It is known that there are two potential faults running through the city: One is Himalayan Frontal Thrust<sup>8</sup> in the east; and the other is Jeelum Thrust in the west. In order to reduce potential hazard risk caused by movement of the faults, special land use control and building construction measures should be applied to the area within 200 m of both sides from the potential faults. The special land use control and building construction measures are:

- Avoid new construction of large-scale public facilities, such as hospitals, schools, government buildings, etc.
- Avoid new development of tall buildings.
- Enforce earthquake resistance structures, when new buildings will be constructed.
- Encourage reinforcement of existing buildings with strong earthquake resistance structures.

**d. Establish parks and open space network:**

Parks and open space network are important elements in the rehabilitation and reconstruction urban planning to establish safer and securer urban structures from natural disaster. The city should establish a parks and open space network, which would be used for recreational space in ordinary times and as evacuation and rescue space in case of emergency. Furthermore, parks and open spaces along with the natural landscape of the city would contribute to resources of tourism attraction.

**e. Reduce flood risk:**

The city has been developed along the Neelum and Jhelum rivers and has experienced several flood damages in its history. In the flood-prone areas in the city, new constructions of buildings should be restricted and existing buildings in the areas are recommended to relocate to secure land areas. The areas along the rivers should serve as public open space and provide footpath and riverside walk, which will become one of the tourism attractions. Urban development should be concentrated on the urban promotion zone that is mainly located along the Neelum and Jhelum rivers. In the preservation zone, future urbanization should be limited due to potential risk of natural hazard. Future urbanization will, therefore, direct toward the south and east along the Jhelum River. Proposed satellite town

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<sup>8</sup> It is said that main part of ground acceleration of 2005 Kashmir Earthquake was caused by the slip of the fault of Himalayan Frontal Thrust (HFT).

near airport will become one of the urban centers to accommodate future population of the city.

#### **(4) Residential Development**

In Muzaffarabad city nearly 6,700 buildings were total collapsed and another 7,300 buildings were partially damaged by the earthquake. Many people lost their houses and were forced to move out from their original locations and to live in makeshift shelters. Recovery of damaged houses and reconstruction of residential area are the essential factor in the city's recovery. Residential development policies are (i) to minimize the number of relocation, (ii) to encourage building rehabilitation and reconstruction with application of earthquake resistance building code, (iii) to control housing development in preservation zone, (iv) to encourage housing development in urban promotion zone and proposed satellite town, and (v) to provide temporary shelters to improve living condition in tents.

#### **(5) Commercial and Industrial Development**

Muzaffarabad City has served as a regional economic center in AJK. These functions were heavily damaged particularly in Old City. It is urgently needed to recover the functions of regional economic center as well as neighborhood commercial functions to support people's life. Key recommendations for commercial and industrial development are as follows:

- Muzaffarabad City will be developed as a gateway city in Kashmir. The city's historical and cultural heritage should be restored and developed as a resource for tourism attraction. Accommodation facilities, restaurants and craft shops should be developed to promote tourism industry.
- The city will continue to serve as a regional economic center in AJK. The regional commercial functions including wholesale, retail and trading should be recovered and enhanced within the City. New core commercial area should be developed in Old City as a cluster type of shops rather than ribbon or linear type, seeking safe and efficient activities for shoppers as well as smooth traffic in major truck roads.
- In Old City the existing commercial area should be redeveloped as a modern commercial center with proper access roads and car parking space. New commercial center will be pedestrian orientation to provide safe and efficient activities for shoppers.
- Neighborhood commercial center should be formulated at proper location in each urban block mentioned before. The neighborhood commercial center will provide convenient and safe shopping activities for the neighborhood dwellers.

- Manufacturing industry and warehouses should be developed at strategic locations in outskirts of the City to avoid negative environmental impact to residential areas.

#### **(6) Park and Open Space Development**

Old City was a densely populated and congested urban area without sufficient road network and open space. Parks and open space network is one of the most important factors in rehabilitation and reconstruction processes to establish strong urban structure against natural disasters.

The master plan proposes park and open space network, which will contribute to recreational space and tourist attraction in ordinary time as well as evacuation and rescue space in emergency. The university campuses will be transferred to and integrated at Chatter Kalas.

#### **(7) Major Public Facilities Development**

Many public facilities were heavily damaged in the city; some government offices, education and welfare service facilities were collapsed. The damages of these public facilities cause delay of recovery and disruptions of people's life. Key recommendations for major public facilities development are as follows:

- The higher education function including old and new University campus will be transferred to and integrated at new location (Chatter Kalas, about 20 kilometer south from the city). The former campuses will be used for urban open spaces, which will function as recreational spaces in ordinary time as well as evacuation and rescue spaces in emergency.
- Medical facilities should be recovered at the previous location, the CMH area, in Old City. New medical facility, such as community hospital / polyclinic, should be developed in the west side of the Neelum and Jhelum Rivers to serve the people in the areas of Gojra and Naluchi. In addition, it is estimated that 7 new basic health units (BHU) need to be developed by 2016 to serve the increased population of the city.<sup>9</sup>
- Government administrative functions should be decentralized into three strategic locations: Muzaffarabad municipal administration in Old City; Muzaffarabad district administration<sup>10</sup> in Jalalabad; and AJK state government administration in Chatter Domel.

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<sup>9</sup> The future requirement of health facilities is based on the planning standard of National Reference Manual on Planning and Infrastructure Standards, prepared by Government of Pakistan, Ministry of Housing and Works in 1986.

<sup>10</sup> The relocation of district headquarter is not decided yet by ERRA and AJK government. In this urban planning, district headquarter will remain in Jalalabad.

- Regarding basic education facility, it is estimated that 9 new two section primary schools and 3 four section secondary schools need to be developed by 2016 to serve the increased population in the city<sup>11</sup>. In addition, a new boy's college should be developed in the west side of the Neelum River to serve the people in the areas of Gojra and Naluchi.

#### **(8) Road Network Plan**

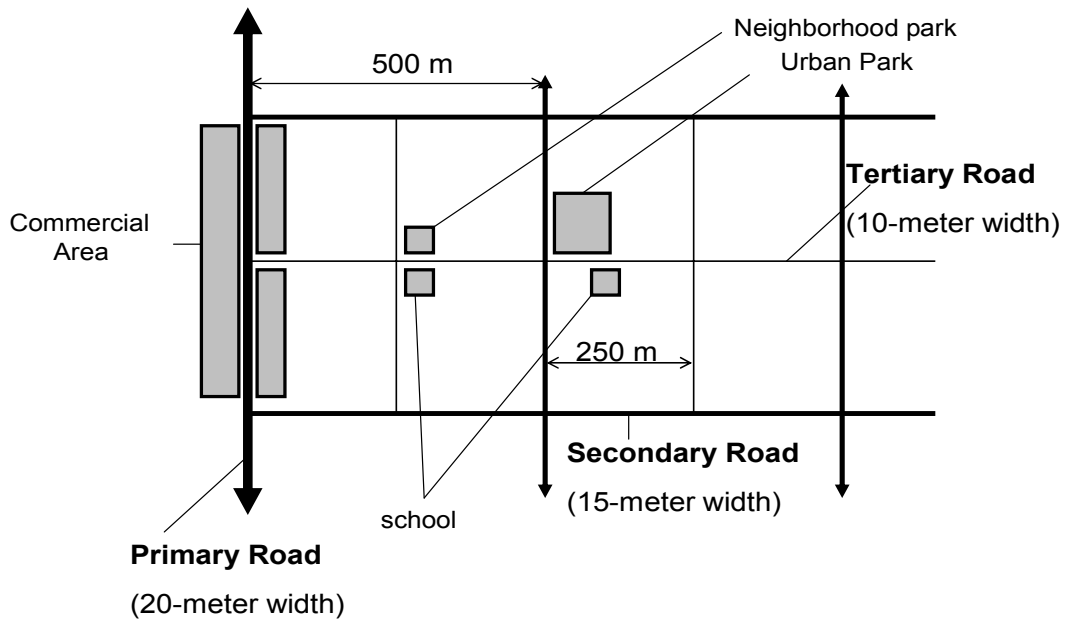
The master plan proposes future road network with the hierarchy of road functions. The road functions are classified into the following four levels: primary, secondary, tertiary and access roads. The structure of the hierarchy is as follows:

- Primary roads are the most important road in the city serving with a standard width of 20 m.
- The secondary road provides access to major geographical districts in the city serving with widths of 15 m in the urban promotion zone and 10 m in the preservation zone.
- The tertiary roads provide major distribution of traffic in each geographical district is serving at 10 m wide. Tertiary roads will be developed every 200-300 meters in the urban promotion zone.
- The access road provides access to each plot or individual property. It would be having widths of 6 m in standard and 4 m minimum in case of difficulty of land acquisition.

A standard road network pattern with its functions is shown in Figure.12.

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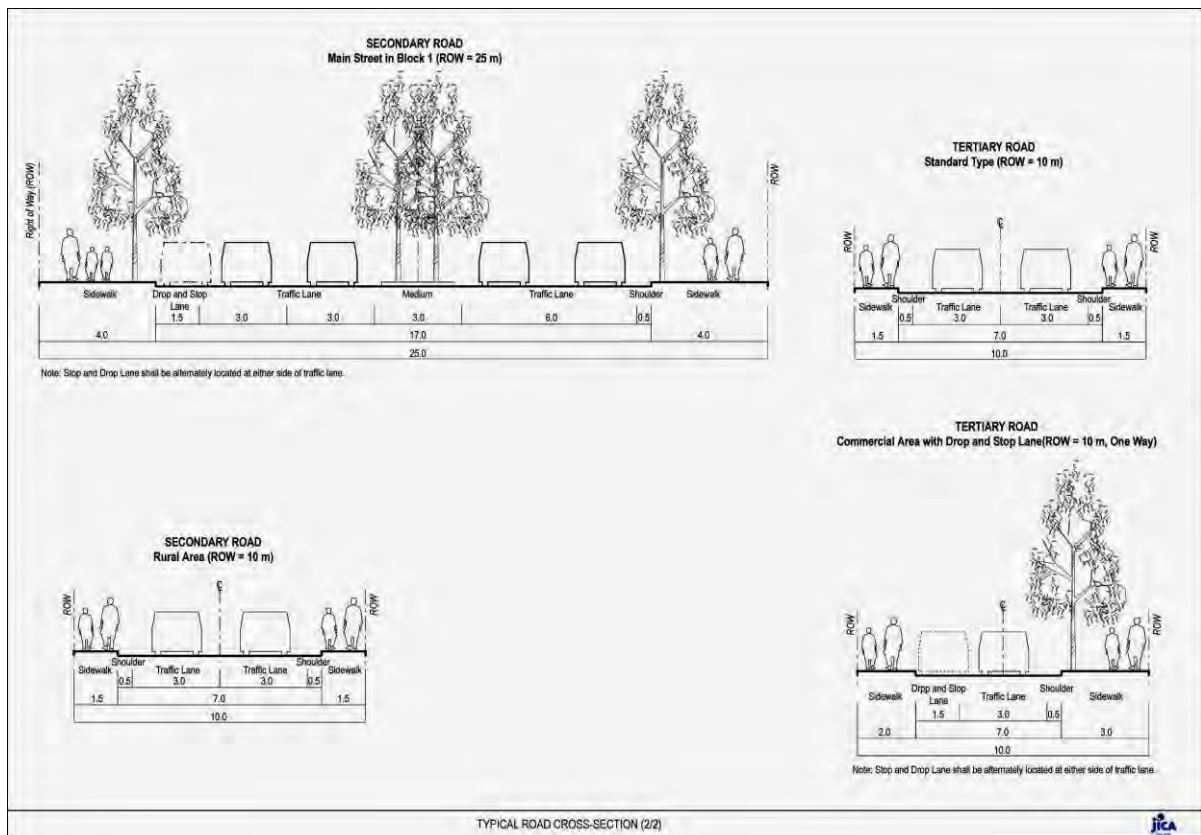
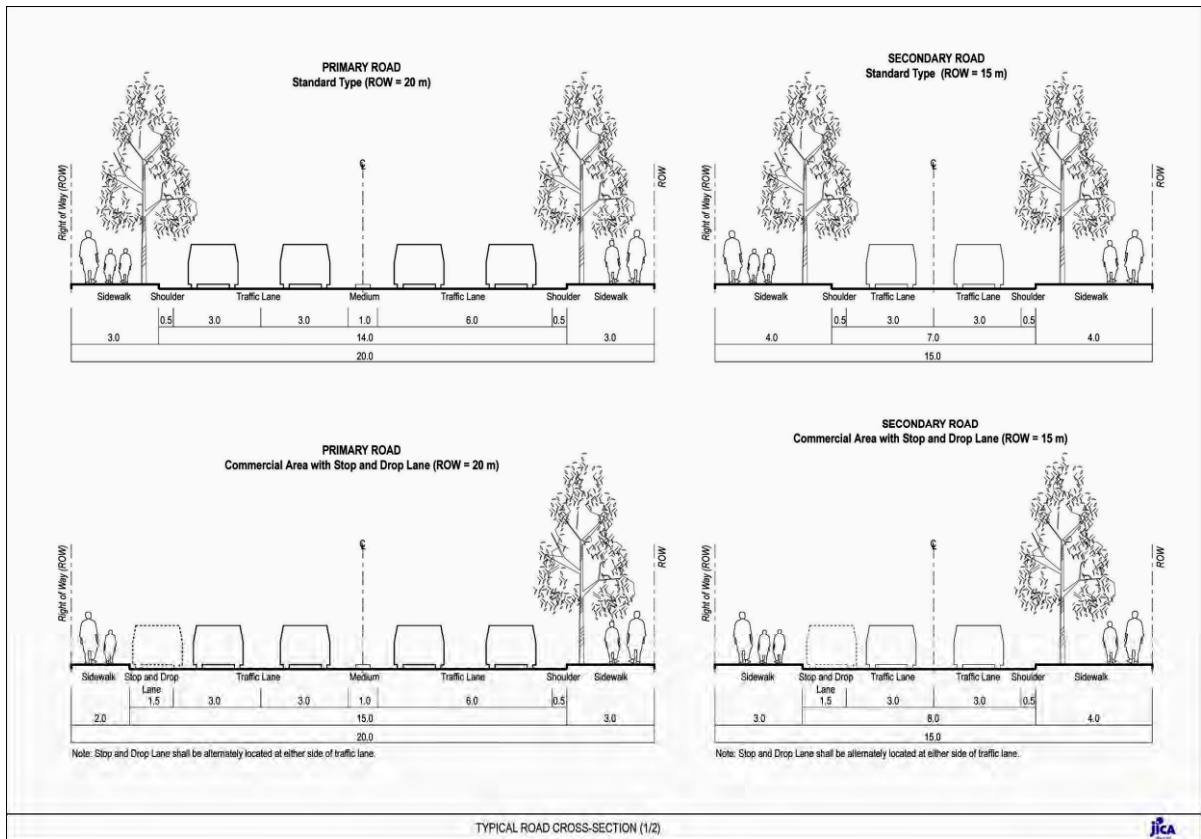
<sup>11</sup> The future requirement of education facilities is based on the planning standard of National Reference Manual on Planning and Infrastructure Standards, prepared by Government of Pakistan, Ministry of Housing and Works in 1986.



Source: JICA Study Team

**Figure.12 A Standard of Road Hierarchy in Urban Area**

Figure.13 illustrates standard cross-sections of proposed primary, secondary and tertiary roads, but actual design of each road should be taken with considerations of surrounding topographic conditions and land use.



Source: JICA Study Team

Figure.13 Standard Cross Sections of Proposed Urban Roads

Besides the standardization of road hierarchy and its networks, strengthen of bus service is also important. New inter-city bus terminals are recommended to be developed in the outskirts of the city, providing transport services to other cities and regions in AJK and Pakistan. The new inter-city bus terminals and Intra-city bus services connecting these bus terminals will contribute to reducing traffic congestion in the city, particularly in Old City.

## **(9) Infrastructure**

Key recommendations for infrastructure, including water supply, sewerage, drainage and solid waste management, are as follows:

### **a. Water Supply**

- The existing water distribution network should be extended to cover the whole city area and the proposed satellite town near the airport.
- The capacity of the Makri Water Treatment Plant should be expanded to meet the water demand of 11.68 million gallons/day in 2016. The land for the future expansion is available at the existing Makri WTP site.
- The main water supply facilities and distribution tanks should be improved to one of earthquake resistance structures and the transmission and trunk distribution lines are recommended to install earthquake-resistant pipelines.
- To reduce the leakage of the pipelines, the distribution system based on block or grid system is recommended. The pipe registration system should be developed to replace the old pipes properly.
- Distribution facilities of storage tanks and pipelines should be designed to meet the maximum daily and hourly factors in accordance with the National Reference Manual on Planning and Infrastructure Standards.

### **b. Sewerage**

- The installation of septic tanks in each building will need a relatively long period and on-site treatment system will face the obstacles posed by narrow roads in the densely populated areas. Therefore, the central sewerage treatment system should be developed connected to the existing sewerage pipelines by interceptor. This system is illustrated in the figure below.
- Taking topographic conditions into account, the service area of the central sewerage treatment system is recommended to be divided into two service areas:

(1) Chela Bandi, Old City, Jalalabad and Gojra; and (2) Chattar, Ambore and Naluchi. Central treatment plants should be developed in each service area.

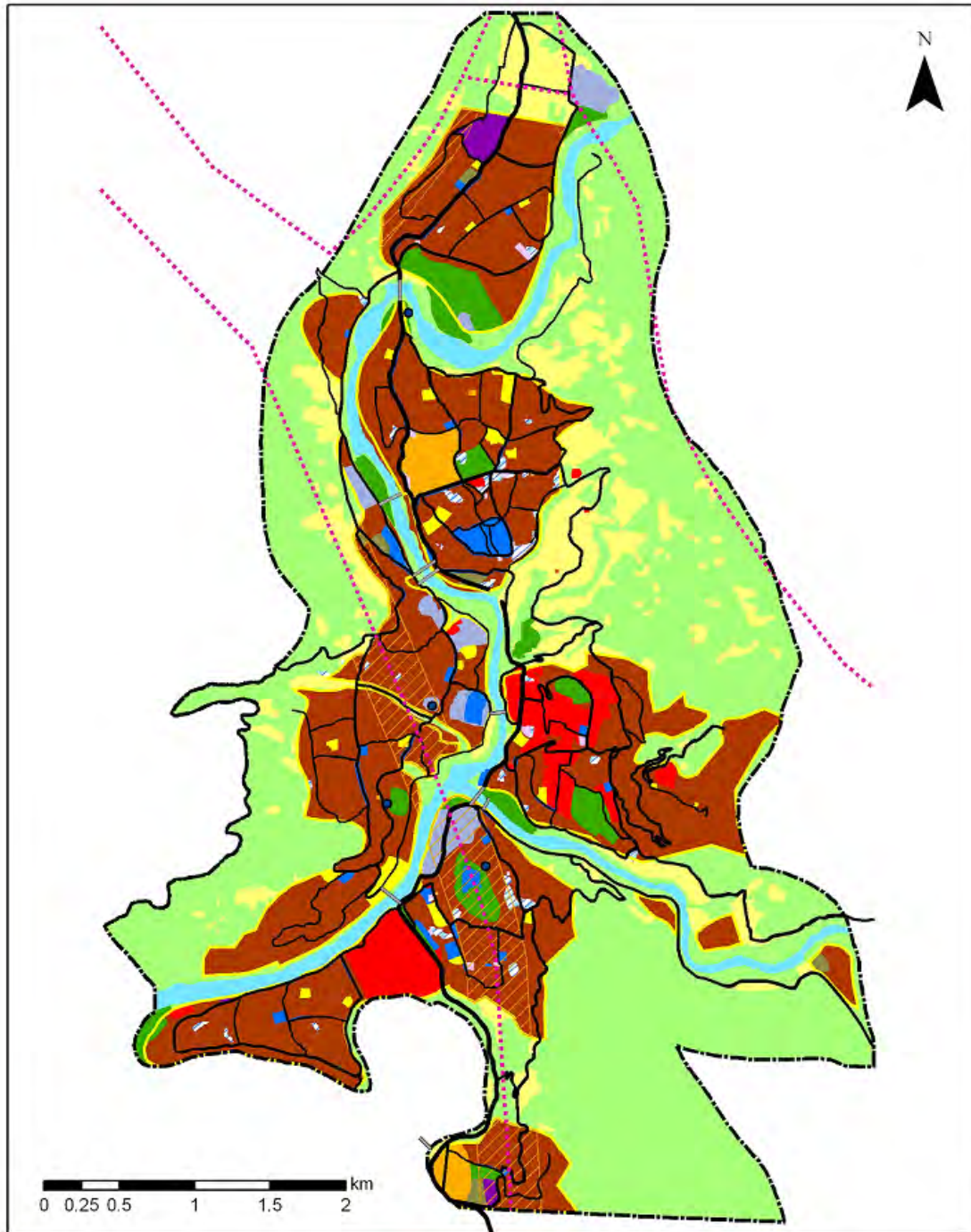
**c. Drainage**

- Drainage system should be recovered to the pre-earthquake conditions. Particularly, the streams blocked by landslides need to be renovated.
- New construction in the flood-prone areas along the Neelum and Jhelum rivers should be restricted. The lands in the flood-prone areas should be used for parks or green areas.

**d. Solid Waste Management**

- Some improvements of solid waste management system will be needed for the next 10 years. The existing landfill site can be used for the next five years, but a new landfill site will be needed after 2011. Required capacity of the new landfill site is estimated at 869,000 m<sup>3</sup> based on the population projection in the period from 2011 to 2016.





- Legend**
- Urban Planning Area
  - Development Promotion Area
  - Circulation:**
    - Primary Road
    - Secondary Road
    - Tertiary Road
    - Bridge
  - Land Use:**
    - Residential
    - Spontaneous Settlement
    - Government/ Governmental Housing/ Utility Facilities
    - Commercial & Business
    - Industrial
    - Army
    - Education
    - Hospital/ Medical Facilities
    - Mosque/ Shrine
    - Grave Yard
    - Park
    - Forest/ Agriculture/ Cliff/ Riverbed/ Bareland
    - Bus/Truck Terminal & Parking Area
    - River
  - Heritage
  - Inferred Fault Line
  - Potential Fault Zone

Source: JICA Study Team

**Figure.14 Future Land Use Plan**

### 3.2.3. Rehabilitation and Reconstruction Measures

Three basic principles are applied in rehabilitation and reconstruction plan in the master plan. (i) bringing people's normal life back at the soonest possible time, and (ii) recovering urban functions to support people's life. These principles are mutually related to each other. People's normal life cannot be recovered without recovering the urban functions and infrastructure. Conventional reconstruction measures, however, primarily focused on the physical recovery of urban functions and paid little attention to recovery of people's life and livelihood.

The master plan proposes four rehabilitation and reconstruction measures:

- 1) building rehabilitation measures
- 2) housing reconstruction measures
- 3) promotion of temporary urban area

#### (1) Building Rehabilitation Measures

Building rehabilitation measures will focus on restoration of damaged buildings. There are two options in restoration of damaged buildings: (i) to restore damaged buildings with repair or retrofitting, or (ii) to demolish damaged buildings to eliminate the risk of further loss and casualties. As to which option to take can be decided upon based on the technical evaluation of each building and its ground conditions. It is therefore necessary to conduct a technical survey to evaluate all damaged buildings as soon as possible in order to have a basis of decision on whether to repair or demolish damaged buildings.

The technical survey has not yet been completed by MCM. The damaged buildings are still left unused due to the risk of collapse, and living in fear of this happening, the people have opted to live in tents or temporary shelters. Further, public facilities, including hospitals, schools, and welfare services are still in a state of disrepair. Delay in rehabilitation activities continues to drag because all of the damaged buildings have not yet been diagnosed for their safety. A technical inspection of damaged buildings is the first step in the process of rehabilitation and reconstruction of Muzaffarabad.

After diagnosing for building safety, then the decision can be made whether to repair or to demolish. If the building was evaluated as safe for continued occupancy, effective retrofitting or repairing measures would be necessary, which need compliance with earthquake-resistant design code, and this is currently being prepared by the Pakistani government. In the case of retrofitting or repairing, the government should provide financial and technical support, such as special loans, information on repairing methods and construction materials. On the other hand, if the building was evaluated unsafe for

continued occupancy, it would need to be demolished. In this case, earthquake-resistant design code should be strictly applied when new buildings will be constructed.

## **(2) Housing Reconstruction Measures**

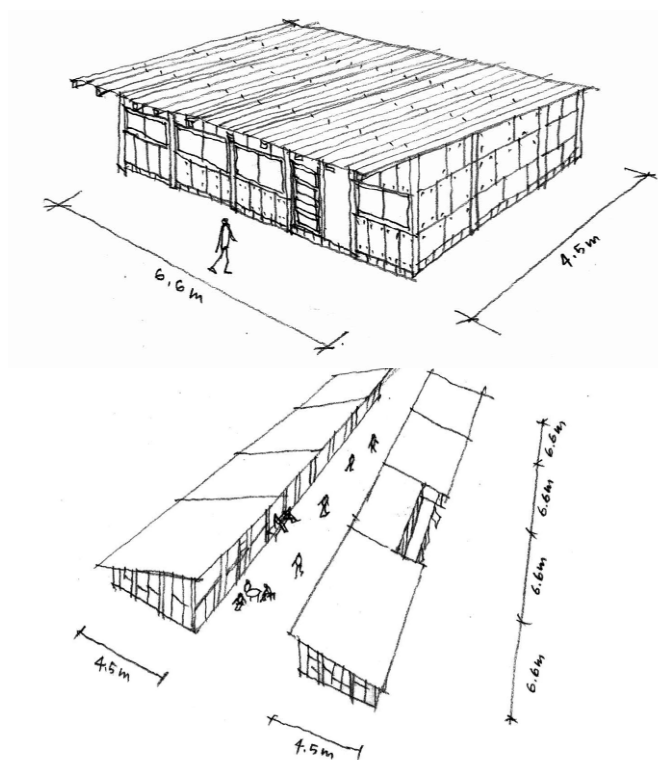
Provision of housing or temporary shelter is important measure in recovery and reconstruction of people's lives. The earthquake brought about a complex situation, and as consequence, each family has different demands and needs. Some who lost their houses and live in tents need temporary shelters to live, and others whose houses had been damaged but can be repaired are willing to go back to their original houses as soon as possible. Taking into account these facts, several housing reconstruction schemes are proposed. They are: (a) temporary shelters, (b) affordable housing, (c) minimum-house, and (d) financial aids. These schemes are described below.

### **a. Temporary Shelters**

Nearly 8,000 families are still living in tents in and around the city, according to the information by MCM. Thus, the provision of temporary shelters is one of the urgent tasks to improve living conditions for the people who are now forced to stay in tents. Temporary shelter aims to provide better living conditions than that in tents. Many people are suffering deplorable living conditions in tents. It is, therefore, recommended that temporary shelter should provide basic infrastructure. Thus people can recover their normal lives more smoothly.

Temporary shelter can be constructed at low cost by using local materials, such as wooden pieces, galvanized iron, and adobe bricks. Local contractors and architects can provide inputs on how best to proceed with the construction. The temporary shelters to be built are not formal houses but they will be used for a limited time for recovery of people's life. In theory, after 2-3 years of use, the temporary shelters will be demolished and the land will revert to its original land use.

Figure.15 illustrates an image of temporary shelter in Muzaffarabad.



Source: JICA Study Team

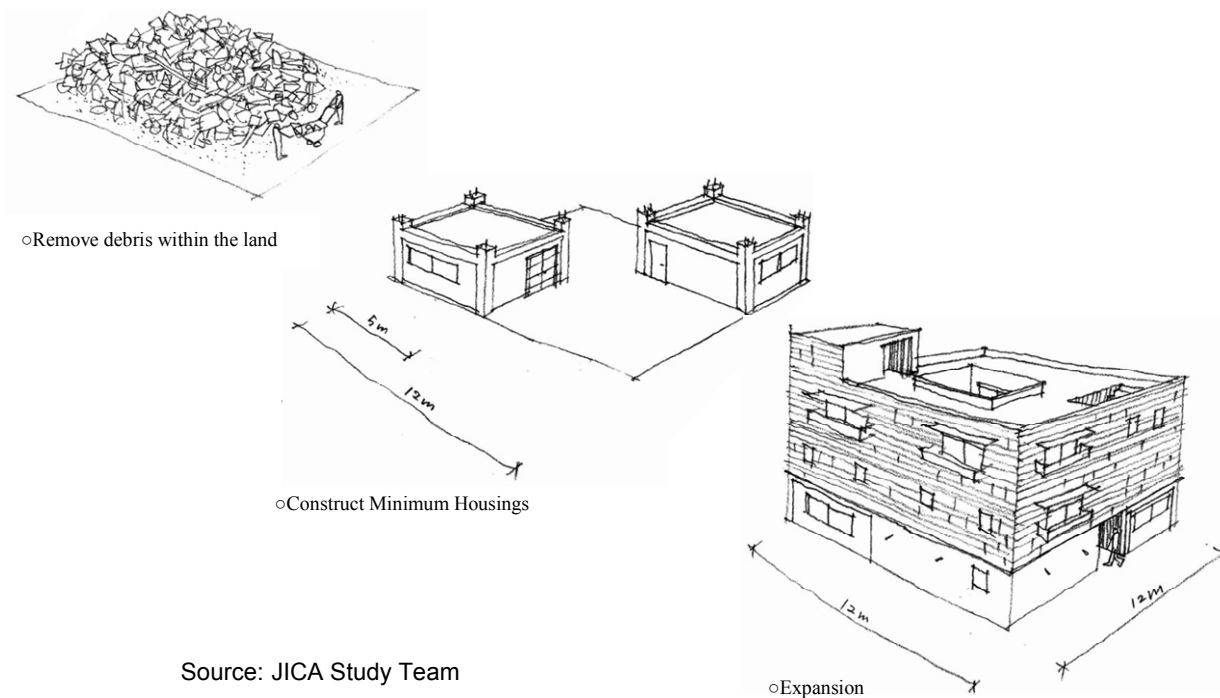
**Figure.15 Image of Temporary Shelters**

#### **b. Affordable Housing Scheme**

Affordable housing is another scheme to provide shelter for people, and it will be developed mainly by public sector. Affordable housing can be developed in either public land or private land. In the case of public land, the government is an owner and developer of affordable housing and rents it out to people. In the case of private land, development mechanisms are more complicated. The government will be a developer but not an owner. The land owner may have priority to use the affordable housing. In either case, some financial support by the government is essential for development of affordable housing. Because of limited land availability in the city, affordable housing will be developed in the outskirts of the urban areas.

#### **c. Minimum-housing Scheme**

Minimum-housing is a scheme to develop minimum function of residence in early stage of reconstruction. It will be able to extend to a bigger house by the resident's own effort, when it will be needed. The minimum-housing scheme can be applied to private properties in which buildings were completely collapsed and needed new construction. This scheme makes possible the reconstruction of houses without relocation.



Source: JICA Study Team

**Figure.16 Minimum-Housing Scheme**

**d. Financial Aids for Housing Reconstruction**

Financial aids for housing reconstruction are particularly important to provide to people who lost their houses and properties and aimed to start a new life in new areas. The temporary shelter, affordable housing and minimum-house cannot be successful without proper financial aids by the government. Such subsidy will make it possible for people to get their life back to normal situation in the early stage of reconstruction.

**(3) Promotion of Transitional Urban Area**

Rehabilitation process is recommended to take two separate approaches: one is to directly reconstruct the affected urban area to permanent ones, and the other is to take intermediate steps toward permanent urban areas by primarily developing “transition” urban areas.

Because Muzaffarabad has experienced such large damage, it is difficult to start reconstruction right away. Developing a transition urban area aims to build a temporary area that is based on the following concepts: By developing transition urban areas, the road map for the reconstruction will be explored, and as a result, it will improve the area. Transition urban areas will aim at being non-luxurious but comfortable areas including facilities such as health care, schools, commercial services, offices, and assembly areas as well as housing.

### 3.2.4. Social and Livelihood Restoration

Allocating residents in or nearby their original neighborhood is one of the cores of the master plan, because it will drastically increase opportunities to enhance existing social capital and bonds. By providing opportunities for residents to generate income, they can support recovery with their own business or in other cases, providing jobs are required. Therefore, it is key measure to restore community livelihood as well as housing reconstruction. The master plan propose four types of approaches:

- self-help, mutual-help, and public assistance
- developing rehabilitation programs by ward
- promoting rehabilitation in an integrated way to preserve the livelihood of the neighborhoods

#### Self-help, mutual-help, and public assistance

One of the important principles of reconstruction procedure is to rely on self-help approaches that use affected individuals as main actors. Yet often, there are many problems and constraints that can not be dealt with by such individuals, and thus, mutual-help among members at the neighborhood level becomes important. The Study Team carried out a debris removal pilot project, and that was quite successful. There were at least two reasons in the success: i) the project generated temporary income to the resident, and ii) it got the residents' own neighborhood cleaned and proved they could do it by themselves. This experience provides the important message that involving communities in the reconstruction process is very important and Community-Based-Organizations (CBOs) are useful organization to initiate rehabilitation and reconstruction activities.

Public assistance is also important to support individuals and communities that accelerate the reconstruction. It is recommended that government establishes some funds for earthquake recovery and allocates them to CBOs. CBOs will look for effective use of the funds based on local characteristics and community's needs. CBOs will play a key role in recovery of people's life.

#### Developing Individual Reconstruction Programs by Ward

Damage conditions, types of household residency, living conditions, as well as distribution of open spaces vary from ward to ward. To take account of such variation, if community-based organizations (CBOs) exist in targeted wards, programs need to be developed to mainly focus on CBO's participation in consensus building, and development of CBOs' roles as the central actor for promoting reconstruction. In case a CBO is not found in a ward, creating such organization is a priority.

Promoting rehabilitation in an integrated way

Neighborhood and regional reconstruction aims at recovering and protecting community networks, culture, and economic development, on top of physical reconstruction that includes housing and urban infrastructures. Reconstruction in urban areas needs to include both social and physical dimensions to achieve complete area reconstruction.

**3.2.5. Reduction of Natural Hazard and Risk**

The building codes and regulation of local government does not exist in AJK. Therefore, it is indispensable to enact regulation of local government with the compulsion power in the AJK government. Regarding structure of building, the Ministry of Housing & Works, Environment & Urban Affairs Division, published "Building Code of Pakistan" as a guideline. This guideline is now on the way of the revision work; the method of the design for earthquake-resistance provided by "1997 Uniform Building Code" is provisionally applied. On the other hand NESPAK made a draft of guideline "Criteria for Seismic Resistant Design of Building in Pakistan (June, 2006)".

The landslide and debris flow will be an imminent and persistent hazard in Muzaffarabad. The JICA Study Team has installed a rain gauge for rainfall measurement and established a disaster management organization within the MCM. Evacuation procedure has been discussed with the residents of the target area and drills have been conducted. It is pointed out that the debris flow and mudflow should be stopped before reaching the urbanized area by constructing check dams or other temporary structures.

**3.3. Project Implementation Plan**

**3.3.1. Implementation Strategy**

The Study Team examines the measures to achieve the vision and objectives and selected four implementation strategies as shown below.

- |  |
|--|
| <ol style="list-style-type: none"><li>1) Rehabilitation and reconstruction of urban areas</li><li>2) Provision of appropriate shelter and housing</li><li>3) Recovery of citizen's life to the normal situations</li><li>4) Reduction of natural hazard risk</li></ol> |
|--|

## (1) Rehabilitation and Reconstruction of Urban Areas

### a. Direction

Urban reconstruction patterns and process will be determined based on the building and housing damage assessment results. Three patterns of rehabilitation and reconstruction of urban areas are proposed: whole urban remodeling, partial remodeling and self-rehabilitation and reconstruction.

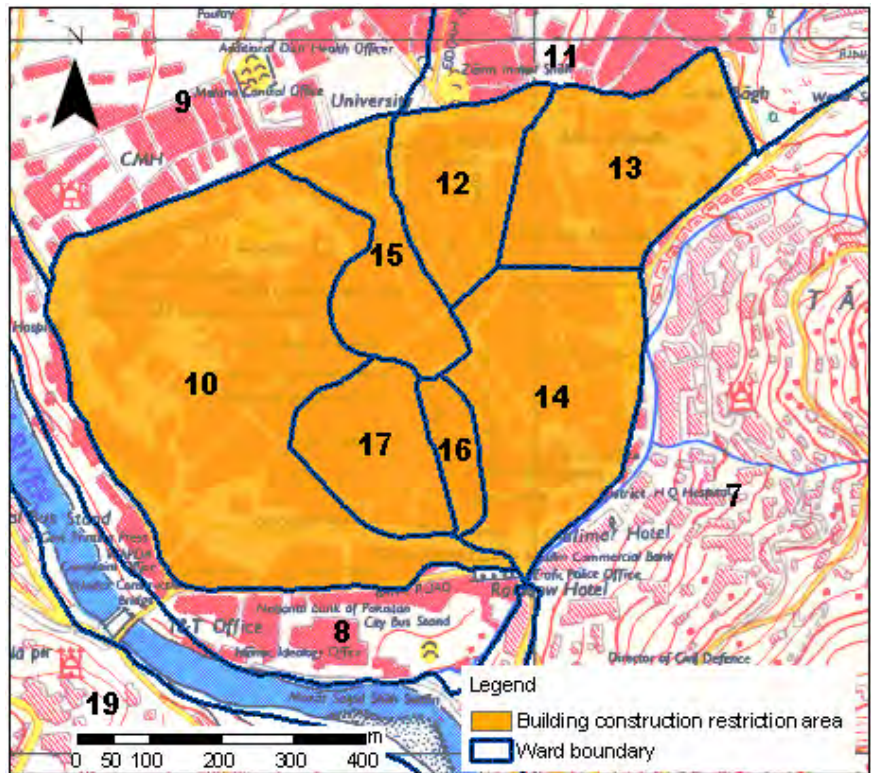
**Table.7 Rehabilitation and Reconstruction Pattern**

Damage Evaluation	Project Implementation Plan		
	Direction	Rehabilitation and Reconstruction	Project Choice
None and slightly damaged area	<u>Pattern A</u> Self-rehabilitation and reconstruction	Start permanent construction	<ul style="list-style-type: none"> <li>• Permanent building construction</li> </ul>
Moderately and most damaged area	<u>Pattern B</u> Partial remodeling	Widening of the existing road Start permanent construction	<ul style="list-style-type: none"> <li>• Detailed urban planning</li> <li>• Relocation of affected people</li> <li>• Temporary house construction</li> <li>• Permanent building construction</li> </ul>
	<u>Pattern C</u> Whole remodeling	Construct a more planned urban area <ul style="list-style-type: none"> <li>• Road pattern</li> <li>• Urban block</li> <li>• Public facility</li> <li>• Parks</li> </ul>	<ul style="list-style-type: none"> <li>• Detailed urban planning</li> <li>• Formulation of transitional urban area</li> <li>• Temporary house construction</li> <li>• Permanent house construction</li> </ul>

Source: JICA Study Team

The results of the building damage assessment done by the JICA Study Team show that Wards 10, 13, 14, 16 and 17 are “most damaged area”. The surrounding areas may have damage ratios lower than that defined for this category, but they also come under the whole urban remodeling pattern. In order to achieve the intended vision, this study puts Wards 10, 12, 13, 14, 15, 16 and 17 under the category needing urban remodeling, and detailed urban planning will be required. Therefore, those wards would be declared as the permanent building construction restriction area, until the government and residents accepted a detailed plan. The plan should include the formulation of commercial complex within the remodeling area.





Source: JICA Study Team

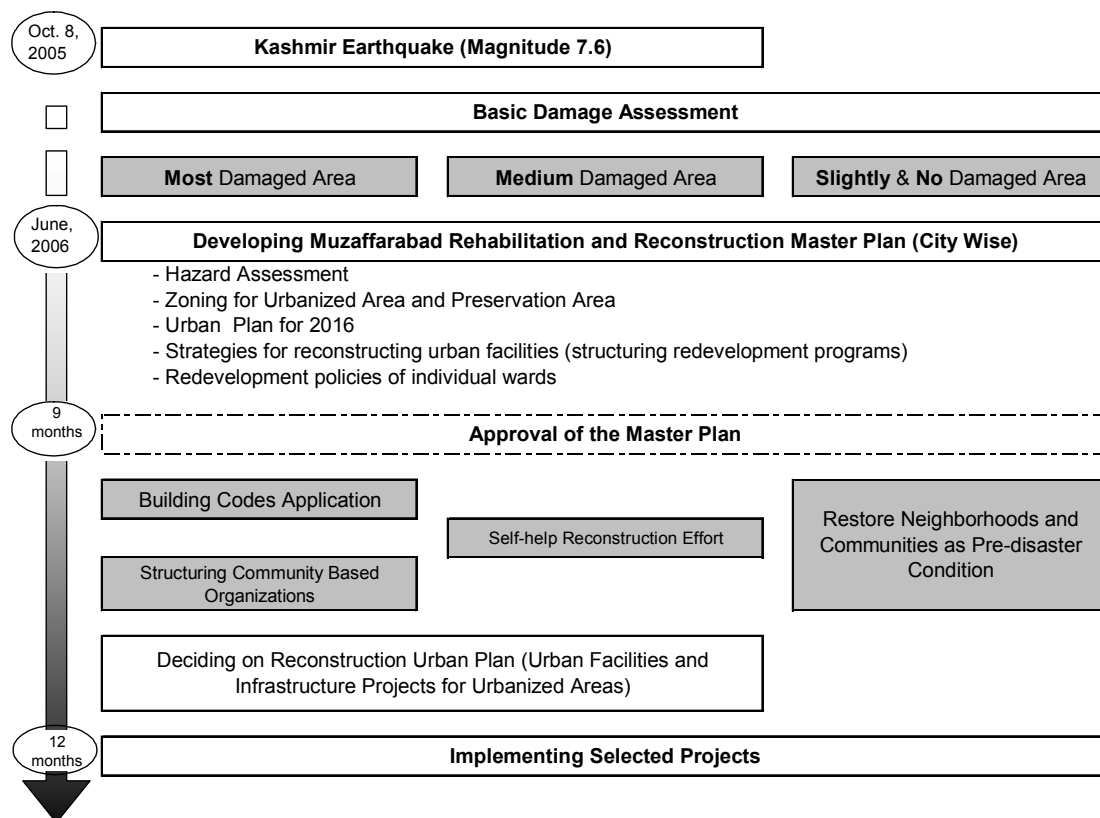
**Figure.17 Location of Building Construction Restriction Area**

Under the category of partial remodeling are Wards 5, 6, 7, 8, 11 and 18. The government should formulate detailed urban rehabilitation and reconstruction plan in those wards, which include from most to moderate damaged area. Special attention should be given to widening the road and damaged areas in the upper bracket of this category.

Other wards, 1, 2, 3, 4, 19 and 20, would proceed with construction of permanent urban areas, if no road widening is planned. In those wards, urban block change will not be recommended.

**b. Reconstruction Process**

The reconstruction process of Muzaffarabad is briefly depicted in Figure.18.



Source: JICA Study Team

**Figure.18 Urban Reconstruction Process of Muzaffarabad City**

**Basic Damage Assessment**

As for the process, first, institutions and organizations involved in recovery implemented a basic damage assessment of the entire city after the earthquake, aiming to identify the areas that fall under the four levels of damage, i.e. most damaged area, moderately damaged area, slightly damaged area and areas with no damage.

**Developing Muzaffarabad Rehabilitation and Reconstruction Master Plan**

By June 2006, the city of Muzaffarabad together with the Study Team had come up with a rehabilitation and reconstruction master plan, which is the major output of this study. In developing the master plan, hazard assessment, zoning for urbanized areas and preservation areas are first implemented to develop an urban plan for 2016. Further, strategies for reconstructing urban facilities and redevelopment policies of individual wards are developed.

**Application of Development Model**

There are three development patterns of urban rehabilitation and reconstruction, i.e., i) Whole Remodeling, ii) Partial Remodeling, iii) Self-rehabilitation and reconstruction. The government should decide the development pattern by ward.

### Approval of the Master Plan

The governments, which will start implementing the projects and activities included, will soon approve this master plan. Concomitantly, rules and regulations will have to be adopted to begin the work of reconstructing a well planned Muzaffarabad with reinforced or earthquake resistance structures based on the damage assessment; the most damaged area will especially need to focus on strictly applying the standards set forth in building codes for new building constructions, and structuring community-based organizations, moderately damaged areas will put emphasis on self-help reconstruction efforts, and areas with slight and no damage will put focus on restoring neighborhoods and communities back to pre-disaster condition. These efforts will have to be sustained throughout the recovery process and further maintain resiliency to natural disasters that would occur in Muzaffarabad city.

### Implementing Selected Projects

After jumpstarting the approved master plan, facilities and other infrastructure projects will also be selected and then be implemented one by one.

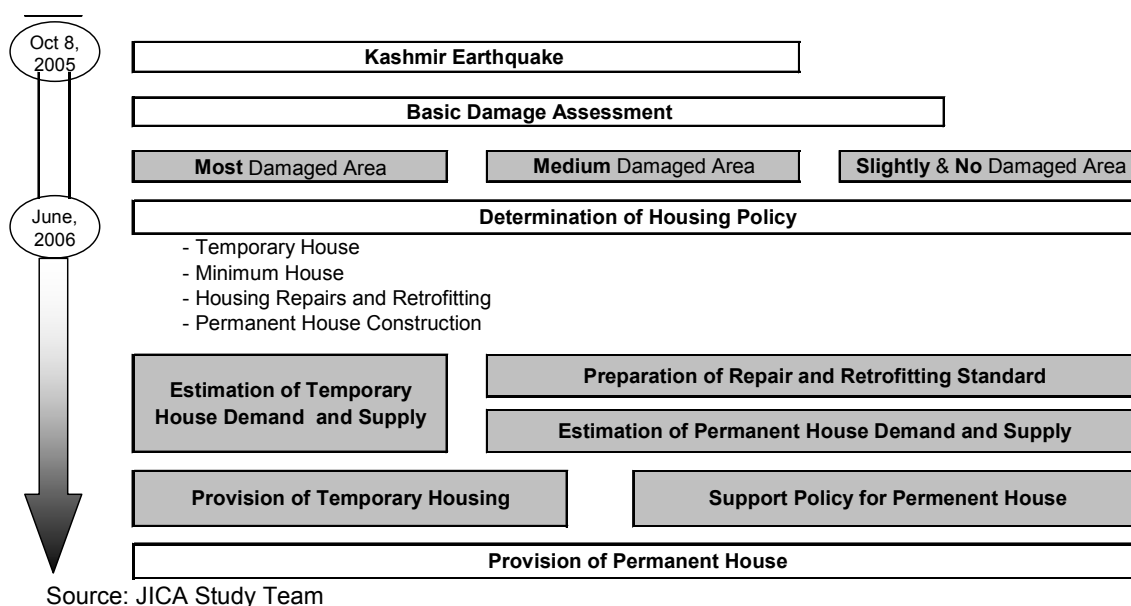
## **(2) Provision of Appropriate Shelter and Housing**

### **a. Direction**

The most important issue in rehabilitation and reconstruction after the earthquake area is shelter and housing because many buildings have been destroyed and damaged by the earthquake. The people have no appropriate place to live and are huddled in tents and damaged houses temporarily. The first priority should be given to provide appropriate shelter and housing. The Study Team proposes a two-step approach to solve shelter and housing problems: the first step is to move out from tents and damaged houses to temporary shelters, and the next step is from temporary shelters to permanent houses. This approach is the most effective and efficient method to solve the shelter and housing problems.

### **b. Reconstruction Process**

The reconstruction process of housing is shown in Figure.19.



**Figure.19 Housing Reconstruction Process**

#### Building damage survey results

As shown by the results of the building damage survey in previous section, the buildings can be categorized into safe, require retrofitting or repair, and unsafe. The results of the survey can be used for baseline data for housing sector policy formulation.

#### Determination of housing policy

The most urgent needs of the victims are the housing reconstruction. The government should address the housing policy, which includes temporary housing, building retrofitting and repair guidelines, permanent housing rehabilitation and reconstruction guidelines and financial support mechanism.

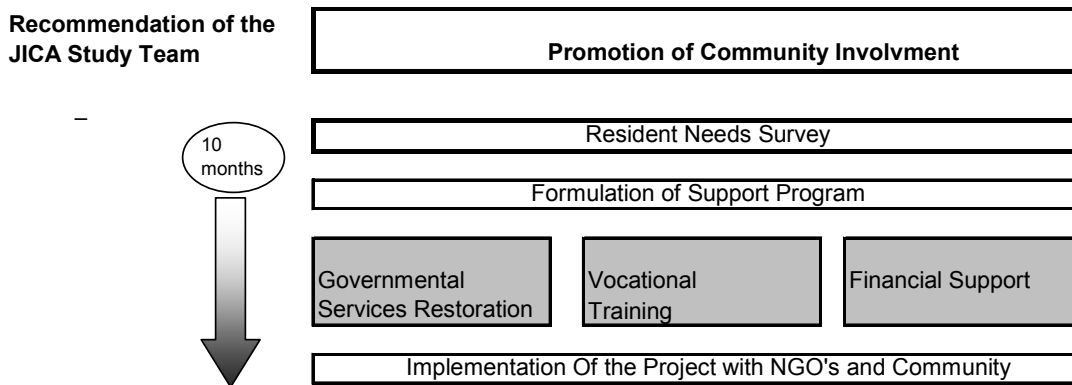
### **(3) Recovery of Citizen's Life to the Normal Situations**

#### **a. Direction**

Since the earthquake struck, the people have been struggling to cope with the many disturbances in their life: in their living environment, the insufficient supply of government services, losing economic opportunities and the dispersed community solidarities. In order to address these issues, the physical measures, construction of a transitional urban area and permanent house, have already been mentioned in previous section. In this section, the focus is more on non-physical measures for rehabilitation issues.

#### **b. Reconstruction Process**

The process on the recovery of the citizen's life is shown in the figure below:



Source: JICA Study Team

**Figure.20 Recovery Process of Citizen’s Normal Life**

**Residents needs survey**

The residents' needs could change the rehabilitation and reconstruction process going on. One year after the earthquake, requests from the residents continually vary. The government should identify needs and requirements from the residents appropriately.

**Formulation of support programs for the residents**

Based on the residents’ needs survey, the government should formulate support programs for the residents. The support program will include many aspects of getting the people’s life back to normal.

**Restoration of government functions**

The government’s level of services is insufficient because many governmental buildings have been damaged and not functioning well. The government services affected include health care, welfare, schools for children etc. The government function should be established in early stage in order to implement rehabilitation and reconstruction projects without delay.

**Provision of training**

Based on the number of people hired living in Ward 13, it seems that many would like to have vocational training to improve their economic situations. The type of vocational training may be determined by the request from the residents.

**(4) Reduction of Natural Hazard Risk**

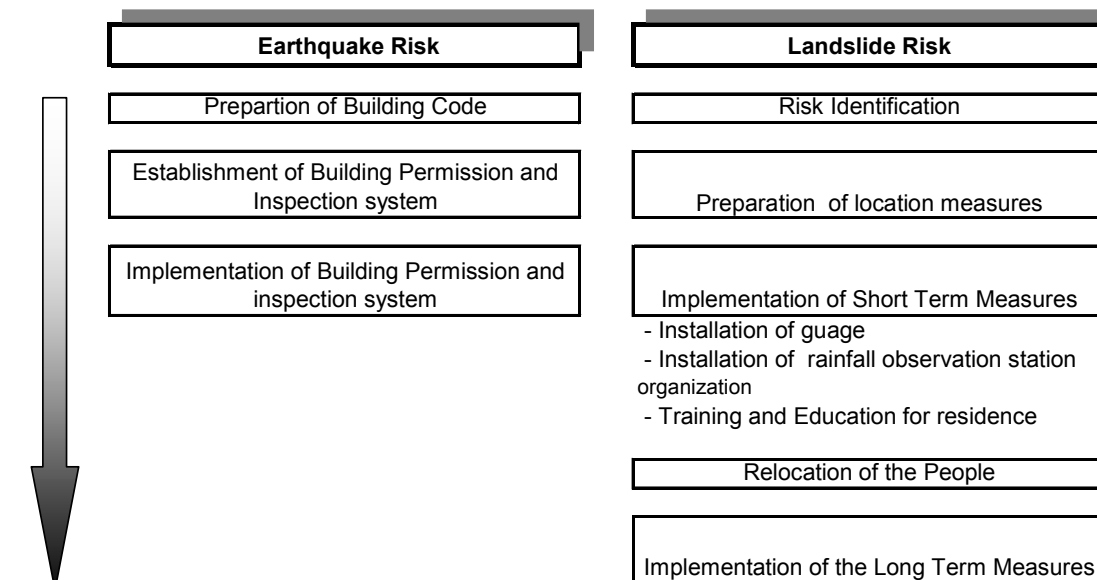
**a. Direction**

The risk of a natural hazard like landslide is still high in the study area. As the Study Team pointed out in March 2006, many landslides and debris flows have happened in the study area during this monsoon period. It is pointed out that the risk of landslide and debris flow will continue for the next ten years, at the least. The Study Team provides technical

assistance for monitoring and warning system in Muzaffarabad. The primary target is technology transfer to Muzaffarabad governmental officials.

**b. Reconstruction Process**

The process of natural hazard risk reduction is shown in the figure below:



Source: JICA Study Team

**Figure.21 Reduction Process of Natural Hazard Risk**

Earthquake risk

In order to mitigate earthquake risk, the buildings should be constructed to withstand earthquakes. The first step in constructing an earthquake resistant structure is to prepare a building code that takes into account earthquake hazard. The building permission and inspection system should be established at the same time in the MDA. The buildings should be constructed properly in accordance with the defined earthquake risk.

Landslide risk

The recent incident of landslide and debris flow, which happened in Muzaffarabad, is evidence of the high risk involved. In order to mitigate landslide risk, the government should understand the risks and measures of the area. Relocation of people from the areas of high risk is a matter of urgency.

**3.3.2. Implementation Period**

Proposed development scheme is in three phases: short-term (rehabilitation period), intermediate term (initial reconstruction period) and long term (full-scale reconstruction period). Past experience in Japan shows that the intermediate phase takes a considerable time, and the Study is expected to need three years. The whole project implementation period is 11 years from 2006.

The following shows the target and explanation of each phase:

**Table.8 Phased Development Scheme**

	Phase 1 Short Term (Rehabilitation Period)	Phase 2 Intermediate Term (Initial Reconstruction Period)	Phase 3 Long Term (Full-scale Reconstruction Period)
Duration	About 2 - 3 years	About 3 years	After the end of intermediate term to 2016
Target	Mainly urgent evacuation areas and refugees, and areas for temporary facility development.	The study area and residents in the area.	The study area and its surrounding area and the residents in the area.
Situation	After the earthquake, many buildings have been damaged or collapsed and many people have no place to live. Those who have no place to live have to evacuate to tents or public spaces.	From evacuation place, people move to temporary urban area to build temporary houses. The people start thinking about reconstruction of their future area and neighborhood.	Reconstruction of urban area and neighborhood starts full-scale.
Most Damaged and Moderately Damaged Area	Preparation of temporary life in temporary facilities Preparation for starting tentative commercial and business activities at temporary facilities Completion of temporary facilities development	Completion of moving to temporary facilities Starting temporary life and commercial and business activities at temporary facilities Preparation of ordinary activities at permanent facilities Completion of permanent facility development	Completion of moving to permanent facilities Starting of normal commercial and business activities Urban development

Source: JICA Study Team

### 3.3.3. Implementation Body

#### (1) Basic Structure

The implementation organization for the projects will be governmental organizations, NGOs, international donor organizations and community level organizations. The private sector, business and commercial community, and professional organizations, should be involved in the project implementation. However, the individuals who are not included in the long list will do the projects. In order to implement these projects, coordination mechanisms should be established within the AJK government.

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## **(2) Reconstruction Process and Responsibilities of the Institutions**

### **a. Responsibilities of the Organizations in the Reconstruction Process**

With the notion of three assistantships in disaster management – self-help, mutual-help, and public assistance – individuals, communities, and governments are the main actors respectively, and have varied roles to play in the recovery scheme explained as Figure.18.

#### **Governments**

Governments, including newly structured organizations that are mainly responsible for coordination in recovery process as well as different level of governments will be responsible for developing, approving, implementing, and monitoring the master plan. Basic role of governments however varies; national governments have larger weights on diplomatic and financial coordination, regional governments are responsible for coordinating national and local, and local governments will play a practical role in the implementation of projects and activities included in the master plan. In line with reconstruction process of Muzaffarabad city, the master plan will need to be approved by the government of Pakistan, and depending on size of projects and activities individual governments will be responsible for implementation.

#### **Communities**

Communities are responsible for the activities that are planned in their neighborhoods. Debris removal supported by the Study Team was one good example of community activity. Such activities are recommended to develop within the neighborhood, and then continue within the area so that it will contribute to nurture the community bonds. This bond is anticipated to accelerate the recovery process. Area-wise, mutual-help aims to improve areas that are not owned by individuals, but located within the neighborhoods such as roads, parks, and open spaces. In developing the mutual-help structure, communities are responsible for selecting members of the CBO, and after establishment, this organization will be the core for the communities. CBOs are responsible for keeping developing activities and motivations. As discussed earlier, CBOs are also in charge of managing and distributing funds by a transparent way, together with the activities that will be on going in the area.

#### **Individuals**

Individuals are responsible for activities that can be controlled by them. Their fundamental role is to rehabilitate and reconstruct their buildings in a safe way, with guides provided by MCM or AJK after permission. Individuals are also responsible for putting effort in securing their own livelihood back close to normal, and thus, need to seek jobs or other opportunities that will benefit them continuously. Lastly, members of Muzaffarabad



communities are accountable to actively participate in meetings to express their interests and possible contribution for the community to the CBOs.

### **(3) Implementation of the rehabilitation and reconstruction plan**

The implementation of the rehabilitation and reconstruction plan will take 10 years from 2006. The AJK government decided the main implementation body of rehabilitation and reconstruction is MDA. In order to monitoring and evaluation of rehabilitation and reconstruction process of the plan, it is recommended that the AJK government should establish “a rehabilitation and reconstruction system” within the government. The plan should be reviewed and revised time to time to cope with rehabilitation and reconstruction progress.

#### **3.3.4. Long List**

The long list prepared in this study includes all projects aiming to achieve the goal and objectives of the rehabilitation and reconstruction master plan. The projects and programs are identified to fill the gap between existing situations and future rehabilitation and reconstruction of Muzaffarabad city. The projects will be compiled by sector and show the implementation organization and time schedule. However, it can be changed when implementation organization modifies the time and scope of the project.

The long list prepared in this study should be shared with donor community for early preparation of the project implementation. Before implementing these projects, an environmental impact study should be carried out and countermeasures should be taken for negative environmental impacts.

Some of the items that could not be formulated projects will be mentioned in Chapter 7, “7.3 Recommendation for Muzaffarabad” in the “Volume 2 : Main Report”.

**Table.9 Project Long List (1/5)**

**Sector : Urban and Housing Reconstruction**

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule																	
					Phase 1			Phase 2			Phase 3											
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016							
UD-1	A-1	Detailed Urban Plan for Block A	Study	CDO and DAM		■																
UD-2	A-1	Detailed Urban Plan for Block B	Study	CDO and DAM		■																
UD-3	A-1	Detailed Urban Plan for Block C	Study	CDO and DAM		■																
UD-4	A-1	Detailed Urban Plan for Block D	Study	CDO and DAM				■														
UD-5	A-1	Detailed Urban Plan for Block E	Study	CDO and DAM				■														
UD-6		Revision of Master Plan	Study	CDO and DAM					■	■											■	■
UD-7	A-1	Institutional Capacity Building in Urban Planning Sector	Capacity Building	CDO and DAM		■		■												■	■	
UD-8	A-2	Formulation of Transitional urban Area in Urban remodeling Area	Study	MDA	■	■																
UD-9	A-2	Construction of temporary housing and/or minimum housing in selected urban remodeling area	Construction	MDA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
UD-10	A-3	Housing Loan/ Subsidiary for Repair and Retrofitting	Program	PWD	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
UD-11	A-3	Housing Loan/ Subsidiary for Reconstruction of Housings	Program	PWD	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
UD-12	A-3	Housing Loan/ Subsidiary for Earthquake-resistant Housing Construction	Program	PWD	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
UD-13	A-3	Introduce housing Insurance Scheme	Program	PWD				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

**Sector: Transportation**

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule																	
					Phase 1			Phase 2			Phase 3											
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016							
T-1		Detailed Design for Neelum Valley Road (North Boundary - Domel Bridge)	Design	CDO and PWD	■																	
T-2		Construction for Neelum Valley Road (North Boundary - Domel Bridge)	Construction	PWD		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-3		Detailed Design for Kohala - Muzaffarabad Road (Domel Bridge - South Boundary)	Design	CDO and PWD			■															
T-4		Construction for Neelum Valley Road (Domel Bridge - South Boundary)	Construction	PWD				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-5		Detailed Design for Tariq Abad By-Pass Road	Design	CDO and PWD	■																	
T-6		Construction for Tariq Abad By-Pass Road	Construction	DAM		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-7	B-1	Detailed Design for West Bank By-Pass Road	Design	CDO and PWD	■																	
T-8	B-1	Construction for West Bank By-Pass Road	Construction	PWD			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-9		Detailed Design for Chela Bandi Bridge - Alama Iqbal Bridge Road	Design	CDO and PWD			■															
T-10		Construction for Chela Bandi Bridge - Alama Iqbal Bridge Road	Construction	PWD				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-11		Detailed Design for Secondary & Tertiary Road in and around Medina Market	Design	DAM	■																	
T-12		Construction for Secondary & Tertiary Road in and around Medina Market	Construction	DAM		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-13		Detailed Design for College Road	Design	DAM		■																
T-14		Construction for College Road	Construction	DAM			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-15		Detailed Design for Secondary & Tertiary Road in and around Upper & Lower Plate	Design	DAM			■															
T-16		Construction for Secondary & Tertiary Road in and around Upper & Lower Plate	Construction	DAM				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-17		Detailed Design for New Katchery Road	Design	DAM		■																
T-18		Construction for New Katchery Road	Construction	DAM				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
T-19		Detailed Design for Upper Adda Makri Road	Design	DAM					■													
T-20		Construction for Upper Adda Makri Road	Construction	DAM						■	■	■	■	■	■	■	■	■	■	■	■	■
T-21		Detailed Design for Secretariat Road	Design	DAM						■												
T-22		Construction for Secretariat Road	Construction	DAM							■	■	■	■	■	■	■	■	■	■	■	■

Note: The number in the left side column does not mean the priority.

Source: JICA Study Team



Table.11 Project Long List (3/5)

## Sector : Infrastructural Rehabilitation, Reconstruction and Development

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule																
					Phase 1			Phase 2			Phase 3										
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016						
W-1	B-4	Rehabilitation of Distribution Tank and Transmission Pipe (Maria Tanoulia)	Construction	DAM																	
W-2	B-4	Field Survey of Damaged Distribution Pipeline	Survey	PWD																	
W-3	B-4	Rehabilitation of Damaged Distribution Pipeline	Construction	PWD																	
W-4	B-4	Rehabilitation of Damaged Distribution Tank (Maira Tanoulia)	Construction	PWD																	
W-5		Feasibility Study for New Water Supply Treatment Plant	Design	PWD																	
W-6		Detailed Design for New Water Supply Treatment Plant	Design	PWD																	
W-7		Construction for New Water Supply Treatment Plant	Construction	PWD																	
S-104	B-4	Field Survey of Damaged Sewerage Pipeline	Survey	PWD																	
S-105	B-4	Rehabilitation of Damaged Sewerage Pipeline	Construction	PWD																	
S-106		Construction of Sewerage Pipeline proposed in Sewerage & Storm Water Drainage Scheme Muzaffarabad Phase II (1st Revision)	Construction	PWD																	
S-107		Feasibility Study of Central Treatment System	Study	PWD																	
S-108		Detailed Design of Central Treatment System	Design	PWD																	
S-109		Construction of Central Treatment System (Block A, Block B, and Block C)	Construction	PWD																	
S-110		Construction of Central Treatment System (Block D and Block E)	Construction	PWD																	
S-201		Debris Removal from Whole Municipality	Program	MCM																	
S-302		Procurement of Collection Vehicle to Replace Damaged Vehicle	Procurement	MCM																	
S-303		Rehabilitation of Approach Road to Landfill Site	Construction	MCM																	
S-304	B-4	Construction of Existing Landfill Site	Construction	MCM																	
S-305	B-4	Master Plan Study for Solid Waste Management	Study	PWD																	
S-306		Detailed Design of New Landfill Site	Design	MCM																	
S-307		Construction of New Landfill Site	Construction	MCM																	
E-401	B-4	Study for electricity distribution system	Study	AJKED																	
E-402	B-4	Rehabilitation of electricity supply system	Construction	AJKED																	
G-501	B-4	Study for Natural Gas Pipeline supply system	Study	AJK																	
G-502	B-4	Rehabilitation of Gas Pipeline Supply System	Construction	AJK																	

## Sector : Parks &amp; Green Spaces

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule																
					Phase 1			Phase 2			Phase 3										
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016						
PO-1		River Side Park at Chela Bandi (Adjacent to Neelum River)	Design	DAM																	
PO-2		River Side Park at Chela Bandi (Adjacent to Neelum River)	Construction	DAM																	
PO-3		Riverside Park at Chela Bandi (Adjacent to Chela Bandi Bridge)	Design	DAM																	
PO-4		Riverside Park at Chela Bandi (Adjacent to Chela Bandi Bridge)	Construction	DAM																	
PO-5	B-3	Central Park with Function against disaster	Design	DAM																	
PO-6	B-3	Central Park with Function against disaster	Construction	DAM																	
PO-7		Sathra Park at Jalalabad	Design	DAM																	
PO-8		Sathra Park at Jalalabad	Construction	DAM																	
PO-9		Narul Stadium Park at Jalalabad	Design	DAM																	
PO-10		Narul Stadium Park at Jalalabad	Construction	DAM																	
PO-11		Domel Park at Jalalabad	Design	DAM																	

Note: The number in the left side column does not mean the priority.

Source: JICA Study Team



Table.13 Project Long List (5/5)

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule												
					Phase 1			Phase 2			Phase 3						
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
PB-8		Relocation of AJK University to Chatter Klas	Construction	MOE													
PB-9		Residential Development at Chatter Klas	Design	MOE													
PB-10		Residential Development at Chatter Klas	Construction	MOE													
PB-11	C-1	Rehabilitation of Market	Construction	DAM													
PB-12	C-1	Development of Shopping Complex	Design	CDO and DAM													
PB-13	C-1	Development of Shopping Complex	Construction	DAM													
PB-14		Rehabilitation of Slaughter House	Construction	DAN													
PB-15	C-2	Preparation of Inventory on the Damage of Government Administration Facilities	Study	CDO													
PB-16	C-2	Rehabilitation and reconstruction of Government Administration facilities	Construction	DAM													

**Sector : Code and Regulation Building**

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule												
					Phase 1			Phase 2			Phase 3						
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
BH-1		Building Damage Survey Training of Evaluation and Implementation of Damage Survey	Capacity Building	PWD and MCM													
BH-2	D-2	Legislation of Building code and Building Laws	Capacity Building	PWD and MCM													
BH-3	D-2	Training of Building Engineers and Building Administration Office	Capacity Building	PWD and DAM													
BH-4		Training of Skilled Workers for Construction	Capacity Building	PWD and DAM													
BH-5	D-2	Establishment of Building Permission and Inspection System	Capacity Building	PWD and DAM													
BH-6	D-2	Standard Drawings and Technical Manual for Earthquake-resistant Building	Capacity Building	PWD and DAM													
BH-7		Standard Drawings and Technical Manual for Rehabilitation of Damaged Building	Capacity Building	PWD and DAM													
BH-8	D-1	Establishment of Land Use Control Measures	Institutional Building	PWD and DAM													

**Sector : Landslides**

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule												
					Phase 1			Phase 2			Phase 3						
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
LS-1	D-3	Study on Emergency Measures for Land Slide Protection at High Hazardous Areas (18 locations)	Study	PWD													
LS-2		Establishment of Monitoring and Warning System at Sunbal Nalla River	Construction	PWD													
LS-3		Establishment of Monitoring and Warning System at Manal Paian Nalla River	Construction	PWD													
LS-4		Capacity Building for Monitoring and warning System	Capacity Building	MCM													
LS-5	D-3	Study on Permanent Measures for Land Slide Protection	Study	PWD													
LS-6	B-1	Countermeasures for Landslide Sector at Pangran Area	Construction	MDA													
LS-7	D-3	Disaster Education for officers and Resident	Capacity Building	MCM													
LS-8		Study and Preparation of debris/mud flow risk map for Muzaffarabad	Study	GSP													
LS-9	D-3	Monitoring of debris/mud flow Hazards and Establishing emergency Evacuation System	Capacity Building	MCM and GSP													
LS-10	D-3	Design of Counter measures for Debris/mud Flow Risk Reduction	Study	MDA													
LS-11	D-3	Construction of Debris/mud flow Risk Reduction Facilities	Construction	MDA													

**Sector: Others**

No.	Action Plan	Project Name	Type of Project	Implementation Body	Implementation Schedule												
					Phase 1			Phase 2			Phase 3						
					2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
OT-1		Training of Doctor and Medical Experts	Capacity Building	MOH													
OT-2		Teacher Training for Disaster Mangment Education at school Level	Capacity Building	MOE													
OT-3		Preparation of Educational Material for Disaster Management	Study	MOE													

Note: The number in the left side column does not mean the priority.

Source: JICA Study Team

### **3.3.5. Urgent Project**

The master plan proposes two urgent projects: provision of temporary shelter and debris flow countermeasures project for early implementation. (See details in “Volume 2 : Main Report”.)

### 3.3.6. Selected Action Plans

Action plans in this study are selected priority projects or activities for effective implementation of recovery and reconstruction of the city from the earthquake disaster. For the selection of action plans, three criteria are applied: “urgency,” “maturity or importance” and “effectiveness” in the process of recovery of urban functions and the citizen’s life back to normal condition. In addition, action plans contribute to reduction of the risk of recurrent natural disaster.

**Table.14 List of Action Plans**

Rehabilitation and Reconstruction Strategies	Code	Name
A. Provision of shelter and housing	A-1	Preparation of micro town planning and its implementation
	A-2	Development of transitional housing schemes and Its Implementation
	A-3	Development of financial assistance scheme for housing reconstruction
B. Recovery of urban function	B-1	Construction of the west bank by-pass road
	B-2	Development of satellite town
	B-3	Development of central park with the function of disaster management
	B-4	Recovery of Infrastructure and basic urban service facilities
C. Recovery of citizen’s life	C-1	Reconstruction of shopping complex
	C-2	Reconstruction of government facilities
	C-3	Development of skill training center for a casualty of the earthquake
D. Reduction of recurrent natural hazard risk	D-1	Establishment of land use and building control measures
	D-2	Establishment of building Permission and Inspection System
	D-3	Construction of Debris and Mud Flow Risk Reduction Facilities

Note: The project code does not mean the priority.

Source: JICA Study Team

Details of the action plans are found in “Volume 2 : Main Report” and “Volume 3 : Sector Report”.



## **4. PUTTING LIFE BACK IN ORDER**

The quake that lasted for a very short time tipped people's lives into desperation. Many families lost part of their members, houses, money, and other assets; all of which are making people so difficult to put back lives into normal. Assets also include social capitals that are explained by neighborhood ties, social norms, and resource personnel in Muzaffarabad.

The process of recovery is long and difficult, however there must be many lessons learned from the world-wide experiences that can be shared in putting life back to normal in Muzaffarabad in least disorder.

### **4.1. Focal Issues in Rehabilitation Process**

Experiences in other earthquakes in urban areas have brought about four critical issues that primarily need to put effort for smooth recovery. These include: i) restoring livelihood of the affected people, ii) recovering places to live, iii) providing opportunity to generate incomes, and iv) preparing plans of regional reconstruction.

Restoring livelihood of the affected people aims at maintaining people's live as close to the pre-disaster period at minimum level. In this rationale, the affected area needs to consider about services related to health and health care system, welfare, education, and information in an integrated way. By so doing, residents of the affected area will have minimum securities on their livelihood.

Second, recovering places to live is critical for the affected. This process, however, is difficult to provide solely by the government and thus need positive participation of the affected residents through neighborhoods. Developing systems that support incentives of residents and providing special assistance for the residents in desperate condition, is the major role of government.

Third, creating jobs and providing such opportunities to the affected are essential in supporting the livelihood through the recovery process. Residents in Muzaffarabad, especially has large population of self-employed, and thus suffering to generate income. Without any opportunities in earning incomes, they cannot put their effort to self-help or mutual-help activities. Further, by being unable to restart their business without places and resources, their life will be a depressed, and be unable to cut the chain of deflationary spiral. Government is responsible to provide, at least at minimum level, income or opportunities that trigger residents to stand up for recovery.

Last, as prepared in the master plan of this study, addressing a road map for regional reconstruction is important so that the living environment of the area will be close to the one

of pre-disaster period. The plan in this Study thus addresses: the vision of recovery, policies on land use, policies on allocating urban facilities, and reconstruction of the urban areas – including transition urban areas.

#### **4.2. Pros and Cons of Past Recovery Procedures from Earthquake**

Past experiences of recovery from earthquake disasters in urban areas addressed several problems that need to be highlighted. In some cases, government urged for rapid recovery which as a result led to large un-satisfaction of the residents. Moreover, top down procedures in the recovery process, such as an attempt to enforce newly crafted city redevelopment plan, was hardly accepted by the residents and further caused distrust and conflicts between the government and residents. Moreover, careless allocation of funds to the neighborhoods as well as provision of infrastructure by top-down approach increased gaps of recoveries between the affected areas.

On the other hand, other experiences show drastic improvement of the affected areas in comparison to the pre-disaster period. In cases where areas have improved, participation of residents were significant, with supportive assistantships of the public. The appropriate assistance like financial subsidies withheld many residents to stay at their original neighborhoods that were ready to emigrate, and at the end succeeded in restoring and enhancing the neighborhoods' bonds. Providing incentives to the affected residents as well as promoting residents to participate in reconstruction activities of own areas were the ultimate factors for this success.

Although the reconstruction processes of the past experiences are very limited, examples in other countries suggest that participatory process of the affected residents is key components for proper recovery. Without paying attention to such social capitals, communities could be segmented and will face difficulties in participating to the decision making process or recovery activities, which will negatively function for an area's recovery at the end. Such notion is also important for the recovery process in Muzaffarabad.

#### **4.3. Recommendations for Muzaffarabad**

This Study mainly discuss on regional reconstruction plans as for recovery and rehabilitation, which includes structure plan of the city – consisting urban function, road networks, urban infrastructures, open spaces, and restoration of buildings – of Muzaffarabad. Further, in the process of recovery, using method of transition urban area is recommended which is expected to nourish community and neighborhood bonds. Moreover, three concepts on i) restoring livelihood of the affected population, ii) providing opportunity to generate income, and iii) recovering places to live, are generally consulted. Proposed activities, such example as debris removal project, include all of these notions and involve

residents in the recovery activities, and also give incentives by providing some incomes to them.

One of the most important and responsible role of government is to develop a system that will propel reconstruction activities at all levels, with emphasis at community level. If the government succeeds in providing incentives to the community members to participate in reconstruction activities, sustainability in recovery is easier to keep. If such structure is developed and the government is capable of continuously providing programs and actions to take for the neighborhoods, the road map of rehabilitation plan can be drawn in a step by step procedure.

On the other hand, the government needs to put effort in improving their capacities as well. Studies on responses to this earthquake incident clarified that the government could not respond in a sufficient manner. In line with this, government needs to begin putting effort in enhancing their emergency response capacities. The effort includes: developing emergency response plans of the government at all levels – local, Ward, and Provincial – including response structure, information dissemination, mutual assistantships, etc. It is Essential factor is to define and clarify the role and responsibilities of all governments by timeline. Additionally, these governments are responsible to hold periodical disaster drills so that there capacities in responding emergency will increase.

Lastly, governments are responsible for providing information on their activities as well as possible assistantships that are given to the residents. It also needs to be equally accessible by the residents for keeping reconstruction as uniform as possible. Such effort is expected to develop trust between the government and the affected in the community which will lead to smooth coordination. This will significantly increase the reconstruction process.