SECTOR I

SOCIAL AND ENVIRONMENTAL ASPECT

VOLUME 3: SUPPORTING REPORT

SECTOR I: SOCIAL AND ENVIRONMENTAL ASPECT

TABLE OF CONTENTS

LIST OF TABLES IN REPORT

LIST OF FIGURES IN REPORT

LIST OF FIGURES AT THE BACK OF REPORT

SECTOR I SOCIAL AND ENVIRONMENTAL ASPECT

1. SOCIAL ASPECT

1.1 Land Use

The land use is defined as the way how the limited land can be used in the most effective manner for different purposes such as residential area, industrial one or public one etc. Hence the land use is usually named and divided with different categories by urban planners. There is a functional category, or administrative one. The categorization is the concept of urban designers/planners, or public development authorities. The government wants a harmonious urban development by defining some areas as more developed one and others as less developed one, based on the future projection of the population and economic activities.

In Pakistan the land use categorization is not regularized by certain laws or regulations, such as the Urban Planning Law. According to available publications related with the land use, different categories are in use. The land use category of Islamabad, which is shown in the table below, is different from that of Rawalpindi. In the "Master Plan of Islamabad 1960" the following categories are used:

Table R I. 1 Land Use Categories of Islamabad

No.	Land Use Category
1	Residential area
2	Civic-Commerce- Business
3	Administrative Center
4	Diplomatic Enclave
5	Whole sale
6	Light Industry - Workshop
7	Special institutions
8	Open space - Parks
9	Attached Departments

Source: Master Plan of Islamabad 1960

The categories referred to here are rather unique in reflecting the functions of the Capital City of a new-born country, or the Islamic Republic of Pakistan, for special categories such as diplomatic enclave or special institutions are included in the category.

On the other hand Rawalpindi TMA (Tehsil Municipal Authority, or former RMC=Rawalpindi Municipal Corporation) has a different categorization of the land use based on the "Rawalpindi Master Plan (1996-2016)." The categorization of Rawalpindi Cantonment Area was not available to JICA Study Team during the field surveys. The categorization for the urban area of TMA is as listed below:

Table R I. 2 Land Use Categories of Rawalpindi TMA

Category 1	Category 2	Category 3
Urban Area	Residential area	Houses and related access roads
	Commercial area	Shops an markets
	Institutional area	Public buildings and offices, schools
	Industrial area	Factories
	Utility area	Trunk roads, and railways
Non-urban Area	Agricultural area:	Farm lands, fields and others
	Vacant/bare land:	Uncultivated lands and empty lands
	Green land	Parks, plants and house vegetable farms
	Forest area:	Deep forests, hills and mountains

Source: Rawalpindi Master Plan (1996-2016)

According to the land use category, the land can be divided into different purposes and uses. It is essential that the division shall be so balanced for the residents to live and work in the area, as well as for the economic activities to develop in the same area. A well-balanced land use will contribute to improve both the social welfare of the residents and the dynamic economic development. In the past there are some cases where the urban development was hindered by some factors: a hazardous factory which is located in vicinity of the residential area has caused serous environmental problems in air and water, or the residential area might not be provided with a convenient traffic system to the work place.

In this context the land use is not necessarily static, but rather dynamic: it shall be developed and changed along with the regional development and new requirements emerging. As the population increases, more lands will be required to accommodate the increased population. The economic activities of the commerce and industry shall be also considered of more lands for economic activities. For the size of the given land for the city remains unchanged, the portion of the components shall be changed to adjust the land use for emerging new developments.

In this process some categories of lands shall be victimized or decreased such as agricultural, bare land or forests due to their relatively low productivity and /or increased population. The total area is fixed and needs to be utilized to the maximum extent. For a sustainable development of the area, the changes of the land use pattern shall be usually monitored for the smooth conversion of land use.

This is a development study aiming at flood mitigation for Lai Nullah and its tributaries, not a general urban planning. The flood mitigation relates to the run-off of the rainfalls, or stormrains. In this regard the land use pattern shall be modified to indicate different run-offs of the rainfalls, as follows:

(1) Agricultural area: to be used for agricultural purposes

(2) Residential area/densely populated: like the congested area in Rawalpindi

(3) Residential area/moderately populated: like the planned area in Islamabad

(4) Residential area/suburbs: like ones located in the suburbs, or village centers.

(5) Forest area: like forest in Margalla Hills

(6) Green area and bare land: located in the city

(7) Water body: rivers and lakes

Based on the first field survey, JICA Study Team recognized the difference between the residential area in Islamabad and that in Rawalpindi, though both are used with the same category of residential area according to the land use category. In Islamabad the residential area is well planned in a large area. On the other hand the residential area in Rawalpindi is highly congested and looks like to have been almost saturated. A clear difference can be recognized between the Twin Cities.

In Cantonment the residential area is relatively well-designed and developed for the residents to live comfortably. It shall be noticed that there are some encroachments in the planned residential area of Islamabad, but the influence of the run-off is negligible, for their areas are small and limited.

1.1.1 Islamabad

Islamabad is a new Capital City for Pakistan, which was finally decided in late 50's the Pakistani Government and commenced the construction in 1961 based on the Master Plan (1960). This M/P was prepared by a Greek consulting of Konstantinos Doxiadis. CDA (Capital Development Authority) is the executing agency for the new Capital. After two years of the construction start, Islamabad, with mobilization of the governmental staff, started its functions as the Capital in 1963. The construction itself is still on-going to develop mainly in the Western direction.

According to the Master Plan, a large area of Islamabad was divided into five zones, of which Zone 1 is designated as urban area. Some part of Zone 2 is also designated as urban area in the future. Zone 3 basically consists of the forest in the North and a national park in the South, including some residential areas in the vicinity with Zone 1. Zone 4 and 5 are sparsely populated and basically rural areas, as shown in Fig. I.1.

Accordingly, the urban area will be developed westwards up to C-16, namely from I-8 and H-8 to 16, G-6, F-6 to 16, E-7 to 16, D-10 to 16 and C-13 to 16. Now the development has been almost completed around E-11, F-11, G-9 and H-10. But there are some spots left vacant without any buildings, meaning that there are no concrete plans to development. CDA is to implement the areas according the demand from public and private sectors.

The area size of each Zone is given in the table below. The total area of 910.6 km^2 is more than tree times of the study area.

Table R I. 3 Zones of Islamabad

Zone	Area (acre)	Area (km^2)
1	54,958.26	222.4
2	9,804.92	39.7
3	50,393.01	203.9
4	69,814.35	282.5
5	39,029.46	158.0
Total	225,000.00	910.6

Source: Master Plan of Islamabad (1960)

1.1.2 Rawalpindi

In Rawalpindi area a mixed land use is predominant in the central areas of the city. There is no clear segregation of compatible land uses, which have not been related to overall transportation system, thereby creating congestion, chaotic traffic conditions, and hazardous environmental problems. The concentration of the commercial activities and its increasing growth have been causing complex problems, such as inadequate parking places, poor accessibility due to encroachments on roads/foot paths and presence of vendors/hawkers. The areas between the main streets, forming pockets, are filled with residential use. The present conditions are making difficult to find proper places for containers for solid wastes, and to construct/maintain drains and sewers.

Rawalpindi City is in a narrow sense defined as the jurisdiction area of RDA, which is sandwiched by those of CDA and RCB. The whole jurisdiction area of RDA and RCB could be also called as the same name of Rawalpindi. Moreover, the jurisdiction area of TMA, which is far larger than those of RDA and RCB, is again called as Rawalpindi. This kind of naming is common here, but causing some confusion even among the governmental officials along with the devolution started in August 2001.

The administrative boundaries of the areas of RDA, RCB and TMA are as shown in Fig. I.2. In this Study, the first definition is used in most cases, if otherwise defined.

1.1.3 Cantonment

The Cantonment is administratively forming a part of Rawalpindi and is called as “Rawalpindi Cantonment,” because there are many cantonments in Pakistan. Most of the administrational functions for this area are ruled and governed by the RCB (Rawalpindi Cantonment Board). The budget to the RCB comes directly from the federal government. The area is characterized not only by the general headquarter of the Pakistani Army and its relevant offices but also characterized by many government offices, residential and commercial area.

The Cantonment area is in the southern side of Murree Road and main railway track, connecting Rawalpindi with Lahore and Karachi. The other physical barrier between the RDA and the Cantonment areas is complex and intermingled at some locations. The industrial area of the city is situated in Western ridge and near Kohinoor Textile Mills along with Peshawar Road. The best residential area of the Cantonment is also located in this area.

It is to be noted that the largest owners of the Cantonment area are private with 63%, which is followed by Armed Forces with 16.83% as listed in the table below. The remaining owners have only small shares of less than 5%. The land values are widely different in a range of about five times, reflecting the localities, specialties or traditional values.

Table R I. 4 Land Ownership

No.	Ownership	Area (Acre)	Area (km^2)	Percentage(%)
1	Central Government	971	3.93	4.10
2	Provincial Government	1,056	4.27	4.46
3	Armed Forces	3,986	16.13	16.83
4	Cantonment Board	959	3.88	4.05.
5	Pakistan Railways	817	3.31	3.45
6	Airport	933	3.78	3.94
7	Private	14,965	60.56	63.17
	Total:	23,687	95.86	100.00

Source: Statistics of RCB 2001

1.1.4 Present and Future Land Use

As mentioned above, the study area appears to be rather complicated in terms of jurisdiction/administration and watershed. The relation is shown in Fig. I.3. The relationship of the study area and administration area is shown in the table below.

Table R I. 5 Relationship of the Study and Administration Area

No.	Legend	In the Study Area	Out of the Study Area
1	Islamabad/In	○	
2	Islamabad/Out		○
3	Rawalpindi/In	○	
4	Rawalpindi/out		○
5	Cantonment/In	○	
6	Cantonment/Out		○
7	TMA/In	○	
8	TMA/Out		○

Note: the total study area is 234.8 km^2.

JICA Study Team prepared the present and the future land use maps applying the above-mentioned seven (7) categories of the land use. The present land use map as of 2001 was produced based on the Landsat image taken in 2001. The future land use maps in 2012 and 2030

are based on the Urban Master Plan 2030 by the relevant government agencies and the population projected in the study (refer to the under-mentioned subsection). The land use maps thus prepared are as shown in Fig. I.4, Fig. I.5, and Fig. I.6. The trend of the land use in the study area is summarized in Table R I.6 and Figure R I 1.

Table R I. 6 Summary of the Land Use

Land Use	Present (2001)		2012		2030	
	(km^2)	(%)	(km^2)	(%)	(km^2)	(%)
Agricultural Area	33.4	14.2	29.1	12.4	11.4	4.9
Residential Area/ Densely Populated	31.2	13.3	35.2	15.0	38.8	16.5
Residential Area/ Moderately Populated	53.3	22.7	68.6	29.2	95.2	40.5
Residential Area in the Suburbs	6.1	2.6	5.6	2.4	2.3	1.0
Forest	34.9	14.8	32.3	13.8	32.0	13.6
Green and Bare Land	74.3	31.6	62.4	26.6	53.5	22.8
Water Body	1.6	0.7	1.6	0.7	1.6	0.7
Total	234.8	100.0	234.8	100.0	234.8	100.0

Source: JICA Study Team 2002

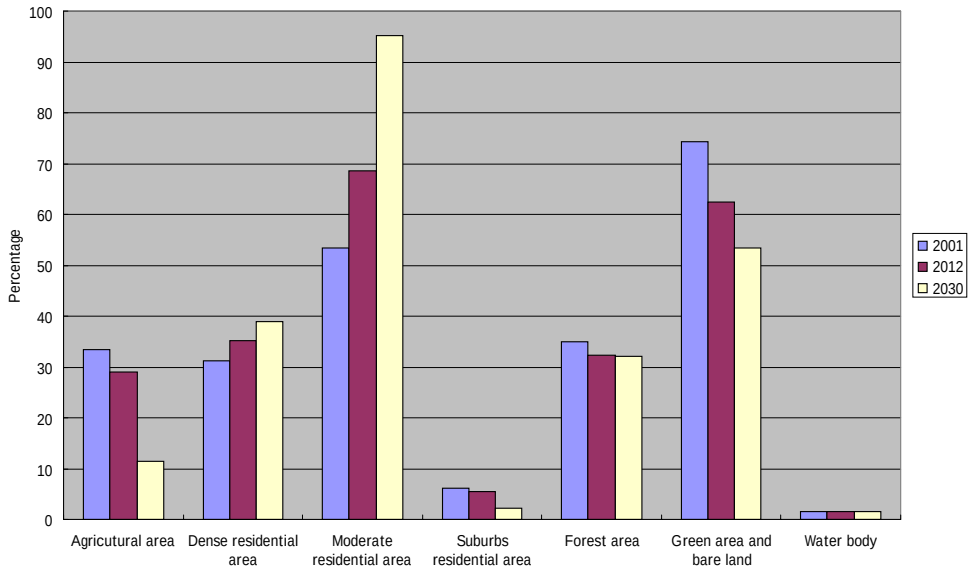

Fig. R I. 1 Trend of Land Use

According to the table and figure the following can be summarized:

(1) Agricultural area: the portion of agricultural area in 2001 was 33.4 km^2 or 14.2%, which will decrease to 29.1 km^2 or 12.4% and 11.4 km^2 or 4.9%, in 2012 and 2030 respectively. This means that the agricultural area will continue to decrease and to be converted to absorb the increased population from the present ca. 1.6 million to ca. 3.5 million (2030).

(2) Densely populated residential area (DPRA): As listed above, it is clear that residential areas will increase in the future, while agricultural area and green/bare land decrease.

The forest area will also slightly decrease to provide more residential areas, as the population increases. Most of densely populated area spreads over Rawalpindi with an average population density of about 28,000 persons per km^2. The population density will increase to about 42,000 and 57,000 persons per km^2, in 2012 and 2030 respectively. These figures seem to be at maximum, where no room could be expected to be available, or completely saturated. In this situation the excessive population will overflow to the neighboring areas, while the densely populated area itself would try to squeeze to the last available rooms like river banks by encroachers. It is estimated that the densely populated area (2001) will increase slightly from 31.2 km^2 (13.3%) to 35.2 km^2 (15.0%) and 38.8 km^2 (16.5%) in 2012 and 2030 respectively.

(3) Moderately populated residential area (MPRA): Islamabad is a planned city, where the residential areas are populated moderately as planned except some encroachment areas. As the population will increase from present some half million to over one million in 2030, the residential areas of Islamabad are expected to develop westwards toward new sectors. Another factor of the population increase in this MPRA is, as mentioned above, the overflow of the Rawalpindi area or "population pressure". The MPRA is relatively large with 53.3 km^2 (22.7%) at present, which will increase sharply to 68.6 km^2 (29.2%) and 95.2 km^2 (40.5%) in 2012 and 2030 respectively. It is expected that the present MPRA will increase in 30 years by ca. 80%, resulting in the largest category of land use at the same time.

(4) Suburbs residential area (SRA): The SRAs are located in the suburbs of the Twin City with relatively independent communities. Most of the residents are basically farmers who are engaged with agriculture to neighboring farms. As the urbanization continues, those scattered SRAs are gradually connected with the urban residential areas to reduce in size. The original area is relatively small with only 6.6 km^2 (2.6 %), and is expected to decrease further to 5.6 km^2 (2.4%) and 2.3 km^2 (1.0%) in 2012 and 2030 respectively.

(5) Forest area: The forest areas are located in the northern part of the study area or Margalla Hills. There are some small communities with small number of population, who are basically engaged in small farming and forestry. The areas are too remote from the urban area and high (more than 500 m above the Twin City) to be urbanized properly. Hence the forest areas will remain unchanged, though a slight decrease, from 34.9 km^2 (14.8%) at present to 32.3 km^2 (13.8%) and 32.0 km^2 (13.6%) in 2012 and 2030 respectively.

(6) Green and bare land (GBL): A large area of western part of Islamabad is undeveloped or reserved for the future development of the capital city. This area has a large potential for development, mainly for residential purpose if the required infrastructure like road,

water, and electricity etc will be installed. This is a good contrast to the almost saturated and congested residential areas in Rawalpindi. The large areas are defined as the GBL, which will reduce as the study area develops further to accommodate the increased population. The present GBL is relatively large with 74.3 km^2 (31.6%) or the largest land use. The GBL will reduce sharply to 62.4 km^2 (26.6%) and 53.5 km^2 (22.8 %) in 2012 and 2030 respectively.

The present population density varies from 11,000 to 30,000 persons per km^2, while the population would increases by about 50% in 2012, whereby the population density would also increase to be in a range from about 13,000 to 40,000 persons per km2. The population density in Islamabad in 2010 would represent the lower population density of 13,000 persons per km^2, which could promise a rather comfortable living environment. On the other hand, Rawalpindi would represent the higher population density 40,000 persons per km^2, which would cause serious urban problems such as living, transportation, and environmental nuisance.

As the development in the study area continues, that land use pattern will change to adjust it and accommodate the population increase. The moderately populated residential area of Islamabad will change largely from 53.3 km^2, 68.6 km^2 and 95.2 km^2 in 2001, 2012 and 2030, respectively. The densely populated residential area, which is most seen in Rawalpindi, will also increase from 31.2 km^2, 35.2 km^2 and 38.8 km^2 in 2001, 2012 and 2030, respectively. These incremental rates are not lager than those of the moderately populated residential area, which is explained that the population density will have reached the maximum level, where there will be almost no room to take in new residents any more.

In order to compensate the increase of the residential area, the green and bare land will decrease from 74.3 km^2, 62.4 km^2 and 53.5 km^2 in 2001, 2012 and 2030, respectively. Likewise, the agricultural area will have to be victimized to the population increase: it will decrease from 33.4 km^2, 29.1 km^2 and 11.4 km^2 in 2001, 2012 and 2030, respectively. This means that the agricultural production will decrease and the study area will be dependent upon the food produced outside.

1.2 Population

1.2.1 Population at National Level

Population of Pakistan reached 130.5 million in the latest Census year of 1998, which stands the seventh among the most populous countries of the world. It underwent nearly quadruple growth in the past five decades with an average annual growth rate of 2.8 percent from 33.7 million in 1951.

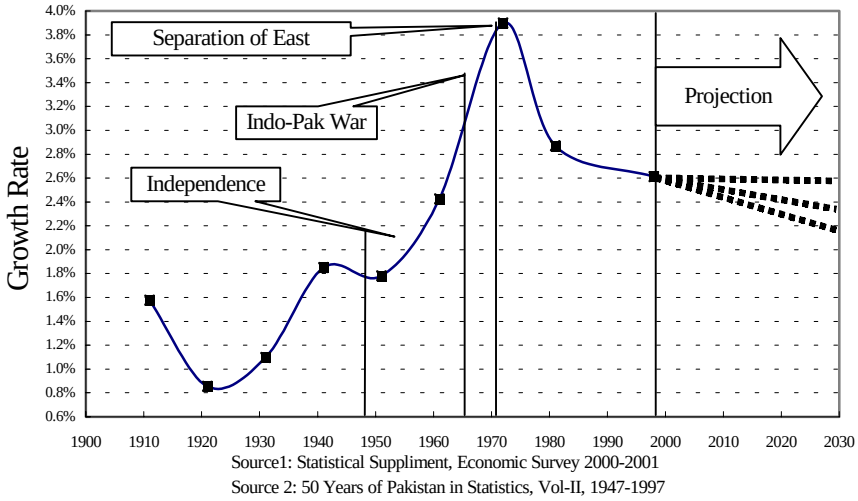

Fig. R I. 2 Changes in National Population Growth Rate

After the independence in 1947, the nation was dragged into the war with India and the political turmoil of separation by East Pakistan (presently Bangladesh). In this martial period, the population growth rate rose from 1.8% to 3.9% as shown in a figure above. With the end of the nation-wide upheaval, the population growth rate has started a gradual decline partly owing to compounded impacts of economic growth and resultant increased access to social services.

Based on this historical background, JICA Study Team has taken into account the following considerations on the projection of population growth of Pakistan:

The general trend of the population growth will remain at the same level at highest, or will not increase rapidly in the foreseeable future. The Study Team, therefore, set three scenarios as follow (refer to fig, R.I.3):

(1) Scenario 1 (high): the population growth rate will remain at the same level of present,

(2) Scenario 2 (middle): the population growth will decline gradually from the present

(3) Scenario 3 (low): the population growth rate will fall more rapidly than Scenario 2.

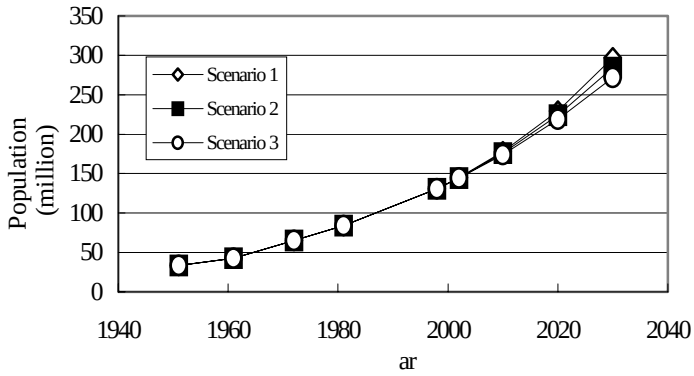

Fig. R I. 3 Population Growth and Projection of Pakistan

1.2.2 Concerned Administrative Units and Population

The study area extends over an area of Islamabad and Rawalpindi positioning on the northern most edge of the tract (known as Potohar plateau) in the range of about 22 km long and 19 km wide. Islamabad City is the capital of the country administered under the Federal Government. Islamabad City has an emerging urban area with merely 40 years of development history, as well as a large rural undeveloped area. It is a well balanced planned one still under development by CDA (Capital Development Authority).

The concerned administrative units in Rawalpindi side within the study area include Tehsil Municipal Administration (TMA) of Rawalpindi, which comes under Rawalpindi District of Punjab Province. The Cantonment Area is administered by Rawalpindi Cantonment Board (RCB). Rawalpindi City, meanwhile, is a geographically adjacent twin city of Islamabad City lying on the northern edge of TMA Rawalpindi. The table below gives populations of the concerned governing bodies as of 1998.

Table R I. 7 Population of the Concerned Governing Bodies as of 1998.

Area	Population	Area (km^2)	Density (person/km^2)
Islamabad District *4	805,235	906	889
Islamabad City	529,180	222 *1	2,383
Islamabad Rural	276,055	684 *1	404
Punjab Province	73,621,000	205,344	358
Rawalpindi District	3,364,000	5,286	636
Tehsil Rawalpindi	1,409,768	686 *2	2,055
Rawalpindi City	781,927	28.5 *3	27,436
Cantonment Area	627,841	72.7 *3	8,636

Source : Provincial Census Report of Punjab, 1998, District Census Report of Islamabad, 1998 and District Census Report of Rawalpindi, 1998
Note*1 : The land area for urban part of Islamabad is defined herein as Zone 1 of the Master Plan of Islamabad, while, the area for the rural corresponds to the rest of the area of Islamabad Capital District.
Note*2 : Initial enumeration by JICA study team
Note*3 : Measured by GIS software
Note*4 : The term 'Islamabad District' is identical to 'Islamabad Tehsil', under which the urban area is called as Islamabad City

From this table, it can be seen that the population density of Islamabad City is 2,383 persons per km^2, while that of Rawalpindi City and Cantonment Area are 27,436 and 8,636, respectively. If the population density of Islamabad is assumed at 1, that of Cantonment Area is 3.6 times more than that of Islamabad. Under the same assumption, the population density of Rawalpindi City is 11.5 times more than that of Islamabad City. This figure means that the urban area of Rawalpindi City is densely populated and will be saturated in the near future. It is commonly said that the figure of about 20,000 to 40,000 persons per km2 is almost saturated with humanly conformable living conditions. The question remains whether or not the population density of Rawalpindi will exceed this level or how high it will be, when it is the case.

1.2.3 Population within the Study Area

The study area is demarcated by natural settings of the Lai Nullah watershed; therefore, the boundary of the area does not correspond to administrative division. The table below shows the estimated present population within the study area. The figures are tentative estimates; therefore, they will be subject to review and change when new information becomes available.

Table R I. 8 Estimated Present Population within the Study Area

Area	Population	Households	Area (km^2)	Density ($/km^2$)		Average Household Size
				Population	Households	
Islamabad City	432,678	72,086	161.3	2,682	446.9	6.0
Zone 1 (urban)	432,678	72,086	74.0	5,847	974.1	6.0
Rawalpindi City	724,311*1	107,219*1	26.4	27,436	4,061	6.8
Cantonment Area	407,622*1	62,770*1	47.2*2	8,636	1,330	6.5
Total	1,564,611	242,075	234.9	6,661	1,031	6.5

Note : The population of Islamabad was enumerated excluding that of the following bodies from urban Islamabad population. C-16, D-15, D-16, E-14, E-16, F-5, G-6(ExG-6/2), I-15, I-16, Mochi Mphra, Noorpur Shahan, Ojhri Khud & Kalan, Poona Faqiran, Qauid-E-Azam Univ., Rawal Town

*1 : Approximate value in the Study Area is enumerated by proportional distribution to the land area.

*2 : The Cantonment Area includes a small strip of land, 2.1km^2,administered by TMA.

1.2.4 Population Growth and Projection

Due to limited range of information on systematical analysis of demography, the projection of population within the study area is technically delicate. To ensure validity of projection under the constraint in information availability, JICA Study Team reviewed the following available information in addition to the aforementioned census data: “The Regional Study for Water Resources Development Potential for the Metropolitan Area of Islamabad-Rawalpindi, Executive Summary, February 1988, JICA.”

The following part attempts to project the national population until the year 2030 by assessing the past patterns of growth and extrapolating the recent trends. Based on this projection, the population for the study area is projected under assumptions that national level growth rate corresponds to natural birthrate and, therefore, gaps between the growth rate at the national level and that of respective administrative division, Islamabad City, Rawalpindi City and Rawalpindi Cantonment Area, are proportional either to social inflow or outflow of the population. Other major assumptions are presented below.

Islamabad City: Population growth rate converges with the projected national growth rate in the year 2030.

Rawalpindi City: Outflow of migrants would begin from the year 2015.

RCB Area: Social inflow and outflow of population would balance until the year 2030 with a growth rate converging with that of the national average.

Historically the population density, which allows a human-like living standard, is said to be the low figure of about 20,000 persons per km^2 at maximum. That of Rawalpindi City has already reached the level (27,346 at present). Therefore it is most likely that the population pressure would work emigration from Rawalpindi City to Islamabad City and Cantonment. The projected population density of Rawalpindi City will be calculated at 42,114 and 56,680 persons per km2 in 2012 and 2030, respectively. The figure of 2012 would be possible and acceptable, if the residents there get used to such a congestion and resultant inconvenience, or no way to solve the problem. However the figure of 2030 seems to be impossible. As a result the quite strong population pressure would work on the emigration from the area.

Obviously there are some uncertainties in projecting the future population in the study area. Therefore JICA Study Team has tried to minimize the discrepancy between the projected and actual population in the future. In careful considerations exerted in the projection, the following table was produced to summarize the populations of the study area in 2001, 2012 and 2030, respectively.

Table R I. 9 Summary of Population Projection within the Study Area

Jurisdiction Area	Population (persons)			Population Density (p/km^2)		Household Density (p/km^2)	
	1998	2012	2030	2012	2030	2012	2030
Islamabad City	432,678	715,151	1,020,697	4,434	6,328	739	1,055
Rawalpindi City	724,311	1,111,802	1,496,339	42,114	56,680	6,230	8,385
Cantonment Area	407,622	676,354	979,562	14,330	20,753	2,208	3,198
Total	1,564,611	2,503,307	3,496,598	10,657	14,885	1,650	2,304

Source: JICA Study Team 2003

1) Population Projection at National Level

Population of the nation is projected with three hypothetical scenario including high, middle and low growth patterns, with due consideration on the past population growth path, by extrapolating the recent growth pattern. (refer to Fig. R 3.1.2)

Table R I. 10 Assumptions in Population Growth Rate until 2030

Year	Scenario 1 High Growth	Scenario 2 Middle Growth	Scenario 3 Low Growth
Up to 2002	2.60%	2.60%	2.60%
2003-2015	2.60%	2.50%	2.40%
2016-2030	2.60%	2.40%	2.20%

The declining trend of population growth rate in the past does not establish good grounds for supporting the first scenario developed on the constant annual rate of 2.6% since the nation's birthrate generally drops with increased income and improved livelihood as empirically demonstrated in other developed countries. The lower growth scenario with the annual growth rate of 2.4 % until 2015 and 2.2 % until 2030 is deemed to be rather

underestimated for the coming three decades by comparatively assessing probability of future growth. The middle growth scenario, on the other hand, is judged the most probable among three scenarios assuming gradual decline in growth rate down to 2.4 percent until the year 2030. With this annul growth rate, the population of the country would be nearly doubled until the year 2030.

Table R I. 11 Projected Population of Pakistan

Year	Scenario 1	**Scenario 2**	Scenario 3
1998*	130,579	**130,579**	130,579
2002	144,698	**144,416**	144,135
2010	177,681	**175,957**	174,248
2020	229,676	**224,143**	218,737
2030	296,885	**284,135**	271,914
Validity	Possibly Overestimated	**Most Probable**	Possibly Underestimated

Source: *National Census 1998 Projection by the JICA Study Team

2) Population Projection of Islamabad

The figure below compares the projected population growth rate at the national level, 'Islamabad A' projected by JICA in 1988 and 'Islamabad B' projected for this study. The gap between the rate at the national level and those of Islamabad are regarded as social migration.

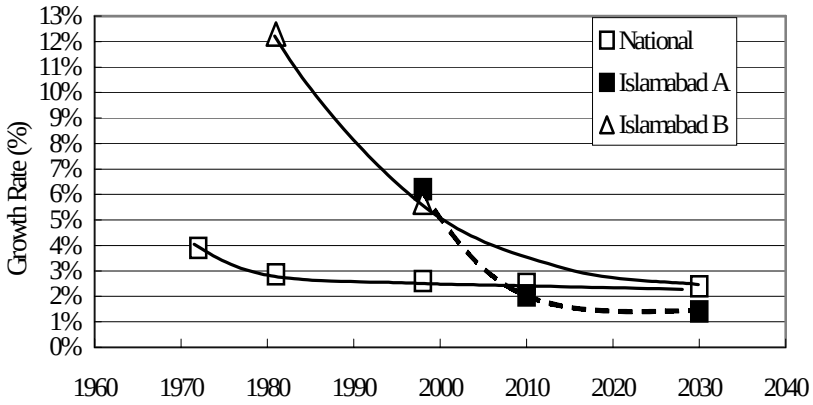

Fig. R I. 4 Projection of Population Growth of Islamabad

As Islamabad became the capital in 1959 and its ground breaking started in 1961 having merely 40 years of development history, a rapid inflow of migrants continues and there still remains much scope for receiving migrants. In this context, the scenario of Islamabad A is judged to underestimate the future growth rate. This indicates a possible reversal of population growth rate of Islamabad with the national level growth rate, and, therefore, the outflow of residents begins until the year 2015. The curve of population growth rate in the scenario of Islamabad B was developed by extrapolating the recent growth pattern

assuming convergence of growth rate of Islamabad with the national average in the year 2030. Based on the growth rate together with estimated population within the study area in Table R I..12, the population of Islamabad within the study area is projected until the year 2030.

Table R I. 12 Projected Population within the Study Area of Islamabad

Projection	1998	2015	2030
Growth Rate until the year	5.7%	3%	2%
Projected Population	432,678	715,151	1,020,697

3) Population Projection of Rawalpindi

Rawalpindi City, in contrast with Islamabad City, has been inhabited for a long time with a dense population as indicated in Table R I.12. With due considerations on the population projection at the national level, the previous projection for the area undertaken in 1988 by JICA is deemed to be underestimate the population growth. The average annual growth rate from 1981 to 1998 rose to 3.4%, which is not expected to continue for the coming decades as the area has been already densely populated. In this Study, the outflow of migrants is assumed to begin from the year 2015, considering the past growth pattern and natural birthrate at the national level. Assumptions in the projection and its population are presented in Table R I.12.

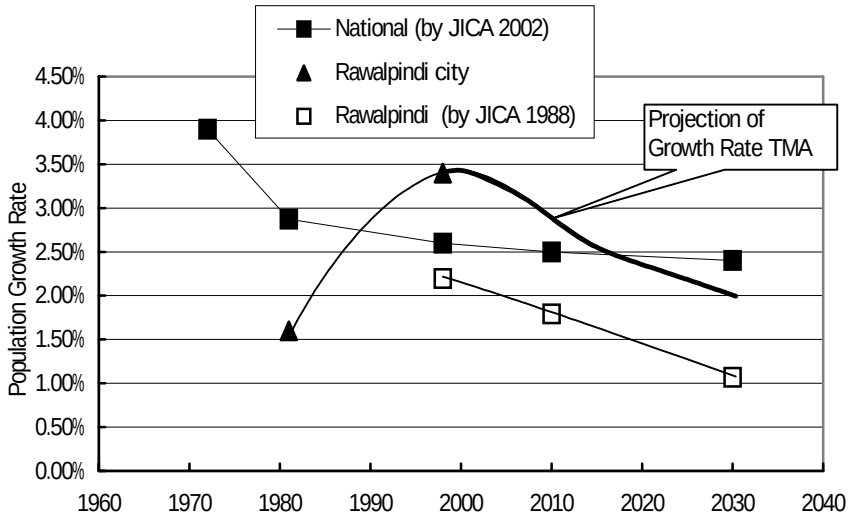

Fig. R I. 5 Changes in Population Growth and its Projection for Rawalpindi

Rawalpindi Cantonment Area, on the other hand, still has scope for a further expansion of the population. The former projections for the cantonment area by JICA in 1988 as well as that by the Cantonment Board are judged underestimating the future growth, likewise, in consideration on national level population growth. In this Study, it is assumed that the social inflow and outflow of population would balance until the year 2030 with a growth

rate converging with that of the national average. Assumptions in the population projection and its population size are presented in Table R I.13.

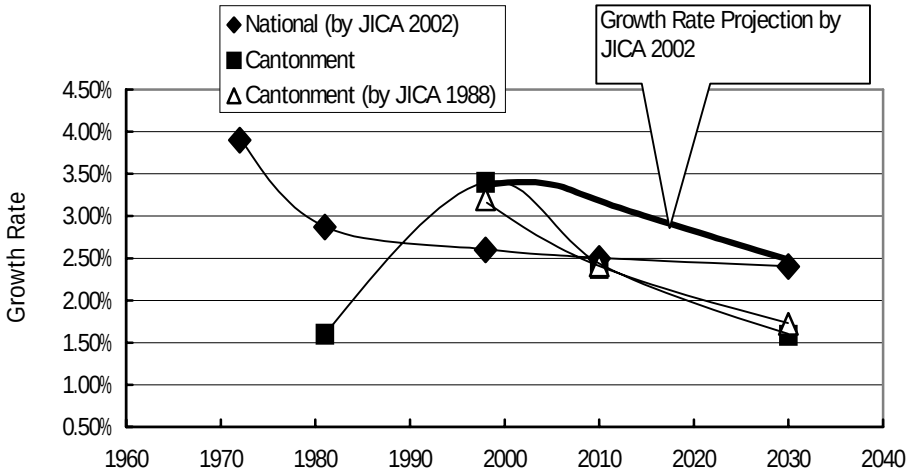

Fig. R I. 6 Population Growth Rate

Table R I. 13 Population Projection for Rawalpindi City area and Cantonment Area

Area	Projection	1998	2015	2030
Rawalpindi City	Growth Rate until the year	3.40%	2.50%	2.00%
	Projected Population	724,311	1,111,802	1,496,339
Cantonment Area	Growth Rate until the year	3.40%	3.00%	2.50%
	Projected Population	407,622	676,354	979,562

Source: JICA Study Team 2002

1.3 Social Survey

1.3.1 Objective of Social Survey

The objective of the Social Survey is to understand the social conditions of the residents in the study area and to minimize adverse social affects to them in establishing a comprehensive flood mitigation plan and related environmental improvement.

Close relationships between social and environmental systems make it necessary that social impacts are identified, predicted and evaluated in conjunction with environmental impacts during the environmental impact assessment. The residents are a component of their environment, and environmental changes are often linked to social change (and vice versa).

In considering social impacts, the needs and possible impacts on individual residents of the community were carefully assessed and reported in the Survey.

1.3.2 Survey Method

A local consultant has conducted the following three kinds of survey:1) base line survey, 2) workshop and 3) interview survey, as explained below. Here are summarized the major findings.

1) Base Line Survey

The base line survey was conducted to understand the basic information by interviewing key informants (Federal Flood Commission=FFC, Tehsil Municipal Administration Rawalpindi =TMA, Rawalpindi Development Authority=RDA, Capital Development Authority=CDA, Small Dams Organization =SDO).

The whole of the target area was divided into 23 areas from Rawalpindi and 4 areas from Islamabad (see Fig. I.7). After the zoning and clustering, those areas were identified and finalized for the baseline survey.

Table R I. 14 Name of Areas and Union Council No in Rawalpindi

No	Name of Area	Council No	No	Name of Area	Council No
1	Dhok Naju	12	13	Akal Garrh	38
2	New Katarian	13	14	Umar Abad	03
3	Khayaban-e-SirSyed	11	15	Sagri Colony (Dhok Ratta)	38
4	Dhok Dalal	37	16	Babu Lal Hussain Road (Dhok Ratta)	02
5	Sana Ullah Colony	13	17	Dhok Ratta	02
6	E-Block, Baba Yousaf Shah Ziarat	13	18	Bhoosa Godam-Katchi Abadi	01
7	Zia-ul-Haq Colony (tributary)	07	19	Ratta Amral	01
8	Muslim Abad, Quaid Abad	07	20	Mohan Pura	36
9	Dhok Hassu	05	21	Itehad Colony	46
10	Safdar Abad	07	22	Usman Pura	46
11	Mujahid Abad	38	23	Chaman Zar	45
12	Kashmir Colony	38			

Source: JICA Study Team 2002

Table R I. 15 Name of Katchi Abadis and Sector in Islamabad

No	Name of Area	Sector	No	Name of Area	Sector
1	Tent Colony	G-7/1	3	Hinsa Colony	G-8/1
2	66 Quarters	G-7/2	4	Charles Colony	G-8/1

Source: JICA Study Team 2002

This is a cross cutting exercise and was done at various stages of the study. The outcomes of the interventions done in base line data exercise were compared and contrasted on the basis of actual and perceived information regarding the area, economics, social conditions, human settlement and gender issues, environment and institutional structures.

Information provided by different stakeholders was assessed, crossed-examined and issues framed for taking these to the stakeholders and participants of the workshops.

2) Workshops

Workshops were held with attendance of about twenty (20) representatives of each category and staff of the executing agencies (FFC, TMA, RDA, CDA, and SDO). Total six workshops were conducted with different stakeholders on different dates. Participatory techniques such as brain storming, role plays, group exercises, group presentations, participatory discussions and feed back techniques to reconfirm the data obtained were utilized to get the information from the stakeholders during the workshops.

Table R I. 16 Workshops Conducted for Social Environmental Survey

No	Participants	Date
1	Legal residents living in the municipal area of Rawalpindi	October 27, 2002
2	Illegal residents staying at river areas of Nullah Lai, in Rawalpindi	October 28, 2002
3	Legal residents living in municipal area of Rawalpindi	October 31, 2002
4	Government officials (FFC, TMA, RDA, CDA, WASA)	October 30, 2002
5	Illegal residents living in flood area of Islamabad	November 04, 2002
6	Joint workshop of all the groups/stakeholders - Residents and govt.	November 02, 2002

3) Interview Survey

This survey is to check and confirm the obtained information at the workshop survey by conducting the interview survey at residents. The interview survey was carried out around first period of the first field survey. About 15 residents, (about five (5) residents times by three (3) classes of low class, meddle class and high class) interviewed by the survey was selected at random at each 4 categories, so total number of interviewees is about sixty (60).

1.3.3 Results of Social Survey

The detailed results of the base line survey, workshops and interview survey are summarized in the Data Book of the Final Report. The Master Plan for the priority projects was formulated in the second field survey, in which the major contents were included to understand the social conditions affecting the residents by the proposed projects and to minimize adverse social affects to them.

1.3.4 Recommendations

Following are the collective recommendation on the basis of results of the study with the rating on the level of possibility of occurrence of each suggestion. The rating scale A to C is used to measure the level of priority; here **"A"** is the highest side and **"C"** the lowest side.

Table R I. 17 Recommendations for Wastewater Management

Recommendations		Priority		
Waste Water		**A**	**B**	**C**
1	To integrate a proper integrated participatory sewerage system (with the participation of all stakeholders) in the areas situated nearer and also on the bank		*	
2	To launch a collective project for community mobilization in order to solve wastewater problems in the area.	*		
3	To develop an effective coordination between WASA/CDA and communities		*	
4	To form a community coordination committee in order to promote the coordination and collaboration among communities		*	
5	To separate sewerage and water pipes in order to avoid contamination in drinking water			*
6	To shift godown (store house) and slaughterhouses and other businesses which are creating environmental and health hazards			*

According to the results, the first priority was to launch a collective project for community mobilization in order to solve the wastewater problem in the area (refer to 2). This is because the residents who are residing along the river are suffering from wastewater related problem, but a clear solution is not presented to them due to lack of technical and financial support. Those people are seeking a integrated participatory involvement in the sewerage system development (refer to 1). However the present political system is rather weak to absorb their involvement, meaning in a sense that the sewerage development planning is highly technical as to limit the involvement of ordinary residents. The government, therefore, make efforts to disclose the information related to the wastewater problem. The residents feel the lack of coordination between WASA and CDA (refer to 3). This is also expected to pay more attention from the government. Based on the results, it appears that communities are lacking coordination in the usual channel, and a mechanism would be required to facilitate the community coordination.

Technically the separation of water supply pipes and sewage pipes would not need, but practically it is desirable to separate the pipes in a certain distance due to loose jointing of the water pipes (refer to 5). The residents recognize the importance of how to deal with environmental hazardous facilities like slaughterhouses, which are essential for the human life (refer to 6). The shifting or locations of those facilities are basically considered in the design phase of the sewerage system.

Table R I. 18 Recommendations for Solid Waste Management

Recommendations		Priority		
Solid Waste		**A**	**B**	**C**
1	To ensure proper dumping places, proper disposal of solid waste and spray of anti infectious, as well as recruit more sanitary workers by the government.		*	
2	To hire more sanitary workers for complained streets other public places, though in case of emergency the community would be the part		*	
3	To launch proper integrated solid and liquid waste management system by the government by involving community, NGO and international institutes.		*	
4	To discourage the solid waste dumping into Lai by levying a heavy fine (Rs.1000/-) along with placing containers at proper places	*		
5	To maintain containers by near-by residents or shop-keepers from damaging, scavenging or cleaning.		*	
6	To take immediate actions on complains of garbage if not collected properly on regular basis, while the community nominates a person for informing such a case	*		
7	To prevent sanitary workers and residents from throwing garbage into Lai and sewer line or manhole, while the community actively participate in developing a community pressure in such a case		*	
8	To conduct proper designing of primary and secondary collection system by experts of solid waste management.			*
9	To monitor the cleaning/sweeping and integrated waste system by councilors at UC level		*	
10	To launch awareness and educational campaigns regarding hazardous waste by the community by voluntary participation of community	*		
11	To initiate the process segregation, reduction, and recycling of waste		*	

There are three (3) high priority items concerning the solid waste management (SWM), according to the opinions of the participants of the social survey: 1) to discourage the solid waste dumping into the river, 2) to take an immediate action for regularization of the solid collection, and 3) to launch awareness and educational campaign regarding hazardous waste. Many people are being seen to dump their wastes into river in the study area, including the waste collectors. The accumulated amount of the dumped wastes is too large to be ignored. So some residents are worried about this practice, because the river water is being deteriorated heavily and the dumped wastes are hindering the smooth flow. Their opinion is to levy a heavy fine as much as Rs 1000 for the waste dumping. Next there are complains among the residents that the waste collection is not regularized. The Sanitation Section can make a regular collection schedule for the day, week and month by deciding the collection routes. To this end the most economical collection schedule can be determined, by avoiding everyday collection. If three times a week collection is introduced in the area, the residents can corporate with the Sanitation Section by keeping the waste at home.

All over in Pakistan the solid wastes are jointly collected and dumped regardless of the degree of hazardousness. However it is to be recognized that some wastes are highly dangerous and infectious, such as hospital and industrial wastes. In order to protect the residents from dangerous wastes, the government shall launch awareness and educational campaigns in corporation with the community.

Second high priority shall be given, based on the residents, to the proper dumping places (not in the rivers), recruitment of more sanitary workers, integrated SWM involved with communities,

proper maintenance of containers by near-by residents, monitoring of cleaning/sweeping, and waste reduction/recycling. This means that no scientific tools have ever exercised in the SWM of Pakistan: the amount of wastes, number of sanitary workers and vehicles, collection schedule, dumping method, and coordination of communities etc. As a result a time-consuming costly management is being carried out, in spite of limitation of the allocated resources.

Though lower priority is given based on the residents, the design of primary and secondary collection system is rather important and a room to save the running cost. While the primary collection is mainly done by hand in the narrow streets and others, the secondary collection is more mechanical collection by using vehicles. The combination of both collection is important, as well as the meeting points of them. Most economical collection system can be drawn by practical "a try and error process".

Table R I. 19 Recommendations for Environment

Recommendations		Priority		
Environment		**A**	**B**	**C**
1	To install hand pumps and tube wells			*
2	To establish stationary and mobile environmental facilities by the government		*	
3	To install water purification, sewerage treatment and recycling plants by the government with close and active collaboration of the community			*
4	To construct roads and small bridges to access river bank, and underground sewerage system by the government.			*
5	To monitor and manage the persons and factors contributing to social and environmental pollution by the local NGOs, SWM committees and community collectively.			*
6	To continue awareness and capacity building on regular and continuous basis and to properly use available resources on equity basis for this program capacity building of community activists and government officials		*	

In the component of environment there is no item of high priority, based on the social survey. As the second high priority, the residents want the government to establish stationary and mobile environmental facilities, because the accumulated environmental data would be required at both stationary and mobile facilities. The mobile facilities will be required in case some hazardous wastewater is discharged into a river from a factory. The location and contents shall be detected so that the residents would be protected by early countermeasures. If a new program is to be commenced, the government officials as well as community activists shall continue to build their capacity to deal with it for a better result. It is commonly said that the capacity building was rather ignored in many programs that had taken place.

Other items are rather common in the environment. Those residents who are suffering from water shortage want the installation of hand pumps and tube wells. In the study area the water problem is always a major one, and the residents want a water purification plant and a sewage treatment plant. The recycling plant is to enable the recycling of used water after treatment for the second use. This plant shall be considered in the framework of the water development strategy.

Table R I. 20 Recommendations for Flood Mitigation

Recommendations		Priority		
Flood Mitigation		**A**	**B**	**C**
1	To accept the wall construction on banks as a preventive mechanism for waste dumping and encroachments.		*	
2	To increase the river depth by dredging the river as a flood preventing or mitigation step		*	
3	To divert the water from Islamabad into Kurang as a preventive measure of inundation in Rawalpindi, with community agreement to demolish some houses and to pay more taxes.		*	
4	To construct small dams in Islamabad upon technically appropriate places to save the storm water and to mitigate flood in future as a long term measure for flood mitigation		*	
5	To ensure all sort of medical facilities by the government, for environmental pollution is generating many kind of diseases		*	
6	To set up industries and factories by the government, so that people would get opportunities for employment and respectable livelihood			*
7	To equip fully institutes like civil defense with latest technical devices and human resources in order to combat any emergency and natural disaster more practically and efficiently		*	
8	To train CBOs (community-based organizations) with first aid from civil defense.		*	
9	To construct septic tanks by the H/H in areas where sewage system does not exist.			*

According to the social survey, the residents recommend as the second-high priority to accept the wall construction on river banks for prevention of waste dumping and encroachment development. In the same priority they recommend to increase the river depth for flood mitigation. This idea was discussed by the JICA study team to find out to be costly, because all the bridges are subject to reconstruction and all the reaches are to be strengthened. As the third one, the residents recommend to divert the Lai Nullah before entering Rawalpindi. This is one of the countermeasures, which the JICA study team recommends.

Small dams to be constructed in Islamabad would be useful measures, as the residents recommend. One of the candidate sites is at Gorla, where some houses upstream are subject to demolished due to water fulfilling in the dam. Social impacts are relatively large and need careful approach, if accepted.

Medical facilities (refer to 5) are their general desire to be ensured against many diseases, but would not have nothing direct to do with flood mitigation. Item 7 refers to emergency case, when the civil defense will play an important role to save the lives and property. In the study a flood risk map will be prepared to show the flood-prone areas based on the analysis. The evacuation routes and places shall be finalized by each community based on the map. CBOs are also an important component for first aid activities, which are, however, beyond the scope of the study.

Item 6 (Priority C) refers to the set-up of industries and factories by the government for employment and livelihood, and have no direct relationship with flood mitigation. So this item should be understood that the interviewed residents had expressed their opinions. At the same priority septic tanks are recommended by the residents for the areas where no sewage services are available. Since the septic tank system can treat the wastewater to some extent, they shall be installed for environmental improvement.

Table R I. 21 Recommendations for Resettlement

Recommendations		Priority		
Resettlement		**A**	**B**	**C**
1	To provide alternate place/land by the government and to pay for extra cost, if necessary			*
2	To develop colony and land for the affectees and provide with all basic facilities for the resettlement			*
3	To establish a cell at government department to verify the status of land from the stakeholders, before planning any resettlement project.	*		
4	To remove the ban and quota system on jobs and to follow the rules and regulations according to merit.			*
5	To work for increasing the number of government schools and to provide free admission on easy conditions for increasing the literacy rate.		*	
6	To make arrangements for more scholarships to help poor children in overcoming over their educational expenses and becoming useful and confident citizens contributing towards their country.		*	
7	To make available loans (interest free), micro-credit on easy and accessible installments for deserving.		*	
8	To provide more Zakat funds with maximum amount for deserving people and related institute, and to ensure its proper utilization. (Proper utilization of Zakat fund).		*	
9	To give priority to the new energetic, creative and hardworking generation for recruitment instead of retired old officials on different posts.	*		
10	To ensure the approach and accessibility of common people towards court and also to provide justice easily in time	*		
11	To ensure efficient and close social interaction for the formation of social welfare organizations in order to promote education and information access	*		
12	To can motivate people by community and NGOs for generating new ways of income and employment and hard working, by adopting the saving behavior and controlling over their expenditure.		*	
13	To motivate and mobilize the rich and influential people by community and NGOs for helping needy and poor people, for the people of the area are having poor resources to establish small business for flood affectees and they lost businesses and finances during flood			*
14	To face the economic crises collectively by providing moral/empathetic and physical support to each other for reducing depression and frustration		*	
15	To launch advocacy and mobilization regarding promotion of the family planning practices for decreasing poverty and unemployment		*	
16	To adopt the type of long, participatory and effective survey for getting opinion, recommendations of the affectees by the government and international organizations			*
17	To play vital role by international organizations in order to develop coordination between government and affectees		*	

The residents recommend as high priority the establishment of a cell at government for land verification before planning any resettlement project (refer to 3). Presently this is a common practice, as shown in the ADB-funded project for Rawalpindi (UWSSP-Phase I), where the required detailed information was prepared in the PMU for the land status and ownership for land acquisition. Then the staff had meetings with land owners and settled the land acquisition, while the Punjabi Government prepared the compensation.

Item 9 refers to shifting of generations and is not directly related to the resettlement. This should be understood as general information that high unemployment exists among young generation, while people of old generation are still working. Item 10 refers to the justice system in Pakistan, and has no direct relation ship with resettlement. However it is assumed that some cases relating to resettlement are sued in court, and once the court trial starts, the project delay will be inevitable. The resettlement may cause major impacts, social and financial, to resettles (refer to

11). The government is required to prepare a resettlement program well in advance, and in coordination with social welfare organizations.

Priority B is given to eight (8) items: 1) increase of government schools for literacy, 2) arrangement of scholarship for low-income households, 3) financial support, 4) Zakat provision, 5) motivation of income generation, 6) collective combat to economic crises, 7) promotion of family plan, and 8) roles of international organizations. Most of them are not directly related to the resettlement issue, but are general. However multi-approaches are required to tackle this issue, because it may have drastic impacts to affectees.

Items 1 and 2 are given Priority C, but they are quite important for the government to carry out the resettlement plan successfully, because alternate lands would be desirable for smooth resettlement. Acceptance of the old communities to new settlers is practically crucial to a successful plan. The government is required to deal with the resettlement with care.

Item 13 refers to the income gap between high and low classes in the society. A social harmonization is a key to promote good community participation. Item 16 refers to the way to collect genuine opinions of the project affectees by the government and international organizations. The government shall not proceed the projects without people's support.

2. ENVIRONMENTAL ASPECT

2.1 Initial Environmental Evaluation

The objectives of initial environmental evaluation of the project are to enable early determination of the potential magnitude of impacts and hence the depth of study required in the succeeding study period. The initial environmental evaluation (IEE) would help to design the project in environmentally sound and socially acceptable in its nature by incorporating environmental dimensions into project design in compliance with the national environmental regulations as well as those of the possible funding institutes. IEE is performed by two distinctive but interrelated processes of screening and scoping. Screening is undertaken to provide a definition of the scale and type of project; to identify a long list of valued ecosystem components in the study area; to establish the general nature and magnitude of the potential impacts; and to suggest the most appropriate EIA process to apply to the project. Scoping is a process used for defining what can and what cannot be accomplished during a particular environmental study. This would include defining the geographic boundary of a study in relation to possible impacts; identifying the time constraints and time horizons of the study; and identifying the skills and human resources needed to undertake the project. The TOR of EIA on priority projects are as presented in Appendixes A and B of this Sector Report.

2.2 Core Projects Examined

The IEE gives main focus on four core structural measures, among others, which include

(1) Flood Diversion Channel,

(2) River Channel Improvement,

(3) Community Pond and

(4) Flood Mitigation Dam.

2.3 IEE Methodology

The initial environmental evaluation (IEE) of the proposed core subprojects was prepared based on information collected during the Master Plan Study, review of related reports, and consultation with concerned government, the NGOs and other project stakeholders. At the time of report preparation, project information was significantly limited, and extent and depth of information varied among the proposed projects, which constrained efficient impact identification.

In this context, the succeeding environmental study should include additional screening. The IEE was compiled as separate document with an assistance of the Pakistan-based local consultants, and thus, this part of the report gives summary of the findings. The separate document of IEE contains site and project descriptions, regulatory framework of the country's environmental protection and EIA system.

The major assessment given below is a cross impact matrix, with the major environmental resources as rows, and the project activities as the columns. The project activities examined in this IEE are summarized below for respective project phase.

Table R I. 22 Project Activities for Each Project Phase.

Phase	Project Activity
Planning and Design Stage	Land Acquisition
Construction Phase	Construction camp establishment
	Equipment servicing and fuelling
	Site preparation and clearing
	Earthworks
	Quarries and borrow sites
Operation Phase	Operation

In the matrix, assessment of impacts was made in terms of magnitude, duration or time framework, causal relationship and probability. The result of the assessment was presented following the categories.

Table R I. 23 Assessment Category

Magnitude of Impact	A:	Major impact is anticipated. Mitigation measure is judged required.
	B:	Potential major impact is anticipated. Detailed study required in EIA.
	C:	Some impact is anticipated.
		Blank represents no anticipated impact.
Duration of Impact	L:	Long-term impact
	S:	Short-term impact
Causal relationship	D:	Direct Impact
	I:	Indirect impact
Probability	H:	Highly probable,
	M:	Moderately probable,
	U:	Unpredictable

Regarding pollution control during construction phase, the common issues among the proposed project alternatives will be discussed in the last section of this part of the report dealing with 1) Air Quality, 2) Water Quality, 3) Soil Quality and 4) Noise and Vibration by heavy machinery operation.

2.4 Overall Assessment

Overall, the projects proposed in the Master Plan will induce relatively insignificant adverse impacts as compared with the flood protection projects in alluvial area in rural setting where flooding recharges soil moisture, replenishes soil nutrients and thus enhances productivity of natural resources such as wildlife, livestock and fisheries. The projects generate significant economic benefit as reduced damage to commercial and industrial activities since the urban communities are not capable to adapt to the natural flood cycle and increased flood frequency. Several potential adverse impacts were, nevertheless, identified in the evaluation.

The project of **River Channel Improvement** does not require involuntary resettlement. Identified problems include those on *traffic disruption* and associated impacts on *economic activities* during the construction phase. Adverse impacts of *waste disposal* will occur in two distinct occasions in construction and operation phases. Site preparation also brings increased risks of *erosion* of exposed ground or stored topsoil. The potential project impact in operation phase include those on *hydrology* and increased *erosive* capacity of the water and associated increased sedimentation. Adverse impacts of waste disposal in operation phase will be of great importance to achieve project objectives.

Community Pond poses the least adverse environmental impact among the core alternatives in the initial screening level, in addition, it will have a significant beneficial impact on improvement of the living environment by increased aesthetic, recreational and partly educational value of the park. The impacts that need special concern include selection of *disposal* site of excavated soil. Adverse environmental impacts in operation phase include *pollution of water* impoundment locating in the downstream part, resulting in increased incidence of *offensive odor* and emergence of *water-borne disease*. *Increased waste disposal* from visitors of the park needs to be properly collected to maintain cleanliness of the park.

Flood Mitigation Dam project in planning phase will require limited number of *resettlement. Dispute over the land ownership* poses another concern in planning phase. In operation phase, impact on the local community include those on *economic activity* such as grazing, *split of community* as well as *cultural properties*. In addition to the direct and indirect effects of the dam construction on the environment, the effects of the environment on the dam must be considered.

Flood Diversion channel project will involve *resettlement* in case of Route 3. Interaction with *traffic and public facilities* will be a potential impact in construction phase. Due to linear alignment of the diversion channel, it will result in *split of community* as well as damage on *cultural properties.* Adverse impacts in *waste disposal* will occur in two distinct occasions in construction and operation phases. It may possibly result in *changes in hydrology* of the river such as increased downstream flooding and sedimentation in the operation phase.

2.5 Evaluation of River Channel Improvement

The proposed project option increases the flow velocity of the river by deepening the riverbed. The project does not require additional land acquisition since the construction work is limited within the present right-of-way, which therefore does not require involuntary resettlement. No major impact requiring mitigation measure was identified in the initial screening level, though, the project poses potential adverse impacts in social as well as natural dimensions of the project in direct and indirect manners, and therefore, the succeeding study will require detailed evaluation on the impacts and development of mitigation measures when judged necessary.

2.5.1 Potential Major Impacts in Construction Phase

The proposed channel improvement work will be executed in densely populated residential and commercial area of Rawalpindi city, which will therefore require Environmental Management Plan specifically developed for this environmental setting. Identified problems include those on *traffic disruption* and associated impacts on *economic activities* during the construction phase. They are direct project impacts having short and reversible nature. As the traffic system of the project site was originally designed to accommodate animal drawn vehicles and pedestrians,

there is limited availability of access roads that can serve for heavy vehicle operation for disposal of a large volume of waste. Therefore, in addition to environmental management plan generally required for construction work, the project will require detailed logistic scheduling, traffic safety measures, detailed planning of waste management.

Adverse impacts of *waste disposal* will occur in two distinct occasions in construction and operation phases. Waste disposal in construction phase is moderate level of magnitude and need detailed study for selection of disposal site.

The project impact of construction activities on *fauna and flora* in the watercourse is judged insignificant as the river is already heavily polluted. However, the construction activity such as site preparation may involve limited range of vegetation loss such as clearing of brushwood and tree removal. To increase positive benefits of the project, incorporation of appropriate mitigation measures and enhancement actions such as compensatory tree planting need to be proposed.

Site preparation also brings increased risks of *erosion* of exposed ground or stored topsoil, and increased water runoff and siltation of watercourses. It will have long-term impact unless the exposed soil surface is appropriately covered with vegetation or other material.

2.5.2 Potential Major Impacts in Operation Phase

Although channel improvement can alleviate flooding problems in the treatment area, flood peaks are likely to increase downstream, thus simply transferring the problem elsewhere. The potential project impact on *hydrology* is an indirect consequence having long-term effect in the downstream. Protection measures should be designed when the increased flooding problems downstream exceed local flood risk management capability.

Increased flow velocity of the river will result in increased *erosive* capacity of the water and associated increased sedimentation, which would arise both on-site and downstream. As part of project component, protective measure of embankment may need to be incorporated.

Adverse impacts of *waste disposal* in operation phase will be of great importance to achieve project objectives. Illegal waste disposal into the channel results in diminished capacity of the stream and decreased flow velocity. This is not the consequent of the project, but, it is the cause of the problem that may lead to failure of the project.

Table R I. 24 Checklist for River Channel Improvement

Category of Environmental Impact	Overall Assess.	Planning and Design Phase				Construction Phase				Operation Phase				Beneficial		
		Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal
Social Environment																
Involuntary Resettlement																
Economic Activity	B					B	S	D	M							
Traffic and Public facilities	B					B	S	D	M							
Split of Communities																
Cultural Properties																
Water and Common Rights																
Public Health Conditions																
Waste	B					B	S	D	M	B	L	I	M			
Hazards (risk)																
Other social impacts																
Natural Environment																
Toporaphy and Geology																
Soil Erosion	B					B	L	D	H	B	L	D	H			
Groundwater																
Changes in Hydrology										B	L	I	M			
Fauna and Flora	C					C	S	D	M							
Meteology																
Landscape																
Other natural impacts																
Pollution																
Air pollution	B					B	S	D	M							
Water Pollution	B					B	S	D	M							
Soil contamination	B					B	S	D	M							
Noise and vibration	B					B	S	D	M							
Land sussistence																
Offensive odor																
Other impact in pollution control																

2.6 Evaluation of Community Pond

The proposed project option poses the least adverse environmental impact among the core alternatives in the initial screening level. The proposed community pond, in addition, will have a significant beneficial impact on improvement of the living environment by increased aesthetic, recreational and partly educational value of Fatima Jinnah Park. The park will be equipped with flower garden, play ground, tennis courts and other facilities. Positive impacts of the project are expected to generate in recharging groundwater aquifer and settling suspended sediments. This positive benefit is further expected to be enhanced by incorporation of appropriate measures for mitigation of moderate level of potential adverse impacts and enhancement actions such as provision of water treatment, waste collection and disposal measures.

2.6.1 Potential Major Impacts in Construction Phase

The impacts specific to this project proposal in construction phase need further study with a particular focus on selection of *disposal area for excavated soil* since considerable volume of soil will be transported out of the park.

Table R I. 25 Estimated Soil Volume for Community Pond Construction

Earthwork quantity		Soil Volume
Surface excavation	Foundation Excavation	+140,000 m^3
	Reservoir Excavation	+2,000,000 m^3
Surface excavation total		+2,140,000 m^3
Dam Embankment		-160,000 m^3
Backfilling		-700,000 m^3
Common embankment		-300,000 m^3
Embankment total		-1,160,000 m^3
Balance (Excessive volume of soil)		+980,000 m^3

The project impacts on *fauna and flora* associated with construction activities would not represent a major problem, in the initial screening level, as they are moderate magnitude of localised, short-term and reversible nature. However, the flora of the park needs to be studied to establish that no threatened or rare species exist in the project area.

2.6.2 Potential Major Impacts in Operation Phase

Adverse environmental impacts in operation phase include *pollution of water* impoundment locating in the downstream part of the park, as untreated wastewater generated nearby community will deteriorate water quality of the proposed artificial small pond. This may possibly result in increased incidence of *offensive odor* and emergence of *water-borne disease* unless appropriate mitigation measures are incorporated into the project design. The options of mitigation measure will include installation of water treatment facility for the local community living in the upstream.

Increased *waste disposal* from visitors of the park needs to be properly collected to maintain cleanliness of the park, unless it would result in additional environmental problem to the area.

The park is currently preserving the original landscape of the area with minimal human intervention. Full consultation with the local community need to be encouraged to reflect perception of local people into design of the park.

Table R I. 26 Checklist for Community Pond

Category of Environmental Impact	Overall Assess.	Planning and Design Phase				Construction Phase				Operation Phase				Beneficial		
		Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal
Social Environment																
Involuntary Resettlement																
Economic Activity																
Traffic and Public facilities																
Split of Communities																
Cultural Properties																
Water and Common Rights																
Public Health Conditions																
Waste	B					B	S	D	H	B	L	I	M			
Hazards (risk)																
Other social impacts														A	L	D
Natural Environment																
Toporaphy and Geology																
Soil Erosion																
Groundwater																
Changes in Hydrology																
Fauna and Flora	B					B	S	D	H							
Meteology																
Landscape																
Other natural impacts																
Pollution																
Air pollution	C					C	S	D	M							
Water Pollution	B					B	S	D	M	B	L	I	M			
Soil contamination	C					C	S	D	M							
Noise and vibration	C					C	S	D	M							
Land sussistence																
Offensive odor	B					C	S	D	M	B	L	I	M			
Other impact in pollution control																

2.7 Evaluation of Flood Mitigation Dam

Formulation of this technical option is the least progressed among project alternatives at the time of progress report preparation; therefore, it was necessary to assume a rather generalized dam structure to measure the severity of the impacts. Large dam projects cause irreversible environmental changes over a wide geographic area and thus have the potential for significant impacts. However, it is deemed, as far as available information is concerned, that environmental and social costs can be avoided or reduced to an acceptable level by carefully assessing potential problems and implementing cost-effective corrective measures in the proposed project. The project has some beneficial impacts such as increased recharge capacity of groundwater, which may need to be studied in the succeeding period.

2.7.1 Potential Major Impacts in Planning Phase

Dam site has not selected, though, Site-1 will be the most probable among the 6 proposed sites. Site-1 locates on the northern part of Islamabad Sector E-11, Golra, where rural population

resides with mainly agrarian economy. Although GOLRA SHARIF in sector E-11 has 715 households with nearly 5,600 population according to the 1998 Census, the number of households *resettled* will be less than 10 households as the dam positions in the upper stretch of the river which is serving as grazing land for cattle raising. In addition, there is an apparent *dispute over the land ownership* and administrative control of the land being illegally developed by private agent. Detailed study on land ownership and definite intervention to settle the dispute is necessary.

2.7.2 Potential Major Impacts in Construction Phase

There are direct environmental impacts associated with the construction of the dam, which include dust, erosion, borrow and disposal problems.

2.7.3 Potential Major Impacts in Operation Phase

Locating on a grazing area for livestock raising of the local community, the project has potential impacts on the *economic activity*. To enhance project benefit to the local community, multipurpose development of the dam may need to be encouraged incorporating local needs and aspiration including irrigation farming development.

Number of households resettled will be limited, though the project may possibly result in *split of community* because there are a number of communities in the vicinity of the proposed dam site. The reservoir, thus, may affect their traditional travel routes. The project will have some impact on *cultural properties*, as there is an old archeological structure upstream of the dam site. It is unlikely that the reservoir will inundate it but the effect needs to be studied. The local community uses the water of the tributaries for domestic use. The construction of the dam and reservoir can affect the *water usage*.

There is no potential wildlife at the dam site, however, it may possibly some impacts on *fauna and flora* of the area. Some aquatic life form is likely to be present in the tributaries, which may require further study. The flora of dam site needs to be studied to establish that no threatened or rare species exist in the project area.

In addition to the direct and indirect effects of the dam construction on the environment, the effects of the environment on the dam must be considered. The major environmental factors affecting the functioning and life span of the dam are those caused by land, water and other resource use in the catchments above the reservoir (e.g., agriculture, settlement, forest clearing) which may result in increased siltation and changes in water quality in the reservoir and river downstream.

Table R I. 27 Checklist for Flood Mitigation Dam

Category of Environmental Impact	Overall Assess.	Planning and Design Phase				Construction Phase				Operation Phase				Beneficial		
		Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal
Social Environment																
Involuntary Resettlement	A	A	L	D	H											
Economic Activity	B									B	L	D	M			
Traffic and Public facilities																
Split of Communities	B									B	L	D	M			
Cultural Properties	B									B	L	D	M			
Water and Common Rights	B									B	L	D	M			
Public Health Conditions																
Waste	C					C	S	D	H							
Hazards (risk)																
Other social impacts	B	B	L													
Natural Environment																
Toporaphy and Geology																
Soil Erosion																
Groundwater	B													B	L	D
Changes in Hydrology	B													B	L	D
Fauna and Flora	B									B	L	D	M			
Meteology																
Landscape	B									B	L	D	M			
Other natural impacts																
Pollution																
Air pollution	B					B	S	D	H							
Water Pollution	B					B	S	D	H							
Soil contamination	B					B	S	D	H							
Noise and vibration	B					B	S	D	H							
Land sussistence																
Offensive odor	B									B	L	D	M			
Other impact in pollution control																

2.8 Evaluation of Flood Diversion Channel

The proposed diversion channel is a man-made by-pass channel that redirects floodwater away from densely populated commercial and residential part of Rawalpindi where a significant economic damage was resulted with the flood 2001. There are three proposed alignment of the channel, all of which run through the land area currently used as the median strip in Islamabad, which serves for pedestrians and cyclists crossing from one sector to the other. For details of the proposed route of the channel, refer to Chapter 7.

2.8.1 Potential Major Impacts in Planning Phase

Land acquisition activity in planning phase will involve *involuntary settlement*. The strip land of the proposed channel alignment is owned by the government, therefore, land acquisition activity will not induce major impact. However, acquisition of limited land area will be required for Route 3 that propose to pass through I-8 sector in Islamabad. Regarding the land acquisition and associated involuntary resettlement in the river basin of Kurang river, the magnitude of the impact is uncertain due to limited information availability. There is some *economic activity*

taking place in a limited level, which include some roadside tea stalls, fuel wood collection and limited livestock grazing.

2.8.2 Potential Major Impacts in Construction Phase

The proposed channels may have impact on *traffic and public facilities*, which include interaction with two major highways and several other roads; therefore, the temporary bypasses for them would be required. Construction of diversion channel results in a major adverse impact on the nearby area such as *split of community* as the diversion channel traverse urban as well as pre-urban part of Islamabad. It is a direct impact and will appear from construction phase with moderate level of magnitude. Upon the construction of the diversion channel, the impact will be signified in its magnitude having long-term and direct nature. Therefore, mitigation measures need to be incorporated into the project design through route selection and construction of small-scale bridges tailoring to local needs through community consultation process. The channel is proposed to run through the land area currently used as the median strip in Islamabad, which serves for pedestrians and cyclists crossing from one sector to the other. The magnitude of the impact on the community may differ among the proposed three routes of the strip land acquired, though, detailed information on community development is not available at the time of this report writing. The proposed route of the channel alignment in Option 3 will pass through a community graveyard. Recognizing that socially stable development requires the society to retain and keep alive ties to their past and their cultural traditions, damage on such *cultural properties* should be avoided, prevented, or minimized through rejection or diversion. Adverse impacts in *waste disposal* will occur in two distinct occasions in construction and operation phases. Waste disposal in construction phase is moderate level of magnitude, though, that in operation phase will be of great importance to achieve project objectives. Illegal waste disposal into the channel results in diminished capacity of the stream and decreased flow velocity. This is not the consequent of the project, but, it is the cause of the problem that may lead to failure of the project.

2.8.3 Potential Major Impacts in Operation Phase

With the project, floodwater is diverted to the Kurang river flowing down relatively scarcely populated rural part of Islamabad. It may possibly result in *changes in hydrology* of the river such as increased downstream flooding and sedimentation unless Rawal dam discharge is appropriately managed. The impact is indirect consequence of the proposed project with long-term effects. Other impacts on flora and fauna as well as landscape are deemed negligible at the screening stage.

Table R I. 28 Checklist for Flood Diversion Channel

Category of Environmental Impact	Overall Assess.	Planning and Design Phase				Construction Phase				Operation Phase				Beneficial		
		Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal	Probability	Magnitude	Duration	Causal
Social Environment																
Involuntary Resettlement	A	A	L	D	M											
Economic Activity	B	B	L	D	M											
Traffic and Public facilities	B					B	S	D	H	B	L	D	H			
Split of Communities	A					B	S	D	H	A	L	D	H			
Cultural Properties	A					A	S	D	M							
Water and Common Rights																
Public Health Conditions																
Waste	A					B	S	D	H	A	L	I	H			
Hazards (risk)																
Other social impacts																
Natural Environment																
Toporaphy and Geology																
Soil Erosion																
Groundwater																
Changes in Hydrology	A									A	L	I	M			
Fauna and Flora	C					C	S	D	H	C	L	D	M			
Meteology																
Landscape	C									C	L	D	M			
Other natural impacts																
Pollution																
Air pollution	B					C	S	D	M							
Water Pollution	B					B	S	D	M							
Soil contamination	B					C	S	D	M							
Noise and vibration	B					C	S	D	M							
Land sussistence																
Offensive odor	B					C	S	D	M							
Other impact in pollution control																

2.9 Pollution Control in Construction Phase

Specific problems arising in the construction phase of the proposed projects were given in the previous part of the report. This section focuses on the common environmental consequence of the construction of water resource management structures.

2.9.1 Impacts on Air Quality

The impacts on air quality associated with the construction activities are moderate impacts of localized, short-term and reversible and if the plants are located away from residential areas, are properly serviced do not represent a major problem. They include 1) generation of dust due to procurement of construction materials in quarries and borrow sites; 2) generation of exhaust, flue gases and dust from asphalt manufacturing; 3) generation of pollutants and dust due to the operation of heavy vehicles and movement of machinery/equipment for material handling, earthmoving, laying of sand, brickbats, metal and stone dust, and asphalt, 4) toxic exhaust gases, dust and odor generated from the manufacture of asphalt and brickbats.

Asphalt plants produce a hot mix of quantities of different sizes of aggregates and bitumen at a desired temperature. The plant size varies with the production requirements i.e., 2-3 to 600 tones, per day. Alternatively liquid (hot) bitumen is carried in tanker trucks mounted with sprayers, to the road and is sprayed over prepared aggregate.

2.9.2 Impacts on Water Quality

The impacts on water quality induced by the activities are direct, but short-term and moderate level of magnitude. Due to proximity to water body, the impact is highly probable unless an appropriate protocol as part of the project's Environmental Management Plan is developed. Project activities in construction phase that have potential environmental impacts on water quality include equipment servicing and fueling, site preparation and clearing, earthworks, quarries and borrow sites, asphalt plant sitting and operation.

The construction activity takes place in and over the water body, which may result in contamination of surface water by leakage of waste oil. Designated fueling areas and servicing centers significantly reduce this potential impact. Site preparation may involve demolition of buildings, clearing of brushwood, tree removal and topsoil stripping. This also brings risks of erosion of exposed ground or stored topsoil, and increased water runoff and siltation of watercourses. Earthworks such as removal and placement of earth can bring further risks of soil erosion. Quarries and borrow sites can have substantial environmental impacts unless these sites are rehabilitated.