3. ZONING FOR URBANIZED AREA

3.1. Zoning for Urbanized Area in Muzaffarabad City and Adjacent Areas

3.1.1. Land Classification Policy

(1) Objective of Land Suitability Assessment

Muzaffarabad city lies within an area characterized by hilly terrain, where there is a high potential of natural hazards such as landslides and mudflows to occur.

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 JICA 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.

The results of the land suitability assessment presented in this report were used as base for preparing land use plans for Muzaffarabad city.

(2) Data, Information and Methodology, etc.

a. Field reconnaissance

The JICA Study Team determined the current land use in and around Muzaffarabad city by referring to hard copy QuickBird Satellite images and topographic maps having a nominal scale of 1:10,000. Field reconnaissance work was also under taken several times during March 2006.

b. Collection of existing data and related maps

Existing data and related maps useful for assessing land suitability were complied by the JICA Study Team. This data was collected from various resources. Details of these data are mentioned in Section 3.3. Table 3.1.1 shows the list of the collected existing maps and data for the land suitability assessment for Muzaffarabad city.

Table 3.1.1 Existing Maps and Data Collected in the JICA Study

Title of data	Contents	Use
Muzaffarabad guide map	Publisher: The Survey of Pakistan A nominal scale: 1:10,000 Data currency: 1995-1996	Base map
QuickBird satellite image	Publisher: DigitalGlobe, Inc. Date of acquisition: October 22, 2005 Resolution: 0.6 m Type of image: Natural color/pan-sharpened	Reference image
Slope classification map	Publisher: Planning and Development Department of the AJK State Government A nominal scale: 1:10,000 Data currency: Late 1990s – fefore 2005	Reference map
Geological hazard map	Publisher: JICA Study Team A nominal scale: 1:10,000 Data currency: March, 2006	Reference map
Building Damage assessment map	Publisher: JICA Study Team A nominal scale: 1:25,000	Reference map

Source: JICA Study Team

In addition to the collected data shown in Table 3.1.1 above, National Engineering Services Pakistan Pvt. (NESPAK), which is a semiofficial company, carried out a study on seismic hazard micro-zoning in Muzaffarabad. The study report prepared by NESPAK includes basic information about possible seismic hazards in the Muzaffarabad region.

c. Discussions and interviews with the local government officers

Discussions and interviews with the local government officers were held several times in March 2006 to assist with preparation of the zoning for urbanized area.

d. Integration of data and maps in GIS

The collected data and maps were digitized, and integrated in a geographic information system (GIS). The contents of the GIS data were show in Section 3.3 in this report.

e. Delineation of land suitability (land use zones)

Use of a GIS assisted with the land suitability assessment and with delineation of land use zones for Muzaffarabad city. Mapping was done at a nominal scale of 1:10,000. The GIS allowed digital versions of various thematic maps to be overlaid on a topographic base map. Land use zones were defined by analyzing the information and drawing polygons (area features) on the map.

3.1.2. Basic Concepts of Zoning for Urbanized Area

(1) Preliminary Land Use Zones

The results of the land suitability assessment allowed land use zones to be defined as follows:

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 exited 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. This zone was generally not developed when the earthquake occurred on October 8, 2005. This area has been designated to allow Muzaffarabad city to expand when the need arises in the future. Secondary Urban Zone includes 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.

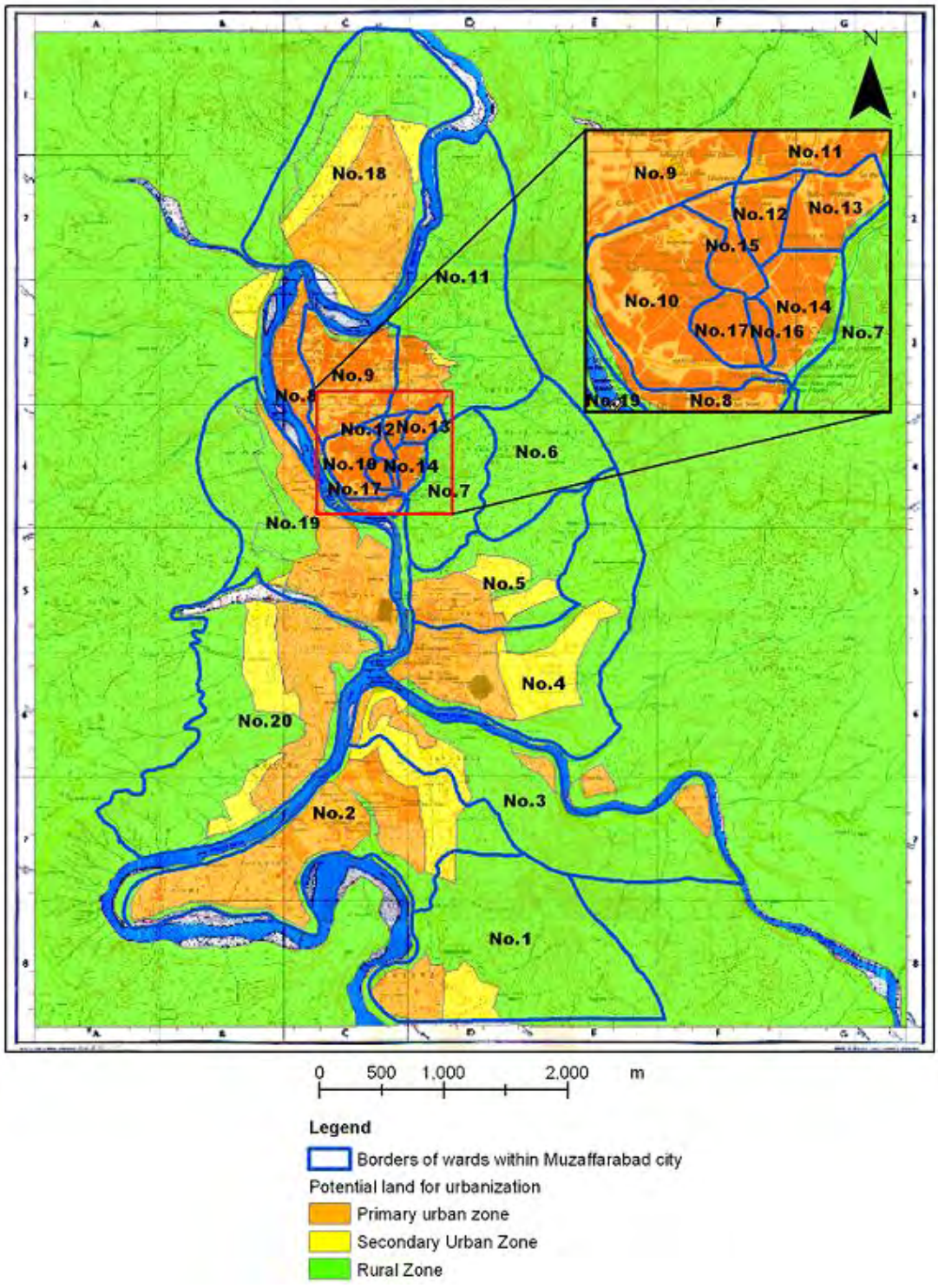
The three land use zones defined above are summarized in Table 3.1.2 below.

Figure 3.1.1 shows the land use zoning for Muzaffarabad city.

Table 3.1.2 Summary of Land Use Zones

	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



Source: JICA Study Team; Base map: "Muzaffarabad Guide Map" (The Survey of Pakistan)

Figure 3.1.1 Proposed Zoning for Urbanized Area in Muzaffarabad City

(2) Delineation of Land Use Zones

a. Topographic Factors

The AJK State Government has already prepared a land capacity classification system that is to be adopted for the Azad Jammu and Kashmir State. Because the major economic activity

in the region is agriculture, the AJK State Government's land capacity classification system is based on the hilly terrain land capability classification system that was developed by the United States Department of Agriculture (USDA). The general farming in the region system is characterized by small-scale subsistence agriculture plus cash-surplus traditional production. Therefore, the current AJK State Government's land capability classification is primarily oriented towards agriculture. The definition of each land capability class used by the AJK State Government is summarized in Table 3.1.3 below.

Table 3.1.3 Azad Jammu Kashmir (AJK) State's Land Capability Classification System

Class	Definition or Description
I	Land with 0°-7° slopes, broad level terraces with stable protected riser, good soil cover. Exhibits little or no erosion hazard or dissection of topography. Attention to field drainage and waterway protection required. Cultivated land.
II a	With slopes 8°-20°, steeper than Class I land, but still with well constructed terraces, good soil cover. Exhibits limiting factors in a minor way, erosion, dissection of topography. Conservation treatments required, attention to terrace rivers, field drainage, and protection of water ways and stream channel banks. Cultivated land.
II b	Land with 8°-20°, slopes, major limiting factors presents; soil erosion extensively in evidence, shallower or poorer quality soils, stony broken terrain. Major attention to physical conservation measures required, including improved terracing. Cultivated land.
II c	Slopes 8°-20°, severe limitation present; shallow soils, rocky broken terrain, severe erosion and gullying of the landscape, underlying bedrock influencing topographic variations. Intensive soil and water conservation treatments required. Not to be recommended for cultivation. Should be maintained under some type of perennial vegetative cover.
III a	Steeply slopping land 21°-30°, but whilst exhibiting major limiting factors, attention has been paid to improved terrace construction and there is adequate soil cover, erosion is an ever-present hazard which requires appropriate treatments. Cultivable land under careful management.
III b	Steeply sloping land 21°-30°, with severe limitations, poor soil cover, erosion and gullying of the landscape, dissection of topography, stony soil with rock outcrops. Often on unsuitable slopes intensive conservation treatments required. Not to be recommended for cultivation, should be maintained under some type of perennial vegetative cover.
IV	All land with greater than 30° slopes, including cliffs or expose bedrock. Exhibits extreme limitations; patchy soil cover, rocky broken terrain, severe erosion hazards often in evidence, dissected landscape, areas may be under active or potential land sliding. No-cultivated land. Conservation treatments not usually economically justifiable unless to protect surrounding better quality lands.

Source: The Planning and Development Department of the AJK Government

The land capability classification shown above does not include the capability/suitability of land for urban development. Therefore, the suitability for urban development in each land use zone was determined by the JICA Study Team, as shown in Table 3.1.4 below. The assessment undertaken by the JICA Study Team was based on the slope classification map prepared by the AJK State Government.

Table 3.1.4 Land Suitability for Urban Development by Slope Gradient Class

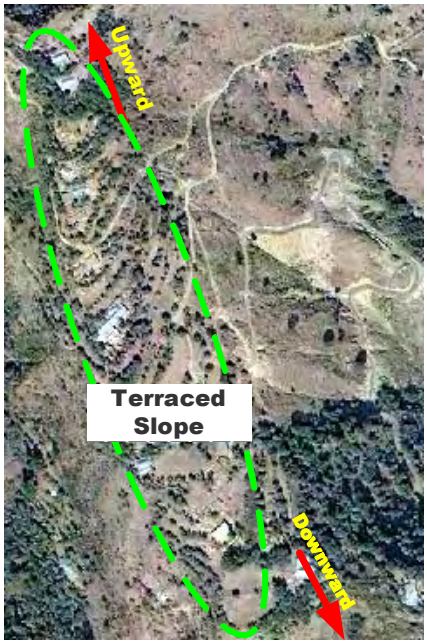
Land Use Suitability Class/ Slope Gradient	Primary Urban Zone	Secondary Urban Zone	Rural Zone	
			Rural/Agriculture	Natural
I : 0° - 7°	Suitable	Suitable	Suitable	-
II : 8° - 20°	Conditional	Conditional	Conditional	-
III : 21° - 30°	Unsuitable	Unsuitable	Conditional	-
IV : 31° - 90°	Unsuitable	Unsuitable	Conditional	-

Source: JICA Study Team

Land categorized as Class I (0° - 7° slope gradient) is considered to be suitable for Primary Urban Zone, Secondary Urban Zone, and Rural Zone. Therefore, when preparing the zoning for urbanized area in Muzaffarabad city, the JICA Study Team determined that land in Category I land could be assigned for urban development. Similarly, land in Category II (8°-20° slope gradient) may be assigned to the Primary Urban Zone, Secondary Urban Zone, and Rural Zone, with the condition that protective measures to ensure land stability be applied. However, Category II land should primarily be assigned to the Primary Urban Zone. Assignment of Category II land to the Secondary Urban Zone and Rural Zone would have a secondary priority.

The steeper sloping land in Category III (21° - 30° slope gradient) is generally unsuitable for assignment to either the Primary Urban Zone or the Secondary Zone. If the slopes were to be made gentler, to increase the area available for urban development, this would require not only huge expenditure, but may also induce potential natural disasters, such as landslides.

Hence, Category III land should be assigned to the Rural Zone, and specifically to “Areas Not to be Urbanized”. This will allow Category III land to be used for nature reserves, parks, or rural/agriculture land. For example, around Muzaffarabad city, many terrace have been artificially developed on slopes in the hilly areas, as shown in Figure 3.1.2 below.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.1.2 A traditional terracing pattern on a slope in a hilly area

These terraces have been used for single dwelling housing sites, small scale farms, or pasture. Such traditional land use seems to be suitable for Category III land.

b. Geology

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 Tanda Fault, a reverse fault, generally runs through the eastern part of Muzaffarabad city and extends from the southeast to the northwest. The devastating earthquake occurred on October 8, 2005 is considered to have been induced by reverse faulting of the Tanda 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 form 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. Nevertheless, it is likely that the next earthquake that affects Muzaffarabad city may occur on the Jhelum Fault.

The AJK State is located in a landslide-prone area. The 2005 Kashmir earthquake triggered landslides near Muzaffarabad city, especially along the Tanda Fault. Once a landslide is initiated, it is not easy to prevent further movement, or control it economically. Basically, such landslides should be avoided for urban use and for large-scale development projects that may accelerate the landslide movement.

When undertaking the land suitability analysis for Muzaffarabad city, the areas affected by landslides were excluded from the Primary and the Secondary Urban Zones.

c. Active faults

An active fault has the potential to cause future earthquakes and seismic ground motion, leading to relative displacement of the ground surface along the fault plane. In Muzaffarabad city, two major active faults have been identified, as described above. The Tanda Fault is considered to be a reverse fault. The hazard map prepared by the JICA Study Team delineates the inferred position of these two (2) active faults. Relative displacement of the ground surface due to faulting will directly harm life and property in the vicinity of the fault lines. Therefore, a zoning guideline for urbanized area based on distance form the inferred active fault lines have been suggested by the JICA Study Team, as described in the following section below.

3.1.3. Suggestions on Muzaffarabad Recovery and Rehabilitation Plan

The zoning for urbanized area in Muzaffarabad, including geological hazard constraints, was drawn on a base map ("Muzaffarabad Guide Map (Second Edition)") having a nominal scale of 1:10,000. As mentioned in the previous sections above, there are likely to be significant natural hazards that will threaten Muzaffarabad city in the future. The special suggestions on these natural hazards for urban planning in Muzaffarabad city are described below, based on the results of the hazard analyses mentioned in CHAPER 1 and CHAPTER 2 within this Sector Report.

(1) Landslide

Landslide areas are excluded from lands suitable for the Primary Urban Zone and Secondary Urban Zone development. However, the Rural Zone includes landslide areas. Based on the activity of each landslide, the following guidelines are suggested for use of existing landslide areas in the Rural Zone.

a. High activity area

In cases where no suitable countermeasures can be constructed for the high activity areas, possible land use should only be "Nature Reserve" (protected land) Zone, e.g. natural forests or natural land. Land development, public facilities, and new residential site development should be avoided unless countermeasures are employed.

b. Moderate activity area

In cases where no suitable countermeasures can be constructed for the moderate activity areas, possible land use should be Rural/Agriculture Zone, e.g. such as natural land, pasture, or small scale agriculture. Again as well as high activity area, public facilities and new residential site development should be avoided unless countermeasures are employed.

c. Low activity area

In cases where no suitable countermeasures can be constructed for the low activity areas, possible land use should be Rural/Agriculture Zone as well as the land use examples listed above for the moderate activity area. Open space, such as parks or sport ground, or foot paths can be planned conditionally. However carefully designed countermeasures have to be undertaken. New residential site development should be made under license/permission to be given by the government authorities.

If a landslide area is completely secured by effective countermeasures, the area can be used for Secondary Urban Zone or Rural/Agriculture Zone, based on the land suitability for the slope gradient class, as defined in Table 3.1.4 above. Table 3.1.5 and Table 3.1.6 summarize the suggestions mentioned above.

Table 3.1.5 Suggestions on Countermeasures and Urban Planning for Landslide Areas

Hazard Level	Countermeasure		Recommendation for Urban Planning
	Short-term	Long-term	
A (High)	- Monitoring (urgent especially in monsoon season) - Early warning - Urgent measures (Surface and subsurface drainage, removal of unstable landslide debris, catch type concrete or gabion wall etc.)	- Permanent Slope - Stability work - Education on natural hazards - Relocation of houses (for Hazard level A and B)	Prohibition on construction of public facilities and new residential sites unless appropriate countermeasures are employed.
B (Moderate)	- Monitoring - Early warning - Urgent measures		
C (Low)	- Monitoring		Public facility construction should be prohibited Residential site development requires permission to be given by government authorities.

Source: JICA Study Team

Table 3.1.6 Possible Land Use without Countermeasures for Landslides

Landslide Activity	Possible Land Use
A: High	Nature reserve (Protected land) - Natural forest - Natural land
B: Moderate	Rural/agriculture - Natural land - Pasture - Small scale agriculture
C: Low	Rural/agriculture - Pasture - Small scale agriculture

Source: JICA Study Team

Source: JICA Study Team

Figure 3.1.3 Landslides Located in the East of Muzaffarabad City, and Activated by the 2005 Kashmir Earthquake (Photo on March 9, 2006)

(2) Mudflows

The devastating earthquake triggered landslides in many places near Muzaffarabad city. The JICA Study Team also identified other existing landslide areas. Debris that was produced form the recent landslides has reached down to, and been deposited in, mountain streams which run across the planned Primary Urban Zone and Secondary Urban Zone for Muzaffarabad city. Actually, a mudflow affected a residential and a tent town located in

Ward no.18 on Jury 24, 2006. The death toll was counted at least 12 and more. Source: JICA Study Team

Figure 3.1.4 below shows another mudflow hazard affected a residential site in Ward no.11 where mudflow risk have been suggested by the JICA Study Team at the end of March, 2006.

Therefore it is necessary to pay attention to possible mudflow hazards in the land use zones planned for future urban development.

Source: JICA Study Team

Figure 3.1.4 Debris Removal Work after a Mudflow Affected a Residential Site in Ward no.11, 2006 (Photo on July 26, 2006)

(3) Active Fault Zone

Currently, there are no internationally agreed or authorized standards governing land use in the vicinity of active faults. The seismic history of the active faults in the vicinity of Muzaffarabad city does not exist, and there are no sufficient or detailed analyses concerning seismic ground motion which might be triggered by these active faults. Therefore, the JICA Study Team only shows the distance from the probable active fault line when undertaking the land suitability assessment for Muzaffarabad city. This means that only the shaking/movement of objects on the ground and relative displacement of the ground itself along the active fault line can be assessed as problems that are likely to be important for disaster management. Table 3.1.7 below provides general remarks to be considered in conjunction with the land use zones prepared for Muzaffarabad city.

Table 3.1.7 Possible guidelines for zoning in the vicinity of inferred active fault lines

Distance from Inferred Active Fault Line / Zoning	~ 200m	~ 400m	Over 400m
a. Important public buildings used in emergencies, and relatively tall buildings	Unsuitable	Conditional	Possible
b. Open space (park, sports ground)	Possible	Possible	
c. Ordinary housing (including small scale private/ commercial buildings)	Conditional		
d. Residential site development			
e. Road construction			
f. Utility supply and communication network		Conditional	
g. Water storage and power generation, etc.	Unsuitable	Unsuitable	Conditional
h. Small scale infrastructure/facilities, etc.	Conditional	Possible	Possible

Source: JICA Study Team

Schools and hospitals are important facilities that can be used as disaster management resources during an emergency. It is essential that these buildings remain usable, even after another disastrous earthquake similar to the one which struck the area on October 8, 2005.

Therefore, these buildings, and related facilities, might not be built in the area of 200m on both sides of the probable active fault lines that are shown on the JICA Study Team's zoning for urbanized area in Muzaffarabad city. The findings of many specialists were assessed by the JICA Study Team when determining the inferred location of the major active faults. Base on these assessments, it is concluded that the actual active faults are probably located within 200 m either side of the lines shown on the zoning for urbanized prepared by the JICA Study Team.

Within 200-400m each side of the probable active fault lines, the peak ground motion, which is sometimes referred to as peak ground acceleration, may reach certain dangerous level for buildings and facilities. Appropriate building design codes, design and construction regulations, and building inspection procedures should be prepared and applied to all important public buildings and facilities. These same standards and procedures should also be applied to all important public buildings and facilities in areas outside of the 400 m buffer zone each side of the inferred active fault lines. When necessary, detailed investigation of the location of the actual active fault lines must be done.

Parks, sporting grounds, and sports stadiums are also important disaster management resources during an emergency. It may be safer to use these facilities for accommodating displaced people than inside of any buildings. These open spaces may be built in areas within 200 m each side of the inferred active fault lines. However, design and construction of the spectator stands in sports stadiums must be based on appropriate earthquake-resistance standards.

Residential site development may be allowable within the 200 m buffer either side of the inferred active fault lines because suitable land for housing is in short supply. However, a detailed assessment of the location of the active fault lines must be done before buildings are constructed in these areas.

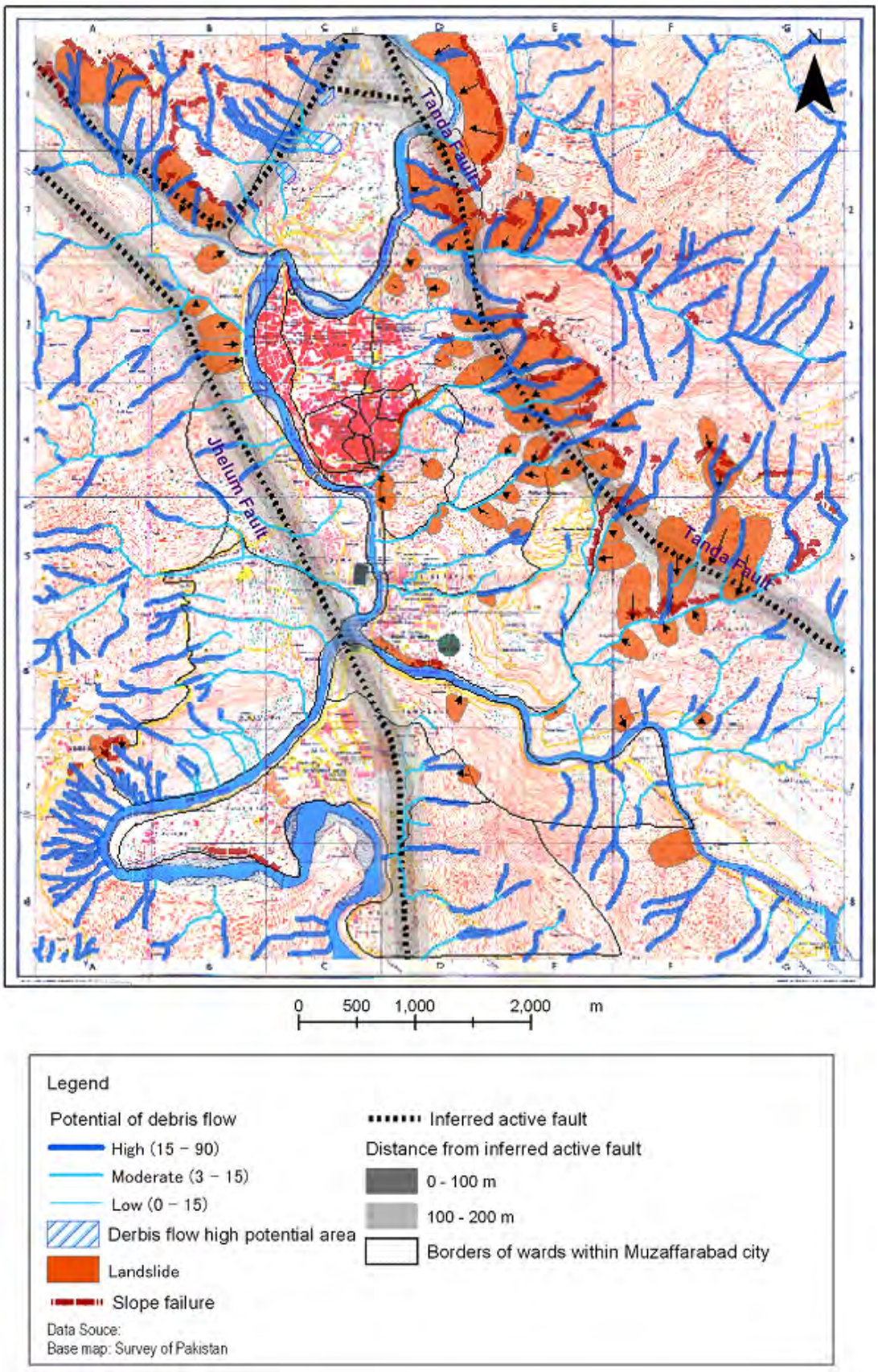
Areas outside of the 200 m buffer either side of the inferred active fault line may be used for ordinary residential sites. Earthquake-resistant designs and construction methods are recommended in this region.

Roads may be constructed within the 200 m buffer either side of the inferred active fault lines. However, road bridges should not be built within the 200 m buffer either side of the inferred active fault liens without doing detailed surveys of site conditions or including countermeasures relating to the structural integrity of structures in this fault-prone area. In addition, it is essential that earthquake-resistant design and construction methods be employed.

Areas outside of the 200 m buffer either side of the inferred active fault lines may be used for road construction. However, even there, earthquake-resistant design and construction methods are required.

As for other facilities, careful earthquake-resistant design and construction should be applied according to facility types.

Figure 3.1.5 shows the geological constraints on the zoning for urbanized area in Muzaffarabad city.



Source: JICA Study Team; Base map: "Muzaffarabad Guide Map" (The Survey of Pakistan)

Figure 3.1.5 Geological Constraints on Zoning for Urbanized Area in Muzaffarabad City

3.2. Land Potential Assessment for Future Satellite Towns of Muzaffarabad

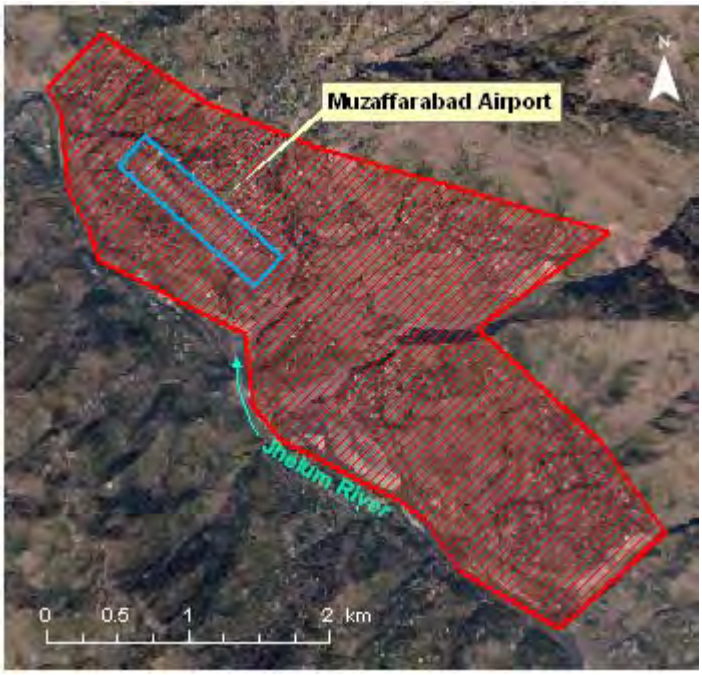
A population of Muzaffarabad city for 2006 was estimated as 176,750 persons, based on the population data given by MCM. And, there is a possibility that residential sites within Muzaffarabad city will not be able to accommodate about 22,000 people in 2016. Additional new land to accommodate the future population growth of Muzaffarabad has to be found out in and around Muzaffarabad city.

In this connection, a rapid and simplified land potential assessment was undertaken in this study, based on information (map and data) and a methodology as mentioned below.

3.2.1. Target Area

An area located in the southeast of Muzaffarabad city was targeted to be as land for future satellite towns in the Muzaffarabad region. There is relatively large and flat/gentle sloping land along the right bank side of Jhelum River. This area includes rural settlement, grassland, agriculture land, forest land, nature land, and airport land.

Figure 3.2.1 below shows the location of the target area for the land potential assessment on future satellite towns in the Muzaffarabad region. The major large-scale infrastructure within the target areas is the Muzaffarabad Airport having a 902 m length runway; however the service has been suspended in 2006.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.2.1 Location of Target Area of Future Satellite Towns in the Muzaffarabad Region

3.2.2. Maps and Data

The following maps and data were used in the land potential assessment for the target area.

(1) Base Map (Satellite Image)

A pan-sharpened natural color version of the QuickBird image of the target area was provided by NESPAK. The image was acquired by the QuickBird satellite on October 22, 2005.

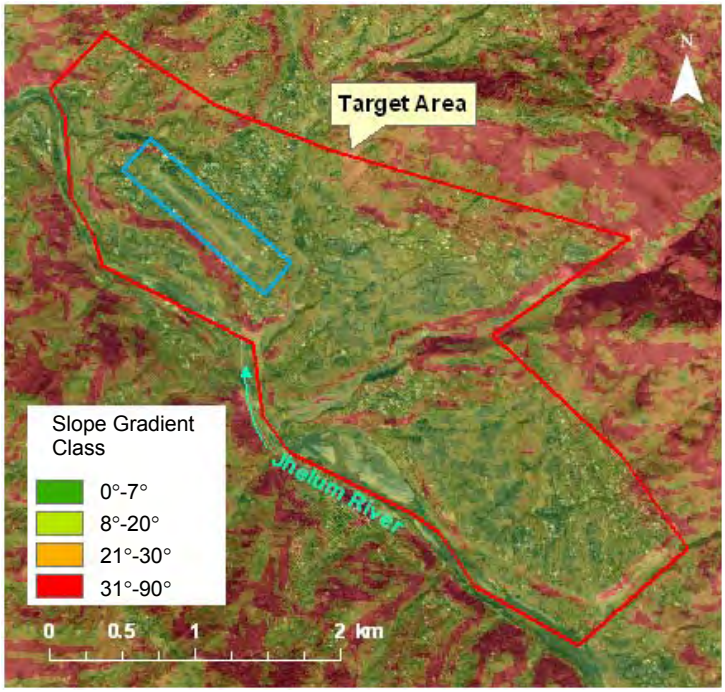
(2) Elevation data

ASTER digital elevation model (DEM) data acquired after the 2005 Kashmir earthquake in 2005 was used for generating a slope gradient map. Each cell of the DEM grid has a size of 15 m x 15 m area.

(3) Slope Classification Map

Slopes were classified based on the modified AJK State's land capability classification system mentioned in the previous sections. Figure 3.2.2 shows a slope classification map for the target area.

A slope classification map was prepared by processing the DEM data in a GIS. The prepared slope gradient map was used as a reference map in delineating the potential land for future satellite towns in the Muzaffarabad region.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.; Digital Elevation Model: ASTER DEM.

Figure 3.2.2 Distribution of Slope Gradients in and around Target Area

3.2.3. Applied Methodology

(1) Creation of Slope Gradient Map

As a reference to determine the potential land within the target area, a slope gradient map was prepared as mentioned above. Criteria applied for slope classification for the target area (Table 3.2.1) is prepared by simplifying the criteria applied for the Muzaffarabad city mentioned in the previous sections.

Table 3.2.1 Land Suitability for Future Satellite Towns (City) by Slope Gradient Class

Slope Gradient	Land Suitability
0° - 7°	Suitable
8° - 20°	Conditional
21° - 30°	Unsuitable
31° and more	Unsuitable

Source: JICA Study Team

(2) Selection of Potential Land within the Target Area

A GIS (ESRI ArcGIS) was used as a tool in the land potential assessment. Mapping potential land was done at a nominal scale of 1:5,000. This mapping was done through interpreting the QuickBird satellite image and the slope gradient map prepared by the JICA Study Team. The potential land was selected on the (QuickBird) satellite image, considering possible natural hazards in the target area (It is necessary for responsible institutions in Pakistan to undertake more detailed survey on the target area at various points of views such as geology and topography in future).

3.2.4. Potential Land for Future Satellite Towns

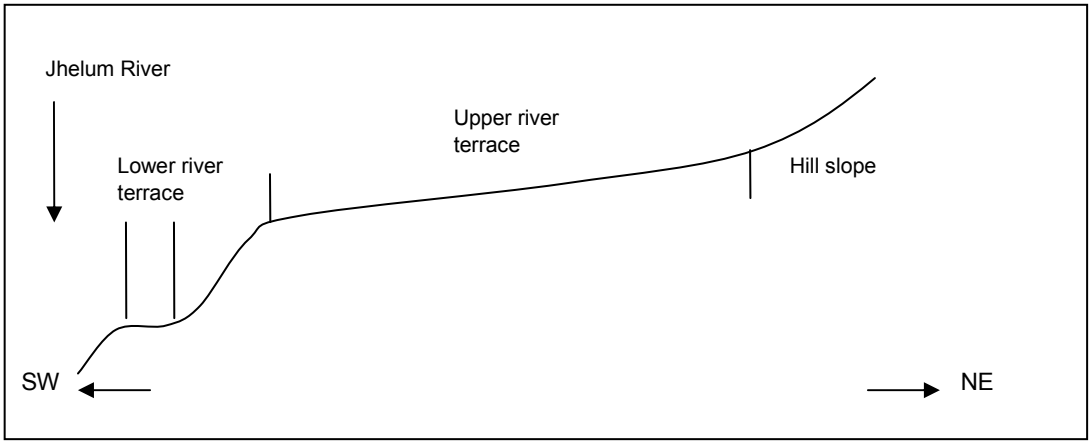
(1) Potential Land

Applying the simplified methodology mentioned in Section 3.2.3, potential land was selected and was divided into three (3) sites that are ‘Site I’, ‘Site II’ and ‘Site III. Within the selected potential sites above, the following land use classes could be identified on the QuickBird satellite images.

- Building land
- Airport land
- Mixed agriculture land (grassland (bare land), agriculture land)
- Forest

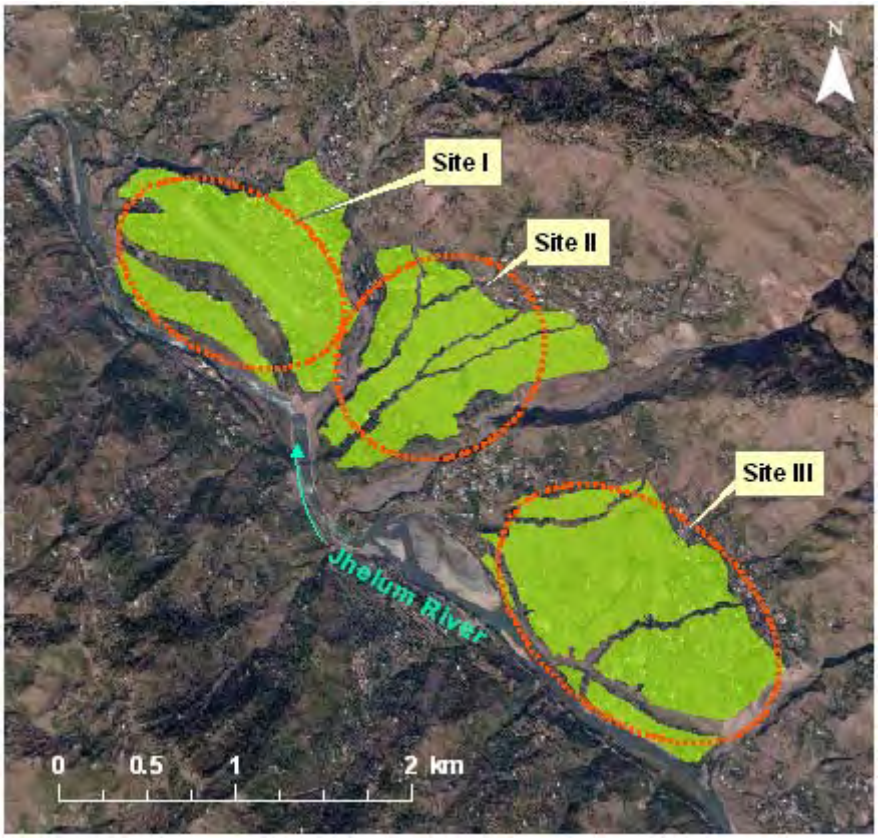
Topographically, the potential land can be divided into two (2) topographic locations as shown in Figure 3.2.3.

- Lower river terrace level
- Upper river terrace



Source: JICA Study Team

Figure 3.2.3 Topographic Profile of the Potential Land



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.2.4 Possible Sites for Future Satellite Towns

Gross extent (ha) of each site is shown in Table 3.2.2 below.

Table 3.2.2 Extents of Possible Sites

Site	Extent
Site I	101.5 ha
Site II	86.1 ha
Site III	137.1 ha
Total	**324.7 ha**

Source: JICA Study Team

The total extent (ha) of the three (3) potential sites is 324.7 ha.

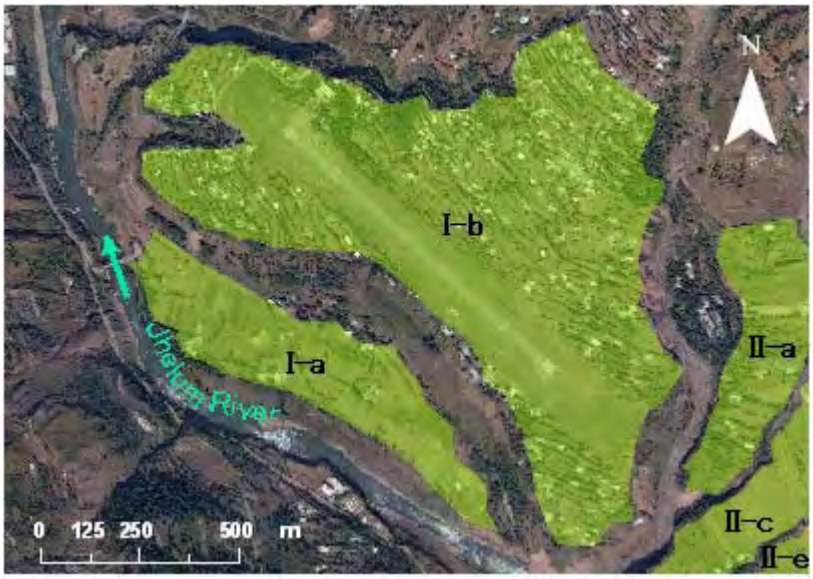
(2) Current Condition of Potential Site

a. Site I: Maira Kalan

Site I (Maira Kalan) is located about 4 km from Muzaffarabad city and the site can be divided into two (2) sub-sites (I-a and I-b) within Site I (See figure below). Site I has an extent of 101.5 ha. Of the extent of Site I, airport land (Muzaffarabad Airport) occupies about 21 ha (20 % of the extent of Site I). Remaining extent of Site I was occupied mostly by grassland (including bare land) and agriculture land in 2005.

Sub-site I-b includes Muzaffarabad Airport within its area. Muzaffarabad Airport has not been serviced in 2006, excluding special cases.

Sub-site I-a is located on the lower river terrace and sub-site I-b is located on the upper river terrace.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.2.5 Site I Comprising Two (2) Sub-sites (I-a and I-b)

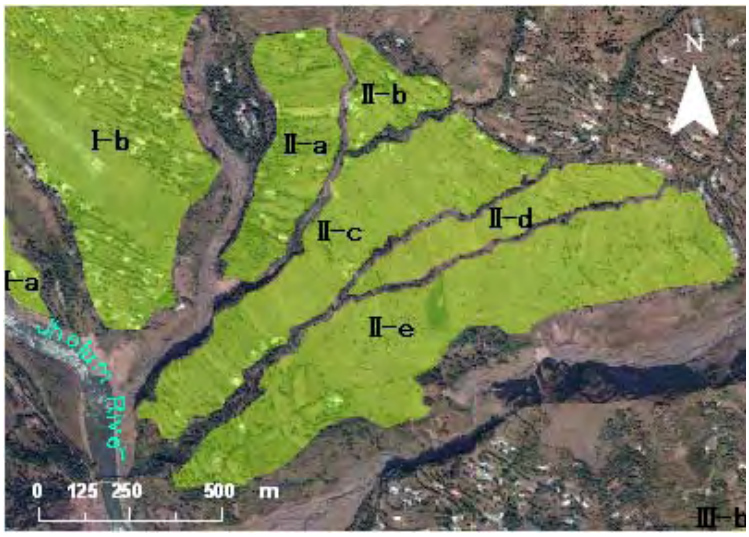
Table 3.2.3 Land Use Condition by Potential Site

Site/ Sub-site	Airport	Mixed agriculture land	Buildings	Forest	Total (ha)
Site I	21.3	74.1	5.6	0.5	101.5
I-a	0.0	18.4	0.4	0.0	18.8
I-b	21.3	55.7	5.2	0.5	82.7
Site II	0.0	85.2	0.9	0.0	86.1
II-a	0.0	12.1	0.2	0.0	12.3
II-b	0.0	4.5	0.2	0.0	4.7
II-c	0.0	23.2	0.3	0.0	23.5
II-d	0.0	8.3	0.0	0.0	8.3
II-e	0.0	37.1	0.2	0.0	37.3
Site III	0.0	133.2	2.1	1.8	137.1
III-a	0.0	1.2	0.0	0.0	1.2
III-b	0.0	7.9	0.0	0.0	7.9
III-c	0.0	72.1	0.7	1.6	74.4
III-d	0.0	10.9	0.0	0.2	11.1
III-e	0.0	41.1	1.4	0.0	42.5
Total	21.3	313.3	2.1	2.3	324.7

Source: JICA Study Team

b. Site II: Miani Bandi and Kardala

Site II (Minani Bandi and Kardala) is located next to the southeast of Site I and divided into five (5) sub-sites, which are bounded by mountain streams (II-a, II-b, II-c, II-d and II-e). The site has an extent of 86 ha, and was mostly (99%) used for grassland/bare land in 2005. Topographically, Site II is located on the upper river terrace.

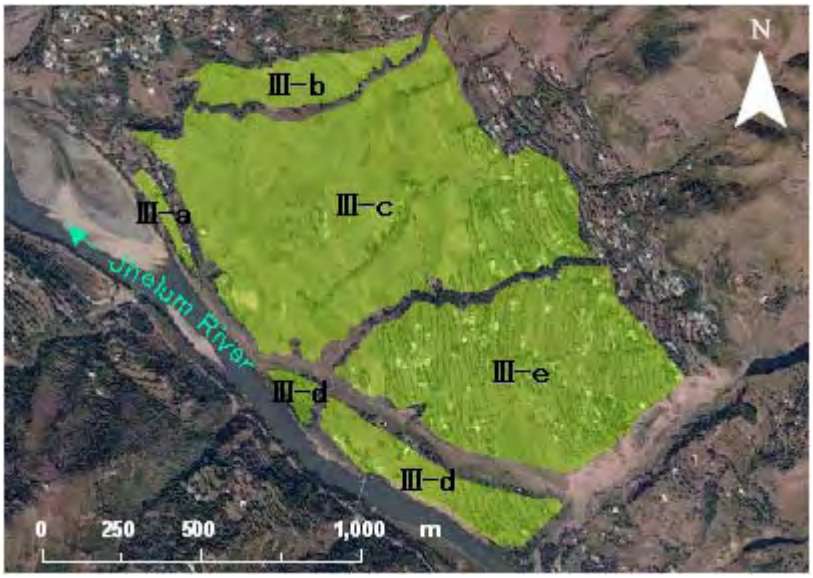


Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.2.6 Site II (Miani Bandi and Kardala) Comprising Five (5) Sub-sites (II-a, II-b, II-c, II-d and II-e)

c. Site III: Langar Pura

Site III (Langar Pura) is located next to the southeast of Site III and divided into five (5) sub-sites (III-a, III-b, III-c, III-d, and III-e). Site III has an extent of 137 ha, and was mostly (95%) used for grassland/bare land in 2005. Remaining area of Site III has been used for building land.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc.

Figure 3.2.7 Site III (Langar Pura) Comprising Five (5) Sub-sites (III-a, III-b, III-c, III-d, and III-e)

Sub-sites III-a and III-d are located on the lower river terrace and remaining three (3) sub-sites are located on the upper river terrace.

(3) Evaluation of Potential Site Capacity

The extent (ha) of each potential site as future satellite towns in the target area were calculated in GIS. The capacity (ha) of each site was calculated using the following simplified formula: [Capacity (ha)] = [Extent (ha)] – ([Airport land] + [Building land]). The calculated capacity for each site is shown in Table 3.2.4 below.

Table 3.2.4 Capacity of Each Site for Future Satellite Towns

Site name	Extent (ha)	Capacity (ha)
Site I	101.5	74.6
Site II	86.1	85.2
Site III	137.1	135.0
All sites above	324.7	294.8

Source: JICA Study Team

Total extent of 294.8 ha is considered to be utilizable as new satellite town development in future, based on the calculation above.

Sub-sites within the three (3) potential sites are divided into three topographic location (See Table 3.2.5 below), according to topographic location shown in Figure 3.2.3 above.

Table 3.2.5 Groups of Sub-sites according to Topographic Location

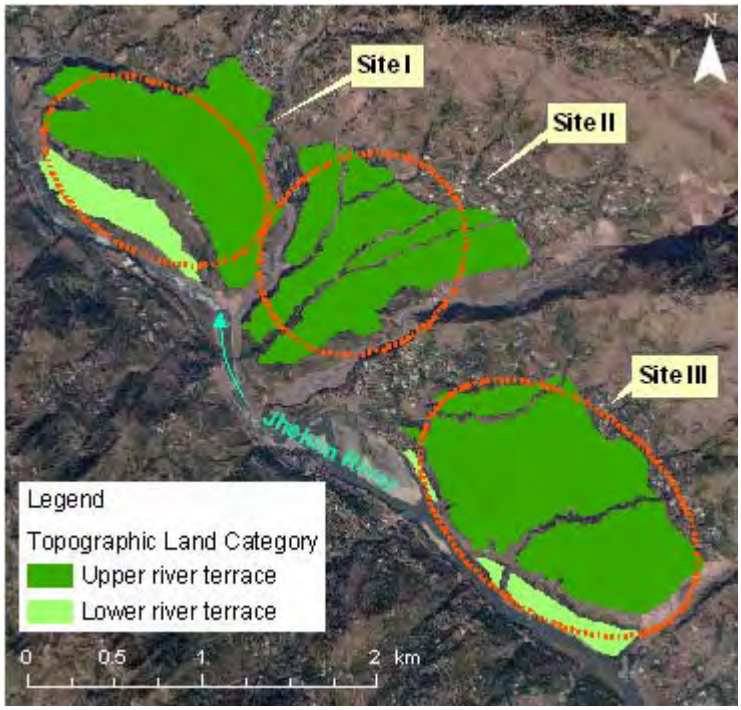
Topographic location	Extent (ha)	Related sub-sites
Lower river terrace	30.7	I-a, III-a and III-d
Upper river terrace	264.1	I-b, II-a, II-b, II-c, II-d, II-e, III-b, III-c and III-e
Total	294.8	

Source: JICA Study Team

Of the suitable area of 294.8 ha within the three (3) sites mentioned above, an extent of 264.1 ha is located on the upper river terraces, and an extent of 30.7 ha is located on the lower river terraces where it might have flood potential within the potential sites.

Figure 3.2.8 below shows the topographic division for each of the three (3) sites.

The land suitability assessment mentioned above was undertaken by the JICA Study Team preliminarily and quickly. Natural hazard potential in and around the potential sites should be studied in detail by responsible institutions in Pakistan, when needing suitable land for future satellite town development.



Source: JICA Study Team; Base map: QuickBird Image © COPYRIGHT 2005 DigitalGlobe, Inc

Figure 3.2.8 Topographic Division of Potential Sites

3.3. Preparation of GIS Database for Muzaffarabad City

3.3.1. Area of Interest

The GIS (Geographic Information System) database prepared in the JICA Study targeted an area of about 70 km^2 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 as well as the Muzaffarabad Guide Map.

3.3.2. Collected/Prepared Geographic Information

(1) Base Map/Image

a. Muzaffarabad Guide Map

A copy of "Muzaffarabad Guide Map (Second Edition)", having a nominal scale of 1:10,000, was used as the base map for the land suitability assessment undertaken for Muzaffarabad city.

This map is published by the Survey of Pakistan and it is based on survey results from 1995-1996. The contour interval shown in Muzaffarabad Guide 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. The QuickBird satellite image was used extensively as a reference image when undertaking the land suitability assessment, urban planning and other planning for Muzaffarabad city. A pan-sharpened natural color version of the QuickBird image was supplied. This image has a resolution of 0.6 m and it was useful for interpreting the current land cover and land use in and around Muzaffarabad city.

(2) Thematic Map/Image

a. Slope (classification) map

A slope classification map was used to assist with the land suitability assessment for Muzaffarabad city. This slope classification map was originally prepared by the Planning and Development Department of the AJK Government, and it shows the slope classes that existed before the earthquake that occurred in October 2005. The slope classification map shows four (4) categories of slopes in and around Muzaffarabad city, as listed in Table 3.3.1 below.

Table 3.3.1 List of Slope Map Classes

Class	Gradient
Class I	0° - 7°
Class II	8° - 20°
Class III	21° - 30°
Class IV	31° - 90°

Source: The Planning and Development Department of the AJK Government

The slope classification map prepared by the Planning and Development Department of the AJK Government was one of the most important resources used by the JICA Study Team when undertaking the land suitability assessment for Muzaffarabad City.

b. Geological hazard map

A geological hazard map of the Muzaffarabad region was prepared by the JICA Study Team. This map identifies the location of existing landslides, and potential mudflow and debris flow hazards. The existing landslides located in and around Muzaffarabad city were divided into three (3) categories, based on their relative activity: (i) High, (ii) Moderate, (iii) Low.

Photo-interpretation of the QuickBird satellite image showed that many landslides had reached down to the mountain streams that run through the existing city center and urban communities. Mudflows in the vicinity of the landslides are expected to occur in the rainy season.

Major probable active fault lines and fault zones are also shown in the hazard map prepared by the JICA Study Team.

c. Building damage assessment map

The JICA Study Team undertook a preliminary building damage assessment, and prepared a map based on the results of this assessment. Building damage rankings were assigned to urban areas, based on the ratio of damaged to undamaged buildings. Three categories of damage were defined, as shown in Table 3.3.2 below.

Table 3.3.2 Urban Area Building Damage Categories

Damage category	Ratio of damaged to undamaged buildings (R)
Moderately damaged areas	R<50%
Heavily damaged areas	50%=<R<80%
Severely damaged areas	R>=80%

Source: JICA Study Team

d. Maps for urban planning

Maps concerning urban planning for Muzaffarabad city were prepared by the JICA Study Team. Mapping current land use and urban plans for Muzaffarabad city and its vicinities was done by analyzing the information and drawing polygons (area features) on the QuickBird satellite image.

(3) Other Data/Image

Other maps related to urban/sector plans were collected through the JICA Study. NESPAK carried out a study on seismic hazard micro-zoning for Muzaffarabad. The figures (maps) enclosed within the report were scanned and stored as raster data for reference.

3.3.3. Software and Data Format

(1) Software

ESRI ArcGIS (ArcView) was mainly used for preparing GIS data and maps. AutoDesk AutoCAD was used for digitizing geographic features, too.

(2) Data Format

a. Vector data

The GIS data were prepared in ESRI "shapefile" format. The shapefiles are readable or convertible with common commercial GIS software (program), or "free" GIS data-viewer programs that are available on the internet. Attribute data for each vector element were also prepared as needed. In addition to the "feature" dataset, existing statistical data and planning data were also digitized and prepared in the JICA Study.

b. Raster data

The raster data sets were prepared as GeoTIFF files, which are readable with common GIS software or image processing software such as Adobe Photoshop.

(3) Projection and Datum

The geographic data were basically projected for UTM Zone 43 N (WGS 1984).

There is some position accuracy difference among the GIS data layers. This difference is mainly caused by the difference of position accuracy between Muzaffarabad Guide Map and the QuickBird Satellite image that were used for digitizing the ground features. This difference can not be corrected without exact GCP (ground control point) data[1].

3.3.4. Prepared GIS Data Layers

The following GIS data layers were prepared in the JICA Study. These GIS data layers were used to prepare necessary thematic maps for the rehabilitation and reconstruction plans for Muzaffarabad city. Those maps are also shown as figures in this report.

[1] It was difficult to obtain the GCP data due to security (military) reason in Pakistan.

(1) Vector Data

Table 3.3.3 below shows the list of the vector data set prepared in this study. The data were prepared by digitizing features shown on the base images (maps) at nominal scales of 1:5,000-1:10,000.

Table 3.3.3 List of Vector GIS Data Layers

Condition	Target Feature	Vector Type	Base Image
Existing	Buildings	Point	QuickBird
Existing	Buildings	Polygon	QuickBird
Existing	Damaged buildings (by 2005 Kashmir Earthquake)	Point	QuickBird
Existing	Built-up land	Polyogon	QuickBird
Existing	Main roads	Polyline	QuickBird
Existing	Main road land	Polygon	QuickBird
Existing	Local roads	Polyline	QuickBird
Existing	Bridges	Polyogon	QuickBird
Existing	Bridge centerlines	Polyline	QuickBird
Existing	Water (rivers)	Polygon	QuickBird
Existing	Water lines	Polyline	QuickBird
Existing	Airport land	Polyogon	QuickBird
Existing	Airport landing field centerline	Polyline	QuickBird
Existing	Airport buildings	Point	QuickBird
Existing	Transportation facilities	Polyogn	QuickBird
Existing	Landslides	Polygon	MGM
Existing	Inferred active faults	Polyline	MGM
Existing	Inferred active fault names	Annotation	MGM
Plan	Buffers of inferred active fault lines	Polygon	MGM
Existing	Arrows representing landslide movement directions	Polyline	MGM
Existing	Slope map classification	Polygon	MGM
Existing	Water (rivers)	Polygon	MGM
Existing	Stream lines	Polyline	MGM
Plan	Streams having mudflow potential	Polyline	MGM
Existing	Danger scarps on slopes	Polyline	MGM
Existing	Building damage assessment result	Polygon	MGM
Plan	Potential land classification for urban planning	Polygon	MGM
Plan	Land use plan for Muzaffarabad city (for area calculation)	Polygon	QuickBird
Existing	Existing landuse	Polygon	QuickBird
Existing	Borders of wards within Muzaffarabad city	Polygon	MGM
Plan	Trunk road network for Muzaffarabad city	Polyline	MGM

Source: JICA Study Team

(2) Raster Data

Table 3.3.4 below shows the list of the raster GIS data prepared in this study. Raster data were mainly used as base images when digitizing needed features for use in GIS.

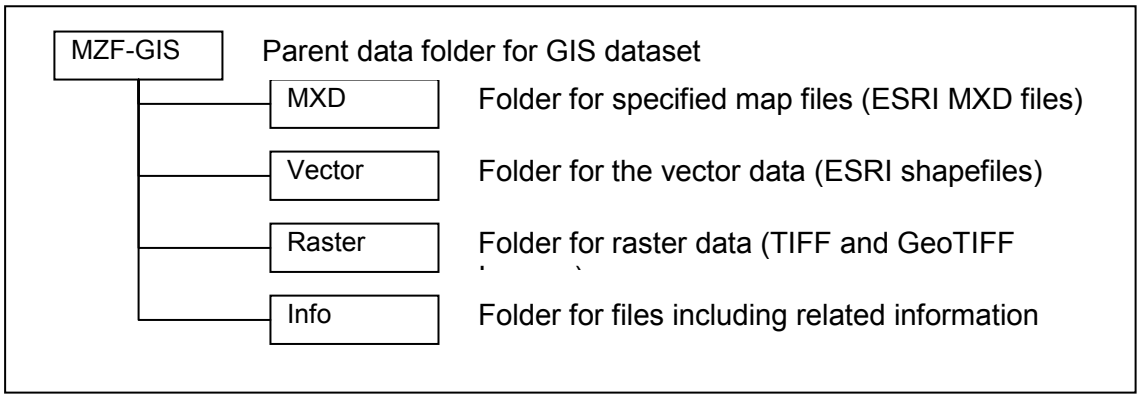
Table 3.3.4 List of Raster GIS Data Layers

Condition	Target	Format	Remarks
Existing	Muzaffarabad Guide Map	GeoTIFF	Rectified
Existing	Scanned maps for creating vector GIS data	GeoTIFF	Rectified
Plans	Scanned maps for creating vector GIS data	GeoTIFF	Rectified

Source: JICA Study Team

(3) Data Compilation

The prepared GIS dataset (database) was stored according to the folder scheme as shown in Figure 3.3.1. 'MZF-GIS' is the parent folder for the GIS database for Muzaffarabad city. 'MZF-GIS' includes four (4) sub-folders. 'MXD' is the folder to store ESRI MXD files to represent important thematic maps for the plans for Muzaffarabad city. 'Vector' and 'Raster' are the folders for the native GIS datasets being used in MXD files. 'Info' includes information of the GIS dataset contained in 'MZF-GIS'.



Source: JICA Study Team

Figure 3.3.1 GIS Data Folders

3.3.5. Utilization of GIS Database

The GIS database was used as a planning tool for the JICA Study Team to assist with the planning process for rehabilitation and reconstruction of Muzaffarabad City. The GIS had generated various thematic maps and results of analyses needed for the planning, which enabled the planners of the JICA Study Team to consider and solve spatial and non-spatial relevant to rehabilitation and reconstruction.

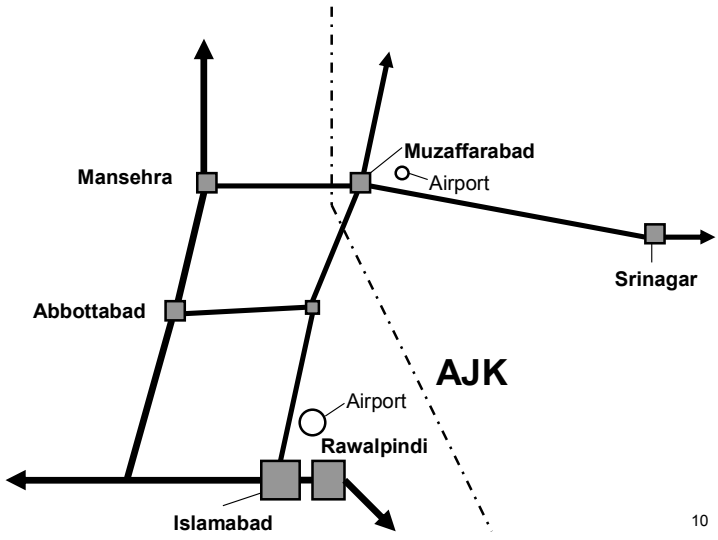
4. URBAN PLANNING

4.1. Characteristics of Muzaffarabad City

4.1.1. Muzaffarabad City in Regional Context

Muzaffarabad City is the capital of the Azad Jammu and Kashmir (AJK) state; 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 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[1]. Figure 4.1.1 illustrates the regional road network.

The City has functioned as political and administrative centers in the AJK; the secretariat of the AJK state government and Muzaffarabad district headquarters[2] 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 AJK.



Source: JICA Study Team

Figure 4.1.1 Regional Road Network

[1] There are two airports in AJK: one is in Muzaffarabad and the other is in Rawalakot. The flight service is presently suspended at both airports.

[2] AJK consists of 8 districts: Muzaffarabad, Neelum, Rawalakot, Bagh, Sudhnoti, Mirpur, Kotli and Bhimber.

4.1.2. Population Trend

According to Census data, Muzaffarabad City had a population of 37,445 persons in 1981 and 80,355 persons in 1998. The average annual population growth rate was 4.6% from 1981 to 1998, while Muzaffarabad district was 2.8% during the same period[3]. Since then, the city's population has increased more significantly and reached 114,864 persons in 2005 (pre-earthquake period) and the average annual growth rate was 5.2% from 1998 to 2005[4]. It can be said that the City's population has tripled for the last two and half decades and about half of the increased population was migration from rural areas outside the City. The population of Muzaffarabad district, on the other hand, increased from 466,100 persons in 1981 to 745,750 persons in 1998 and the average annual growth rate was 2.8% during the period. Muzaffarabad City occupied about 15% of the district population in 1998.

The earthquake in October 2005 caused heavy damages to the City with nearly 3,400 death and casualties, and about 7,000 buildings were completely destroyed[5]. After the earthquake, several thousands of people have evacuated from the City to other areas, such as Islamabad. On the other hand, many people who lost their houses and livelihoods by the earthquake have moved into Muzaffarabad City from other damaged areas in the AJK. Hence, it has been difficult to identify exact number of population in the post-earthquake period. Currently, the Municipal Corporation Muzaffarabad prepared a latest figure of post-earthquake population. According to this data, the current population was 103,487 persons at the end of April 2006[6], which was about 11,400 persons less than the pre-earthquake population of 2005.

Table 4.1.1 Population Trend in Muzaffarabad City, 1981-2006

Year	Population	Average Annual Growth Rate
1981	37,445*	
1998	80,355*	4.6% from 1981 to1998
2005	114,864**	5.2% from 1998 to 2005
2006	103,487**	

Note: * the data from census.
** the data from MCM.
Source: Population Census, MCM

[3] The average annual population growth rate of Muzaffarabad District was 4.68% in urban population and 2.55% in rural population from 1981 to 1998.

[4] Data from Municipal Corporation Muzaffarabad (MCM)

[5] Data from Municipal Corporation Muzaffarabad (MCM).

[6] It is not included the people living in temporary camps in the municipality, who came from outside the city.

4.1.3. Existing Land Use

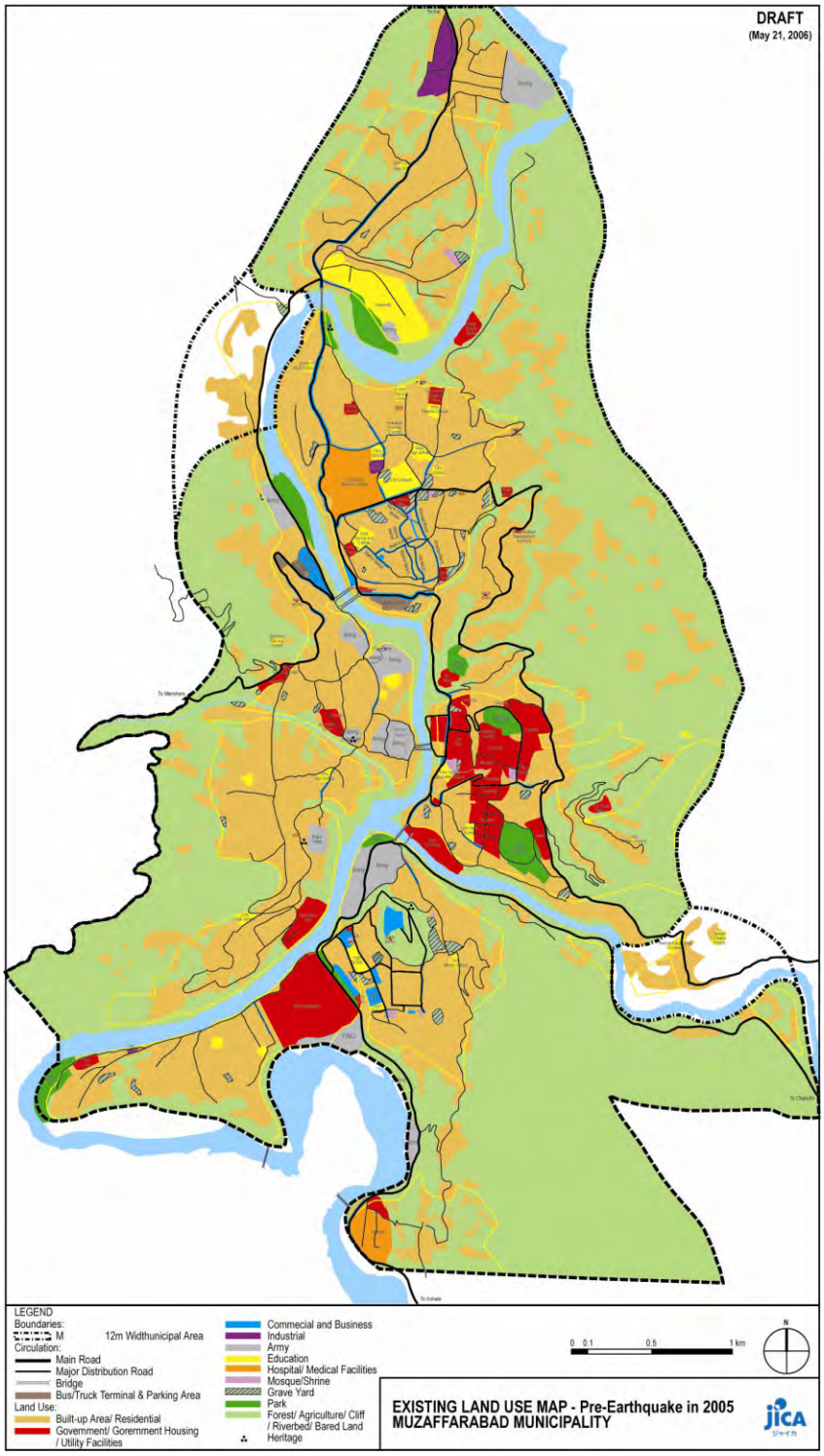
Existing land use map of Muzaffarabad City is shown in Figure 4.1.2 Existing Land Use Map of Muzaffarabad City in 2005, which was prepared by the study team with a scale of 1:10,000, based on the analysis of satellite image of post-earthquake period in 2005. The total administrative area of Muzaffarabad City is 2,133 ha[7] and more than half of the total area is occupied by forest/agricultural lands (1,177 ha) and river (74 ha). Historically, the City has grown along the Neelum and Jhelum Rivers and existing urban areas are located in the river terraces and gentle slope areas in the mountain. Recently, however, many people have lived in steep slope areas without proper infrastructure and access road. The total residential area including scattered settlement in mountain amounts to 658 ha and occupy 31% of the City's administrative area. It is noted that one of the significant characteristics of the City is relatively large area of government facilities, which amount to 72 ha and occupy 3.4% of the total area. The government facilities are mostly concentrated in Jalalabad (old secretariat of AJK government) and Chattar (new secretariat). Existing land use composition in the City is shown in Table 4.1.2.

Table 4.1.2 Existing Land Use Composition in Muzaffarabad City, 2005

Category	Area (ha)	Composition (%)
Residential/Spontaneous Settlement	658.5	30.9
Commercial	16.0	0.7
Industrial	7.1	0.3
Education	30.9	1.5
Hospitals	18.9	0.9
Government	72.5	3.4
Army	40.6	1.9
Mosque/Grave Yard	13.3	0.7
Bus Terminal	3.0	0.1
Parks	27.1	1.3
Forest/Agriculture	1,117.4	52.4
River	74.3	3.5
Roads	53.8	2.5
Total	**2,133.5**	100.00

Source: Population Census, MCM

[7] The total administrative area of the City (2,133 ha) is based on the municipal boundary prepared by MCM.



Source: JICA Study Team

Figure 4.1.2 Existing Land Use Map of Muzaffarabad City in 2005

4.2. Framework for Rehabilitation and Reconstruction Master Plan

4.2.1. Objectives of Master Plan

A main objective of this study is to prepare rehabilitation and reconstruction master plan in Muzaffarabad City. The term "master plan" sometimes causes misunderstanding and

confusion, because each individual and society has different perceptions regarding the meaning of master plan. We will clarify the meaning of master plan in this study.

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, 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 planning field with the statement that master plan is too idealistic and static picture of the long-term future and sometimes divorced from real issues and the people[8].

The master plan in this study is not 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 framework 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 targeted 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 City. 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.

4.2.2. Vision of Muzaffarabad City Toward 2016

In the process of preparing 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 common vision, the master plan cannot be prepared properly nor be used after its preparation.

Since February 2006, the study team has conducted field investigation 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:

[8] International City Management Association, "The Practice of Local Government Planning", 1988, Washington DC, P. 75.

Vision of Muzaffarabad City toward 2016

"Muzaffarabad City will be recovered from the damages of earthquake for the next 10-years by the efforts of Earthquake Reconstruction and Rehabilitation Authority (ERRA), Azad Jammu and Kashmir (AJK) state government, Municipal Corporation Muzaffarabad (MCM) as well as the citizen. The City should be reconstructed with strong urban structure against natural disaster, and it will function as a modern capital city of AJK and a gateway in Kashmir."

4.2.3. Population Projection

A future population of Muzaffarabad City in 2016 was projected on the basis of post-earthquake population of 103,487 in April 2006. It is expected that the City's population will be recovered soon due to intensive rehabilitation and reconstruction efforts by the government. In our estimation, the average growth rate will increase to 6.0% per annum for the next 5-years from 2006 to 2011, which is 0.8 points higher than the average growth rate from 1998 to 2005. This is derived from the lessons that many cities which had earthquake disaster experienced higher population growth during the recovery period. Thus, the city's population is forecast to increase from 103,490 persons in 2006 to 138,490 persons in 2011. Then, the average growth rate is estimated to drop to 5.0% per annum from 2011 to 2016, and the population will reach 176,750 persons in 2016.

Table 4.2.1 summarizes population projection of the City from 2006 to 2016. The total increased population estimation is 73,260 persons for the next 10-years. One of major questions in this master plan study is where and how the increased population will be accommodated in the City

Table 4.2.1 Population Projection of Muzaffarabad City, 2006-2016

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

Source: JICA Study Team

4.2.4. Land Use Framework

(1) Urban Promotion and Preservation Zones

This section will discuss land availability for future urbanization of the City Based on the result of hazard assessment, the study team classified the lands in the Municipality into two

zones[9]: 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 Municipality. 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[10]ha. Figure 4.2.1 illustrates the locations of urban promotion zone (yellow color) and preservation zone (green color).

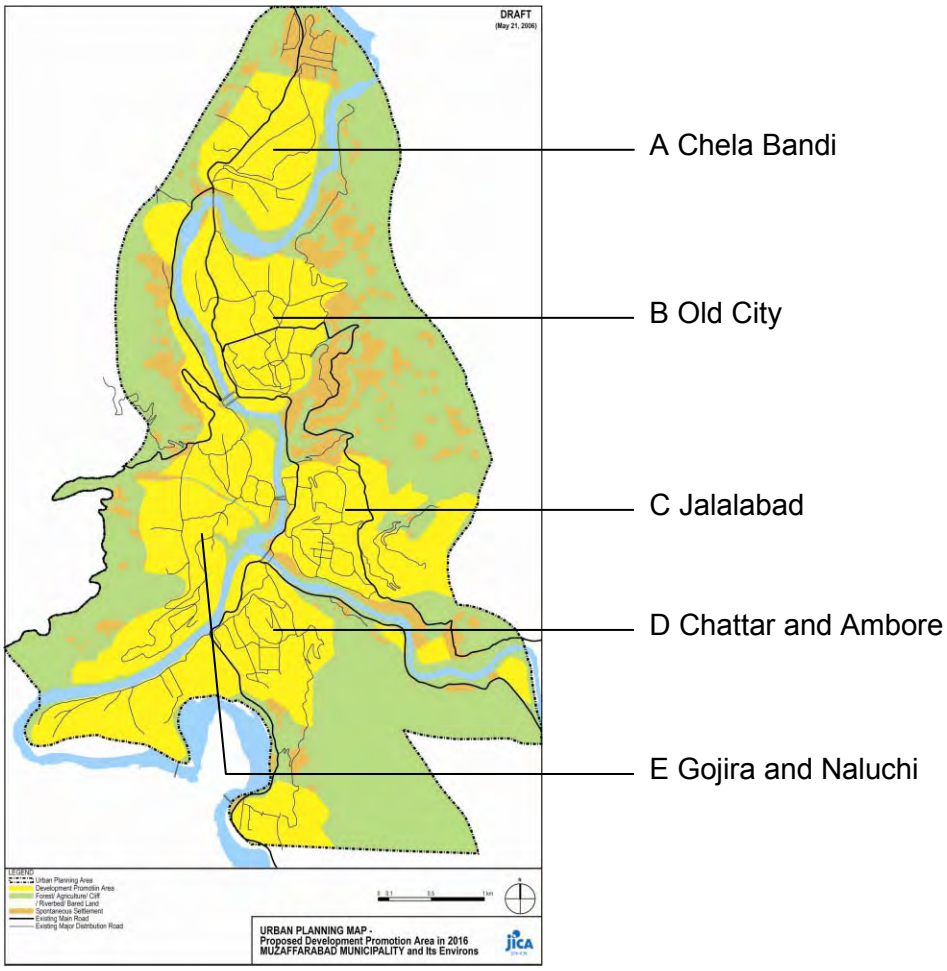
Existing built-up areas are mostly located in the urban promotion zone. However, some densely populated settlements are located in the preservation zone, especially in the areas of Tariqabad (word number 6 and 7) and Dherian (word number 11). In our estimation, there were some 85,900 habitants in the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

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 will 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 4.2.2 summarizes the pre-earthquake conditions and future development directions in the urban promotion and preservation zones.

[9] According to hazard assessment, the lands in the Municipality were classified into three zones: primary urban zone, secondary urban zone and rural zone. In terms urban planning perspective, there is no much difference between the primary and secondary urban zones are these zones were designated as urban promotion zone. The rural zone was designated as preservation zone in terms of urban planning perspective.

[10] The total area of urban promotion and preservation zones is 2,255 ha, which is bigger than the area of Municipality (2,133 ha). The master plan includes some areas with a total of 122 ha adjacent to the municipality.

[11] 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 4.2.1 Urban Promotion and Preservation Zones

Table 4.2.2 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 inhabitants 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 inhabitants 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

(2) Capacity of Population in the City

The study team made an analysis of future population density in each geographic district or urban block in order to estimate the capacity of future population within the City. For this purpose, the urban promotion zone is further divided into five urban blocks: A. Chela Bandi, B. Old City, C. Jalalabad, D. Chattar and Ambore, and E. Gojra and Naluchi (see Figure 4.2.1).

The capacity of population in each urban block was estimated based on the following assumptions:

1) The increased population from 2006 to 2016 will be mainly concentrated in the urban blocks in the promotion zone, especially Chattar and Ambore (Block-D) in the south and Gojira and Naluchi (Block-E) in the west. Since Old City (Block-B) 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 structure. Thus, the population in the preservation zone is estimated to increase only by the natural growth[12].

3) The future population density in each urban block 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 each urban block and preservation zones was estimated as shown in Table 4.2.3. According to the estimation, the total capacity of population within the City will amount to 154,870 persons in 2016, including 118,510 persons in the urban promotion zone and 36,360 persons in the preservation zone. 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 due to strict land use control.

Accordingly, we can say that there is lack of space within the Municipality to accommodate the future population of 176,750 persons in 2016. It will be needed some measures to accommodate another 21,880 persons by 2016.

[12] Since there is no data available in AJK, we use the natural growth rate of 2.1% in 2000 in Pakistan based on Pakistan Demographic Survey.

Table 4.2.3 Capacity of Population in 2016 by Zone and by Urban Block

Zone and Urban Block	Land Area (hector)	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
A Chela Bandi	119	7,630	64	11,900	100
B Old City	155	34,547	223	31,000	200
C Jalalabad	164	7,797	47	13,120	80
D Chattar & Ambore	252	16,848	67	30,240	120
E Gojra & Naluchi	215	19,103	89	32,250	150
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 block in 2016 was estimated based on the population density in 2005 and geographical conditions.
Source: JICA Study Team

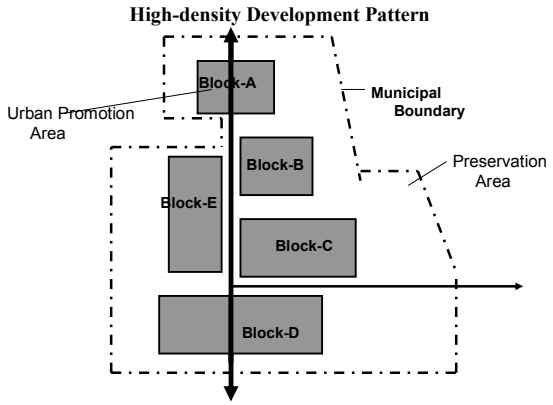
4.2.5. Urban Development Scenarios

(1) 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. This section will discuss several options of future urban structure to accommodate this population. There are three types of development scenarios: (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:

a. 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. This development pattern is illustrated in Figure 4.2.2.

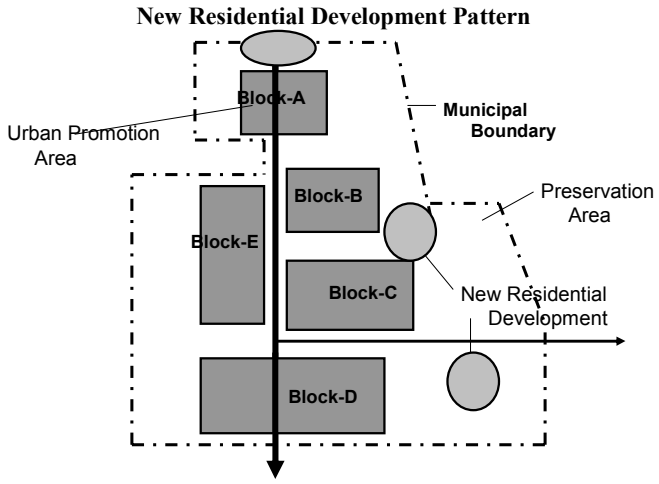


Source: JICA Study Team

Figure 4.2.2 High-Density and High-Rise Development Pattern in the Urban Promotion Zone

b. 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. This development pattern is illustrated in Figure 4.2.3.

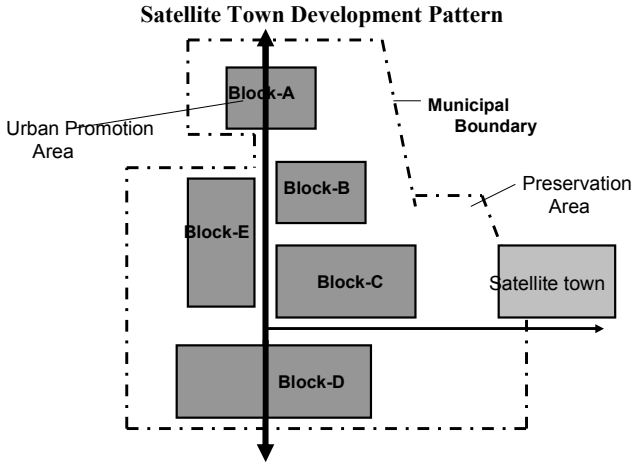


Source: JICA Study Team

Figure 4.2.3 New Residential Development Pattern in the Preservation Zone

c. 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. This development pattern is illustrated in Figure 4.2.4.



Source: JICA Study Team

Figure 4.2.4 New Satellite Town Development Pattern outside the Municipality

(2) Recommendation of Future Urban Structure

Table 4.2.4 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 life style 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[13] 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,

[13] The satellite town will be useful for accommodation of not only increased population but also people who lost their houses by the earthquake and need temporary shelters.

this option (satellite town development) is more feasible in further growth of the city beyond 2016.

Table 4.2.4 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 structure 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 of infrastructure to protect 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-resistance structure in new building construction	• Need hazard assessment study in potential site
Social and Institutional Issues	• Life style 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

(3) Discussion about Shifting Some Urban Facilities to Outside the City

During the course of this master plan study, there have been discussions between ERRA and AJK government about shifting some urban facilities damaged by the earthquake to outside the municipality. Recently, an agreement was made 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. Chattar Kalas has flat land with

more than 60 ha (about 1,200 kanal[14]). The shift of the university campuses will encourage decentralization of population in 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, discussions have been undertaken between ERRA and AJK government about shifting 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 municipal boundary and about 3 km from Jalalabad), Langarpura (about 16 km in the east from the city), and Garhi Dopatta (about 25 km in the south-east from the city). Final decision on the shift of district headquarters is not made by the end of July 2006.

4.3. Urban Planning

4.3.1. 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 from the earthquake disaster. The urban planning framework is guided by a set of basic policies for creating safe and strong urban structure against natural disaster. These policies are summarized below:

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 should 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 structure.

[14] Kanal is a local measurement in Pakistan: 1 kanal is approximately 500 sq.m.

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[15] 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:

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 structure 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 shift to secure land area. 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.

4.3.2. Land Use Plan

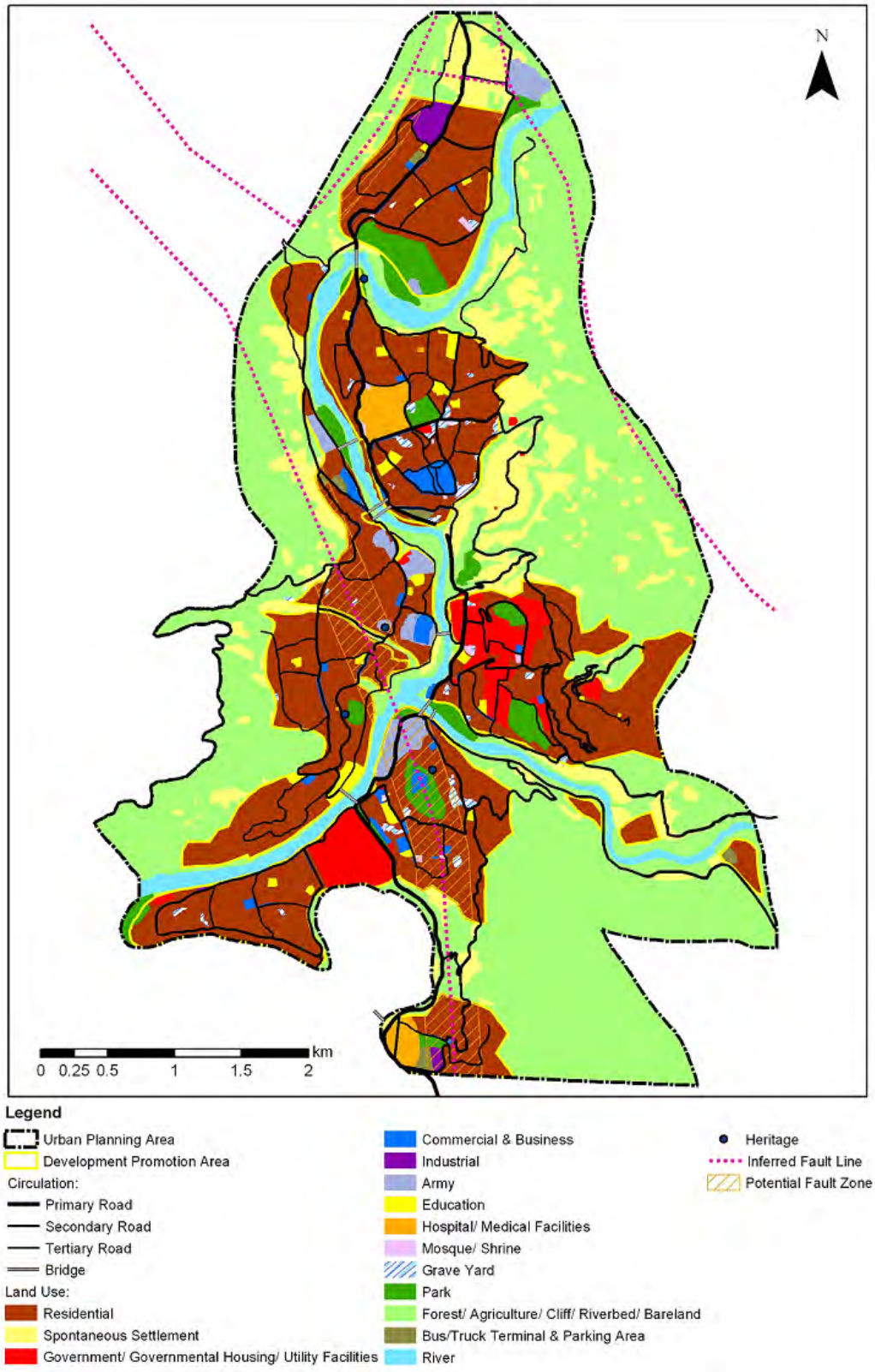
A future land use plan in Muzaffarabad City in 2016 was prepared by the study team, with a scale of 1:10,000. It was a result of field investigations, a series of discussions with ERRA and AJK government and public meetings with the citizens. The proposed land use plan is illustrated in Figure 4.3.1 and its composition of each category in the urban promotion zone is summarized in Table 4.3.1.

[15] 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)

Table 4.3.1 Land Use Composition in the Urban Promotion Area in 2016

Category	Area (ha)	Composition (%)
Residential/Spontaneous Settlement	616.5	68.1
Commercial	23.4	2.6
Industrial	7.9	0.9
Education	16.1	1.8
Hospitals	19.8	2.2
Government	58.7	6.5
Army	21.7	2.4
Mosque/ Graveyard	13.9	1.5
Bus Terminal	6.0	0.7
Parks	41.6	4.6
Roads	80.0	8.8
Total	905.7	100.00

Source: JICA Study Team



Source: JICA Study Team

Figure 4.3.1 Proposed Land Use Plan in Muzaffarabad City in 2016

4.3.3. Key Recommendations for Urban Development

(1) 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. Key recommendations for residential development are as follows:

- In urban promotion zone, relocation and displacement of the settlement should be minimized. It is recommended that people who evacuated to temporary shelter should be allowed to return to the previous locations as soon as possible, if their buildings are in secure condition.
- Hazard-resistance standard should be established and enforced by relevant authorities.
- Promote residential development with high and medium density in the urban promotion zone to accommodate future population. Old City, however, already has over concentration of population and it is recommended to be reconstructed with more open space.
- In the preservation zone, people should be allowed to return to their previous locations. When damaged buildings are recovered, it is recommended to enforce strong earthquake-resistance structure. New construction in the preservation zone should be minimized, especially in the areas with potential hazard of landslides.
- New residential development should be encouraged in the areas of Jalalabad, Chattar, Thurri and Naluchi within the city. In addition, new satellite town should be developed in the areas of Rabani, Khand and Miani Bandi, near airport, where have more than 300 ha[16] of agricultural or bared lands in total with moderate slope.
- Living conditions in the temporary camps have become worse in recent days. In order to improve their living conditions, temporary housing should be considered. Potential sites for temporary housing are the plots of government facilities, former university campuses and parks in the urban promotion zone.

[16] This number does not include the area of existing airport.

- The site of Maira Tanoulian Housing Scheme[17] is now used for the temporary camp of the victims, but it is not suitable for the site of temporary housing because of potential hazard of landslides.

(2) 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.
- Neelum Road and Kohala Road will function as a primary road. New commercial development along the primary roads should be minimized to avoid further traffic congestions. The widening of these roads will become a trigger to minimize the road-side commercial shops.
- In Old City the existing commercial area along Madina Market, Main Bazar and Khawaja Bazar Roads 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. The

[17] It was proposed by Muzaffarabad Development Authority (MDA)

potential sites for industrial development are Chela Bandi in the north and Ambore in the south.

(3) Park and Open Space Development[18]

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. Parks and open space network is one of the most important factors in rehabilitation and reconstruction processes to establish safe urban structure against natural disasters. Key recommendations for park and open space development are as follows:

- In order to reconstruct the city with a safe and secure urban structure, a park and open space network should be established in the urban areas.
- New proposal will connect parks, sports facilities, schools, hospitals and other public facilities. It will be used for recreational purpose in ordinary time and also used for evacuation and rescue routes in case of emergency. The total proposed parks and green space in the city is about 50 ha in 2016, which is almost double of the area in 2005.
- The Old University campus located at the center of Old City should be transformed into a new urban park. It should be developed as a park dedicated to the victims of the Earthquake. Also, it is a symbol of city's reconstruction from the earthquake disaster. The New University campus located at the south of Chela Bandi will be used for the city's open space with greenery and natural landscape, which will contribute to a resource of tourist attraction.
- College Road running through the center of Old City is recommended to be widened to 25 m with 4 m width of pedestrian each side. Along with the central park at the old University campus, College Road will be developed as a symbol of city's reconstruction from the earthquake disaster.
- The natural landscape of the Neelum and Jhelum rivers is a significant resource for tourism attraction. Footpath along the rivers will be one of the scenic attractions for visitors. New riverside parks are proposed at several locations and the area near the confluence of the Neelum and Jhelum rivers is proposed to be a scenic attraction with the development of hotels, restaurants and park.
- The existing Jalalabad Garden and Sathra Park in Jalalabad shall be improved and become natural parks in the city. During the recovery period for the next 2-3 years,

[18] Park and open space development is discussed in detail in Chapter 9 of this report.

it is recommended that these parks will be used for temporary housing sites. Existing grave yards would be maintained at the previous locations. New grave yards should be planned in the outskirts of the city instead of scattered grave yards all over the city.

(4) 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 helth units (BHU) need to be developmed by 2016 to serve the increased population of the city.[19]
- Government administrative functions should be decentralized into three strategic locations: Muzaffarabad municipal administration in Old City; Muzaffarabad district administration[20] in Jalalabad; and AJK state government administration in Chattar Domel.
- 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[21]. In addition, a new boy's college should

[19] 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.

[20] The relocation of district headquarter is not decided yet by ERRA and AJK government. In this urban planning, district headquarter will remain in Jalalabad.

[21] 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.

be developed in the west side of the Neelum River to serve the people in the areas of Gojra and Naluchi.

(5) Land Use Zoning and Special Regulations

Land use zoning regulations should be prepared by AJK government, and MCM will be responsible for its enforcement. Table 4.3.2 shows available buildings in each land use category.

Table 4.3.2 Available Buildings and Uses in Each Land Use Zoning Category

Land Use Zoning Category	Available Buildings and Uses
Government Area	It consists of administrative offices, town hall, courts, etc. It may also include government housing and its amenities and services, such as hospitals, clinics, post offices, mosques, community halls, etc.
Commercial / Business Area	It consists of retail shops, super markets, business offices, banks, hotels, restaurants, guest houses, etc. It may also have some residential structures and related amenities and services, such as post offices, mosques, etc.
Residential Area	It consists of dwelling structures and other amenities and services, such as detached housing, apartment buildings, convenience shops, schools, dispensaries, clinics, guest houses, mosques, open spaces, parks, community halls, etc.
Educational Area	It includes educational facilities, such as nursery schools, kindergartens, primary schools, secondary schools, high schools, colleges, universities, research institutes, etc. These educational facilities may also be located in residential area.
Industrial / Logistic Area	It mainly consists of factories, workshops, warehouses, wholesale markets, bus terminals, truck terminals, etc.
Hospital / Medical Area	It includes hospitals, clinics, medical research institutions, nurseries, child care center, etc.
Religious Area	It includes mosque, shrine, grave yards, etc.
Parks and Greenery Spaces	It includes outdoor recreation spaces, such as city parks, play grounds, sports stadiums, greenery spaces, community centers, foot path, etc.

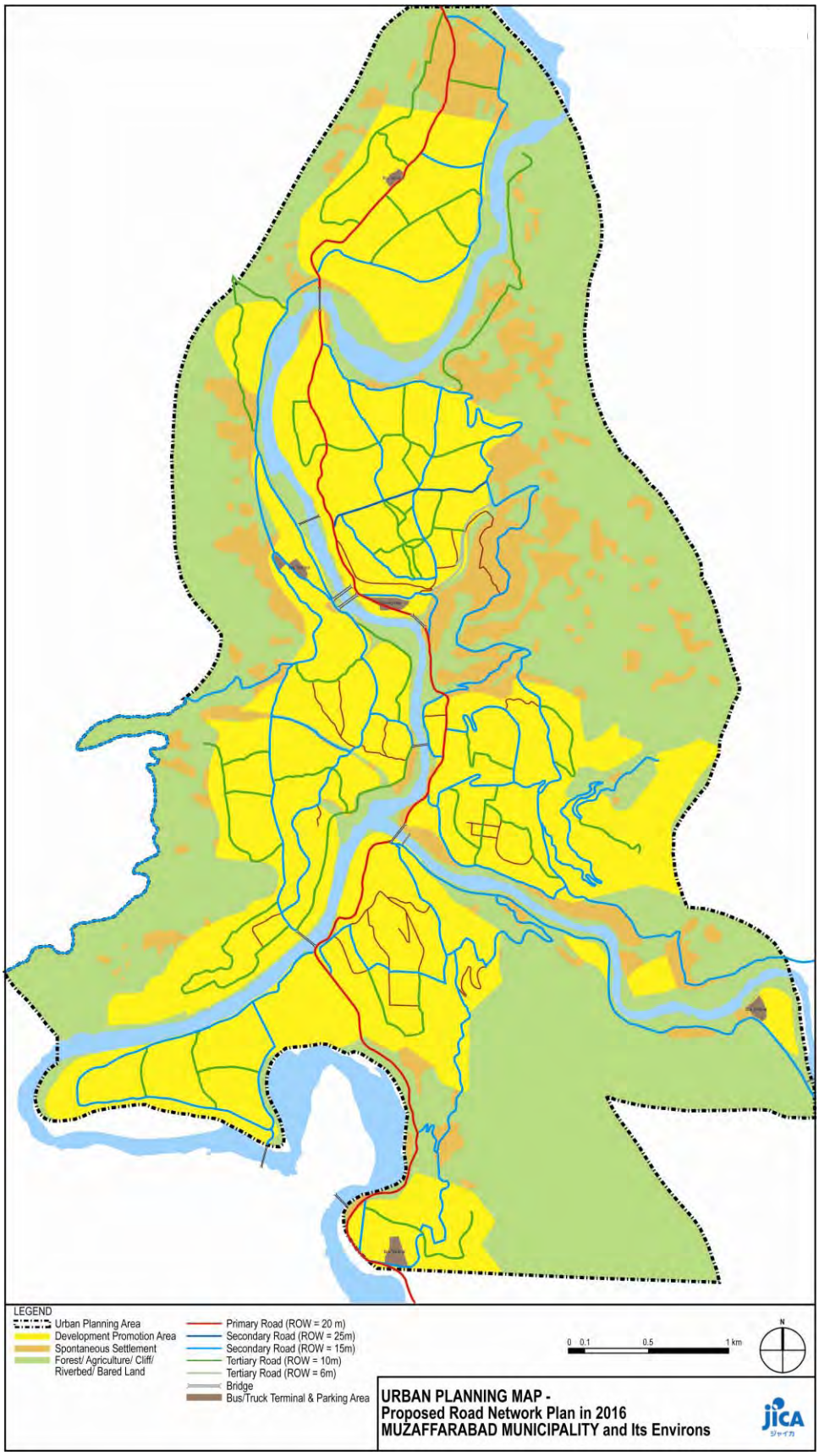
Besides the land use zoning, special planning and building control regulations should be established. One of the important regulations is provision of development control measures in the area of potential fault line running through the city, particularly Jhelum fault line. Although there is no consensus of the development control in the area of active fault line, it is recommended special measures to be taken in the zone within 200 m on both sides of

active fault line. A guideline for development and building control measures is shown as follow:

- Restrict new construction of large scale of public facilities, such as hospital, school, government building, etc.
- Restrict new construction of important infrastructure, such as power generation plant, water storage, bridge, etc.
- Restrict new construction of tall buildings.
- Enforce earthquake-resistance building code, when new buildings will be constructed.
- Reinforce existing buildings with strong earthquake-resistance structure.

4.3.4. Road Network Plan

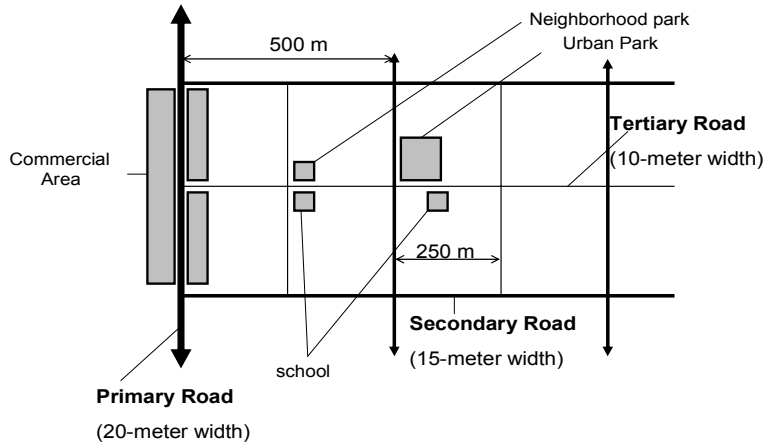
A proposed road network in Muzaffarabad City is illustrated in Figure 4.3.2. Road functions are classified into the following four levels: primary, secondary, tertiary and access roads. A standard road network pattern with its functions is shown in Figure 4.3.2. Key recommendations for road development are described as follows:



Source: JICA Study Team

Figure 4.3.2 Proposed Road Network in 2016

- Primary road is the most important road in the city serving with 20 m width in standard. It is proposed that the existing north-south axis from Kohala Road to Neelum Road throughout the city be reconstructed as a primary road.
- The secondary road provides access to major geographical districts in the city serving with 15 m width in the urban promotion zone and 10 m width in the preservation zone. A by-pass road from Chattar to Chela Bandi (West Bank By-pass Road) with a new bridge crossing the Jhelum River is recommended to be developed as a secondary road. It will encourage urban development in Naluchi and Gojra in the west bank of the Neelum and Jhelum rivers.
- A by-pass road from Jhelum Valley Road in the east to Chela Bandi in the north should be reconstructed to reduce through traffic in the city. It will function as a secondary road and encourage urban development in the eastern part of Jalalabad and future urbanization of the areas near airport.
- The tertiary roads provide major distribution of traffic in each geographical district serving with 10 m width. Tertiary roads will be developed every 200-300 meter in the urban promotion zone.
- The access road provides access to each plot or individual property. It would be 6 m width in a standard and 4 m width minimum in case of difficulty of land acquisition.

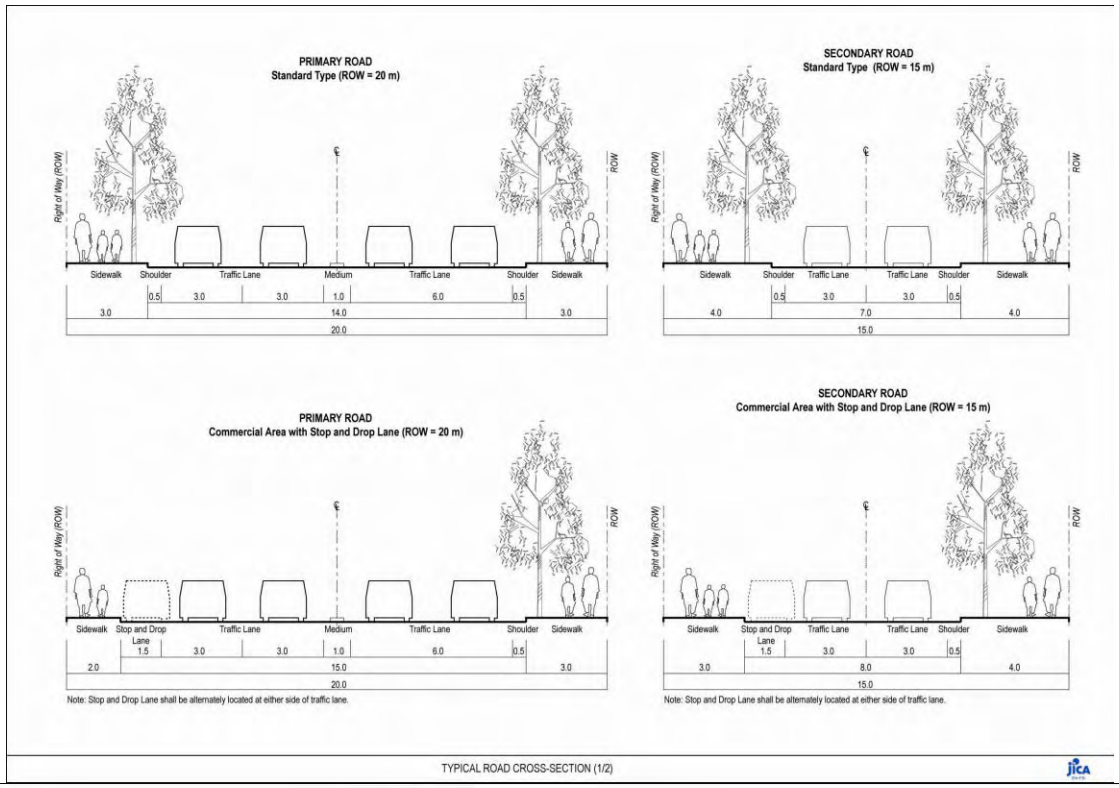


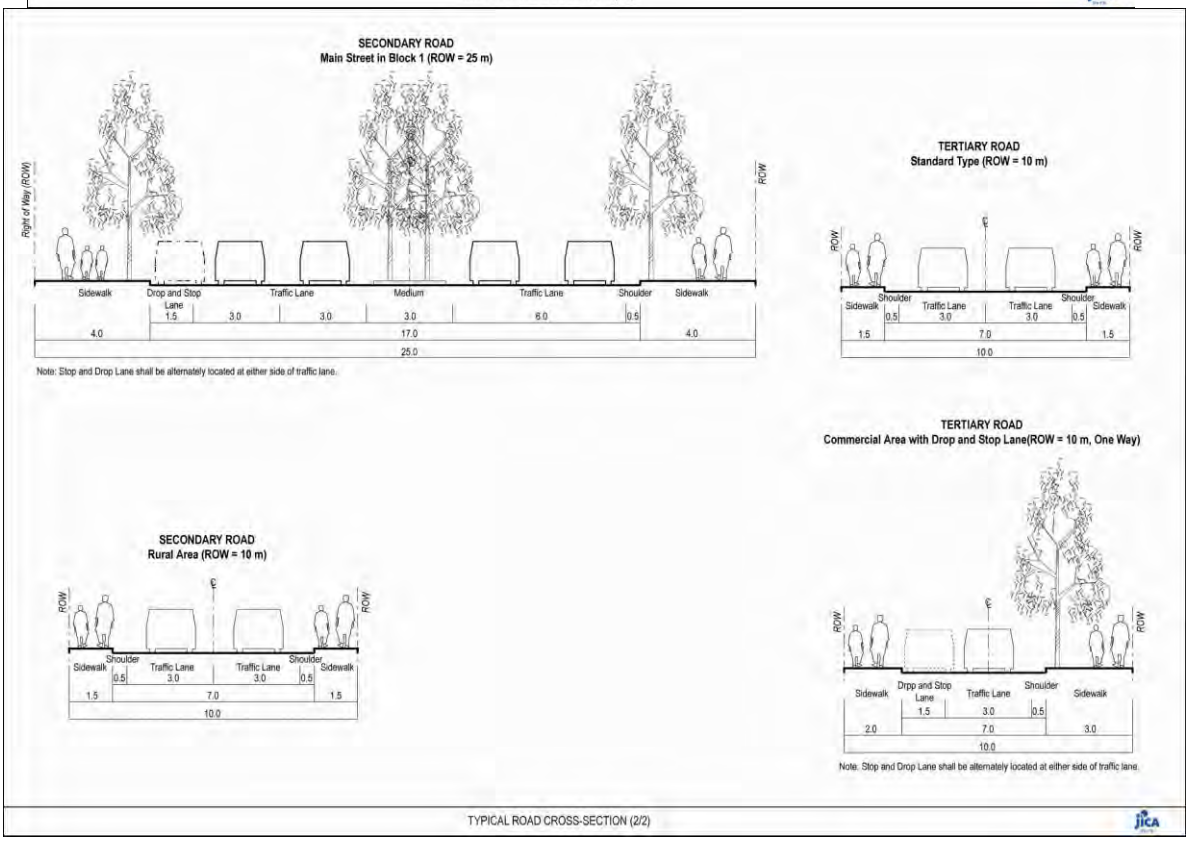
Source: JICA Study Team

Figure 4.3.3 A Standard of Road Hierarchy in Urban Area

- New inter-city bus terminals would 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 will contribute to reducing traffic congestion in the city, particularly in Old City. Intra-city bus services to access to each geographical district will be provided by the network connecting these bus terminals.
- Reconstruction of road network in Old City is particularly important in terms of recovery of the city. It is recommended that Bank Road, which is proposed as a primary road, should be replaced to the south to solve the traffic congestions. Existing Fort Road, College Road, Eidgah Road, Madina Market Road and Khawaja Bazar Road should be widen and serve as secondary road.

Figure 4.3.4 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 4.3.4 Standard Cross Sections of Proposed Urban Roads

4.3.5. Priority Projects

Priority projects were selected in terms of urgency and importance to achieve the goals in the rehabilitation and reconstruction master plan. In urban planning sector, priority projects are: 1) Detailed Plans in Urban Block; and 2) New Satellite Town Planning and Development. These projects are described as follows:

(1) Detailed Plans in Urban Block

A. Background and Objectives of the Project

The rehabilitation and reconstruction master plan provides basic policies and guidelines for recovery of Muzaffarabad City for the next ten years. Once the master plan is approved, AJK government and MCM must prepare detailed plans in each urban block: Without detailed plans, actual rehabilitation and reconstruction works cannot be implemented properly. The preparation of detailed plan in Old City (Block-B) is urgently necessary, where it had the most severe damages due to over concentration of population, narrow streets, lack of open space and vulnerable building structure. The preparation of detailed plans in other blocks should follow.

Each detailed plan should include the following tasks: i) review of the master plan, ii) topographic survey, iii) building inventory survey with damage assessment, iv) preparation of existing land use map (e.g., scale of 1:2,500), v) preparation of future land use map (e.g., scale of 1:2,500), vi) zoning regulation, vii) proposed road demarcation (e.g., scale of 1:500), viii) infrastructure development plan, ix) urban facility development plans, x) temporary shelter and relocation plan and xi) implementation of public meetings to make consensus building.

B. Project Period: 4-6 months in each urban block

C Implementation Agency: Municipal Corporation Muzaffarabad (MCM) in collaboration with Central Design Office (CDO) and Muzaffarabad Development Authority (MDA).

(2) New Satellite Town Planning and Development

A. Background and Objectives of the Project:

The master plan study identified that Muzaffarabad City does not have enough space for future urbanization within its administrative boundary. Thus, the development of new satellite town outside the municipality is one of the most important and urgent projects in the rehabilitation and reconstruction processes. The potential site for new satellite town is the area near airport, about 3-5 km from Jalalabad. The area has more than 300 ha of agricultural or grass lands with moderate slope and it is rather secure from potential natural hazard. The

development of new satellite town will extend urban area to the east along the Jhelum River and encourage multi-core urban structure.

The satellite town planning and development should include the following tasks: i) site selection study, ii) geographical and topographical survey, iii) hazard assessment, iv) preparation of layout plan, v) detailed design of infrastructure including water supply, electricity, sewage and drainage, solid waste management and roads, vi) land acquisition, vii) development phasing plan, viii) financial and investment plan, x) temporary shelter and relocation plan.

B. Project Period:

Site selection and preliminary design: 6 months

Detailed design of related infrastructure: 12 month

Construction of the first phase (about 100 ha): 18 months

Construction of the second phase (about 100 ha): 18 months

Rehabilitation and construction of access roads and bridges: 18 months

C Implementation Agency: Muzaffarabad Development Authority (MDA)

5. RECOVERY AND RECONSTRUCTION PLAN ON RESIDENCES AND COMMUNITIES IN LOCALITIES

5.1. Introduction

The Kashmir earthquake disrupted people's normal lifestyles. It destroyed property, forced people out of their homes, closed businesses, suspended commuting services, and took many lives away. This earthquake changed the communities' landscape in one fell swoop with building collapse, infrastructure destruction and changes in the geographic condition. This disaster also disrupted community solidarity—a condition that may bring about slower recovery from the disaster.

Two principles of (i) bringing people's lives back to normal at the soonest possible time, and (ii) reconstructing urban blocks into better shape than they were in during the pre-disaster period, need to be underscored for the successful reconstruction process. These principles will be further supported by the concept of sustainability, which will give localities a framework that will serve as the basis for them to "do many of the forward-looking things that they are already doing (or want to do), whether they be improvements in lifestyle, safety, economic opportunity, or protection of the environment"[1]. This holistic approach to disaster recovery is necessary to bring life back to normal for the people in the affected localities.

5.2. Damage and Loss of Muzaffarabad

Muzaffarabad faced tremendous damage and loss. People slipped into desperation in a matter of seconds with many losing their living places, members of their families, friends, social activities, and sources of income.

5.2.1. Affected residential buildings and people

Buildings and people affected. In May 2006, MCM concluded a ward-wise survey of population and destroyed buildings in the Municipal Area and Muzaffarabad city. According to this survey, of a total 16,823 buildings in Muzaffarabad city, approximately 40% (6,736) collapsed completely, 44% (7,323) were partially damaged, and 16% (2,764) were reported to have no damage. Of affected residents, 11% (1,719) moved to other regions while 49% (7,900) are living in the tents. Around 40% (6,540) (Figure 5.2.1) of the households continue to live in these houses that were either partially damaged or had no

[1] "Holistic Disaster Recovery", Natural Hazard Research and Applications Information Center, p. 1-1, 2001

damage at all, while others who faced total destruction or large damage to their residences had to either move to other regions or move into the tents.

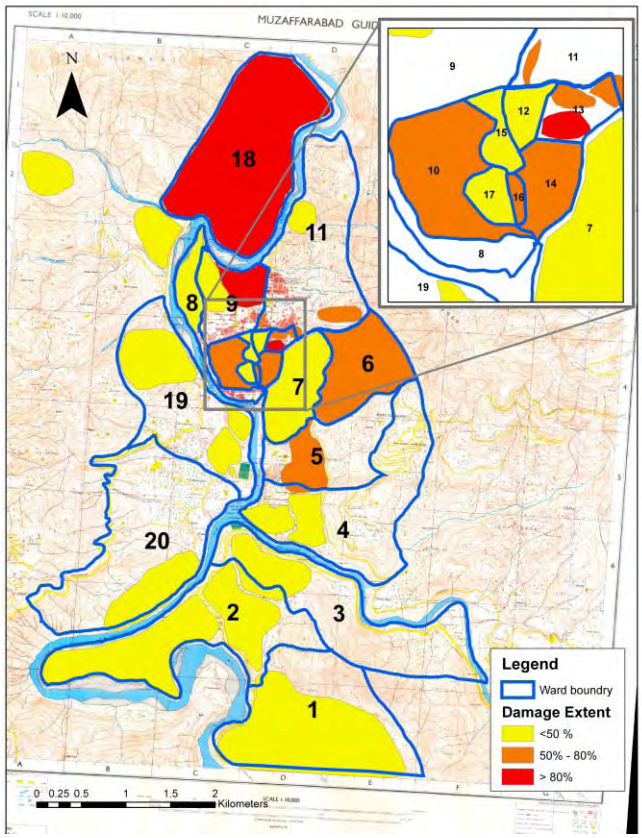
Conditions of Building Damages (# of bldg)	Type of Residency (households)
Totally Collapsed: 6,736 (40%)	Moved out to other Regions: 1,719 (11%)
Partially Damaged: 7,323 (44%)	Living in Tents: 7,900 (49%)
No Damage: 2,764 (16%)	Living at Home: 6,540 (40%)

Source: JICA Study Team

Figure 5.2.1 Building Damage and Distribution of Household Residency

The building damage survey by the Study Team reveals that areas with a high proportion of heavily damaged buildings are mainly distributed in the old town area, located in the central and northern parts of Muzaffarabad where residences are distributed on land with steep slopes.

Building damage survey. The survey on building damage looked at the ratio of heavily damaged buildings per ward, classified into three levels. Rank A, shown in red, has a damage ratio of more than 80%, rank B, shown in orange, has a damage ratio of 50% to 80%, and rank C, shown in yellow, has a damage ratio of less than 50% (see Figure 5.2.2).



Source: JICA Study Team

Figure 5.2.2 Ratio of Heavily Damaged Buildings per Ward

5.2.2. Disrupted livelihood

People living in temporary tents. At present, many people continue to live in tents which they personally set up in their land. People living in these tents include those who lost their residences and those having residences but damaged to certain degree that they are uneasy to live inside. Such households add up to nearly 10,000, comprising about 55,000 people (calculation based on the result of MCM information). Tent dwellers are badly affected by severe weather conditions—the area being extremely cold during winter, with temperatures falling beyond freezing point, and acutely hot during summer, with temperatures rising to 45 degrees Celsius. People who have lost their homes are hoping to obtain safe residences again as soon as possible. Many of those affected by the earthquake refuse to migrate to other places because they feel strongly about living in their neighborhood. In addition to this, they are afraid to lose their lands.

Debris littering the localities. Collapsed buildings are still left in the same state they were in immediately after the earthquake. Mounds of debris have been partially removed from the affected areas but most are still left at the various sites. Furthermore, many people who lost their lives beneath the rubble are still trapped inside. Such situation is seriously seen in places where damage is significant. With debris still littering the neighborhood, people are finding it quite difficult to put their lives back on track, further slowing down the recovery process.

Welfare services collapsed. Welfare service functions, including health, education, social activities, as well as religious activities, have also been disrupted due to the damage suffered by supporting facilities and established systems. These facilities include clinics, hospitals, schools, community halls, and mosques; many of them were significantly damaged by the earthquake and still cannot be used fully. This situation is affecting the smooth delivery of welfare services and is thus disrupting the established welfare system. Again, this has made it very difficult for people to carry on with their normal lifestyles. To make matters worse, markets, where basic necessities for living are sold, have also been damaged contributing to the difficulties of day-to-day living.

Another system that has been disrupted has to do with education. Though schools started operating again almost immediately after the earthquake, many children have been forced to attend classes in school buildings that are half collapsed or in tents that are set up in the school grounds. Often, they do not have blackboards nor desks and chairs in the classroom. Moreover, not all teachers who used to teach are actually back to teach at this point; many of them have been forced to give up pursuing their profession due to difficulties in commuting.

5.2.3. Dispersed community solidarity

Community ties segmented. Together with the buildings, facilities, and equipment damages, community ties have also been disrupted. There used to be a strong bond among relatives and close neighbors in Muzaffarabad prior to the disaster, yet the disaster brought death of the community members. In some occasions, people had to move out from their original residences in order to survive the next day. Furthermore, social activities that have helped sustain community solidarity are not being implemented at the moment since many facilities are no longer suitable for use and additionally, people are missing,

Disrupted organizational and institutional functions. Administrative functions are also an important ingredient in maintaining the sense of community.. The smooth flow of administrative functions could contribute to jumpstarting and sustaining community activities and rebuilding efforts. However, the situation in Muzaffarabad is not ideal.

Administrations in Muzaffarabad are represented by wards and *mohallah.* In theory, these wards function synergistically with community organizations like CBOs. The administrations in the current situation, however, are unable to define clear roles and mandates to support the local initiatives to reconstruct. If worked out properly, this could contribute to faster recovery. Community organizations, referred to as the CBOs, are also having complications in reactivating their functions because many communities have faced loss of key members.

This loss of community members, disruption of organizational functions, as well as destruction of places to nurture community ties resulting from the earthquake, if not carefully addressed, may result into the further disintegration of the community.

5.2.4. Losing economic opportunities

Discontinuing private businesses. Many people were making their living through small, family-owned businesses including convenience stores, jewelry shops, and shops selling fresh and dairy products. The earthquake damaged family-owned buildings, as well as some equipment used for their business operation. Further, key members of the family operating the various businesses faced life loss or injuries, which made it difficult for families to continue doing business. People in family-owned businesses lost their income opportunities because of loss of their business operation resources and the ideal business environment.

Difficulties in continuous industrial operation. Private sector industries in Muzaffarabad are known for soap making, furniture making, wood carving and Kashmiri handicrafts. There are also a number of textiles centers that produce bed sheets, pillow covers and cushion covers. These industries have also been affected tremendously by the earthquake,

often forcing them to stop operation. Their factories or plants are damaged, equipment are broken, and people are gone. Some workers have either lost their lives, have been injured, are unable to commute, or have pursued other life priorities other than working at this point.

Employed losing opportunity to work. The earthquake also brought discontinuation of public transport, due to damage and loss of roads, infrastructure, people, and systems. This unavailability of an efficient public transportation system has kept people away from their places of work. There are many people who are willing to go back to work, yet are unable to do so due to the difficulties in commuting. Moreover, a number of employees have also suffered injuries, making it impossible to travel to their places of work without any family support or welfare systems.

To add to this, many work places, including offices, factories, and plants, are still closed and have not yet restarted operations, thus minimizing income-generating opportunities further for the people in Muzaffarabad.

5.3. Planning Issues in Recovery and Reconstruction Plan

Recovery and reconstruction: Primal focus on people's lifestyles or urban functions? Putting primary focus on either people's lifestyle or urban function for recovery and reconstruction process matters, because it will bring different results. If focus is on reconstructing urban function, past experiences have shown that many people have had to move out of their neighborhoods, and have had to relocate to suburban areas or to new areas that had been developed as public temporary shelters. This has resulted in people and communities not being able to get back to the pre-disaster condition. People who were relocated had places to live, yet did not have societal networks, support, or could not keep the work that they previously had. Many people often encountered difficulties in finding new jobs.

Focusing on reconstruction of people's lifestyles, on the other hand, will encourage people to stay in their communities. This situation is known to provide better opportunities for resource use – including social capital, people's networks and ties, as well as job reinstatement. Thus, there is a need to be primarily focused on the reconstruction of people's lifestyles for sound recovery.

Reconstruction of urban function, however, still needs to be addressed and implemented in ways that will provide safety to people against risks of natural disasters in Muzaffarabad. Therefore, the plan also needs to reconstruct urban areas to ensure better structures and layouts from those existing during the pre-disaster period.

Degree of damage and building density are important indicators for selecting reconstruction strategies. The Study Team has classified the degree of heavily damaged buildings of Muzaffarabad into three: more than 80%, 50-80%, and less than 50%. This is the primary indicator that is important to look at; chances are high in changing urban layout if the percentage of damage ratio is great. Since most of the buildings and infrastructures are damaged, the effort in rehabilitating the existing resources will be difficult, thus, new reconstruction process is preferable. On the other hand, if the degree of heavily damaged buildings is low, the area needs to primarily focus on rehabilitating buildings and infrastructure to maximize as much as possible the use of existing structures and available resources.

Another important indicator in selecting reconstruction procedure is the building density. High-density areas require higher attention in the reconstruction procedure, because issues on land use, land rights, and available land for temporary use are greater in magnitude and thus, more complicated as compared to the same issues for low density areas. In low-density areas, self-help reconstruction may be undertaken by property owners. These areas could also provide additional land for those living in higher density areas.

Details of planning issues in reconstruction. Focusing on strategies of putting people's lives back together will bring about some essential issues to highlight in reconstruction. First, setting up an environment that will provide incentives to people participating in the reconstruction process is critical. Because people are attached to their own localities, neighborhoods and residences, starting up an activity in their respective areas is the most powerful incentive of residents to participate in reconstruction activities. Second, reconstruction needs to take a holistic approach, to include reconstruction of residential buildings, livelihoods, community ties, and economic opportunities at once and as soon as possible. As aforementioned, recovery and reconstruction will take a long time and will often develop distortion of social systems, if approached individually. Third, recovery and reconstruction would need to set a certain unit, ward or *mohallahs* for example, that will allow community organizations, referred to as the CBOs, to take an active part, and institutional arrangements will be set up around these units at all times. Fourth, and not least, government support is a great factor in fast-tracking local initiatives for the neighborhood. Lack of information, policies, and funds, often slow down or bring failure of the recovery process by the people.

5.4. Reconstructing Localities

5.4.1. Reconstruction Strategies of Muzaffarabad

Basic Strategies of Recovery Process. Degree of damage is classified into three levels in Muzaffarabad; all of which have one or two strategies followed by few available practices.

For areas classified as level A, pertaining to areas with over 80% coverage of heavily damaged buildings, making overall changes in urban structure from the original layout is the primary strategy.

For areas classified as level B, where heavily damaged building ratio is 50 to 80%, the intent and participation of residents become especially important in the policy direction to be pursued. There are two options to take in the recovery process for such areas, one of which is to apply overall change in urban structure from the original layout, and the other is to rehabilitate and reconstruct areas without any drastic change to the original layout. The second option focuses more on utilization of resources that survived from the earthquake. The final decision on policy direction thus relies on the intent of the residents guided by a deeper study of the degree of building damage and damage patterns for better selection.

For areas with level C damage, rehabilitation and reconstruction of residences and infrastructures will be the primary aim. Because most of the original structures and layouts are usable, reconstruction of the whole area will be difficult.

Table 5.4.1 Basic Strategies of Recovery Process in Urban Area

Degree of Damage*	Basic Strategies	Possible Reconstruction Processes	Main Actors
Level A: more than 80%	Strategy 1: Overall changes in urban structure from the original layout	1) Transitional urban reconstruction process	Community Residents
		2) Rehabilitation center for refugees	AJK and Pakistani Government
Level B: 50 to 80%	Strategy 1: Overall changes in urban structure and layout	1) Transitional urban reconstruction process	Community Residents
		2) Rehabilitation center for refugees	Government
	Strategy 2: Rehabilitation and reconstruction of individual buildings and infrastructure without drastic change in urban layout	1) Rehabilitation and reconstruction of residences	Individuals
Level C: less than 50%	Strategy 2: Rehabilitation and reconstruction of individual buildings and infrastructure without drastic change in urban layout	1) Rehabilitation and reconstruction of individual residences	Individuals

Note: * Degree of damage corresponds to ratio of heavily damaged buildings against total land area gathered as a result of damage assessment of the Study Team.
Source: JICA Study Team

Selected strategy and possible reconstruction process. There are basically two strategies for the reconstruction process: i) to change overall urban structure from the original layout and, ii) to rehabilitate and reconstruct residences without any drastic changes.

The first strategy, aiming for the overall change in urban structure and layout, proposes two reconstruction processes. The first one is to apply a transitional urban reconstruction process, and the second one is to provide a rehabilitation center for refugees. Main actors in these two processes are somewhat different, with the first process mainly relying on community residents to take leadership, and the second process to be spearheaded by the government, for example, by AJK and Pakistani governments.

The second strategy, aiming to rehabilitate and reconstruct residences without any drastic changes mainly recommends promoting reconstruction by rehabilitating individual buildings. Main actors in this case are, thus, individual households, with some level of support coming from the government.

5.4.2. Strategy 1: Make overall changes in urban structure from the original layout

Strategy 1 corresponds to areas that suffered level A damage, or in some cases level B damage. There are two possible approaches to take in this strategy, the transitional urban

reconstruction, and developing temporary shelters for refugees. If the situation allows, the transitional urban reconstruction process is the priority strategy for devastated areas in Muzaffarabad.

(1) Strategy 1-1: Apply Transitional Urban Reconstruction

Transitional urban reconstruction approach. Transitional urban reconstruction is a holistic approach to reconstruction that promotes sustainability of localities. It includes the reconstruction of residential buildings, livelihoods, community ties, and economic opportunities all at once. This ensures a speedier reconstruction of people's lifestyles compared to other reconstruction approaches.

Transitional urban reconstruction likewise benefits people by putting back livelihood opportunities in their neighborhood, so that recovery is implemented smoothly. Further, it enables the reformation of urban structure, especially the urban layout, to a way that the residents wish to develop.

Targeted Areas. Targeted areas to introduce transitional urban reconstruction procedure should meet two sets of criteria:

i) Areas that have large land areas defined as rank A (ratio of heavily damaged buildings is more than 80%) and B (ratio of heavily damaged buildings is 50 to 80%), and,

ii) Contain considerable areas of high building density – mainly the urban area.

Further, if there is any plan to change the layout of the ward – such as road widening – the area would need to consider taking the opportunity to introduce the transitional urban reconstruction procedure.

According to damage assessment results as shown in Figure 5.2.1, wards that contain significant areas of ranks A and B are Wards 5, 6, 7, 9, 10, 11, 13, 14, 16, and 18. Among these wards, Wards 10, 13, 14, and 16 contain considerable proportion of land that have high building density. Table 5.4.2 shows these indicators, and further provides information on ratio of totally collapsed buildings and condition of building density (high or low). Figure 5.4.1 shows the location of targeted wards for transitional urban reconstruction, namely Wards 10, 13, 14, and 16, as these areas were found to have significant values for the two sets of criteria provided.

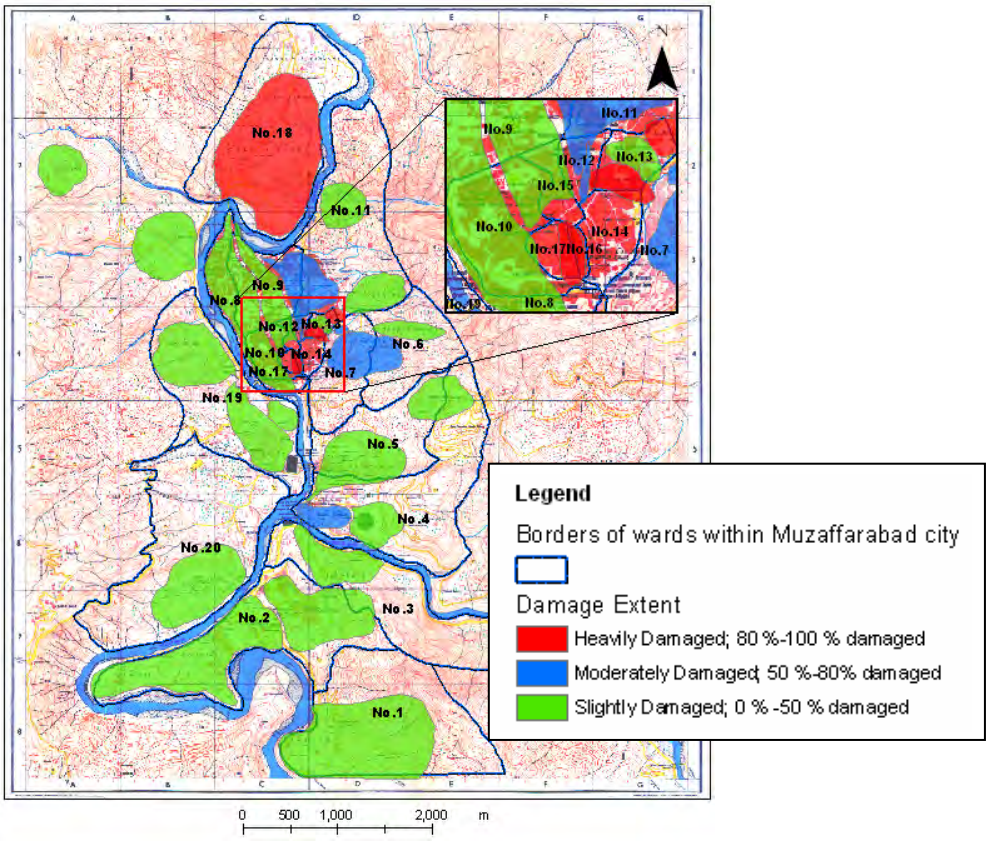
Further, Wards 12, 15 and 17 have plans to widen roads within their territory. Thus, these wards are added as to the priority areas for applying transitional urban reconstruction.

Table 5.4.2 Priority Areas for Applying Transitional Urban Reconstruction

Ward No.	Ratio of Totally Collapsed Buildings (%)*	High Building Density	Contains Significant proportion of Rank A and B areas
5	78	No	Yes
6	89	No	Yes
7	55	No	Yes
9	41	Yes	No
10	45	Yes	Yes
11	44	No	No
12**	41	Yes	No
13	68	Yes	Yes
14	60	Yes	Yes
15**		Yes	No
16	43	Yes	Yes
17**		Yes	No
18	50	No	Yes

Note: *Figures of "Ratio of Buildings Totally Collapsed (%)" collected from damage assessment by Muzaffarabad city.
**Wards 12, 15 and 17 have plans to widen roads within their land.

Source: MCM and JICA Study Team



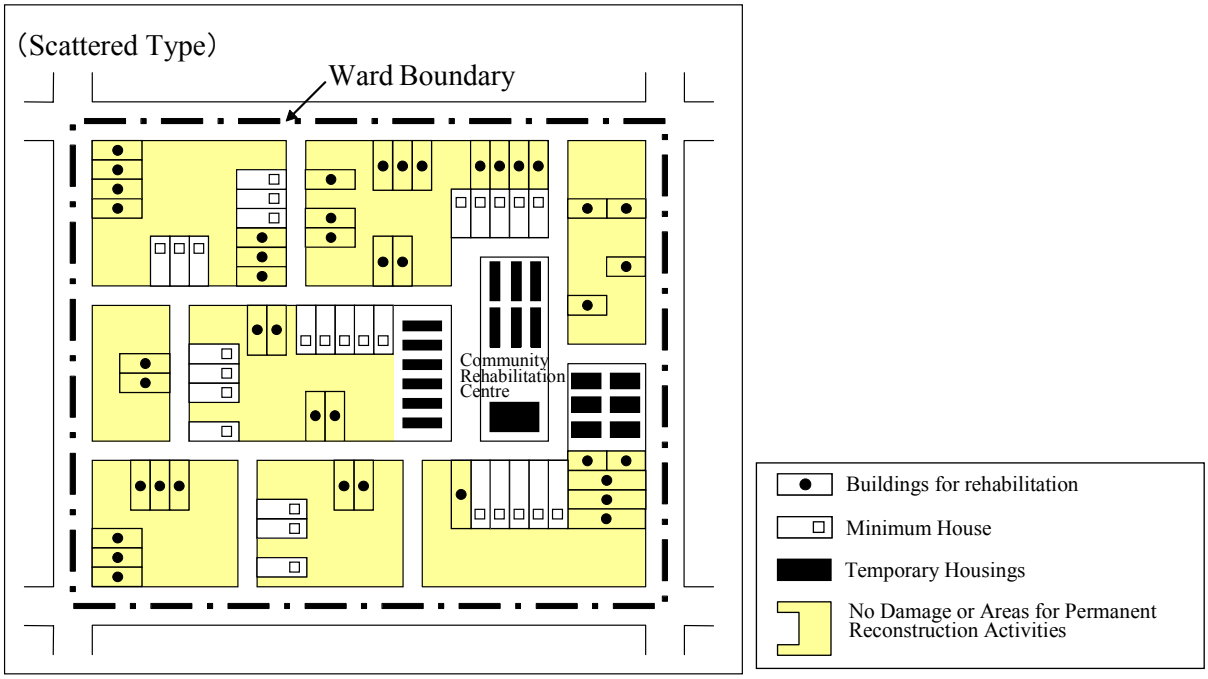
Source: JICA Study Team

Figure 5.4.1 Priority Wards for Applying Transitional Urban Reconstruction Process

Transitional urban reconstruction faces limited amount of land. Transitional urban land that develops within urban, high-density areas will need to cope with the limited use of land. In putting this approach into action, the following issues are important for smooth implementation:

- Available resources, namely residences, facilities, and infrastructure, must be effectively used.
- In cases where individual lands are available, construction of minimal-housing must be promoted. This will be described later.
- Temporary housing must be constructed after preserving land within the ward.
- Reconstruction will include permanent reconstruction and transitional urban reconstruction.

Figure 5.4.2 provides the idea of urban layout by applying transitional urban reconstruction.



Source: JICA Study Team

Figure 5.4.2 Transitional Urban Reconstruction that Develop within Urban Areas

(2) Strategy 1-2: Construct Rehabilitation Center for Refugees

Rehabilitation center for refugees. There will be many cases when transitional urban reconstruction process will not be suitable to apply. Such cases are mainly found in areas where all buildings and infrastructure can no longer be used, or where people present, mainly refugees, do not own property.

This rehabilitation center primarily aims to accommodate refugees, in places where certain area of land can be reserved. This center could be temporarily used for people who are seeking a new place to live, and also used permanently if the land is defined and designated

for residential or commercial use. This center also aims to accommodate local residents who are expected to contribute to the reconstruction process, catalyzing the reconstruction of residential buildings, livelihood, community ties, and economic opportunities all at once. By reconstructing an area in a holistic way, the speedy recovery of people's lifestyles as well as nurturing of social bonds and capitals will be secured.

The rehabilitation center for refugees is beneficial for people who have lost all their properties as this will allow them to make a minimal shift from their original residences and keep their social ties. Putting affected residents in one place will also help develop information networks, and provide the motivation to participate in recovery and reconstruction of their respective neighborhoods. The idea of keeping affected people of one locality in one rehabilitation center is beneficial in many ways as described, to restore resources that existed during the pre-disaster period.

Targeted Areas. Targeted localities to introduce a rehabilitation center for refugees are places that meet the following criteria:

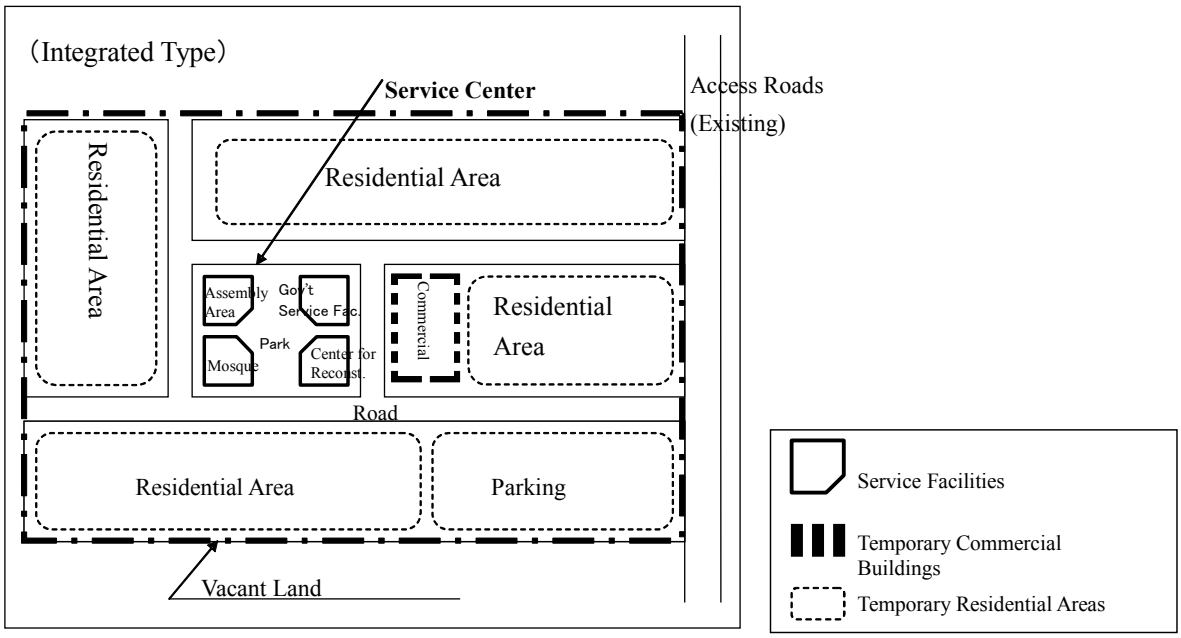
i) Areas that have large land areas defined as rank A (ratio of heavily damaged buildings is more than 80%) and B (ratio of heavily damaged buildings is 50 to 80%), and;

ii) Majority of residents are house renters, or have lost their properties/ land and admit to being refugees.

Damage assessment showed that Wards 5, 6, 7, 9, 10, 11, 13, 14, 16, and 18 contain large proportion of land under rank A and B. Priority is given to these wards to build rehabilitation centers for refugees, focusing especially on areas where damage wrought by the earthquake was the most devastating, creating many refugees in the process.

Develop rehabilitation centers for refugees by cross-linking necessary facilities. This type of reconstruction will also be done in a holistic way, to include residential areas, welfare facilities, and commercial centers in a cross-linking manner. This type of development in rehabilitation requires:

- Spacious land that is more than one hectare, without any obstacles.
- A detailed plan of facility layout that is intended to address possible vulnerabilities.
- Putting effort at the planning stage in developing permanent urban layouts and structures, rather than temporary ones. Site selection is also important to ensure that development is permanent.



Source: JICA Study Team

Figure 5.4.3 Transitional Urban Areas that Develop in Spacious Land

(3) Issues for Putting Strategy 1 Work

One of the most important issues in applying strategy 1 is to secure land and know how to utilize it. This section provides some examples of land selection processes and prototypes of layout plans for this strategy. The given example is the most common approach to take, however, the approach could vary and be improved by participants.

a. Land selection process for strategy 1: reconstruction that involves overall urban reform

Candidate lands for use. One of the critical processes in applying overall change to urban structures in reconstruction is to reserve land – whether for the application of transitional urban development or the construction of rehabilitation centers for refugees. There are several land types to reserve: individually owned lands, private-vacant lands, and public lands. Another important candidate for Muzaffarabad city is the land used for temporary tent camps provided for refugees that are scattered in and out of the city.

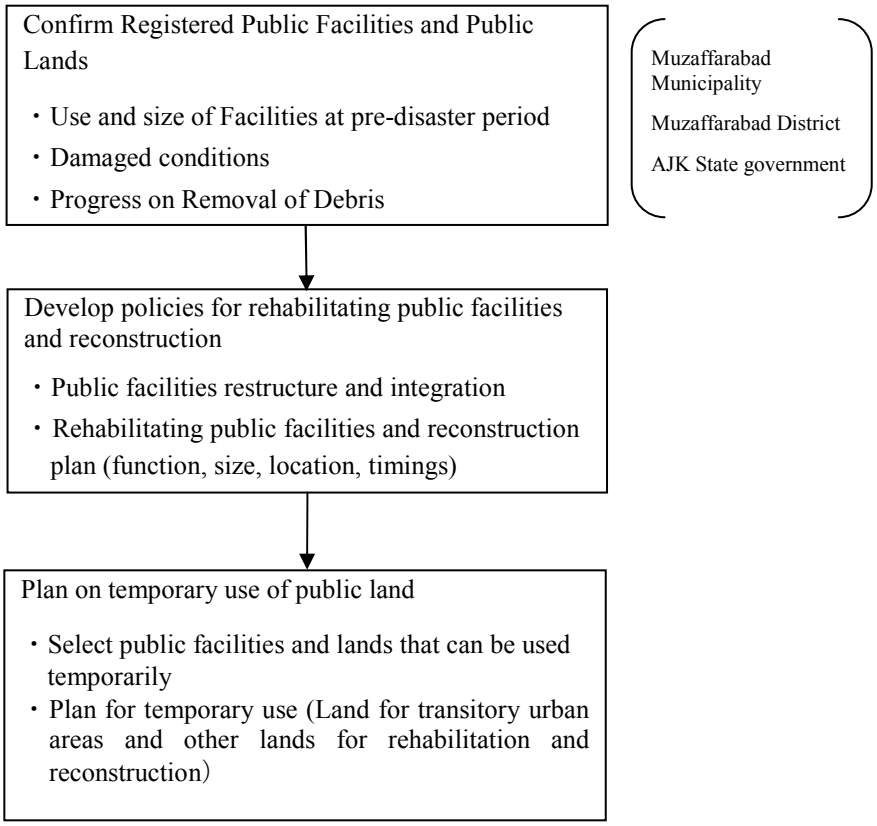
In case land is unavailable within the targeted locality, alternative land needs to be secured in nearby areas, or may be obtained from other government lands. Local, regional, and central governments, namely Muzaffarabad Municipality, Districts, and AJK governments, need to decide among themselves which areas to use.

Using public lands. Public land is limited to temporary use. Thus, this should be allocated to those who are defined as refugees or others needing temporary places to live while their localities are going through transitional reconstruction. Using public land

therefore requires a detailed time line to show when to begin accommodating people and when to transfer them out.

In the case of Muzaffarabad city, public land is recommended to be developed by the end of August 2006, and needs to be linked with plans for transitional urban reconstruction. It will mainly support and accommodate people who have to move out from their lands while the reconstruction process is on-going.

The figure below shows the process of developing a plan for using public lands in a transitional way.



Source: JICA Study Team

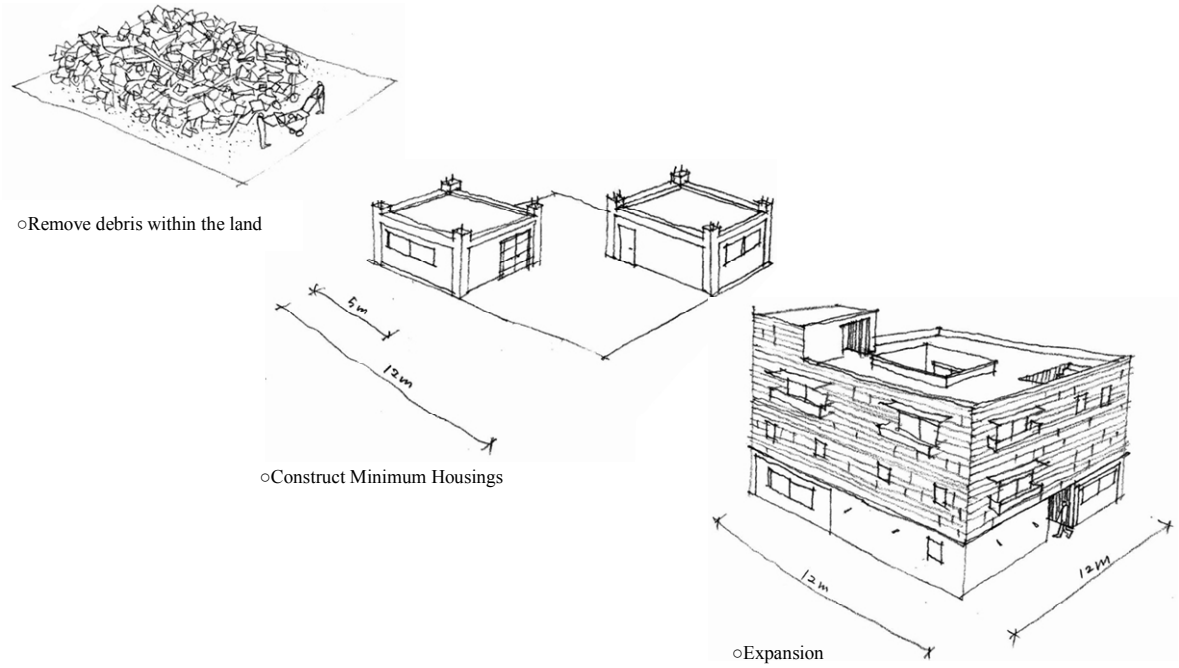
Figure 5.4.4 Process of Developing Plan on Temporary use of Public Lands

b. A prototype of layout plans in reconstruction that involves overall urban reform

Minimum-housing policy. One policy that may be applied to reconstructing residential areas involves minimum-housing.. This policy intends to develop permanent residences in transitional reconstruction areas or areas to be developed permanently, to meet the minimum requirements to support livelihood. This type of development is still difficult to promote without detailed plans, due to complexities of demarcating individual lands. However, establishing communication lines among residents will provide channels to settle problems that may arise in the reconstruction process. Further, once this minimum-housing policy is adopted, people will be expected to participate in expanding this type of permanent

buildings, by living in their own lands to reconstruct. Development orientation should be discussed and developed by residents through discussions, such as through CBO meetings.

In this set-up, the government will be responsible for subsidizing and providing appropriate development directions through the provision of information, specialists, and necessary materials for construction of such areas. The government will also be responsible for promoting collective rather than individually owned housing.



Source: JICA Study team

Figure 5.4.5 Minimum-Housing Policy Application and its Expansion

c. Utilizing Local Initiatives in Transitional Urban Reconstruction

The transitional urban reconstruction process has the advantage of reflecting the preference and utilizing the manpower of local people. Ward 13's experience is one of the examples for mutual interaction of CBOs and the JICA Study Team. Interactions done in the process of developing the urban reconstruction plan are recorded in Appendix-13.4. This way of utilizing local initiatives supports the idea that local residents have the most information about their residences, and reconstruction process can whet their motivation to participate in it.

5.4.3. Strategy 2: Rehabilitation and Reconstruction of Residences without Drastic Change

Strategy 2 is applicable to areas that suffered level C damage, and in certain cases when residents prefer, may also be applicable to areas with level B damage. Level C damage refers to areas with heavily damaged buildings comprising less than 50%, and level B

damage pertains to areas with 50 to 80% heavily damaged buildings. Strategy 2, where damages are relatively smaller, mainly focus on the process of rehabilitation and reconstruction by individuals without drastic change in urban layouts. This process relies on the capability of individuals, with some responsibility provided by government in investing in public facilities and infrastructure.

(1) Strategy 2-1: Rehabilitation and Reconstruction of Localities by Individuals

Utilizing individual powers in reconstruction. Areas with slight to moderate damage, with a ratio of heavily damaged buildings below 50%, will logically not aim to restructure the existing urban layout. Therefore, maximizing local people's knowledge and power will be the key for rapid recovery. Many individually-owned residential houses could be made livable again, if structures are appropriately diagnosed for safety, and proper ways of rehabilitation are identified. Though government investment given to individuals may be minimal, residents may take it upon themselves to expand benefits derived and harness efforts to bring their neighborhoods back to normal at the soonest possible time. Government will provide support to individuals to enforce their reconstruction activities, yet provision has to be carefully considered for individuals to use solely for reconstruction purposes.

Targeted Areas. Targeted localities to introduce strategy 2 basically include places that are not included in strategy 1. Such areas are:

i) Areas that have relatively small damage, i.e., ratios of heavily damaged buildings are either less than 50% or 50 to 80%, which are level C and level B respectively, and

ii) Building density is relatively low, and not necessarily on urban land.

Public facilities and infrastructure. Although this strategy and process focuses on individual participation for recovery and reconstruction, government will also need to perform the important role of putting back facilities and infrastructure that are for public use. Resident-led reconstruction is expected to promote rehabilitation at minimal cost with priorities in appropriate order.

(2) Issues for Making Strategy 2 Work

Building Assessment by professionals. Initial work that needs to be provided by government is the building assessment of localities by professionals. Main actors responsible for this assessment are local government: MCM, wards, *mohallahs* or CBOs, who will be responsible for finding and requesting professionals to do the assessment. This assessment will minimize the secondary damage and loss that may occur as a result of sudden building collapse. Professionals will be responsible for assessing which buildings

will be safe if rehabilitated, and unsafe at current condition. The results of this assessment will then have to be displayed in respective buildings, for proper disclosure of information.

Rehabilitation and reconstruction by residents. After diagnosing building safety, individuals will now be guided as to the necessary action to take with their respective residences – whether to rehabilitate or to demolish. Building owners with structures that can be rehabilitated need to look for ways to undertake this. There are many experiences in the past that have shown certain cases where subsidy intended for rehabilitation of properties is not used for this purpose. Thus, it is important for governments to provide support by procuring supplies, such as locally found construction materials, instead of providing financial assistance outright.

In cases where buildings need to be demolished and people have to be transferred, the priority will be for government to provide support for people to reconstruct and rebuild their residences.

Examples of available rehabilitation. Full-scale rehabilitation (i.e. reinforcing columns and beams), and simple rehabilitation (i.e. using PP bands for walls) are some examples of available options for rehabilitating buildings.

5.4.4. Recovery and Reconstruction of Housing Policies

(1) Three Housing Policies in Recovery and Reconstruction

Housing policies are one of the most important aspects in recovery and reconstruction. The earthquake put residents in different and complex situations, giving rise to different demands and needs for housing, e.g., as a result of loss of all assets including homes, or loss of everything with willingness to remain in original area, etc. Taking these facts into account brought about three basic actions for Muzaffarabad: developing temporary shelters for refugees, providing permanent and affordable housing, and providing housing aids.

Temporary shelters for refugees. Ideally, it is recommended that areas where temporary shelters for refugees are to be constructed should include basic urban facilities, as well as temporary housing that links to commercial and community buildings. It is also advisable for this construction to make use of resources that are low-cost and available in Muzaffarabad, including wood pieces, galvanized iron, and adobe bricks. The help of local building contractors and architects is needed for the construction of these temporary buildings and shelters to be able to develop various models that accommodate different household sizes and uses. In terms of building location, temporary shelters may be built on either public or private land, and for a limited time – say about two years – these could be used by residents free of charge and subsidized by the Muzaffarabad city.

After the lease period, buildings will then be demolished and the land will be transformed back to its original use. If the occupants wish to stay for a longer period, government should permit residences only in areas which are suitable for efficient reconstruction. The land and buildings in such areas should now be sold to promote the land's development according to an individual's capacity and the neighborhood's economic level.

Providing permanent affordable housing. Developing affordable housing for refugees, preferably in the outskirts of urban areas, is another policy that the government, i.e. Muzaffarabad city, could introduce. Affordable housing could either be rented out or sold to people through monthly lease payments or outright cash purchases. It is proposed that affordable housing be developed within a certain unit, like wards or *mohallahs*, in public vacant lands and devastated private lands to primarily accommodate local residents.

This program, however, has been known to encourage people to leave their original settlement areas and have forced some to start new lifestyles, which often develop difficulties and hardships. Thus, this policy of providing permanent affordable housing to relocate people shall be limited to minimum numbers in Muzaffarabad reconstruction.

Housing Aid. It is recommended that housing aid should be provided to people who are seeking to transfer to a new place to build a new life. One of the subsidy programs could aim to partially pay for the rent of people who are starting new lives in new areas. Such subsidy may be provided by the central government, like AJK government, for people who will have to be relocated far from their original homes.

(2) Decisions on Building Restoration

In rehabilitation and recovery, there are two options to take in building restoration: utilizing buildings that are still safe to use, or demolishing buildings to eliminate the risk of further loss and casualties. The identification of criteria for the demolition and restoration of structures and the definition of safe approaches in building restoration are thus essential to the smooth flow of rehabilitation and reconstruction.

a. Choices on building restoration: selecting urgent rehabilitation or long-term reconstruction

At the moment, people in Muzaffarabad are still not using affected buildings due to the risk of building collapse. Living in fear, people have instead opted to reside 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 these buildings – whether private or public owned – have not yet been diagnosed for their safety. Building diagnosis will help determine which structures need urgent rehabilitation and which ones require long-term reconstruction.

One approach of rehabilitation is retrofitting. Rehabilitation and retrofitting do not need the most up-to-date technology. What is important is that buildings are able to comply with an earthquake-resistant design code as the minimum requirement. If the building is diagnosed to be durable enough to be rehabilitated, the primary objective will be to put back the strength of buildings to maximum levels.

For collapsed buildings and those diagnosed to be demolished, immediate removal will be recommended to give way to the construction of new buildings. In this case, an earthquake-resistant design code will need to be applied, especially for public buildings. In doing so, all newly constructed buildings will meet at least the minimum level of resistance. This overall process of demolishing buildings and reconstruction is considered to be a long-term reconstruction process.

(3) Urgent Rehabilitation

Half the year has already passed since the earthquake struck Muzaffarabad, and the danger of aftershocks is increasing. Thus, many damaged buildings are facing the need for urgent rehabilitation.

One of the important aspects in urgent rehabilitation is the assessment of the land condition: If the ground has become unstable as a result of the past earthquake, the supporting capacity of building foundations is also minimized, thus, causing instability of the buildings.

Another important aspect to note is that the earthquake-resistant design code does not necessarily meet the most up-to-date engineering standard for rehabilitation; because rehabilitation and retrofitting of a building can only bring back the foundation's original strength.

(4) Long-term Reconstruction

In the long-term reconstruction process, buildings will need to be demolished and permanent buildings constructed.. In this case, the building strictly needs to meet the level set forth in the earthquake-resistant design code.

The earthquake-resistant design codes used in Pakistan may be found in the "Building Code of Pakistan" and "1997 Uniform Building Code", revisions of which are currently in progress.

5.5. Implementation Plans

5.5.1. List of Programs for Implementation

- Transitional urban reconstruction in Wards 10, 12, 13, 14, 15, 16, and 17: Wards and MCM are responsible for this program

- Development of temporary reconstruction areas for refugees: Wards, and MCM
- Affordable housing development for refugees: MCM, AJK
- Diagnosis of affected buildings: Wards, MCM, AJL
- Subsidy programs to support people in finding residences in new places: AJK, MCM
- Subsidy programs for residential building rehabilitation and reconstruction: AJK, MCM

5.5.2. Projects for Urgent Implementation

Table 5.5.1 Action Plan No.1

Project Title	Transitional Urban Reconstruction Project
Background and Objectives	Wards 10, 12, 13, 14, 15, 16, and 17 have suffered large damage of building collapse. Further, some wards are planning to restructure their urban form, especially with focus on road widening. This transitional urban reconstruction project will include reconstruction of residential buildings, livelihoods, community ties, and economic opportunities all at once to further secure speedy reconstruction of people's lifestyles. This project will contribute to putting back local resident's livelihood back to normal as soon as possible. Further, it enables the reformation of urban structure, especially the urban layout, to the way that is less vulnerable to future natural disasters.
Project Component	• Developing CBOs and holding workshops • Building and infrastructure damage assessment • Urban Planning: Land use, facility layouts, urban development strategies • Minimal-housing development • Welfare facility development • Infrastructure (Electricity, Water, Gas) rehabilitation and reconstruction
Implementation period	6 months from the project commencement
Implementation agency	Wards and MCM. AJK when appropriate.
Effects developed by the project	Beneficiary: Beneficiaries are the residents Economic and financial viability: Needs further study Environmental impact: Construction will affect residents and environment, but more importantly, improve living conditions of the people, especially the sanitary conditions of their areas.

Table 5.5.2 Action Plan No.2

Project Title	Diagnosis of affected buildings.
Background and Objectives	People in Muzaffarabad are still not using the affected buildings due to the risk of building collapse. Living in fear, people have opted to take up residence in tents or temporary shelters. Moreover, 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 these buildings – whether private or public owned – in Muzaffarabad have not yet been diagnosed for their safety. Building diagnosis to decide the needs of urgent rehabilitation or long-term reconstruction is, thus, in priority to initiate housing reconstruction.
Project Component	• Building safety diagnosis on public facilities • Building safety diagnosis on private owned buildings
Implementation period	2 months after project implementation
Implementation agency	MCM with support of wards
Effects developed by the project	Beneficiary: Cities and building owners Economic and financial viability: Needs further study Environmental impact: None

Table 5.5.3 Action Plan No.3

Project Title	Subsidy programs for residential building rehabilitation and reconstruction.
Background and Objectives	There will be many residential buildings that will need to be rehabilitated and reconstructed. For areas with slight to moderate damages, individuals will be responsible for putting their residences back in order. To encourage people to start rehabilitating and reconstructing their residences, government will provide support for rehabilitation and reconstruction.
Project Component	• Provision of necessary professionals to give advice on finance and rehabilitation procedures • Provision of necessary materials that will be needed to rehabilitate houses • Provision of subsidy programs for building reconstruction of local residents • Provision of tax incentives to private firms to reconstruct promoted commercial areas
Implementation period	Up to 2 years
Implementation agency	AJK, MCM but individual residents will take action in rehabilitation and reconstruction.
Effects developed by the project	Beneficiary: Building owners Economic and financial viability: Needs further study Environmental impact: None