

*APPENDIX H*

**ATTACHMENT 4**  
**FLOODS AND THEIR IMPACTS**



MUNDA DAM MULTIPURPOSE PROJECT  
ENVIRONMENTAL SURVEY

Attachment 4: Floods and Their Impacts

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## 1. Introduction

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### 1.1 Project Location and Study Area

This flood impact study was conducted for Japan International Cooperation Agency (JICA) as part of an environmental survey for the Munda Dam Multipurpose Project, the findings of which will be used in an environmental impact assessment (EIA) of the project.

The Swat Valley has been mentioned in the most ancient book of the Aryan civilization, the Rigveda. This area was a fertile tract of land and the seat of power of Hindu and Buddhist civilizations. Although a system of irrigation has been in place in the valley since ancient times, it was greatly improved when the British colonized the area and built the Lower Swat Canal in the 1890s. After building this canal, the British introduced a system of irrigation record keeping, which had not existed previously. Records of the area downstream of Munda Headworks were prepared (both for the new canal commanded areas and the old, civilian-managed channels offtaking directly from the river) and a system of "water rights" was developed.

Occasionally, high-intensity floods dislocated the crude channel system downstream of Munda Headworks and damaged the river banks. These floods caused land erosion, drowned domestic animals, and made it difficult for the farmers to restore the irrigation infrastructure through community labor. Until now, nothing has been done in the area to mitigate the frequency or the intensity of the floods.

This report outlines the historical and current flooding activity in and around the study area, and describes the likely impacts of the proposed Munda Dam on the flood regime.

The study area comprises of the regions where floods will be directly affected by the construction of the Munda Dam. This consists of the command area of the proposed canals and some additional area downstream of Munda Headworks. The areas that are directly affected by floods are those lying along the banks of the Swat River, from the Munda Dam site till the river's confluence with the Kabul River, 30 km downstream of Munda Headworks. The only large tributary that joins the river downstream of Munda Headworks is Jindai. This sluggish perennial channel is confined by comparatively high and well-vegetated banks, and has little influence on the flood regime of the Swat River.

Areas presently irrigated by Munda Headworks are some of the most well-irrigated parts of Pakistan. Here, the cropping intensity exceeds 150 percent, and,

in some places, even 200 percent. The area is densely populated. Because of the high value cash crops cultivated here, people enjoy a better standard of living in comparison with many other parts of NWFP.

### 1.2 Methodology

Most of the information in this report is based on secondary literature and was collected from the offices of the local administration, WAPDA, and the Irrigation Department. One reconnaissance visit was also made to the study area to examine the river banks for evidence of past floods.

### 1.3 Organization of this Report

Section 2 of this report describes the morphology of the Swat River, the people residing along its banks, and the benefits they derive from the river. Section 3 discusses floods in the study area, including the area's flood regime, flood effects, and the nature of damage that normally results from floods in the area.

## 2. Swat River and Its Utilization

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### 2.1 River Morphology

The Swat River is a braided stream, divided into a number of creeks and channels with islands in between. At most places, the river is 2-2.5 m deep. Near its confluence with the Kabul River, however, it gets deeper. In the study area, the river generally drops around 600 feet every kilometer. The river width, including the islands between the creeks, varies from 650 m to about 1,200 m.

The river is divided into three to five creeks, some of which have dried up. The riverbed generally consists of coarse gravel and rocks. In the river's upper reaches, the riverbed is a mixture of cobbles, gravel and sand; the soil grows finer downstream. Soil along the river banks is generally fertile loam.

### 2.2 Habitation on River Banks

Outside the cities, the Peshawar valley is probably the most densely populated part of Pakistan. This land is under immense demographic pressure, which has been exacerbated by the influx of Afghan refugees during the last two decades.

Since no orderly arrangements have been made for the area's development, haphazard settlements have sprung up along the river. Inhabitants of long established villages have left their homes to reside in isolated dwellings or hamlets closer to unutilized, cultivable land. The entire stretch of the river is flanked by crowded settlements of various sizes.

Most of the dwellings are clay structures, though a few burnt brick houses can be seen.

Ethnologically, the population is homogenous. It consists of *Pashtuns* belonging to the Mohmand and Gigianic clans.

### 2.3 Irrigation Arrangements

Irrigation has always been practiced along the banks of the Swat River. In the past two centuries, it has been organized into a communal irrigation system. This was accomplished with the institution of the "*Riwaji-Abpashi*" (Accepted Irrigation Practices). The *Riwaj* comprised of a code for the maintenance and operation of the numerous water courses leading from the creeks of the Swat River. It established water rights, and dealt with the distribution of water among villages served by the same channels. As water has always been plentiful in the area, no difficulty was experienced in implementing the *Riwaj*, and it is still in force.

Irrigation water is obtained from the river by constructing diversions upstream of the villages and channeling the water into watercourses leading to the villages. The diversion consists of an obstruction in the river's path, and is made of river boulders, brushwood, and gunny bags filled with rocks. It directs the water into a watercourse that slopes away from the river to agricultural land.

This system works satisfactorily until the diversion structures are disturbed by changes in river discharge and in water levels in the creek, and by the shifting and meandering of creeks due to floods. Damage caused by normal changes in creek water levels, which occur due to the seasonal variation in river discharge, is minimal and managed collectively by the farmers. The local administration assists by providing a bulldozer. However, serious problems arise during the flash floods that occur between March and early September. These floods damage the diversion arrangements or wash them away altogether. The damaged infrastructure then needs to be reconstructed, either at the same site, or at a different location, depending on how the flood has affected the riverbed and bank.

Recurring flash floods prolong the dislocation of irrigation infrastructure. Fortunately, during spring (March-April), the rains are generally sufficient for crop cultivation, and farmers do not have to rely on irrigation. However, during the monsoons (July-August), rains are less frequent and crops suffer if irrigation arrangements are disrupted.

Records collected from the archives of the Irrigation Department (Peshawar Canals Division) show that there are 11 offtaking irrigation channels supplying water to 30,951 acres (1,253 hectares) of agricultural land in the study area. These 11 main channels divide into 123 channels of varying size: the largest

irrigates 312 acres (936 hectares in the area of *Khatyala Khuma*), while the smallest irrigates 1 hectare (See Appendix A for information on irrigation in the study area).

Although no records of water discharge are available, it is estimated that the total amount of water diverted from the Swat River into these channels is around 310 cusecs (8.78 m<sup>3</sup>/s).

## 3. Floods In the Study Area

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### 3.1 Flood Regime

The Swat River has a catchment area of 13,650 square kilometers at Munda Headworks. From this point to its confluence with the Kabul River, the river has an additional catchment area of 153 square kilometers.

The flood regime of the Swat is similar to that of other snow-fed streams in Pakistan and Northern India. There are very large variations between the summer and winter discharges—the normal summer discharges are 10 to 12 times larger than the winter discharges. Flash floods, varying in duration from a few hours to three to four days, occur in spring and during the monsoon season. Irrigation Department records for 1961-1995 show that, at the annual flood peaks, the river flow is generally double its normal high level during the preceding week. The peaks can sometimes be as large as five to six times the normal high flow, but this is not common.

The complete records required to determine the flood characteristics of Swat River are not available. Reliable records of the Swat Rivers' flood regime are available only at Chakdara (Exhibits B.1 and B.2 in Appendix B). There are no authentic records for the major right-bank tributary, Pinjkora. The flow records maintained by the Irrigation Department at Munda are provided in Exhibit B.3, though these appear to be inaccurate.

Estimates of flood frequency and intensity can be formulated using the records of Kabul River for Nowshera and Warsak, after making the necessary hydrological adjustments. Alternatively, flow data from Pinjkora, for days on which Swat River is in spate at Chakdara, can be used to estimate the magnitude of floods in Swat River. (A hydrological study of the Swat River does not fall in the scope of this study, which is concerned with estimating the magnitude of floods in the area, and examining their consequences.)

The catchment characteristics, such as slope and vegetation cover, of Pinjkora River are similar to those of Swat River, and storms that cause noticeable flooding in Swat River, also affect Pinjkora. It is estimated that, at Munda, the Swat River experiences

floods of 21,000-24,000 cfs (i.e., 595-680 m<sup>3</sup>/s) annually. Heavier floods of 33,000 cfs (934 m<sup>3</sup>/s) occur every few years. The normal high flow varies from 12,000 to 16,000 cfs (340-453 m<sup>3</sup>/s).

### 3.2 Flood Effects

As stated earlier, in the area downstream of the Munda Dam site, the river is 650-1,200 m wide, and forms braided channels. Due to the width, the numerous creeks, and the steep slope of the riverbed, the water does not rise above its banks as frequently or as intensely as it would otherwise. The damage caused by floods is, therefore, not too severe, and it is possible for riverside settlements to persist in the area. Land erosion and dislocation of irrigation infrastructure do pose considerable difficulties, however, and the government has to provide financial assistance to mitigate flood-related problems every year.

The effects of floods in the study area are:

1. Dislocation of the temporary diversion works for 123 irrigation channels
2. Weakening of spurs by eroding material from around their peripheries; damage to the galvanized iron wire meshes that hold stones together to form protective dikes
3. Occasional local erosion of river banks due to meandering of creeks, which affects the cultivated lands and, at times, villages.

These damages are an annual occurrence in the study area. It is difficult to find systematically compiled information about the extent of damages for a definite period. The primary reasons are frequent personnel changes in the Administrative Division, which deals with and keeps records of flood damage and repair, and the fact that records are not properly maintained and filed.

The extent and nature of damages can be gauged to some extent from the lists of flood-caused damages (for financial years 1989-90 and 1998-99) in Appendix C. The total damages reported amount to Rs. 4.78 million and Rs. 3.25 million in 1989-90 and 1998-99, respectively. These do not include losses accruing from lowered crop yields due to dislocation in irrigation systems. However, such losses are believed to be modest because irrigation arrangements are disturbed mostly during the rainy season in the area, when cultivation does not depend entirely on irrigation channels.

Villagers close to the banks are anxious to protect their lands and houses from floods. They are politically aware and demand that the government provides protection dikes and spurs to prevent land erosion by floods. In response, the Irrigation Department has built protecting spurs and dikes around almost 75 percent of the villages. However,

these structures are in poor shape and not properly maintained. Most spurs in the Swat River do not stay in place for more than one season and there is a constant demand for restoration and additional works.

### 3.3 Expected Project Impacts

The Munda Dam Multipurpose Project will provide electricity, irrigation, and flood control in the study area.

The floods that cause such problems as irrigation system dislocation, bank erosion, and damage to protection works, are not the normal high flows of summers. They are the brief flash floods, and the longer lasting floods of the monsoon season.

The Munda Dam will serve to mitigate these floods and their impacts greatly. The Munda reservoir will accommodate the floods entirely, so that only regular, planned, water releases from the dam occur. Floods will occur very occasionally, when the reservoir is full at the end of the high flow season (mid September). Even then, the peaks will be suppressed compared to their current levels.

Appendix A: Irrigation from Swat River

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Exhibit A.1: Overview of Area Irrigated from Khayali (Swat) River

<i>Irrigation Diversions</i>	<i>Area Irrigated (Kanals-marlas)</i>
<b>Doaba Circle</b>	
1	24,261-11
2	23,332-11
3	8,347-15
4	12,399-13
5	54,330-14
<b>Total (Kanals-marlas)</b>	<b>122,672-4</b>
<b>Total (acres)</b>	<b>15,334</b>
<b>Shulgara Circle</b>	
1	31,321-2
2	39,910-1
3	53,713-0
<b>Total (Kanals-marlas)</b>	<b>124,935</b>
<b>Total (acres)</b>	<b>15,617</b>



## Appendix B: River Discharge Data

Exhibit B.1: Swat River Discharge at Chakdara, 1961-1991 (Cusecs)

		July	Ratio (High/Low)	August	Ratio (High/Low)
1961	Low	13,000	1.46	8,000	1.75
	High	19,000		14,000	
1961	Low	7,000	4.57	6,000	1.66
	High	32,000		10,000	
1963	Low	9,000	2.11	5,000	2.6
	High	19,000		13,000	
1964	Low	7,000	3.71	8,000	2.25
	High	26,000		18,000	
1965	Low	13,000	1.92	7,000	2
	High	25,000		14,000	
1966	Low	9,000	2.55	6,000	3.33
	High	23,000		20,000	
1967	Low	12,000	2.55	6,000	2.5
	High	27,000		15,000	
1968	Low	14,000	1.92	4,000	4.5
	High	27,000		18,000	
1969	Low	13,000	1.92	6,000	4.5
	High	25,000		27,000	
1970	Low	6,000	3.33	8,000	1.875
	High	20,000		15,000	
1971	Low	7,000	2.42	6,000	2.33
	High	17,000		14,000	
1972	Low	12,000	1.66	6,000	4
	High	20,000		24,000	
1973	Low	13,000	1.46	12,000	1.66
	High	19,000		20,000	
1974	Low	8,000	1.75	5,000	2.8
	High	14,000		14,000	
1975	Low	11,000	1.63	7,000	3.71
	High	18,000		26,000	
1976	Low	12,000	1.5	7,000	3
	High	18,000		21,000	
1977	Low	10,000	2.6	5,000	2.8
	High	26,000		14,000	
1978	Low	12,000	2.33	6,000	2.83
	High	28,000		17,000	
1979	Low	80,000	2.25	4,000	3.25
	High	18,000		13,000	
1980	Low	10,000	1.5	5,000	4.4
	High	15,000		22,000	
1981	Low	11,000	1.72	5,000	2.4
	High	19,000		12,000	
1982	Low	6,000	2	3,000	5
	High	12,000		15,000	
1983	Low	7,000	2.28	8,000	2.25
	High	16,000		18,000	
1984	Low	9,000	1.55	8,000	4.625
	High	17,000		13,000	
1985	Low	6,000	4.16	5,000	2.8
	High	25,000		14,000	
1986	Low	12,000	1.91	5,000	4.4
	High	23,000		22,000	
1987	Low	11,000	1.81	8,000	1.25
	High	20,000		10,000	
1988	Low	10,000	5.7	5,000	3.2
	High	57,000		16,000	
1989	Low	8,000	3.25	6,000	3.33
	High	26,000		20,000	
1990	Low	9,000	1.88	7,000	2.14
	High	17,000		15,000	
1991	Low	13,000	1.92	8,000	1.875
	High	25,000		15,000	

Exhibit B.2: Maximum Discharges in July and August

Discharge (cubic ft/s)	Month	Number of Times Exceeded
17,000	July	26
17,000	August	11
20,000	July	17
20,000	August	9
25,000	July	12
25,000	August	2
30,000	July	2
30,000	August	
35,000	July	1
35,000	August	

Exhibit B.3: Water Discharge Data of Swat River at Munda Headworks -- Cusecs

Year	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
1961	1,010	1,091	1,974	7,554	14,343	23,235	23,817	14,265	9,813	2,753	1,392	1,015	8,522
1962	755	802	1,498	5,055	7,900	14,446	18,547	12,276	4,968	1,444	1,018	981	5,808
1963	534	360	3,980	9,288	17,318	23,505	20,757	13,007	4,866	1,410	1,528	760	8,109
1964	1,112	1,448	3,453	8,540	12,014	18,985	25,007	17,274	7,195	1,988	610	1,049	
1965	1,010	2,434	3,215	13,895	20,208	32,075	29,597	15,744	8,478	2,073	389	896	10,585
1966	670	1,482	4,830	12,144	15,788	28,505	22,287	16,084	8,062	2,821	1,205	726	9,550
1967	602	1,737	3,487	8,625	12,014	29,525	29,427	15,030	6,549	2,379	1,069	1,406	9,321
1968	1,095	1,108	3,198	8,285	13,595	31,055	30,787	18,974	4,135	1,784	1,307	1,882	9,767
1969	1,112	2,026	6,751	9,968	14,887	26,635	32,147	21,864	6,192	3,552	1,936	1,032	10,675
1970	891	802	2,280	6,942	13,204	21,195	15,487	13,976	10,298	2,787	916	607	7,448
1971	362	411	14,181	7,860	15,278	21,195	17,187	14,112	4,135	951	440	301	6,976
1972	483	1,227	4,286	8,234	16,468	29,695	25,177	16,084	6,991	2,090	1,630	1,304	9,472
1973	1,299	2,145	4,949	10,767	18,338	28,846	25,517	22,204	8,402	2,328	746	811	10,529
1974	721	1,210	3,096	7,469	9,787	17,625	18,037	11,205	3,268	1,342	457	641	6,238
1975	398	816	3,265	10,673	19,149	25,896	24,318	23,119	8,069	2,233	1,299	1,420	10,055
1976	1,488	2,205	3,630	12,133	17,083	21,818	25,032	18,018	6,899	2,302	1,027	788	9,369
1977	1,338	1,166	1,969	2,812	11,622	21,190	23,061	11,674	4,667	2,823	1,528	1,130	7,531
1978	970	899	5,729	9,725	17,166	25,042	25,131	16,810	4,627	1,907	1,780	1,006	9,233
1979	774	1,160	2,959	10,680	11,935	20,717	23,584	13,589	6,055	1,559	1,120	824	7,913
1980	942	1,686	6,292	11,141	16,468	24,595	19,567	12,038	4,849	2,277	1,698	1,253	8,567
1981	1020	1,654	5,607	16,089	22,096	18,254	22,449	12,544	4,281	1,852	976	440	8,939
1982	624	752	2,526	6,746	10,454	11,785	11,467	13,109	2,399	1,805	2,742	1,814	5,510
1983	1,314	1,582	5,234	8,381	14,114	16,967	15,886	17,042	7,708	2,099	1,354	1,397	7,756
1984	398	810	2,121	6,032	12,935	28,035	16,705	15,055	7,060	1,534	1,498	1,323	7,792
1985	1,170	1,064	1,592	5,086	9,032	13,315	17,311	11,195	3,540	1,755	243	862	7,792
1986	652	1,586	4,115	10,933	15,491	16,023	23,857	17,286	3,431	1,633	902	1,800	8,197
1987	404	855	6,343	10,066	12,863	19,973	23,303	13,762	5,944	6,997	2,377	1,472	8,696
1988	840	1,363	6,020	11,855	17,998	19,835	26,707	14,197	4,322	1,444	559	709	8,821
1989	1,207	872	2,016	4,647	14,607	21,640	18,998	13,492	4,480	2,236	1,659	1,566	7,285
1990	1,469	3,077	9,222	14,649	25,531	21,747	19,936	15,039	8,030	3,961	2,587	2,786	10,670
Average	889	1,328	3,926	9,389	14,990	22,445	22,370	15,336	5,890	2,267	1,266	1,133	8,436

Note: These are net discharge values after deducting direct diversion 200 cfs and historic discharge values of Upper Swat Canal at Amandara Headworks.

## Appendix C: Flood Protection Data

## Exhibit C.1: Flood Protection during 1989-90

	Description	Cost, Rs.
1.	Protection of village <i>abadies</i> (settlements) and cultivated lands of Mian Wala Turlandi Sarasang from Khayali River floods	2,768,070
2.	Protection of cultivated land and irrigation infrastructure from Khayali River floods	1,088,211
3.	Provision of 3 spurs for protection of Adadir and cultivated land of Bairo Sukkhar from Khayali River floods	2,228,442
4.	Protection of Mula Khela from Khayali River floods	700,422
	<b>Total</b>	<b>6,785,145</b>

## Exhibit C.2: Existing Flood Protection Works on Khayali River (1998-99)

	Description	Cost, Rs.
1.	Repairs of spur protecting Island Canal RD 16600 from Khayali River	148,500.00
2.	Rehabilitation of existing structure on Khayali River	300,000.00
3.	Repairs of protection works at Sakar village against Khayali River floods	200,000.00
4.	Repairs of protection works at Srikh village against Khayali River floods	170,000.00
5.	Repairs of protection works at Mira Khela against Khayali River floods	200,000.00
6.	Repairs of damaged spur in Turlandi and Sarasang village against Khayali River floods	200,000.00
7.	Repairs, restoration of diversion bund of Shakra Pura, left side of Khayali River	50,000.00
8.	Protection and improvement of Khatha Jogaa offtaking left side of Khayali River	300,000.00
9.	Protection of agricultural land and village <i>abadies</i> of Shahbar from Khayali River floods	400,000.00
10.	Protection and improvement of protection works in Tabai area against Khayali River floods	450,000.00
11.	Repairs and improvement of protection works at Jahi Abad against Khayali River floods	200,000.00
12.	Repairs of protection works at <i>bund</i> at Mula Khela against Khayali River floods	250,000.00
13.	Protection of Bela No. 4 providing earthen <i>bund</i>	50,000.00
14.	Repairs of protection works at village Amba Dher against Khayali River floods	130,000.00
15.	Construction of diversion <i>bund</i> at Katha Shambora on Khayali River	300,000.00
16.	Repairs of protection works at Shahi Kulalai village against Khayali River floods	80,000.00
17.	Repairs of damaged spurs on left bank of Khayali River, upstream of Charsadda Bridge	200,000.00
	<b>Total</b>	<b>3,628,500.00</b>



*APPENDIX H*

**ATTACHMENT 5**  
**SOCIOECONOMIC SURVEY**

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MUNDA DAM MULTIPURPOSE PROJECT  
ENVIRONMENTAL SURVEY

Attachment 5: Socioeconomic Survey

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## 1. Introduction

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This study was conducted as part of an environmental survey for the Munda Dam Multipurpose Project. It will be used in the environmental impact assessment (EIA) of this project. This dam is planned to be built on the Swat River, about 5 km upstream of the existing Munda Headworks. The project will include the construction of irrigation canals on the left and right banks of the river. The reservoir area is located in Mohmand Agency, the command area of the left bank irrigation canal lies in the Malakand Protected Area, while the command area of the right bank irrigation canal also falls in Mohmand Agency. The objectives of this project are power generation, flood mitigation, and the provision of irrigation water to the command area.

### 1.1 Project Location and Study Area

As mentioned above, the proposed Munda Dam Multipurpose Project site is located about 5 km upstream of Munda Headworks on the Swat River in the North West Frontier Province (NWFP). The site falls in the Mohmand Agency, Swat Valley and can be accessed through the town of Shabqadar. Currently, a dirt track leads from the existing Munda Headworks to the dam site. The Munda Headworks is about 13 km from Shabqadar, which is at a distance of about 48 km from Peshawar. The Mohmand Agency lies between 34° 10' and 34° 43' North and 70° 58' and 71° 42' East, and includes areas of rugged, barren mountains. The Munda Dam reservoir area extends into Malakand Agency.

This study focused on the areas expected to be affected by the construction of Munda Dam Multipurpose Project. This includes areas affected by the dam and reservoir, plus the left and right bank command areas downstream of the dam site—these areas have been referred to as "the study area" in this report.

### 1.2 Methodology

To compile this report, extensive data gathering was conducted in the command areas on the left and right banks of the Swat River during October 1998 and January-February 1999. The dam and reservoir sites were also surveyed using the same data collection method. A detailed resettlement action plan (RAP) is being prepared by the Water and Power Development Authority (WAPDA), and all involuntary resettlement and compensation issues are to be addressed in that report.

Secondary information was also procured from the Political Agent, Ghalanai, which is the *tehsil*

(administrative subdivision) headquarters of Mohmand Agency; the *tehsildar* (*tehsil* head), Yukaghund, Mohmand Agency; the Bureau of Statistics, Government of NWFP; and the Chief, Federally Administered Tribal Areas (FATA). Unfortunately, relevant and reliable data was largely unavailable. Some data from the 1981 Census has been referred to as and where necessary.

Because of the lack of secondary data, primary data was gathered for the entire command area. All 70 villages and settlements there were surveyed for this study.

In every settlement, at least two questionnaires were administered to crosscheck the information obtained. The questionnaires were administered to the *maliks* (elders). The respondents were people who were well aware of the prevailing situation in their settlements and surrounding areas.

The data collected by the village questionnaires provided a rich socioeconomic profile of the command area.

A lot of the information generated may not be completely accurate, especially where women are concerned. This is because all of the respondents of the survey were men and the sociocultural norms of the area discourage talking about women. The possibility of having female respondents was broached in the initial stages of the survey but permission was not given it became immediately obvious that pushing the issue would raise serious problems, which could have jeopardized the entire survey. The survey team was, therefore, compelled to compromise on this issue.

### 1.3 Organization of this Report

Section 2 of this report describes the history and the existing socioeconomic conditions in the study area. This includes information on the local administration, demographic characteristics, refugee problems, education and literacy, income and employment, economy, communications, and health issues. Section 3 describes both the positive and negative impacts expected to result from the construction and operation of the dam. Section 4 suggests mitigation measures to manage negative project impacts.

## 2. Socioeconomic Environment

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### 2.1 History of Mohmand Agency

The Mohmand tribe was one of the Afghan races that moved eastwards from the Kabul and Ghazni hills, before the Mughal and Hazara invasions. Between the thirteenth and fifteenth centuries, the Afghans

started settling in Swat, Buner, Dir, Bajaur, and the hills now forming Mohmand Agency. In this movement, the Afghan tribes either expelled or subdued the natives of the area.

Once the Mohmands had settled down between the Kabul and Swat Rivers, they began to fight their neighbors. They succeeded in wresting Kamali and Mitai from the Bajaur, and the Shilman valley and low-country south of the Kabul River from the Shinwaris.

Since they controlled one of the major routes into the subcontinent, the Mohmands levied taxes and tolls on caravans passing through their area.

The establishment of the Durand line in 1894 created a political boundary between Afghanistan and British India and roughly divided the Mohmand tribe into two halves lying on both sides of the border. That situation remains largely unchanged.

### 2.1.1 Tribes

The Mohmand Agency is inhabited by the Mohmands, the Safis, and the Utmarkhel. The Mohmands greatly outnumber the rest of the tribes in the area. The three tribes are sub-divided into eight clans or sub-tribes, namely: Khwezai, Baizai, Halimzai, Tarakzai, Isa Khel, Burhan Khel, Dawezai, and Utmanzai.

In physical appearance, the area's people greatly resemble other Afghans. They are well-built and hardy. Living in harsh and rugged conditions, they have developed an acute sense of independence and are defiant in the face of non-tribal authority. Consequently, they fought against the Sikhs and the British, and remained irrepressible during their rule. These exploits have been recorded and are part of the local folklore and myths about the Mohmands' courage and valor.

### 2.1.2 Culture

Culture is a dynamic and complex phenomenon that is difficult to describe. Descriptions of culture can suggest a static picture, which is misleading. In reading such descriptions, it should be borne in mind that the information to be grasped is the *essence* of the culture, and that changing socioeconomic realities inevitably lead to cultural change.

Typically, villages in the study area are divided into smaller units known as *kandis*. Each *kandi* has its own *malik* (designated head). The system of designating *maliks* (*Maliki*) was established by the British as part of the administrative setup of the tribal areas: the Political Agent administers the Agency through the *maliks*, whose duties are to maintain law and order, and settle disputes in their units. Each *kandi* has its own mosque and '*hujra*.'

The *hujra* is an open compound attached to the *malik's* house where men gather in the late afternoon and evening to talk about various communal and personal affairs. Though the tradition of the *hujra* is slowly disappearing, communal consultation remains an integral part of the culture.

The *jirga* is an offshoot of the *hujra* and is a central mechanism for the dispensation and adjudication of local conflicts. The *jirga* consists of a group of men, chosen by both the parties involved in the conflict, that listens to the arguments of both sides and then implements decisions. In theory, for every conflict, a different group of men can be appointed as the *jirga*; however, in practice, it is usually the same men who are chosen.

The *jirga* is the primary judicial organization of the tribal system and people generally prefer to have their conflicts resolved by it. This system works well as long as everyone accepts the *jirga* and its decisions. However, this authority has been declining recently. Since women are not involved at all in the *jirga*, the objectivity of certain decisions regarding the property and rights of women is doubtful.

The patriarchal system is very deeply entrenched in Mohmand society. There is strict social segregation. Houses are designed in such a way that men and women remain separate most of the time. However, *pardah* (wearing the veil and seclusion from men) is not observed in the traditional sense and women and girls can be seen outdoors in and around the village attending to various chores. They do not interact with the men at these times. When going outside the village, the women wear the traditional *burqa* or the *chaddor*, which is wrapped around the body.

Marriage decisions are made on the basis of family convenience and circumstances. People of the area generally marry among their own clan or tribe. Marriage is strongly endogamous, and mostly takes place between patrilineal cousins. Most people are married soon after puberty. As a result, girls become mothers at a very young age. Family planning is still a largely alien concept amongst the Mohmands. Marriages are important as an index of sociopolitical status, and for forging alliances between families.

The Mohmands, like other Pakhtoons, are well-known for their hospitality. They welcome visitors and are courteous and simple in their manner. The men enjoy outdoor activities like hunting, riding and shooting. Like other tribal people (and because of the numerous battles and internecine feuds which they have historically been involved in), the Mohmands value arms and guns. This is one reason why many of their conflicts are resolved in a violent manner. Blood feuds are common and often extended. This aggressive lifestyle is a drain on the household economy, as even families with very limited resources invest heavily in weaponry.

The Mohmands are a very religious people. Both *Eid ul Fitr* and *Eid ul Azha* are celebrated by holding local fairs (*mela*). All of the people in this Agency are Sunni Muslims. However, many of the day to day affairs of the Mohmands, as for most other Pakhtoons, are run according to the 'Pakhtoonwali' code of law, and not according to religion. *Nang* (honor) and *Qalang* (rent and taxes) are key features of this code and regulate the practical affairs, relationships, and interactions of these people. Amongst the Mohmands, *Nang*, which is founded on the concept of egalitarianism, is more important.

Musical instruments, especially the big drum (*dholl*) and a three-stringed guitar (*ruba'b*), are very popular. Men play music, sing, and dance at gatherings from which women are excluded. However, women and children do sing and dance to music at weddings.

## 2.2 Existing Socioeconomic Environment

The following sections describe the present socioeconomic conditions in areas affected by the Munda Dam project. Areas affected by the project can be divided into two distinct parts: the area to be inundated by the reservoir, and the command area that will receive additional irrigation water from the left and right bank canals. Both the reservoir area and the command area were studied using the same questionnaire and methodology. Certain aspects of the reservoir area were found to be quite different; the differences are described in Section 2.3.

### 2.2.1 The Affected Area

The left and right bank command areas of the Munda Dam project fall in the Yakaghund, Pandialey, and Prang Ghaar *tehsils* in the Mohmand Agency; the *tehsil* Dargai in the Malakand Agency; and the *tehsil* Tangi in District Charsadda.

The dam's command area covers five *tehsils*, and has 70 settlements (including towns, villages, and smaller settlements). The right-bank command area falls in Pandialey and Yakaghund and has a total of 32 settlements. The left-bank command area has 38 settlements: 15 in Dargai, 16 in Prang Ghaar, and 7 in Tangi. The dam and reservoir area falls in the Mohmand, Malakand, and Bajaur Agencies and contains 16 settlements.

Mohmand, Malakand, and Charsadda have separate administrative setups, but the administrative borders have not been clearly marked. This report discusses the command area and the dam and reservoir area separately, but administrative boundaries within these areas have been ignored because they do not affect socioeconomic conditions.

The dam and reservoir areas comprise mostly of low, dry mountains, with elevations ranging from 300 meters above sea level to 600 m. The command area

will lie in the foothills of these mountains, and is largely plain land.

Vegetation in the study area is sparse and almost totally dependent on rainfall. The area contains deposits of precious and semi-precious stones, chromite, marble, soapstone, asbestos, and clay used for making ceramics.

### 2.2.2 Tribal Administration

Other than the seven settlements in Tangi, all the settlements likely to be affected by the project are situated in tribal areas, where the tribal system of administration is in force. Only the administrative system of Mohmand Agency has been described below, as it is similar to the systems in other tribal agencies in the area.

An Assistant Political Agent heads each sub-division in the area, while a Political *Tehsildar* or, sometimes, a Political *Naib Tehsildar*, is in charge of each *tehsil*.

The Political Agent at Ghalanay is in charge of the Mohmand Agency. He acts as district magistrate, session judge, and collector of revenue. He executes his duties with the help of the traditional *Maliks* and through the *jirgas*. Most of the adjudication is based on unwritten conventions that are a mixture of the Pakhtoon and Islamic codes, with an emphasis on the former. The Governor of NWFP is the final authority for the tribal areas, although, in practice, his authority may not be acknowledged by the locals.

As mentioned earlier, Pakistan's legal system does not apply in the tribal areas. The written code applicable there is the Frontier Crimes Regulations (FCR), which was formulated by the British. Even this is generally disregarded. The FCR is rather draconian in nature, in that it confers tremendous powers of punitive action on the Political Agent, and offers almost no right of appeal. Recently, there has been some debate about replacing the FCR with a more democratic and egalitarian law.

The tribal areas do not have a regular police system. Local police, called the *Khasadars*, facilitate internal administration. There is also a Frontier Constabulary unit that checks smuggling, and protects roads, bridges, pickets, forts, and other government installations. The unit also patrols the border with Afghanistan.

### 2.2.3 Demographic Characteristics

In all, there are 16 settlements in the dam and reservoir area, all of which appear to be temporary, with adobe (*kacha*) houses. There are 19,454 houses in the command area, 78 percent (15,234) of which are *kacha* structures. The remaining 22 percent (4,220) are made of brick and mortar.

Most of the households are joint families, some with up to 80 members. Joint families are the norm in this area, and are supported by tradition as well as economic considerations. However, emigration to other cities in Pakistan and Middle Eastern countries, such as Qatar and Dubai have resulted in changes in the area's socioeconomic setup, including the breaking up of families into smaller units.

Primary demographic data is given in Exhibit 2.1, and the cluster distribution of the households is given in Exhibit 2.2.

The total population of the command area is 143,030. Results of field surveys showed that the command area population consists of 52.4 percent (74,995) men and 47.6 percent (68,035) women. It is possible that the female population has been underreported, as all questionnaire respondents were men.

Settlement size varies from 80 to 18,000. The cluster distribution of populations is given in Exhibit 2.3.

As is evident from the information given above, the study area is sparsely populated, especially the left-bank command area. This is probably because the land cannot sustain a large population and there is hardly any industry.

The entire population consists of ethnic Pakhtoons, who are strict adherents of Sunni Islam. There are about 389 (three hundred and eighty nine) mosques in the command area. The social setup is very traditional and backward. Men and women are strictly segregated. Three main tribes, namely, the Utmankhel, Tarakzai, and Burbankhel, with numerous sub and sub-sub tribes, inhabit the area.

#### 2.2.4 Afghan Refugees

The majority of the population comprises of local people. However, Afghan refugees are also part of certain settlements. There are a total of 1,424 (7 percent) Afghan refugee households in the command area. There are about 50 (fifty) of these in the left bank command area and the remaining 1,374 (one thousand three hundred and seventy four) are in the right bank command area.

Most of the Afghan refugees live in the Mohmand agency. The majority of them (1,220 households) in the Mohmand agency are concentrated in four settlements, of which two are refugee camps. Thus, only two settlements have a mixture of local and refugee populations. There are no reports of tension and/or conflicts between the locals and the refugees.

#### 2.2.5 Education and Literacy

According to the survey data the total literacy rate in the command area is 14.97 percent (say, 15 percent). The male literacy rate is 21.7 percent and the female, 8.24 percent. The overall literacy rate is low

compared to national or provincial averages, with the male literacy rate being about twice that of females.

However, if these figures are compared with the literacy figures obtained during the 1981 census, the increase in literacy rates has been dramatic. According to those figures, the overall literacy rate for Mohmand Agency was 3.61 percent, with male being 6.07 percent and female 0.64 percent.

The numbers and levels of government schools in the command area are given in Exhibit 2.4. There are no schools in the dam and reservoir area.

Besides the government run schools there are a total of eight privately run schools; seven functional and one non-functional religious schools or 'madrasas'; and one vocational school. There is no NGO-run school in the command area.

Although basic educational facilities exist, the quality of education is poor. There are no facilities for higher or technical education in the command area. However, proximity to cities like Charsadda, Mardan and Peshawar makes it possible for the children of well-off families to obtain higher education.

The lack of development in the command area can be attributed to the low level of education, which also affects all other aspects of life, thus shaping the area's socioeconomic profile. However, this situation can be rectified since economic uplift has a significant impact on the ability of people to educate their children. The construction of the Munda Dam may contribute to the economic uplift of the area, which in turn may enable the locals to provide education to their children.

#### 2.2.6 Economy

The main sources of income (in descending order) are: agriculture, labor (mostly unskilled), remittances of migrant workers, animal husbandry, government jobs, small businesses, mining, and small cottage industry.

Of the 70 settlements surveyed, 68 have access to electricity, and 93 percent of all households in the command area are electrified. However, the issue of billing for electricity consumption is a thorny one in tribal areas. Traditionally, consumers pay a flat rate regardless of the actual consumption level. This seems to have resulted in quite a lot of wasteful misuse. Setting up (small) industries that are energy intensive is financially beneficial. Recently, the government has been attempting to rationalize electricity billing in tribal areas, but no decision has been made so far.

#### 2.2.7 Agriculture

As in other tribal areas, there are no written records of landholdings. Ownership of land is based on tradition and local knowledge of possessions. There

are numerous instances of owners who live in one settlement but have land in areas outside it. This informal demarcation and ownership method raises a host of problems for surveying.

Farming is the main economic activity but the arable land resource base is extremely small; roughly 5-8 percent of the total land in the command area is used for farming. There is very little agricultural activity in the dam and reservoir area, and probably less than 1 percent of the total land is used for farming. Land holdings are fragmented and self-cultivation is the dominant mode of farm management. Lack of irrigation is a major problem and much of the agricultural activity is just enough for subsistence.

The area's main crops, in order of importance, are wheat, maize, barley, sugarcane, and tobacco. The cropping patterns are slowly undergoing a change towards cultivation of high value crops.

Vegetables, onions and tomatoes are harvested quite abundantly in the command area and are an important source of income for the farmers. They are being marketed in the nearby towns and cities.

There are a few fruit orchards in the area, but the fruit crops do not contribute much to the farmer's income. Fruits grown in the command area include melons, watermelons, dates, oranges/citrus, guavas, and mangoes.

Tubewells, springs, channels, and lift systems are currently being used to irrigate crops, fruit orchards and vegetables. Most of the irrigation systems have been constructed and are maintained by the farmers. These efforts indicate their capacity to work hard under difficult circumstances.

The distribution of land holdings in the command area is given in Exhibit 2.5 below.

As is evident from Exhibit 2.5, about 50 percent people do not own any land. Most of the landless people work for daily wages on farms owned by other people. Of the people who do have land, the majority (41.8 percent) have holdings of only up to five acres. In rainfed areas such as these, such small land holdings can only provide subsistence outputs.

The dam is likely to have a significant positive impact on the agricultural productivity of the command area. However, as irrigation increases the productive value of land, conflicts regarding land ownership and use may also rise.

### 2.2.8 Labour and Remittances

Most of the labor in the study area is unskilled or semi-skilled, as the local economy can only absorb such workers. Such workers are all men and work for daily wages. The skilled labor and the few trained professionals are forced to migrate to other cities

and/or to the Middle East. Nevertheless, the migrant workers maintain very close links with their households and remit or invest a major portion of their earnings in the community to which they belong.

### 2.2.9 Animal Husbandry

Like all rural communities in Pakistan, animal husbandry is an integral part of the study area's economy. Domestic animals are a source of food and income, and are present in almost every household.

Given the aridity of the area, goats and sheep are easier to raise and graze. Most of the grazing land is in the communal areas surrounding the settlements, and young boys and girls take the livestock out for grazing during the day. Livestock is generally grazed close to settlements, so that it can be taken out and brought back within the same day. The meat and milk from the goats and sheep is consumed at home as well as sold in the larger settlements and/or neighboring towns and cities. Households in the command area owned approximately 48,032 goats, 21,540 sheep, 37,129 cows and oxen, 4,201 water buffaloes, 3,902 donkeys and mules, and 406 horses at the time of the survey.

The grazing patterns of large ruminants are similar to those of goats and sheep. Again, as in the case of goats and sheep, cattle are both a source of food and income (through the sale of milk and beef).

Draught animals such as donkeys, mules and horses are used in farming, transportation of goods and people, and in construction activities. Cattle dung is used as fuel and as fertilizer.

There are a total of 29 poultry farms in the command area. The chickens raised in these farms are mostly sold in the markets of neighboring towns and cities.

There are three veterinary facilities and one (veterinary) dispensary in the command area. These facilities are located in the villages Palai (Nusrat Zai) (in Tangi, Charsadda); Palai Barozai (Paloojor) (in Pranghaar, Mohnand Agency); and Gharib Abad (in Dargai, Malakand Agency). The veterinary dispensary is in Usmani Khel Garhi (in Dargai), which is the most populous village in the command area.

### 2.2.10 Government Jobs

Since the educational level of the people in the area is low, people working for government agencies are not very highly paid. However, a few families are highly educated and socially well placed, and some of their members have held or currently hold important positions in various government departments. Most such people are posted outside the study area.

### 2.2.11 Mining

Initially, because of clearance problems, geological studies of the study area were conducted on a small scale, and generally under cover of some other work. The study area seems to be quite rich in mineral resources, which are being exploited on a small scale by locals.

Below is a résumé of the area's mineral potential.

#### **Decorative Stones**

Large deposits of decorative stones such as marble and dolomite are found throughout the study area. The marble obtained from these deposits is of various shades and qualities. These stones are cut and polished and then used in construction. However, since mining techniques in the area are quite primitive, there is a lot of wastage.

#### **Dolomite**

Dolomite is used in the steel industry, in chip making and in marble units. Some of the large deposits of dolomite lie close to the main roads and are thus accessible. Unfortunately, these deposits are being damaged because of blasting techniques used to mine them.

#### **Chromite**

Found sporadically, chromite is an important ferro-alloy mineral that is both used locally and exported. This valuable natural resource is also not being properly exploited, and very primitive mining techniques are being employed.

#### **Precious stones**

Emerald is the main precious stone found in this area. The local people mine emeralds by blasting the deposits. The quality/grade of these emeralds is similar to those found in Panjshir (Afghanistan) and Mingora, Swat.

#### **Asbestos**

This is a useful industrial mineral used in the manufacture of heater and cooker plates, fireproof and heat resistant materials, and asbestos sheets. The local people mine asbestos for use in the incipient local small industry and, more importantly, to export it to Punjab.

Asbestos is being mined without proper health protection measures. This is dangerous because mining asbestos can prove cancerous unless protective measures are in place.

#### **Soapstone**

This is being mined in the village Amir Khan Koroonia in Tehsil Yakaghund of the Mohmand

Agency. It is exported to other parts of the country for use in the production of cosmetics such as talcum powder.

### 2.2.12 Small Industry

There is a small cottage industry spread over the area, largely focused on the indigenous mineral resources of the area. Most of it is owned and run by local entrepreneurs and labor.

There are 11 marble and stone cutting, and chip and chip powder production units in the command area. However, the machinery required for polishing marble is of low quality.

There are three units that produce heater plates and one that produces brake linings for vehicles. Locally mined asbestos is used in the production of these goods.

Usmani Khel Garhi has five agro-industrial units: one each of flour and oil, and three sugar cane crushing units that produce raw sugar.

### 2.2.13 Markets and Retail Shops

Most of the settlements have general retail shops where daily-use household goods are available. The number and kinds of shops in the settlements depends on the people and the demand in that area. Larger settlements have a greater number and variety of shops.

Three settlements in the Malakand Agency have 'melas' (open markets) where cattle is bought and sold. The *mela* is a traditional trade institution of the rural Pakhtoon areas. It is a hub of economic activity and takes place at regular intervals, usually on a designated day every week.

Markets for wholesale items are located in the three tehsil headquarters, Dargai, Yakaghund and Tangi. These markets sell non-perishable items like sugar and cooking oils at a wholesale level. In order to purchase sophisticated industrial goods, people have to travel to Mardan or to Peshawar.

### 2.2.14 Communications

Most settlements in the dam and reservoir area can only be accessed after walking for at least a couple of kilometers from the nearest road. The dam and reservoir area can be accessed from three directions. A road runs towards the dam site from the Munda Barrage, a track runs into the reservoir area from the village of Kot, and the tail end of the reservoir can be accessed from the town of Batkhela. Most of the settlements in the command area are accessible by roads. However, less than 50 percent (33 of 70) have metalled ('pucca') roads, while over 50 percent (36) have dirt ('kutcha') roads. The primary means of transportation for people and small goods in the area

is the Datsun pick-up, which is suitable for the rugged, hilly and rough terrain.

There are only two post offices located in the command area. One at Kharki, Malakand Agency, and one at Bahi Koroona, Mohmand Agency. Most people have to travel long distances to use these facilities. The average distance of the nearest post office from the settlements is 4.5 km.

The command area has a total of 12 public call offices (PCOs), mainly located in the larger settlements. Again there is a lack of PCOs and the average distance of the nearest PCO from the settlements is 4.6 km.

From a total of 19,454 households, 9,844 (50.6 percent) own television sets. Given the backwardness of the area, this is a high proportion and indicates some modernization through the electronic medium. Only eight of the 70 settlements receive newspapers.

#### 2.2.15 Health

The health facilities in the area are inadequate both in terms of infrastructure and personnel. Consequently, most people are compelled to travel to Mardan or to Peshawar for health services. Because of the traditions and customs in the area, women's health is not a high priority.

The major health problems in the area are malaria, kidney problems, coughs, colds and fever.

An overview of the Basic Health Units, doctors and other health facilities in the command area is given in Exhibit 2.6.

#### 2.2.16 Potable Water

The quality of drinking water is high. However, mostly, it has to be drawn from the ground.

Potable water is obtained through public wells in the area, which number about 3045, including 116 tube wells. There are 4,448 electric and 747 diesel pumps operating in the command area.

There are also natural springs in 21 settlements, which are used as supplemental water sources.

Water supply schemes are present in 11 of the 70 (15.7 percent) settlements. A total of 5,945 households in the area (30.56 percent) have water supply scheme connections.

#### 2.2.17 Drainage

The drainage system in most of the settlements is primitive. There is only one town in the command area, Kharki, in the Malakand Agency, with a population of 11,000, which has a cemented drainage

system. While 59 settlements have mud drains, 10 do not have any drainage system at all.

Because of the poor drainage arrangements, drainage and sewage water flows and accumulates in the streets and alleys of most of the settlements. These pools of stagnant water cause pollution and act as breeding grounds for pests such as mosquitoes and flies. The high incidence of malaria in the command area can probably be attributed to the faulty drainage systems.

### 2.3 The Dam and Reservoir Area

This section describes characteristics of the dam and reservoir area that distinguish them from the command area.

A study conducted by WAPDA identified 15 settlements in the Munda Dam reservoir area. In addition, during the surveys conducted for this study, the settlement Serikh Banda was identified, which is believed to fall in the reservoir area, but which is not mentioned in the WAPDA report. A sample of 7 settlements out of the 16 identified was surveyed for this study (Appendix B).

The total population of all the affected settlements, obtained by combining data collected for this study and data from the WAPDA study, is 926 (excluding the population of Patai Banda which, due to its proximity to the command area, was included in that sample). The population of the settlements surveyed for this study is 753; in other words, 81.4 percent of the total population was covered. Of the 753 people in the surveyed settlements, only 93 (12.3 percent) were women. In the command area, the male:female ratio was found to be 52.4:47.6.

This striking difference indicates the different nature of settlements in the reservoir area. Most of them are temporary dwellings that are occupied only when livestock is taken there for grazing during summer months. Most of the people surveyed were found to have permanent dwellings elsewhere, mostly in other parts of Mohmand Agency. It is therefore quite likely that these people are being counted twice, once in the command area and once in the reservoir area.

The average household size in the reservoir area was found to be 17.11, which is significantly greater than that in the command area.

According to information from a senior WAPDA official, all settlements in the reservoir area are temporary, but are being shown as permanent for compensation purposes only.

The salient socioeconomic features of the reservoir area are as follows:

- > There are no individual landholdings.
- > There is no school.

- > There are no health facilities.
- > None of the settlements is electrified.
- > Drinking water is obtained from wells.

From the above profile it is clear that these settlements cannot be considered permanent abodes, and the construction of the dam will not entail any real relocation from the reservoir area.

The only economic activity is livestock grazing, which only takes place during summer months. Land in the reservoir area is communal, and grazing rights are established through tribal traditions. The construction of Munda Dam will inundate some areas used for grazing, but it is believed that the losses will not be significant, as other areas are likely to be identified and utilized without much difficulty.

### 3. Socioeconomic Impacts

#### 3.1 The Dam and Reservoir Area – Involuntary Resettlement and Compensation

The 16 villages surveyed contained 196 households and had a population of approximately 926 people. They will be directly affected by the dam and reservoir. It is presently believed that most of these settlements are temporary, and therefore much resettlement will not be required. However, if any households do need to be compensated and resettled, the compensation and resettlement program should follow donor guidelines such as those of the World Bank and the Asian Development Bank. Such guidelines are quite comprehensive.

The basic requirement of any resettlement program is that, after resettlement, members of resettled households should be able to maintain a standard of living that is at least as good, but preferably better, than what they enjoyed previously. In order to achieve this, a comprehensive resettlement action plan needs to be prepared, which takes into account issues such as the valuation of land and built property, a compensation and resettlement schedule, and a resettlement monitoring program.

The project will affect the way resettled people live, since it may not be possible for them to continue with their existing lifestyles and income generating activities in the resettlement reception areas. For instance, it may not be possible for people to take their livestock with them due to lack of grazing areas. All decisions regarding how people are to be compensated, and where they will be resettled, must be made in close consultation with the people.

For the Munda Dam Multipurpose Project, the resettlement action plan is being prepared by

WAPDA, and comprehensive field surveys have already been conducted. Since involuntary resettlement has traditionally been controversial, both in Pakistan and elsewhere, it would be essential for the project donor to closely monitor the resettlement program, ensuring that it is carried out to the satisfaction of all interest groups.

#### 3.2 The Command Area

Once completed, the Munda Dam project is expected to encourage economic activity in the area. Greater availability of electricity is likely to give a boost to the mining and cottage industries and commerce, and to help in modernizing agricultural and household activities. The greatest impact is likely to be on agriculture due to the availability of irrigation water. Demand for livestock, dairy products, and poultry is also expected to increase. These factors will convert the study area, currently a semi-wilderness, to a thriving area of economic activity.

However, the project is expected to have certain negative impacts also. These negative impacts can be either short or long term. The short-term impacts will prevail during the construction phase of the dam, while the long term will continue after the completion of the project.

##### 3.2.1 Short-term Positive Impacts

Construction of the dam will lead to increased demand for local resources and provide employment opportunities in the area.

People who provide local materials and resources will receive cash compensation. This is likely to affect the consumption patterns of the beneficiaries, which in turn will have a positive spillover effect on the local economy.

The construction activities will also provide employment to the local people. Most jobs given to them will be unskilled labor jobs, which will only last during project construction. Once the project enters the operation phase, very few workers will be required.

Generation of local employment will have a positive impact in two ways: one, through the increased consumption capacities of the workers, which will raise the demand for local goods and services; and secondly, through reduction in emigration, which is a significant problem at present.

Roads will be built for the movement of construction machinery and vehicles, and this will facilitate the development of the local infrastructure.

##### 3.2.2 Long-term Positive Impacts

The most important impact will be an improvement in the agricultural productivity of the command area



because of the provision of irrigation water. The local people have always been involved in farming and agricultural activities. Currently, wherever water is available for cropping, people have developed fairly thriving farms and orchards. And, in many cases, land that was quite rugged has been leveled and made cultivable. The major hurdle in the agricultural development of the area is the lack of regular supply of irrigation water. Once this becomes available, there are very good indications that the local people will be able to improve their socioeconomic conditions.

Electricity generated by the Munda Dam will boost local mining and the affiliated small industries.

Floods in the Swat River have caused some destruction in the surrounding areas, though these incidents have been few and far between. The Munda dam will eliminate chances of flooding.

In this manner, the Munda dam will effect overall economic and social development in the area in the long run. It is expected that there will be a qualitative improvement in such services as education and health.

### 3.2.3 Short-term Negative Impacts

Since there is no permanent human settlement close to the proposed dam site, there will be no need for relocation. However, people will need to be compensated for their temporary shelters and any land that is inundated. There is also a shrine ('ziarat') nearby and arrangements will have to be made to ensure that it does not get damaged during the construction period. There are also four households downstream of the proposed dam that will have to be relocated after the dam has been completed and the spillway comes into operation.

The construction activities will necessarily mean a concentration of workers around the building site. This could have a negative impact on the nearby local communities. Villages closest to the dam site are quite small and the infusion of even a small number of outsiders is likely to have negative impacts, especially on female mobility.

The use of blasting and chemicals for construction purposes could adversely affect the local ecology. To minimize any negative impacts, care should be exercised in the storage and use of such materials, and in the manner and scheduling of blasting activities.

The excavated materials can become a problem. Plans for the appropriate and safe disposal of such materials should be in place before construction commences, or the fragile local ecology could suffer.

### 3.2.4 Long-term Negative Impacts

The biggest long-term problem will be the issue of rights to use irrigation waters, and the ownership and use of land. The provision of irrigation water will inevitably raise the value of the land and the possibility of land grabbing is high.

Currently, about 50 percent of the local people do not own any land, and the land-owners have small holdings. With the increase in the productive value of the land, the more affluent landlords, many from the nearby settled areas, are likely to buy out smaller landowners. While the overall income of the area is bound to increase, unless appropriate steps are taken, the poor may continue to remain poor and the benefits will accrue to the already well-off who have, or will obtain, ownership of the land. The increase in the productive value of the land may not automatically benefit the poor and may lead to further marginalization if the small landholders are bought out, which is a likely scenario. Thus, although the dam will, on the whole, bring substantial benefits to the area, measures must be taken to ensure that they are well-distributed among the local people, and that there is proper ownership and use of land.

Already there seem to be such moves in collusion with the provincial authorities. Recently, a notification was issued by the Governor's office, which stated that 44 villages of the Mohmand Agency would be made part of the settled area. Some of these villages fall in the command area. The government justifies its actions by claiming that criminals hide in the villages, and that in the past this area was settled, and not tribal. Some landlords from Charsadda also claim that they are the original owners of land in the study area. These claims have generated a lot of conflicts and are being contested by the local people. The local people, including women and children, have been demonstrating on this issue and blocking roads on a fairly regular basis. The feeling of resistance can be gauged from the fact that women are being allowed to appear in public in such a traditional area.

The administration, the police, and the Frontier Constabulary have taken a number of aggressive steps to subdue this resistance. As a result several people, including women, have been injured and/or arrested. This conflict is becoming more complicated by the day and is being reported almost daily in the print media.

The electricity the dam will generate is also likely to further distort the dynamics of socioeconomic power in the area. Based on past experience, it can be assumed that the electricity generated will be WAPDA's, and will become part of the national grid. The Mohmand tribes have already made a claim on the royalties from the Warsak dam, which is located in Mohmand Agency. A conflict of interests is likely

to emerge between the local people and the government over the Munda Dam electricity.

The Mohmands feel that the state and government exploit local resources for the benefit of non-locals. If WAPDA takes over the electricity generated by the dam, this view will be strengthened. It is not possible to predict what may ensue after that. However, it is important that this issue be deliberated upon and resolved so as to minimize its long-term negative impacts.

The generation and greater availability of electricity will make the establishment of mining and associated industries a profitable business. Again, however, there is a strong possibility that the already rich will derive most of the benefits.

Almost everything mentioned about land ownership and use can be applied to the use of irrigation water also. The government line departments (of land revenue, irrigation, and WAPDA) are likely to be the controlling authorities regarding the use of water, ownership of land and its produce, and electricity revenues. This increases the danger that government officials will collude with the rich landlords in exploiting the poor. Broadly, this is a problem of improper governance and distribution of income.

The building of the dam is likely to result in the import of governance mechanisms operative in the settled areas, and all the associated problems. As mentioned earlier, there are currently two parallel systems of administration and justice operating in the study area. One is the government controlled tribal administration system under the Political Agent. This system is opaque, undemocratic, and based on patronage. It is colonial in nature and fosters social fracturing and non-egalitarianism. The second is the traditional *jirga* system, which is more community based and egalitarian. Although this system also has its problems, it is more familiar to and acceptable by the locals.

There have been many cases of tension and conflicts between the Political Agent's office and the community. These have mostly had unfortunate consequences and the people who suffer the most are the poor. When the government's line departments start operating here, the situation will grow worse.

## 4. Recommendations

### 4.1 Compensation and Involuntary Resettlement

The resettlement action plan (RAP) is being prepared by WAPDA. This section offers some recommendations regarding compensation and resettlement issues.

The World Bank's Operational Directive (OD) 4.30 on Involuntary Resettlement has become an internationally recognized basis for resettlement and compensations policies, and should be followed by WAPDA while preparing the RAP, and while implementing the compensation and resettlement program. The main elements of OD 4.30 are as follows:

1. Involuntary resettlement is an integral part of project design, to be addressed from the earliest stages of project preparation;
2. Involuntary resettlement is invariably disruptive, and often impoverishing, and should be avoided or minimized wherever feasible, by exploring all viable alternative project designs;
3. Where it is unavoidable, resettlement should be conceived, developed, and executed as a development program, with resettlers provided with sufficient investment resources and opportunities to share in project benefits;
4. Persons to be displaced should have their former living standards and income earning capacity improved, or at least restored, and should be provided with adequate support during the transition period;
5. Community participation in the planning and implementation of resettlement should be encouraged and facilitated;
6. Land, housing, infrastructure, and compensation for all other losses of assets and of sources of livelihood should be provided to the adversely affected population;
7. Compensation should be paid for the loss of land and material assets, and also for the loss of income-earning opportunities to those who do not own the means of production;
8. The compensation process should be fully transparent.

### 4.2 Dialogue with the Local Community

All foreseeable impacts and proposed mitigation measures regarding water, land and socioeconomic costs and benefits of the project will need to be clearly discussed with community representatives, especially with the people who will be affected by the project.

These discussions must ensure that everyone is given a chance to voice their views. The poor and the marginalized (especially women) must especially be represented. There is a risk that the traditional wielders of power and privilege will try to perpetuate the status quo by excluding most of the local people from the dialogue.

The areas that need to be resolved in these discussions are:

- The costs and compensations for the land on which the dam is to be constructed. Whatever the extent of compensations necessary, these discussions will require the participation and agreement of both the project sponsors and the community.
  - The rules and laws regarding the ownership of land, agricultural revenues, and water use. These are complex issues that will require sensitive handling, and openness on the part of government authorities and other key actors to facilitate and provide opportunities for developing alternative, more just systems.
  - The rights over the incomes from the electricity generated. As revenues from electricity do not generally directly benefit the local population, the issue will have to be handled carefully. Fair compensation and a development program for the area would help mitigate the problem.
  - Employment. As far as possible, employment should be provided to locals and the recruitment of outside workers minimized.
  - Movement of construction personnel during project construction and operation. This may lead to tension between the local people and the outsiders. The contractors/employers will need to brief and monitor their workers about the required behavior and movement in the area, especially with regard to interaction with local women.
  - Potentially harmful construction activities. Care will need to be exercised in the storage and use of chemicals and toxic materials, and the timing of blasting activities. Consultations with the locals could greatly minimize the negative impacts of such activities.
- Legal advisory services should be available to the local people to advise and guide them in their negotiations.
  - Community groups should be formed that can enter into dialogues with the relevant authorities and the project sponsors. The kind and number of groups to be formed needs to be carefully thought through and decided beforehand in close consultation with all the significant participants (locals, political authorities, line departments, project sponsors, WAPDA).
  - Whatever the number and kinds of groups formed, there must be separate groups for men and women. Otherwise the chances of women being excluded from the consultation process are high.
  - Checks should be set in place to prevent market forces from facilitating the emergence of large land holdings at the cost of dispossession of the small farmer.
  - Systems and processes for such matters as compensation and user-rights need to be established in such a manner that the rights and obligations are clear and acceptable to all parties, especially the local people.

### 4.3 Recommendations

Listed below are recommendations for WAPDA, or any NGOs that get involved in community aspects of the project, concerning the rights and entitlement of the local communities to the project's outputs and benefits.

- The representation system should be rationalized so that all affected people are included.

**Exhibit 2.1: Primary Demographic Data**

Male	Population		Households	
	Female	Kacha	Pakka	
74,995 (52.4%)	68,035 (47.6%)	15,234 (78%)	4,220 (22%)	
Total: 143,030			Total: 19,454	

**Exhibit 2.2: Household Clusters across Settlements**

Size	100 and below	101-500	501-1000	1001 and above
Number of Clusters	42	19	5	4

**Exhibit 2.3: Population Clusters across Settlements**

Size	50-500	501-1000	1001-5000	5001 and above
Number of Clusters	30	16	16	08

**Exhibit 2.4: Government Schools in the Command Area**

	Primary		Middle		High	
	F	NF	F	NF	F	NF
Boys	67	2	14	0	8	0
Girls	45	4	8	2	1	0
<b>Total</b>	<b>112</b>	<b>6</b>	<b>22</b>	<b>2</b>	<b>9</b>	<b>0</b>

F = Functional schools  
NF = Non-functional schools

**Exhibit 2.5: Distribution of Land Holdings in the Command Area**

	No Land	Up to 1 Acre	1-5 Acres	6-20 Acres	Over 20 Acres
Number of Households	9,104 (46.82%)	5,408 (27.8%)	3,561 (18.3%)	956 (4.9%)	415 (2.13%)

**Exhibit 2.6: Health Facilities in the Study Area**

<b>Infrastructure</b>	
BHUs	10
Family Planning Centers	05
Dispensaries	01
Medicine Shcps (Retail)	28
<b>Personnel</b>	
Male Doctors	10
Allied Health Personnel, Male	64
Female Doctors	04
Allied Health Personnel, Female	23 (including 8 LHVs)

**Exhibit 3.1: Settlements close to or within the Dam and Reservoir Area**

Settlement	Households	Population	Settlement	Households	Population
Patti Banda	17	169	Gurkal Banda	18	91
Todobo Banda	49	123	Jorgah Banda	12	66
Dam Site	19	100	Shah Mad Khan Banda	4	21
Chak Mandi	8	24	Narai Banda	3	8
Bara Patti	3	16	Dorod Banda	11	27
Palosai Banda	35	294	Sandak Patti	6	21
Bara Pakosai Banda	6	0	Khajural Khula	3	22
Zaray Gudar	2	8	<b>Total</b>	<b>196</b>	<b>990</b>

## Appendix A: Command Area Data

Exhibit A.1: Population and Households of Villages/Settlements

S. No.	Name of Village/Settlement	Tehsil	Agency/Distt	Total Population	Male	Female	No. of Households	Kuccha	Pucca
1	Mardand	Tangi	Charsadda	600	280	320	100	100	-
2	Oilla (Palai)	Tangi	Charsadda	750	400	350	110	110	-
3	Palai (Nasrat Zai)	Tangi	Charsadda	1050	450	600	300	297	3
4	Palai Barozai (Paloojor)	Prangghar	Mohmand	975	575	400	70	64	6
5	Palai Barozai	Prangghar	Mohmand	625	300	325	55	50	5
6	Nasapai/Asghar	Prangghar	Mohmand	500	300	200	30	29	1
7	Dewo Dehri	Prangghar	Mohmand	600	350	250	120	120	-
8	Spinkay Salay	Prangghar	Mohmand	600	300	300	60	60	-
9	Neve Kallai	Prangghar	Mohmand	2200	1320	880	220	210	10
10	Buchai (Koorona)	Prangghar	Mohmand	1500	800	700	100	100	-
11	Nao Kallay	Prangghar	Mohmand	500	250	250	80	79	1
12	Nari Kallay	Prangghar	Mohmand	600	350	250	40	40	-
13	Asghar	Prangghar	Mohmand	1700	950	750	150	150	-
14	Zarifo Baba (Iro Shah)	Dargai	Malakand	500	270	230	55	40	15
15	Degar (Haryan Kot)	Dargai	Malakand	600	350	250	150	140	10
16	Zhoor Aero Shah	Dargai	Malakand	3900	1900	2000	280	275	5
17	Qaldara	Dargai	Malakand	14000	7000	7000	2000	1000	1000
18	Salgaro	Dargai	Malakand	700	300	400	55	25	30
19	Rustam (Mian) Kallay	Dargai	Malakand	12000	6000	6000	1250	650	600
20	Gharib Abad	Dargai	Malakand	800	300	500	80	40	40
21	Kharki	Dargai	Malakand	11000	6000	5000	3000	1000	2000
22	Amir Akbar Shah Kallay	Dargai	Malakand	600	300	300	50	46	4
23	Hero Shah Banda	Dargai	Malakand	160	80	80	50	45	5
24	Usmani Khel Ghari	Dargai	Malakand	18000	9000	9000	2100	1900	200
25	Saroo Shaheed	Prangghar	Mohmand	250	140	110	25	25	-
26	Dando Karido	Prangghar	Mohmand	280	150	130	30	30	-
27	Triaki	Prangghar	Mohmand	100	60	40	15	15	-
28	Bakro Dehri	Prangghar	Mohmand	450	250	200	50	50	-
29	Patas Salay	Prangghar	Mohmand	200	120	80	25	25	-
30	Chandan Dehri	Prangghar	Mohmand	300	180	120	25	24	1
31	Landai Shah	Tangi	Charsadda	1000	500	500	120	110	10
32	Kero Shah	Tangi	Charsadda	200	110	90	16	16	-
33	Landi Rod	Tangi	Charsadda	100	45	55	10	10	-
34	Behram Dehri	Tangi	Charsadda	700	350	350	80	80	-
35	Degar Raj (Raj)	Dargai	Malakand	600	350	250	140	130	10
36	Shakar Tangi	Dargai	Malakand	80	55	25	12	12	-
37	Uch Tangai	Dargai	Malakand	80	50	30	20	20	-
38	Zara Mina	Dargai	Malakand	300	240	60	50	25	25
39	Sab Khan Kor	Pandyale	Mohmand	150	100	50	12	12	-
40	Sado Brig	Pandyale	Mohmand	250	180	70	17	17	-
41	Dag Kallay	Pandyale	Mohmand	8000	4500	3500	1000	1000	-
42	Saroo Kallay	Yaka Ghund	Mohmand	2000	1000	1000	80	20	60
43	Refugee Camp	Yaka Ghund	Mohmand	2500	1300	1200	400	400	-
44	Arabistan Kallay	Yaka Ghund	Mohmand	500	200	300	25	25	-
45	Darvaz Gai	Yaka Ghund	Mohmand	300	180	120	60	44	16
46	Mateen Kor	Yaka Ghund	Mohmand	250	130	120	60	57	3
47	Shna Ghundai	Yaka Ghund	Mohmand	4500	2000	2500	350	340	10
48	Petaoo Kallay	Yaka Ghund	Mohmand	150	75	75	10	8	2
49	Saleh Kor	Yaka Ghund	Mohmand	200	80	120	25	24	1
50	Musal Kor	Yaka Ghund	Mohmand	1000	600	400	300	296	4
51	Khawadak Kor	Yaka Ghund	Mohmand	200	75	125	30	28	2
52	Shah Alam	Yaka Ghund	Mohmand	100	60	40	20	16	4
53	Bangloo	Yaka Ghund	Mohmand	3500	1750	1750	260	258	2
54	Bahi Korona	Yaka Ghund	Mohmand	2400	1200	1200	1000	999	1
55	Khadoo Korona	Yaka Ghund	Mohmand	1500	800	700	100	75	25
56	Shaheed Banda	Yaka Ghund	Mohmand	6000	3500	2500	300	300	-
57	Aqbar Dag	Yaka Ghund	Mohmand	8000	5000	3000	1000	996	4
58	Mian Pattay	Yaka Ghund	Mohmand	300	160	140	50	50	-
59	Salgaro Kallay	Yaka Ghund	Mohmand	5000	2700	2300	220	170	50
60	Kachkool Korona	Yaka Ghund	Mohmand	120	70	50	22	21	1
61	Amir Khan Korona	Yaka Ghund	Mohmand	1580	900	680	180	180	-
62	Mian Patai	Yaka Ghund	Mohmand	200	100	100	50	50	-
63	Karapa	Yaka Ghund	Mohmand	180	80	100	30	30	-
64	Patal Banda	Yaka Ghund	Mohmand	200	80	120	20	20	-
65	Shar Makhno Dnd	Yaka Ghund	Mohmand	550	250	300	40	40	-
66	Khawaja Was Korona	Yaka Ghund	Mohmand	6000	3000	3000	1000	980	20
67	Sroo Kallay	Yaka Ghund	Mohmand	600	300	300	120	116	4
68	Daryab Korona	Yaka Ghund	Mohmand	3500	2000	1500	700	690	10
69	Aranda	Yaka Ghund	Mohmand	1200	400	800	500	490	10
70	Sama Nath	Yaka Ghund	Mohmand	3000	1500	1500	350	340	10
	<b>Grand Total</b>			<b>143030</b>	<b>74995</b>	<b>68035</b>	<b>19454</b>	<b>15234</b>	<b>4220</b>

Exhibit A.2: Sources of Income and Land Holdings

S. No.	Name of Village/ Settlement	Sources of Income					Land Holding by No. of Families				
		Agri.	Labor	Govt. Job	Business	Remitt	Landless	Upto 1 Acre	1-5 Acre	6-20 Acres	Above 20 Acres
1.	Mardand	✓	✓	✓	-	-	10	10	40	35	5
2.	Qilla (Palai)	✓	✓	✓	✓	✓	40	15	20	25	10
3.	Palai (Nasrat Zai)	✓	✓	✓	-	-	250	10	22	6	2
4.	Palai Barozai (Paloojor)	✓	✓	-	-	-	10	-	-	-	60
5.	Palai Barozai	✓	✓	✓	-	✓	10	20	15	5	5
6.	Nasapai/Asghar	✓	✓	-	-	-	-	-	-	18	12
7.	Dewo Dehri	✓	✓	-	-	✓	45	20	35	15	5
8.	Spinkay Salay	✓	✓	✓	-	-	-	60	-	-	-
9.	Neve Kallai	✓	✓	✓	✓	✓	75	25	65	35	20
10.	Buchai (Koorona)	✓	✓	-	-	-	-	15	30	25	30
11.	Nao Kallay	✓	✓	-	-	-	-	-	10	30	40
12.	Nari Kallay	✓	✓	-	-	-	-	-	10	15	15
13.	Asghar	✓	✓	-	-	-	30	10	20	25	65
14.	Zarifo Baba (Iro Shah)	✓	✓	✓	-	-	10	2	16	25	3
15.	Degar (Haryan Kol)	✓	✓	-	-	-	100	25	11	8	6
16.	Zhoor Aero Shah	✓	✓	✓	-	✓	200	75	5	-	-
17.	Qadara	✓	✓	✓	✓	✓	900	600	600	-	-
18.	Salgaro	✓	✓	-	-	-	40	-	10	5	-
19.	Rustam (Mian) Kallay	✓	✓	-	-	✓	1050	100	60	40	10
20.	Gharib Abad	-	✓	-	-	-	80	-	-	-	-
21.	Kharki	✓	✓	✓	✓	-	2000	700	292	8	-
22.	Amir Akbar Shah Kallay	✓	✓	✓	-	✓	8	20	20	2	-
23.	Hero Shah Banda	✓	✓	✓	-	✓	25	20	5	-	-
24.	Usmari Khel Ghari	✓	✓	✓	✓	✓	500	800	400	350	50
25.	Saroo Shaheed	✓	✓	✓	-	-	3	-	18	4	-
26.	Dando Kando	✓	✓	✓	✓	✓	12	5	-	13	-
27.	Traki	✓	✓	✓	-	-	-	-	-	15	-
28.	Bakro Dehri	✓	✓	✓	-	-	-	25	20	5	-
29.	Palas Salay	✓	✓	✓	-	✓	-	-	10	15	-
30.	Chandan Dehri	✓	✓	✓	-	✓	-	-	10	15	-
31.	Landai Shah	✓	✓	✓	✓	✓	30	40	50	-	-
32.	Kero Shah	✓	✓	-	-	✓	2	10	4	-	-
33.	Landi Rod	✓	✓	-	-	-	2	-	8	-	-
34.	Behram Dehri	✓	✓	✓	-	✓	20	26	30	4	-
35.	Degar Raj (Raj)	✓	✓	-	-	-	100	25	7	4	4
36.	Shakar Tangi	✓	✓	-	-	-	-	5	2	5	-
37.	Uch Tangai	✓	✓	-	-	-	10	2	8	-	-
38.	Zara Mina	✓	✓	-	-	-	20	10	10	10	-
39.	Sab Khan Kor	✓	✓	-	-	-	7	1	2	2	-
40.	Sado Brig	✓	✓	-	-	-	4	3	10	-	-
41.	Dag Kallay	✓	✓	✓	✓	✓	100	100	780	10	10
42.	Saroo Kallay	✓	✓	✓	-	✓	15	20	32	10	3
43.	Refugee Camp	-	-	-	-	-	400	-	-	-	-
44.	Arabistan Kallay	✓	✓	-	-	-	10	6	-	15	1
45.	Darwaz Gal	✓	✓	-	-	✓	-	25	8	5	2
46.	Mateen Kor	✓	✓	-	-	-	60	-	-	-	-
47.	Shna Ghundai	✓	✓	✓	-	✓	100	100	135	10	5
48.	Petaoo Kallay	✓	✓	✓	-	✓	1	5	3	1	-
49.	Saleh Kor	✓	✓	✓	-	✓	12	11	-	2	-
50.	Musal Kor	✓	✓	✓	-	-	140	60	90	2	1
51.	Khawadak Kor	-	-	-	✓	-	14	14	2	-	-
52.	Shah Alam	✓	✓	✓	✓	-	8	-	12	-	-
53.	Bangloo	✓	✓	-	-	-	110	50	50	50	-
54.	Bahi Korona	✓	✓	✓	-	✓	400	300	300	-	-
55.	Khadoo Korona	✓	✓	-	-	✓	40	30	30	-	-
56.	Shaheed Banda	✓	✓	-	-	✓	25	200	20	16	39
57.	Aqbar Dag	✓	✓	-	-	-	300	480	200	20	-
58.	Mian Pattay	✓	✓	✓	-	✓	-	50	-	-	-
59.	Salgaro Kallay	✓	✓	✓	-	✓	120	80	20	-	-
60.	Kachkool Korona	✓	✓	✓	-	✓	8	8	6	-	-
61.	Amir Khan Korona	✓	✓	-	-	-	-	180	-	-	-
62.	Mian Palai	✓	✓	✓	-	-	20	10	20	-	-
63.	Karapa	✓	✓	-	-	-	-	15	10	5	-
64.	Patal Banda	✓	✓	-	-	-	8	5	7	-	-
65.	Shar Makhno Dnd	✓	✓	✓	✓	-	40	-	-	-	-
66.	Khawaja Was Korona	✓	✓	✓	-	✓	300	700	-	-	-
67.	Sroo Kallay	✓	✓	✓	-	✓	75	25	20	5	-
68.	Daryab Korona	✓	✓	✓	-	✓	700	-	-	-	-
69.	Aranda	✓	✓	✓	-	✓	435	60	1	2	2
70.	Sama Naih	✓	✓	✓	✓	✓	50	200	50	40	10
	Grand Total						9104	5408	3561	956	415

## Appendix B: Dam and Reservoir Area Data

Exhibit B.1: Primary Data of Surveyed Settlements in the Reservoir Area

Name of Settlement	Population		Households		Livestock		
	Male	Female	Kacha	Pakka	Cow/Ox	Goat	Donkey
Todobo Banda	70	53	10	0	300	400	20
Dam Site	100	0	2	0	300	1000	10
Chak Mundai	24	0	1	0	200	600	6
Bara Patai/Kas Patai	16	0	1	0	300	600	10
Palosai Banda	300	0	8	0	300	50	8
Grookai Banda	90	0	10	0	300	700	6
Serikh Banda	60	40	12	0	300	100	100
<b>Total</b>	<b>660</b>	<b>93</b>	<b>44</b>	<b>0</b>	<b>2000</b>	<b>3450</b>	<b>160</b>

