

15.3.2 Household interview survey

A household interview survey was conducted by the Study Team to collect background information about the social, economic, and cultural aspects of the local people in the Study area.

Seven (7) VDCs (Sitapaila, Ramkot, and Bhimdhunga VDC of Kathmandu District, and Chhatre Deurali, Jiwanpur, Naubise, and Kewalpur of Dhading District) were selected as the survey area, and the fieldwork was carried out in May 2000.

After the quick reconnaissance of the alignment alternatives to identify the influenced wards of 7 VDCs, the target sample size of interview was determined based on the number of households by each ward within the identified area. Survey teams interviewed about 300 households by using the questionnaire sheet prepared beforehand. Numbers of household and samples are shown in Table 15.3. Some description of main findings is included in Section 15.4.

Table 15.3 Numbers of Household and Sample

DDC/VDC name		Nos. of HH	Nos. of Sample	Ward No.
Kathmandu	Sitapaila	521	52	1,2,3,4,5,6
	Ramkot	639	64	1,2,3,4,5,6,7,9
	Bhimdhunga	278	32	1,2,3,4,5,6,7,9
Dhading	Chhatre Deurali	651	67	1,2,3,4,5,8
	Jiwanpur	668	15	5,6,8,9
	Naubise	270	15	1,2
	Kewalpur	102	5	8
Total		3129	304	

Source: Field Survey

15.4 Initial Environmental Examination

15.4.1 Site description

1) Bio-physical environment

Topography and geology

The Study area can be topographically divided into two characteristic watersheds. The former is Mahesh khola watersheds from Bhimdhunga pass to Dharke. The later is Manamati khola watershed from Bhimdhunga pass to Ring Road in Kathmandu city.

The Project Road starts at Sitapaila, Ring Road in the Kathmandu district at about 1300 m altitude, crosses the Sitapaila and Ramkot VDCs, and ascends through a steep ridge to Bhimdhunga at about 1500 m altitude. The west slope of the

Bhimdhunga ridge is very steep, and after crossing it, the road descends to Chhatre Deurali and Jiwanpur area through ridges and valleys. The end of the Project Road is set at Dharke at about 800 m altitude near the confluence of Mahesh and Naubise Khola.

The rock type exposed in the project vicinity is a part of the Kathmandu Complex of Bhimphedi group (Early Cambrian) and of Phulchoki group of Cambrian - Devonian age. Bhimphedi group of rocks, which occupies mostly the southern portion of the Project area, is represented by gray to greenish phyllite with interbands of brown to gray to grayish white limestone, while the Phulchoki group of rock is represented by gray to brown and pale brown limestone with argillaceous coating and phyllite interbands in them.

Many dormant landslides and slope failures are distributed over the Study area, especially on the mountainous slope along Mahesh Khola. Steep gradient slopes in the Study area are almost failure trace. Besides, some dangerous streams of debris flow exist on the mountain slopes in the Study area.

Climate

The Project Road is located in the area with a sub-tropical climate. The recording station at Dhunibesi in Dhading district, which is located in the south of the Study area at 1,085 m altitude, has recorded precipitation of 1,541 mm as yearly average for the period from 1971 to 1996.

The following is a summary of the meteorological data recorded at Dhunibesi station in 1996 (Climatological Records of Nepal, DOHM, 1999).

- a) Annual mean temperature: 22 °C
Max. monthly mean temperature: 31-34 °C in April - July
Min. monthly mean temperature: 8-10 °C in January, February, and December
- b) Annual mean relative humidity: 79 %, mornings
- c) Annual Precipitation: 1,541 mm
Precipitation in wet season: 1,158 mm from July to August

Natural condition

Two extensive forests with high density are located in the north and south of Ramkot valley, respectively. The northern one, namely Nagarjun Forest, is one of the Royal forests and protected by the government. The southern one is a community forest handed over from the government to the local user's group to manage and conserve it. Since these forests are comparatively rich in biological diversity, the wild animals such as jackal and weasel are often seen in the Study area. Besides, many small-scale forests with low or medium density are scattered

in the Study area, and some of them are pure stands of young planted pines. Most of these small forests is managed by the local communities or private households.

The major plants noted along the roadside include chilaune (*Schima wallichii*), saur (*Betula alnoides*), katush (*Castanopsis indica*), phalant (*Quercus* sp), laligurans (*Rhododendron arboreum*), kafal (*Myrica esculenta*), and bilaune (*Maesa chisia*). Utis (*Alnus nepalensis*) is predominant in the degraded hill slopes. Other plants in the Study area are ketuki (*Aloe* sp), siundi (*Euphorbia roylaena*), dabdabe (*Garuga pinnata*), ainselu (*Rubus ellipticus*), banmara (*Eupatorium adenophorum*), and sal (*Shorea robusta*). Sal is the protected species legally as per Forest Act, 1992 and Forest Rules, 1995.

According to the local people, tiger (*Panthera tigris*), leopard (*Panthera pardus*), jackal (*Canis aureus*), barking deer (*Muntiacus muntjak*), and jungle cat (*Felis chaus*) are occasionally seen in the forest areas. Dove (*Streptopelia* sp.), jureli (*Pycnonotus* sp.), maina (*Acridotheres* sp.), crow (*Corvus macrorhynchos*), junglefowl (*Gallus gallus*) and pheasant (*Lophura leucomelana*) are the common birds found the Study area. According to local people, the area has a good population of pheasant. Different species of lizard are also found in the Study area. Meanwhile, fish diversity in the river such as Mahesh Khola is not rich.

Water quality

The results of field survey show that river water quality of Mahesh Khola is far better than that of Manamati Khola. Existence of high population density as well as high degree of human activities prevailing in the catchment area of Manamati Khola has degraded the water quality of this river system. Whereas such activities are comparatively very less in the catchment area of Mahesh Khola as a result of which the observed water quality of this river system remains far better than that of the previous one

So far as the potable spring and well sources water quality are concerned, the measured physico-chemical characteristics of these water samples are remained in fairly good condition except a few parameters. However, observed count of total coliforms and E-coli are far beyond the permissible level of WHO for drinking water in all water samples. High level of Nitrate most possibly may be the cause of domestic sewage contamination into the groundwater source, which is mainly due to the unsewered sanitation as well as may be due to the extensive use of chemical fertilisers in and around the source. Corresponding high level of TDS and conductivity is also due to the cause of same reasons as mentioned above.

Air quality and noise

The study undertaken by Kathmandu Valley Vehicle Emission Control Project (KVVEPC) shows the recent and available data to grasp the existing condition of

ambient air quality near the Study area. As part of this study, the measurements of TSP, PM₁₀, NO₂, and SO₂ were made at 14 sites for the period from September to December, 1993. Among these sites, Kalimati (selected by KVVVEPC as the commercial area with medium traffic) and Tribhuvan University Kirtipur (as regional background/control site) are located relatively near the Study area. The values observed by KVVVEPC are shown in Table 15.4.

Table 15.4 Values Observed by KVVVEPC

Site name	TSP		PM ₁₀		NO ₂		SO ₂	
	Range	24hr. ave.	Range	24hr. ave.	Range	24hr. ave.	Range	24hr. ave.
Kalimati	331-441	391	114-154	135	12-31	19	16-202	77
Tribhuvan Univ.	45-255	94	64-81	66	10-35	18	13-77	38
WHO standard		120		70		150		125

Source: Urban Air Quality Management Strategy in Asia, Kathmandu Valley, 1997

Note: The period of measurement is from 20/11/93 to 1/12/93 at Kalimati, and from 18/11/93 to 19/12/93 at Tribhuvan University.

The TSP and PM₁₀ values are high, which have exceeded the standard of WHO. This situation is usual in Kathmandu Valley. Meanwhile, with regard to NO₂, and SO₂, the concentration levels are within the safe limits from the viewpoint of health hazards.

However, as the number of vehicles are increasing day by day, side by side, and the old vehicles are also running in the narrow streets, the present scenario of ambient air quality in Kathmandu Valley must be further deteriorating (National Planning Commission Secretariat, 1998).

There are no available data of noise levels measured in or around the Study area. Under the current condition, the ambient noise levels are generally low, since the current traffic volume is not so large in existing road, and there are few other sources of noise pollutant in the Study area. However, the noise levels at the area adjacent to the Ring Road are presumed to be comparatively high due to a certain volume of traffic including heavy trucks and buses.

2) Socio-cultural environment

Demography and settlement

The Study area mainly comprises 3 VDCs in Kathmandu district and 3 VDCs in Dhading district. Bhimdhunga, Ramkot, and Sitapaila VDC in Kathmandu district are passed through by the Project Road, and so are Chhatre Deurali, Jiwanpur, and Naubise VDC in Dhading district. The demographic features of each district and VDC are shown in Table 15.5 and 15.6, respectively.

Table 15.5 Demographic Features of Districts

District	Area (km ²)	VDCs	Households (1991)	Population (1991)	Density (persons/km ²)	Growth Rate (1981-1991)	Projected Population (1998)
Kathmandu	395	60	127,196	675,341	1,709.7	1.599	938,439
Dhading	1,926	50	51,237	278,068	144.4	1.142	305,200
Total	2,321	110	176,442	951,418	-	-	1,241,641

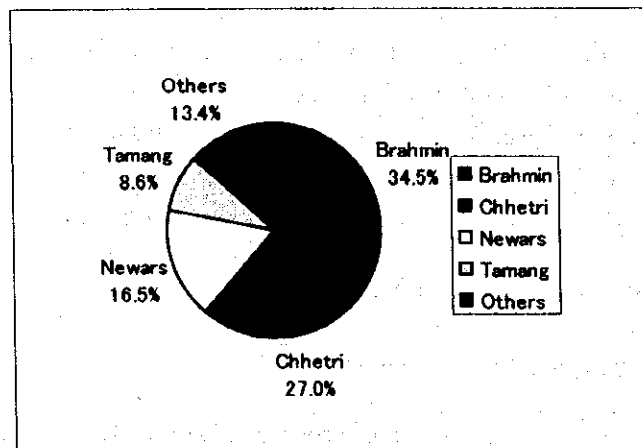
Source: Nepal District Profile (National Research Associates, 1999)

Table 15.6 Demographic Features of VDCs

District	VDC Name	Households (1991)	Population (1991)			Ave. HH size
			Total	Male	Female	
Kathmandu	Bhimdhunga	449	2,400	1,211	1,189	5.35
	Ramkot	974	5,406	2,697	2,709	5.55
	Sitapaila	1,009	5,162	2,608	2,554	5.12
Dhading	Chhatre Deurali	1,325	7,475	3,719	3,756	5.64
	Jiwanpur	1,446	8,217	4,195	4,022	5.68
	Naubise	2,276	12,338	6,217	6,121	5.42

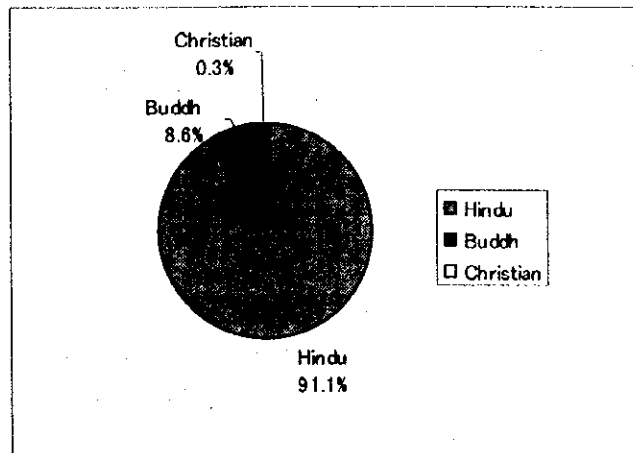
Source: Nepal District Profile (National Research Associates, 1999)

The ethnic and religious compositions found in the field survey in the Study area are shown in Figure 15.2 and 15.3. Households in the Study area are multi-ethnic. Brahmins (34.5% of total households) and Chhetries (27.0%) are predominant ethnic/caste groups in the Study area. Other groups found in the survey are Newars, Tamangs, Sanyasi, Damais, Sherpas, Magars and Gurungs. In general, the settlement is found in clusters of ethnic/caste groups. Meanwhile, Hindus are the major religious group that accounts for 91.1% of the population in the Study area, and 8.6% are Buddhists as the next major group. Among the sample households of the field survey, only one family is Christian.



Source: Field Survey

Figure 15.2 Ethnic Composition in the Study Area



Source: Field Survey

Figure 15.3 Religious Composition in the Study Area

Some wards near the Ring Road in Sitapaila VDC are most developed area in the Study area, where many houses, shops, and business establishments are located, since these areas have good access to the center of capital city. Also, the dense settlement is found along the existing unpaved road especially in Ramkot, Bhimdhunga, and Jiwanpur VDC. In other places, settlement pattern generally reflects both the distributions of arable land and topographic features. Small villages composed of 5 to 30 houses are scattered on the gentle slope or the plain ridge of mountainous area, and these villages are surrounded by cultivated land.

Based on the field survey, the occupied area of a house in the Study area is 5.2 m² on average. Most of the houses (86%) have mud and bricks walls with the thatched, tiled or corrugated sheet roof, while the rate of the houses made of RCC is less than 10%. 70% of the houses in the Study area have two floors, and the rest are divided approximately equally between one floor and three floors.

Land use and tenure

The land use in the Study area can be broadly divided into 5 types. They are cultivated lands including pasture, forests, scrub, barrens, and built up area. The area adjacent to the Ring Road is highly built up, where the Project Road will pass for Ring Road connection. Two extensive forests with high density are located in the north and south of Ramkot valley respectively, and many small-scale forests or scrub with low density exhibit a scattered pattern in the Study area. However, most of the alignment of the Project Road passes through the cultivated land.

Table 15.7 shows the number of registered landholdings in Kathmandu and Dhading district as of 1991.

Table 15.7 Landholdings by Districts

District	No. of holdings	Total area (ha)	Total No. of parcels	Average No. of parcels per holding
Kathmandu	45,540	12,809.7	119,006	2.6
Dhading	48,258	35,291.4	168,476	3.5

Source: Statistical year book of Nepal (CBS, 1999)

The average landholding size in Kathmandu district is 0.28ha, while in Dhading district is 0.73ha. On the other hand, the average size in the Study area is 1.12 ha comprised of 0.54 ha of lowland and 0.42 ha of upland, based on the result of the field survey.

Occupation

Table 15.8 summarises the occupational status of the population who are older than 10 years in Kathmandu and Dhading district. The vast majority of the population in Dhading district is recorded in the farming/agriculture sector, whereas little less than 50 % of the population in Kathmandu district is engaged in tertiary industry such as service and trade.

Table 15.8 Occupational Status by Districts

District	Prof/ Technical	Admin/ Clerical/ Sales	Service	Farming	Prod. Labour	Others	Not Stated
Kathmandu	5.1	23.9	13.6	25.5	21.3	9.9	0.7
Dhading	1.0	1.8	1.9	91.5	2.2	1.4	0.2

Source: Statistical year book of Nepal (CBS, 1999)

Table 15.9 shows the status of principal activities of the population found in the field survey in the Study area. The majority is engaged in agricultural work. However, only 36% of people are engaged in full time in agriculture. The largest numbers of people in the Study area are students. 7.2% of the population, mainly females, declared that they take care of the household. 5.1% of the population are engaged in trade and service.

Table 15.9 Principal Activities in the Study area

Principal Activities	Percentage of Population
Farming/Agriculture	36.1
Taking care of HH	7.2
Trade and service	5.1
Craft and arts	0.0
Student	38.2
Others	13.5

Source: Field Survey

Agriculture

The production of cereal crops in Kathmandu and Dhading district is shown in Table 15.10. The main production among cereals in Kathmandu district is paddy, and in Dhading is paddy and maize. The productivity of paddy in Kathmandu is much higher than that in Dhading.

Table 15.10 Production of Cereal Crops by Districts

District	Year	Paddy		Maize		Millet		Wheat		Barley	
		Area (ha)	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)	Prod. (t)
Kathmandu	1995/96	11,146	45,730	5,700	12,540	1,050	1,480	7,000	12,600	10	10
	1996/97	11,140	52,410	5,750	14,940	990	1,380	7,000	12,600	10	10
Dhading	1995/96	14,370	29,688	19,900	31,263	8,900	9,835	4,700	7,990	380	342
	1996/97	14,500	28,520	20,000	30,210	8,600	9,940	4,700	7,589	380	338

Source: Nepal District Profile (National Research Associates, 1999)

Agriculture is the main occupation in the Study area. Paddy, wheat, and maize are the major cereals. The cash crops, which are sold in Kathmandu market, such as tomato, potato and cucumber are also produced as major source of income, especially in Bhimdhunga, Chhatre Deurali, Jiwanpur and Naubise VDC. In these 4 VDCs, two or three crops a year are produced, and typical cropping patterns are as follows:

- Paddy
- Paddy
- Maize
- Vegetable
- Wheat
- Vegetable
- Mustard
- Vegetable
- Vegetable
- Wheat
- Vegetable
- Vegetable
- Fallow

The fruits such as orange, mango, and papaya are also grown as an alternative source of income.

On the other hand, the typical cropping patterns in Ramkot and Sitapaila VDC are as follows:

- Paddy
- Maize/millet
- Wheat
- Wheat/mustard
- Fallow
- Fallow

In these 2 VDCs, little volume of cash crops are produced due to lack of irrigation.

Livestock rearing by the households is popular in the Study area. They keep cattle, buffaloes, goats, and poultry. Dung of cattle and buffaloes are major source of fertilizers for cultivation. Livestock products are one of the sources of households' income. Calves are sold for pulling plough while goats are sold for meat. In addition, chickens are grown for meat and eggs both for consumption by

household itself and for sale at the market. The result of field survey in the Study area shows that one household keeps 1.2 cattle, 0.7 buffaloes, 2.5 goats and 5.3 chickens on an average.

Public facilities and service

The offices of VDCs in the Study area have constructed reservoir tanks in most of their wards for storing spring water for water supply. From these reservoirs, the water for drinking and other miscellaneous use is distributed through PVC pipes to the taps. One tap is provided for 5 - 15 households generally. During the rainy season, the water supply is often disrupted by the flood which sweeps away the PVC pipes. Also, floodwater contaminates the spring water and the same water is supplied through the taps. The result of field survey in the Study area shows that 73.2% of the households use tap water for drinking purpose, while other households use well, spring, and stream as a source of drinking water. Although nearly half of households have taps or drinking water sources close to their house, some people personally or united in-groups bring drinking water near their houses through PVC pipe from the springs directly without constructing reservoir tank.

The result of field survey shows that approximate 50% of the households in the Study area have irrigation facilities. Chhatre Deurali and Jiwanpur VDCs have high percentage of households that possess irrigation facilities, 88% and 86%, respectively. Meanwhile, not a single household among the target samples has irrigation facility in Sitapaila VDC.

The diseases, which often occur in the Study area, are hepatitis, dysentery, cholera, tetanus, and so on. Chhatre Deurali VDC has two health posts and one sub-health post. In the other VDCs (Sitapaila, Ramkot, Bhimdhunga, Jiwanpur, and Naubise), there is only one health post or sub-health post. Each health post is headed by a health assistant, while sub-health post is by an assistant health worker. In these posts, primary treatment such as injection for some diseases, vaccination, and tablets for slight illness are available. For serious diseases or injuries, people go to Kathmandu City for treatment, and it takes about 50 minutes to 6 hours to reach the hospital in Kathmandu.

Table 15.11 summarized the educational facilities and student enrolment of the 6 VDCs of the Study area. These schools are provided by both governmental and private funds. The teacher/pupil ratio in 3 VDCs of Dhading district is about 1:30 to 1:60 in 1991 (DIRDP, 1994).

Table 15.11 Schools and Students of VDCs

District	VDC Name	Primary		Lower Secondary		Secondary	
		No. of School	Total Student	No. of School	Total Student	No. of School	Total Student
Kathmandu (1999)	Bhimdhunga	5	439	1	N.A.	0	252
	Ramkot	6	1,108	2	N.A.	2	749
	Sitapaila	3	975	2	N.A.	2	762
Dhading (1991)	Chhatre Deurali	9	995	0	0	1	330
	Jiwanpur	4	514	0	0	0	0
	Naubise	13	1,404	0	0	1	1,040

Note: N.A. means "Not Applicable".

Source : DIRDP, 1994

: Kathmandu District Education Office, 1999

According to the field survey, the literacy rate in the Study area is 80.3%. This rate is considerably higher than that of the national level of 39.6% (1991 census). 32.9% of the population in the Study area have primary level of education. Similarly, 15.7% have lower secondary level, 20.3% have secondary level, 9% have certificate level or 10+2 level, 2.2% have graduated level and 0.3% have post-graduate level of education. Chhatre Deurali VDC has highest rate among the surveyed VDCs with not only primary level of education (45.2%) but also post-graduate level of education (1.0%).

Energy

If was found that the households in the Study area use firewood, kerosene, liquid petroleum gas (LPG), and electricity as the major energy sources for cooking. The respective rate of utilization of each source is roughly quartered in the whole Study area. Generally speaking, use of firewood is decreasing rapidly because it is becoming very expensive due to depletion of the forest, whereas LPG is getting popular as an energy source for cooking. However, the individual status of the energy utilization for cooking is very diverse by VDCs. Maximum number of the households (40.6%) in Jiwanpur use firewood, 57.7% in Sitapaila use electricity, and 39.0% in Ramkot use LPG.

Electricity and kerosene are the major energy source used for lighting by the households in the Study area. 54% of the households are found to use electricity, and 45% use kerosene in whole Study area. Individually speaking, however, 93% of the households use kerosene in Jiwanpur, whereas 98% use electricity in both Ramkot and Sitapaila.

Participation in user's group/community programs

According to the result of field survey, less than 20% of the households are found to be engaged in different types of user's groups/community programs. 2% of the households are engaged in irrigation system committees (user's group), 6% are

engaged in community forestry, 4% are engaged in community water supply committees, and 7% are engaged in other groups or community programs such as women's group and farmers' group. Jiwanpur VDC has the highest rate of households (36.2%) engaged in user's groups/community programs, while Bhimdhunga has low rate (3.1%).

However, about 70% of the households in the Study area are found to participate in one or more community programs by providing the voluntary labour or by cash donations. Therefore, most of the households have the opportunity to engage or participate in some user's groups or community programs.

Cultural/religious aspects

The major festivals or religious activities in the Study area are Dashain, Tihar, Maghe Sankranti, Fagu Purnima, Sivaratri, Ghodejatra, Ram Nauami, Chaite Dashain, Nag Panchami, Krishnastami, Gaijatra, Indraajatra, Matatirtha Aunsi and Gokarna Aunsi. Most of these festivals and activities are very popular in Nepal, and both Hindus and Buddhists equally participate in these festivals/religious activities.

There are many social activities of the people in the Study area, and these are also popular in Nepal. The typical activities, for example, are Nwaran, Gufa Rakhne, Bratabandha, Shradha, etc.

No items of cultural heritage nor historic site are reported in the Study area. However, there are some religious places such as temples in the Study area. Two big temples are located on the top of both hills of Ramkot valley, which will not be directly affected by the construction of the Project Road. Small temples of various gods and goddesses, namely Ram, Krishna, Ganesh, Mahadev, Saraswati Devi, Bhagwati, etc., are scattered in the Study area. Also, there are many spots in the Study area, namely Chautara, where local people gather commonly for resting and communication. These spots are generally located along the existing road/trail, or near the public facilities such as school/temple in the village. Chautara is composed of one or more ancient big trees, and small shrine and drinking fountain are sometimes settled on the base of tree.

15.4.2 Examination on potential environmental impact

Based on the data and information in terms of the existing environmental conditions in the Study area, characteristics of the Project Road, and issues raised by VDCs and local people, an examination on potential environmental impact was conducted. The results are shown in Table 15.12.

In the examination, an evaluation was conducted on the selected 18 environmental elements, referring the JICA environmental screening format and other related

guidelines. Among the selected environmental elements, the issues marked "A" and "B" in the table are recognized as the items to be studied in the next EIA stage, since serious or some impact is expected due to the Project. For the items marked "U" in the table, further investigation and examination in the next stage will be required to identify the magnitude or extent of impacts. Therefore, EIA study regarding these environmental elements should be carried out, and proper countermeasures and/or environmental monitoring plan should be developed in the next stage if necessary.

Besides, the following viewpoints and issues are also recognized to be taken into consideration during the preparation of draft EIA report.

1) Physical issues

Construction stage

- Change in land use and likely loss of farm and forest lands;
- Landscape disturbance;
- Land stability, landslide, soil erosion and downstream sedimentation, including geological hazard;
- Tunneling including blasting and vibration;
- Change in air quality due to dust and exhaust emission, change in water quality due to sedimentation, and noise level;
- Disposal of large volume of spoil due to tunnel construction and hill slope cutting;
- Management of solid wastes disposal generated by the construction workers
- Stocking piling of construction materials;
- Operation of quarries and borrow pits;
- Drainage alteration and associated erosion and sediment; and
- Road safety measures.

Operation and maintenance stage

- Road slope stability and management; and
- Human health associated with the change in air quality and noise level along the road alignment.

2) Biological issues

Construction stage

- Loss of forest area as a part of site clearance along the road alignment and right-of-way;
- Pressure on legally categorized forests for firewood and timber;
- Possible impact on flora, fauna (biodiversity);
- Disturbance to wildlife movement, and possible hunting and poaching;

- Use of forest product by the construction workers and construction activities including bitumen heating; and
- Community forest and associated issues.

Operation and maintenance stage

- Impact on and growth of natural forest near the Bhimdhunga ridge;
- Possible extraction of firewood and timber; and
- Disturbance to wildlife movement.

3) Socio-economic and cultural issues

Construction stage

- Loss of agriculture products;
- Population displacement, if any;
- Loss of assets due to land acquisition;
- Land acquisition and compensation at market price;
- Resettlement, relocation and/or rehabilitation;
- Effect or pressure on social service facilities such as drinking water, school, health post, etc.;
- Effect on irrigation schemes;
- Effect on health, sanitation and safety;
- Availability of local construction workers, employment opportunities and mobilization of local people;
- Impact on cultural, religious and historical sites;
- Protection of public important places; and
- Mobilization of local people for road construction.

Operation and maintenance stage

- Employment generation to local people;
- Possible increase in vegetable production, and enhancement of other economic activities; and
- Possible township development and likely environmental impacts along the road alignment.

Table 15.12(1/2) Results of Examination on Potential Environmental Impact

Environmental elements	Type of impact	Expected impact and its magnitude
Land use	Change of land use pattern due to road construction	A There are various types of land use in the Study area, such as agricultural land, forest, scrub/barren land, and built-up area. Change of existing land use pattern in ROW is expected due to the construction of the Project Road.
Landscape	Changes of the topography or deterioration of harmonious landscape	B Some impact on the landscape is expected, since the cutting and embankment work will cause the changes of topography, and artificial structures such as bridge and gabion wall will appear.
Land stability	Increment of risk of slope collapse, land slide, and soil erosion due to the cutting and embankment work	B Some parts of the proposed alignment pass through steep slope areas especially in Section C and D, and there are a few dormant landslides near the alignment. Therefore, increment of the risk of slope collapse, landslide, and soil erosion is expected due to the cutting and embankment work.
Air pollution	Change in air quality caused by gaseous emission from vehicles	B A certain volume of the future traffic of the Project Road is anticipated especially near the Ring Road. This may make the air quality worse due to the gaseous emission and dust by the vehicle traveling.
Noise	Generation of noise due to the vehicle traveling	U The impact of noise due to the vehicle traveling is not significant in general. However, the magnitude of impact of noise on some facilities such as schools and temples should be considered and reduced to the proper level, if serious impact is expected. Therefore, more investigation is required along the selected optimum route, whether sensitive facilities to be protected against noise exist adjacent to the alignment.
Vibration	Generation of vibration due to the vehicle traveling	- There is no significant impact of vibration due to the vehicle traveling.
Water quality and sedimentation	Change in water quality and impact on river system by sedimentation	B Some impact on the water quality and the change of river system are expected, since sediment discharge may occur or be increased in comparison with the current condition, due to the deforestation and appearance cutting/banking slope.
Water resource	Reduction or depletion of water supply volume due to drawdown of groundwater table	B Big-scale cutting work or tunneling may cause the reduction or depletion of water supply volume due to drawdown of groundwater table.
Waste	Generation of waste including the construction waste such as surplus soil and debris	B It should be assessed whether big volume of the construction waste such as surplus soil and debris will be generated. And also, domestic waste generated by the construction workers may occur.
Offensive odor	Generation of offensive odor	- There is no significant impact of offensive odor.
Forest	Loss of forest area due to site clearance along the road alignment	B The selected optimum route does not pass through two extensive forests in the Study area. However, loss of the small forests scattered is not avoidable due to the site clearance along the road alignment. And also, the utilization of the forest products for the construction activities should be considered.

Note: A: Serious impact is expected. B: Some impact is expected. U: Extent of impact is unknown. -: Impact is not significant.
Source: JICA Study Team

Table 15.12(2/2) Results of Examination on Potential Environmental Impact

Environmental elements		Type of impact	Expected impact and its magnitude
Bio-physical environment	Flora and fauna	Impact on habitat of flora and fauna, and extinction of species due to construction work or due to change of habitat condition	Some impact on the habitat of flora and fauna, including the disturbance of movement for wildlife, is expected due to the road construction.
	Meteorology	Changes in microclimate such as temperature and wind due to large-scale reclamation or construction	There is no significant impact on meteorology.
Socio-cultural environment	Resettlement and land acquisition	Resettlement due to road construction (Transfer of residence/land ownership)	Some parts of the proposed alignment pass through residential areas, and built-up area with high density of houses exists near the Ring Road, where the route of Section A will be constructed. Besides, the chief concern raised by the VDCs and local people is the issue on land acquisition and on compensation for land or houses to be lost or affected.
	Economic activities	Loss of production base such as agricultural land, and change of economic structure	Loss of agricultural land due to the construction of the Project Road may cause the negative impact on the production yield of cereal crops, or cause the reduction of income from cash crops. However, positive effects are also expected, such as generation of employment opportunities, promotion of trade and business, enhancement of social services, and acceleration of economic activities.
	Social/living facilities	Impact on social or living facilities such as schools, medical posts, and irrigation system	Some impact on the social or living facilities may be caused by construction of the Project Road, since schools, irrigation canals, water supply systems, etc. exist in the Study area. However, the magnitude or extent of the impact is unclear. Therefore, more investigation is required along the selected optimum route to specify the likely affected social/living facilities.
	Cultural /religious sites	Loss or deterioration of cultural/religious properties such as temples and historic assets	There are neither cultural heritages nor historic sites in the Study area. Two big temples are not affected directly by the construction of the Project Road. However, some cultural/religious spots such as small temple and Chautra are scattered in the Study area. Therefore, more investigation is required along the selected optimum route to specify the likely affected cultural/religious spots.
	Health and sanitation	Deterioration of health or sanitary conditions due to the population gathered	Deterioration of health and sanitary conditions may be caused by the concentration of workers during the construction stage and by the urbanization in post-construction stage.

Note: A: Serious impact is expected. B: Some impact is expected. U: Extent of impact is unknown. -: Impact is not significant.

Source: JICA Study Team

15.5 Environmental Impact Assessment on Optimum Route

15.5.1 Introduction

In order to formulate environmental mitigation measures and an environmental monitoring plan for the Project, the various environmental elements were examined in the detailed Environmental Impact Assessment, based on the results of the IEE described in the previous section and approved TOR by MOPE.

Prior to the commencement of the EIA study, the Scoping Report and TOR of EIA was prepared in cooperation with DOR, JICA Study Team, and other related organizations. DOR submitted the Scoping Report and TOR to MOPE through MPPW on 25th May 2000. MOPE held the EIA Report Recommendation Committee on 8th and 9th of June 2000 to examine the TOR, and notified DOR of its approval on 14th June 2000.

EIA study on the selected optimum route was conducted based on the above approved TOR. The full contents of EIA study was prepared as the Initial draft EIA report separately. This section outline the EIA study, comprising i) prediction and assessment of environmental impact, and ii) development and recommendation of mitigation measures and environmental monitoring. The cost of mitigation measures was estimated to compose the total project cost.

The tasks of the JICA Study Team are the works until the preparation of the Initial Draft EIA Report, and DOR will follow the required procedures such as a public hearing on the result of EIA study, so as to meet the EIA approval for the project implementation as per the legal EIA scheme of Nepal.

15.5.2 Impact prediction and assessment

Based on the project features and the existing environmental condition in the Project area, impact prediction was carried out. The results of prediction were assessed in comparison with a target of environmental conservation, i.e. the deterioration of the existing environment in the Project area should be minimized to the extent possible. When the significant impact was found and it was unavoidable, mitigation measures would be proposed.

1) Bio-physical environment

- Land use

The total area to be required for ROW of 50 m (25.0 m either side from the center line) will be approximate 103 ha, excluding tunnel portion. The existing land use pattern within ROW is shown in Table 15.13.

Table 15.13 Land Use within ROW

Land use	ROW(m)	Area(ha)	Percentage	Remark
Khet	50	49	47 %	Lowland for agriculture
Bari	50	43	42 %	Upland for agriculture
Orchard	50	1	1 %	
Forest	50	4	4 %	
River	50	0	0 %	
Barren land	50	6	6 %	
Total		103	100 %	

Note: Tunnel portion is excluded.

Source: Field Survey

The area to be actually changed will be less than the values in the table, since almost all of the Project Road can be constructed in the width less than 50 m. However, in the portion of STA. 6+100 ~ 14+000, more than 50 m width will be required for the road construction due to the steep terrain.

- Landscape

The existing landscape will be changed due to the cutting and embankment work. Especially in the steep terrain in Bhimdunga and Chattré Duerali VDC, large slope will appear and many structures such as retaining wall will be constructed. It is proposed to minimize these artificial changes of landscape by means of slope sodding or plantation.

- Land stability

The potential risk of landslide was decreased satisfactorily, since dormant landslides in mountainous area were avoided when selecting the optimum route. However, the Project area is geologically weak and fragile. And also the construction of road on hill slope and terraces will create new bare surface and remove the existing vegetation. It is therefore inevitable that there will be an increased risk of soil erosion, which could result in the gully and the loss of topsoil. Temporary erosion control should be provided during construction stage especially in rainy season, and mitigation measures should include slope protection in order to reduce the rainfall impact.

- Air pollution

Although the activities of heavy equipment and trucks during construction period may cause the adverse affect on air quality, this affect will be for the short term and temporary. However, the TSP concentration level in the Project area is fairly high even under the current conditions. The countermeasures for reduction of TSP generated by construction activities should be considered.

During operation period, the air pollution due to the vehicle emission may be severe. For the projection of this magnitude, the JICA Study Team has conducted the air quality measurement along the Tribhuvan Highway (current traffic volume at Thankot is approximate 5,500~6,000 vehicles per day), and observed values are shown in Table 15.14.

Table 15.14 Air Quality along Tribhuvan High Way

Sampling Stations	Observed Values ($\mu\text{g}/\text{m}^3$)			
	TSP	PM ₁₀	SO ₂	NO ₂
Dharke	111	57	< 13 (2.2)	10.1
Kanakot	419	157	< 13 (3.7)	10.2
Thankot/Balambu	246	93	< 13 (2.3)	9.0
WHO Guidelines	150-230	70	100-150	150

Source: Field survey

Note: Field survey was conducted on October 23-25, 2000

This table indicates that, along the existing highway, the gaseous emission levels of NO₂ and SO₂ are much below the values of WHO guideline. Considering the future traffic volume shown in Table 15.15, the air pollution of gaseous emission along the Project Road will be similar on the whole, and it is still expected to be low. However, there is the possibility that TSP concentration level along the Project Road will be high, since that of existing highway exceeds the value of WHO guideline. Therefore, adequate maintenance and repairing of the pavement of the Project Road will be required.

Table 15.15 Future Traffic Volume of Project Road

Year	(vehicle/day)			
	Sitapaila	Ramkot	Bhimdhunga	Dharke
2010	5,680	4,470	4,120	3,900
2020	8,390	6,150	5,590	5,310

Note: The traffic volume of existing highway in 2,000 is approximate 5,500~6,000 vehicle/day.

Source: JICA Study Team

- Noise

Under the current conditions, the ambient noise level in the Project area is generally low, except near Ring Road (Sitapaila VDC) where trucks and buses are sometimes passing. The construction activities of the Project Road are likely to increase noise level near it due to the operation of heavy equipment. Since this affect will be continuous and inevitable, it is recommended that the operation of heavy equipment be away from the settlement area as far as possible, and the work hours be restricted to the daytime basically.

Blasting method will be applied to the tunnel construction, and result in impulsive noise and vibration nearby. Therefore, activity schedule should be strictly considered and be informed to local people.

In post construction stage, the increment of noise level due to traffic may be severe. For the projection of this magnitude, the JICA Study Team has conducted a noise level measurement at Thankot of the Tribhuvan Highway, and noise level of approximate 50~70 dB (L₅₀) was recorded. It is expected that the noise level along the Project Road will be similar to that of current level at Thankot on the whole, considering the traffic volume both of the Project Road and of the existing highway. Although the noise level of 70 dB is relatively high, this was recorded in a small fraction of 24 hours measurement at Thankot. It is not, therefore, expected that the noise impact on the living environment of local people along near the Project Road will be significant. However, consideration for reduction of noise should be given to the sensitive receptors such as schools.

- Water quality and sedimentation

During the construction period, there will be a risk of pollution to Manamati khola, Mahesh khola and their tributaries from blasting or earthwork that would provide increased sediment. In particular, an increase in the turbidity caused by sediment discharges due to exposing areas and tunnel construction, and the alkaline discharge due to the tunnel construction would adversely affect the river water quality. It is therefore necessary to develop sediment control measures against soil erosion of exposed area, and to provide treatment facilities for tunnel construction.

A large labor force will be employed for construction work. In order to avoid organic pollution of the existing water bodies, the wastewater from campsites should be treated on site. Moreover, emergency measures should be developed in the event of an accidental spillage of oil and other chemicals.

- Water resource

Most of the households in the Project area depend on groundwater or spring water for the resource of drinking water. It is likely that earthwork of excavation and tunnel construction would affect the groundwater flow in the vicinity of road construction, and reduction or depletion of domestic water may occur. Moreover, the current water supply volume would be affected, since the large number of labor forces, mobilized for construction work, will require drinking water. Consideration should be given to the domestic water supply for local people, in order to keep or restore current supply volume.

- Waste

The Project Road has the concept to balance the earthwork quantity between cutting and embankment in the design. However, surplus soil of approximately 130,000 m³ would be generated. In order to minimize the impact of spoil bank, the JICA Study Team has designed an additional embankment on both sides of

the Project Road in Sitapaila (Package-I). This additional embankment will not cause any adverse affect, because the embankment is designed within ROW. And also, it is proposed that surplus soil be reused for the construction of the truck terminal near the Manamati Bridge, which will contribute toward the environmental improvement near Ring Road. If this plan is put into practice, no spoil bank is required.

A large labor force will be mobilized for construction work. In order to keep the health and sanitary conditions in the Project area, the domestic waste generated by construction workers should be treated adequately.

- Forest

The Project Road does not pass through any legally protected forest area. However, the field survey recorded that ROW would pass through two small patches of forest. One is a community forest located in Ramkot VDC (near STA. 3+000), and another is a private forest located in Bhimdhunga VDC (near STA. 5+000). The estimated quantity within the ROW in these forests is approximately 550 trees. Besides, approximately 1,700 standing trees, which might be cleared, were recorded within ROW. These affects of forest/tree clearance will not be significant. However, it is proposed that the loss of trees be mitigated by means of compensatory planting, since the forest resources in the Project area are very poor at present. And also, during the construction period, any other forest/tree clearance for the firewood or timber should be prohibited.

- Flora and fauna

No endemic or threatened species of flora and fauna were recorded in the project area. Sal (*Shorea robusta*) and champ (*Michelia champaca*), which are protected species legally as per Forest Act and Rules, were recorded by the field survey. However, the ratio of these trees to be cleared among the total recorded quantity is estimated to be about 20% only. Therefore, the impact of these two species will not be significant, and the compensatory planting can mitigate this impact.

No endangered mammals were recorded by the field survey. Only tiger (*Panthera tigris*), which is on the Red List of IUCN, was reported by the local people. However, it is presumed that main habitat of this species is Nagarjun Royal forest which has good biological diversity. Direct impact on this species will be insignificant.

Birds, amphibians, and reptiles recorded by the field survey are common species, and the population density of these species is same in and around the Project area. Therefore, very small impact on these species is expected. Although the Mahesh khola and Manamati khola have few fish diversity and population, sedimentation or increment of turbidity of water body may cause adverse impact on fish.

2) Socio-cultural environment

- Resettlement and land acquisition

At present, 185 house structures exist within ROW of 50 m width. These houses will be required to resettle or relocate. Two schools will be also required to relocate. The secondary school in Jiwanpur VDC (at STA. 17+300) is located in ROW. Although the primary school in Chhatre Deurali (at STA. 11+100) is not within the ROW, this school will be surrounded by the hairpin curve of the Project Road. It is better for this primary school to relocate nearby.

For the construction of the Project Road, approximately 103 ha of land will be acquired as ROW of 50 m width. As described in Table 15.13, about 90% of acquired land is agricultural land, and other is consisting of orchard, barren land, and forest.

The plan of land acquisition and resettlement is proposed in Chapter 16.

- Economic activities

In general, the Project Road will lead to various beneficial effects and acceleration of economic activities, and enhance the social services. However, as the adverse impact on economic activities, the loss of agricultural production is expected due to the land acquisition. The income of cash crop of affected households will decrease, or expenditure for purchasing food will increase. Therefore, adequate compensation and consideration should be provided to the affected households (mentioned in Chapter 16).

- Social/living facilities

The Project Road is likely to pass through and demolish irrigation canals (about 800 m of total length), electric line and poles (about 2 km line and 60 nos. poles), and many temporary water taps (PVC pipe). And also, 1 water tank (near STA. 18+100), and 2 permanent water taps (near STA. 6+500 and 14+800) will be affected. These facilities should be restored or renewed in order to keep the social/living conditions of local people.

In addition, the population growth due to the construction workers mobilization, or due to the urbanization in post construction stage, will lead to the urgent requirement of school facilities.

- Cultural/religious sites

In the Project area, there are no cultural heritage or historic site. Significant impact on cultural/religious aspects is not likely to occur. However, the Project Road will pass through a small temple in Chhatre Deurali VDC and 3 Chautaris.

According to the focus group discussion with local people, these impacts can be easily mitigated by means of replacement of the temple and small shrines under Chautaris to a preferable location.

- Health and sanitation

A large labor force will be mobilized for construction work. In order to avoid deterioration of health and sanitary state in and around the project area, it is recommended that construction workers be given basic education and preliminary aid, and also that public medical services be improved. In the long term, the improvement of public medical improvement will be beneficial to the local communities, since the urbanization along the Project Road is expected in post construction period.

3) Others

The risk of traffic accidents is likely to increase both during the construction and post construction period. The facilities for prevention of accidents and securing the safety for local people should be designed, and also, traffic safety education should be provided to local people.

15.5.3 Mitigation measures

Based on the impact prediction and assessment, the mitigation measures, to be included in design/construction/post construction stage, are proposed in Table 15.16. Mitigation measures should be incorporated into the tender documents prepared under the engineering component of the Project, in order to ensure that the contractors are obliged to comply with measures.

Table 15.16 (1/5) Proposed Mitigation Measures

Environmental Elements		Proposed Mitigation Measures	Purposes and Expected Effectiveness	Responsibility
Bio-physical environment	Landscape	<p>Design stage</p> <p>a. Cutting/embanking slopes should be covered by sodding. (*1)</p> <p>b. Evergreen tree belts on both sides in Sitapaila and Ramkot should be considered. (*1)</p>	<p>Mitigation for change of landscape</p> <p>Continuity of green belt from Ring road</p>	<p>Design team</p> <p>- ditto -</p>
	Slope stability and erosion	<p>Design stage</p> <p>a. Slope gradient and protection of end toe of slope should be followed to standard or diagraph of roadway. (*1)</p> <p>b. Earthwork schedule avoiding rainy season should be developed. (*2)</p> <p>c. Drainage systems of cutting/embanking slopes should be designed. (*1)</p> <p>d. Cutting/embanking slopes should be covered by sodding. (*1)</p> <p>e. Experimental sodding of slope using indigenous species should be carried out. (*1)</p> <p>During construction</p> <p>a. Temporary drainage and erosion control should be provided. (*1)</p> <p>b. Earthwork should be minimized in rainy season. (*2)</p> <p>c. Exposed areas by cutting or embanking should be given attention in order to maintain slope with temporary erosion control in rainy season. (*1)</p> <p>d. Post construction</p> <p>e. Any damage of sodding and slope drainage systems should be restored immediately. (*1)</p>	<p>Reduction of risk of slope collapse</p> <p>- ditto -</p> <p>Prevention of slope erosion</p> <p>- ditto -</p> <p>Enhancement of effectiveness of slope protection measures</p> <p>Prevention of slope erosion</p> <p>- ditto -</p> <p>- ditto -</p>	<p>Design team</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>Contractor</p> <p>- ditto -</p> <p>- ditto -</p> <p>DOR</p>

Table 15.16 (2/5) Proposed Mitigation Measures

Environmental Elements	Proposed Mitigation Measures	Purposes and Expected Effectiveness	Responsibility
Bio-physical environment	<p>Air pollution</p> <p>Design stage a. Evergreen tree belts on both sides in Sitapaila and Ramkot should be considered. (*3) During construction a. Access roads should be gravelled. (*1) b. Water spraying on access roads should be carried out whenever required. (*1) c. Stocked soil should be covered by plastic sheet. (*1) d. Construction equipment should be maintained in an efficient condition. (*1) Post construction a. Adequate maintenance and repairing of pavement should be carried out. (*1)</p>	<p>Reduction of gaseous emission</p> <p>Reduction of TSP - ditto - - ditto - - ditto - Reduction of TSP and gaseous emission</p> <p>Reduction of TSP</p>	<p>Design team</p> <p>Contractor - ditto - - ditto - - ditto -</p> <p>DOR</p>
	<p>Noise and vibration</p> <p>Design stage a. Schools adjacent to the Project Road should be protected by evergreen trees against noise insulation. (*3) b. Such structural improvement as glass window installation or wall reinforcement should be provided to schools. (*3) During construction a. Work schedules minimizing impact on sensitive receptors should be developed. (*2) b. Construction activities should be undertaken in daytime basically. (*2) c. Vibrating compaction method should be avoided near settlement. (*2) d. Blasting in nighttime for tunnel construction should be prohibited in principle. (*2) e. Blasting schedule of tunnel construction should be informed to local people. (*1)</p>	<p>Reduction of noise impact on sensitive receptors Reduction of noise impact on sensitive receptors - ditto - Reduction of noise impact Reduction of vibration impact Reduction of noise and vibration impact Securing safety for local people</p>	<p>Design team - ditto -</p> <p>Contractor - ditto - - ditto - - ditto -</p>

Table 15.16 (3/5) Proposed Mitigation Measures

Environmental Elements	Proposed Mitigation Measures	Purposes and Expected Effectiveness	Responsibility
<p>Bio-physical environment</p> <p>Water quality</p>	<p>Design stage</p> <p>a. Cutting/embanking slopes should be covered by sodding. (*1)</p> <p>During construction</p> <p>a. Temporary drainage and erosion control should be provided in order to avoid contamination of local waterway by turbid water. (*1)</p> <p>b. Earthwork should be minimized in rainy season. (*2)</p> <p>c. Exposed areas by cutting or embanking should be given attention in order to maintain slope with temporary erosion control in rainy season. (*1)</p> <p>d. Stocked soil should be covered by plastic sheet. (*1)</p> <p>e. Treatment facilities of turbid and alkaline water should be provided for tunnel construction. (*1)</p> <p>f. Wastewater from campsite should be treated on site. (*1)</p> <p>g. Emergency measures should be prepared for an accident of spillover of oil or other chemicals. (*1)</p> <p>Post construction</p> <p>a. Any damage of sodding and slope drainage systems should be restored immediately. (*1)</p>	<p>Restraint of turbid water effluence</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>Restraint of turbid and alkaline water effluence</p> <p>Prevention of organic pollution</p> <p>Risk management</p> <p>Restraint of turbid water effluence</p>	<p>Design team</p> <p>Contractor</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>- ditto -</p> <p>DOR</p>
<p>Water resource</p>	<p>During construction</p> <p>a. Reduction of water supply volume for local communities due to construction should be restored by means of securing new resources and installing storage tanks. (*1)</p> <p>b. Domestic water for campsite should be secured with less impact on current supply volume for local communities. (*1)</p>	<p>Compensation for reduction or depletion of domestic water due to drawdown of groundwater table</p> <p>Keeping current volume of domestic water for local people</p>	<p>Contractor</p> <p>- ditto -</p>

Table 15.16 (4/5) Proposed Mitigation Measures

Environmental Elements	Proposed Mitigation Measures	Purposes and Expected Effectiveness	Responsibility
Bio-physical environment	<p>Waste</p> <p><u>Design stage</u> a. Surplus soil should be minimized. (*2)</p> <p><u>During construction</u> a. Balancing of cutting and embanking volume should be considered beyond construction packages. (*1) b. Domestic waste from campsite should be adequately stored and disposed at an approved landfill site. (*1) c. Waste oil or other chemical wastes should be adequately collected, stored, and disposed. (*1)</p>	<p>Reduction of dumping soil</p> <p>Reduction of dumping soil</p> <p>Waste management</p> <p>Waste management</p>	<p>Design team</p> <p>Contractor(s)</p> <p>Contractor</p> <p>- ditto -</p>
	<p>Forest, flora and fauna</p> <p><u>Design stage</u> a. Evergreen tree belts on both sides in Sitapaila and Ramkot should be considered. (*3) b. Cutting/embanking slopes should be covered by sodding. (*1) c. Cleared tree quantity due to construction should be mitigated by planting. (*3)</p> <p><u>During construction</u> a. Boundary of forest clearance should be rigidly identified. (*1) b. Use of forest product for firewood and timber should be restricted. (*2)</p> <p><u>Post construction</u> a. Any damage of sodding and tree planting should be restored immediately. (*1)</p>	<p>Mitigation for forest clearance</p> <p>Mitigation for impact on habitat of flora and fauna</p> <p>Mitigation for forest clearance</p> <p>Prevention of superfluous forest clearance</p> <p>Preservation of remainder forest</p> <p>Keeping mitigation effectiveness</p>	<p>Design team</p> <p>- ditto -</p> <p>- ditto -</p> <p>Contractor</p> <p>- ditto -</p> <p>DOR</p>
Socio-cultural environment	<p>Resettlement and land acquisition</p> <p>Social/living facilities</p>	<p>(mentioned in Chapter 16)</p> <p>Restoration of living conditions and social services</p> <p>Improvement of social services</p> <p>- ditto -</p>	<p>Contractor, NEA and Central Gov. local Gov.</p> <p>- ditto -</p>
	<p><u>During construction</u> a. Damaged facilities such as irrigation canal, water tap and pipe, and power transmission should be renewed. (*1, *3) b. Social services such as schools should be provided to construction workers and their families. (*2)</p> <p><u>Post construction</u> a. Social services such as school should be provided according to urbanization. (*2)</p>	<p>Restoration of living conditions and social services</p> <p>Improvement of social services</p> <p>- ditto -</p>	<p>Contractor, NEA and Central Gov. local Gov.</p> <p>- ditto -</p>

Table 15.16 (5/5) Proposed Mitigation Measures

Environmental Elements	Proposed Mitigation Measures	Purposes and Expected Effectiveness	Responsibility
Socio-cultural environment	<p><u>Cultural/religious spots</u></p> <p><u>During construction</u></p> <p>a. Such religious spots as small shrines in ROW should be replaced or moved to preferable location. (*1)</p>	Restoration of religious spots	Contractor
	<p><u>Health and sanitation</u></p> <p><u>During construction</u></p> <p>a. Basic health and sanitary education should be given to construction workers. (*1)</p> <p>b. Preliminary medical care should be available at campsite. (*1)</p> <p>c. Public medical services should be provided to construction workers and their families. (*2)</p> <p><u>Post construction</u></p> <p>a. Medical and sanitary services such as health-posts should be provided according to urbanization. (*2)</p>	<p>Risk management against deterioration of health and sanitary conditions</p> <p>- ditto -</p> <p>Improvement of medical and sanitary services</p> <p>- ditto -</p>	<p>Contractor</p> <p>- ditto -</p> <p>Central and local Gov.</p> <p>- ditto -</p>
Others	<p><u>Road safety and convenience</u></p> <p><u>Design stage</u></p> <p>a. Existing foot trails damaged by construction should be relocated on cutting/embanking slopes. (*1)</p> <p>b. Zebra crossing and road signs should be designed near schools and settlements. (*1)</p> <p>c. Bus park should be designed near settlements. (*1)</p> <p><u>During construction</u></p> <p>a. Road signs, traffic controllers, and gates should be arranged at required points of access roads. (*1)</p> <p>b. Tracks and heavy equipment should be checked periodically and maintained in an efficient condition. (*1)</p> <p>c. Basic instruction of traffic safety should be given to the truck drivers and heavy equipment operators. (*1)</p> <p>d. Traffic safety education for local people should be carried out. (*1)</p>	<p>Restoration of local movement and access</p> <p>Prevention of accidents</p> <p>Reduction of traffic congestion</p> <p>Securing safety for local people</p> <p>Prevention of accidents</p> <p>- ditto -</p> <p>Securing safety for local people</p>	<p>Design team</p> <p>- ditto -</p> <p>- ditto -</p> <p>Contractor</p> <p>- ditto -</p> <p>- ditto -</p> <p>DOR</p>

Remark: Cost of measures marked "1" is included in the project cost or maintenance cost.

No cost of measures marked "2" is required.

Cost of measures marked "3" is separately estimated and described in Chapter 18.

Source: JICA Study Team

15.5.4 Environmental monitoring

The main objectives of the environmental monitoring are to provide continuous feedback on the project implementation so as to identify actual or potential successes/problems, and to execute timely adjustments to the project works. Monitoring should be an integrated part of good environment management during the construction. Post construction monitoring is also required to examine the success of the site restoration and to evaluate the effectiveness of the mitigation measures.

On the other hand, Schedule 6 of EPR 1997 presents an outline of the environmental monitoring. Monitoring agency, time-schedule, monitoring indicators, etc., should comply with the provision of EPR 1997.

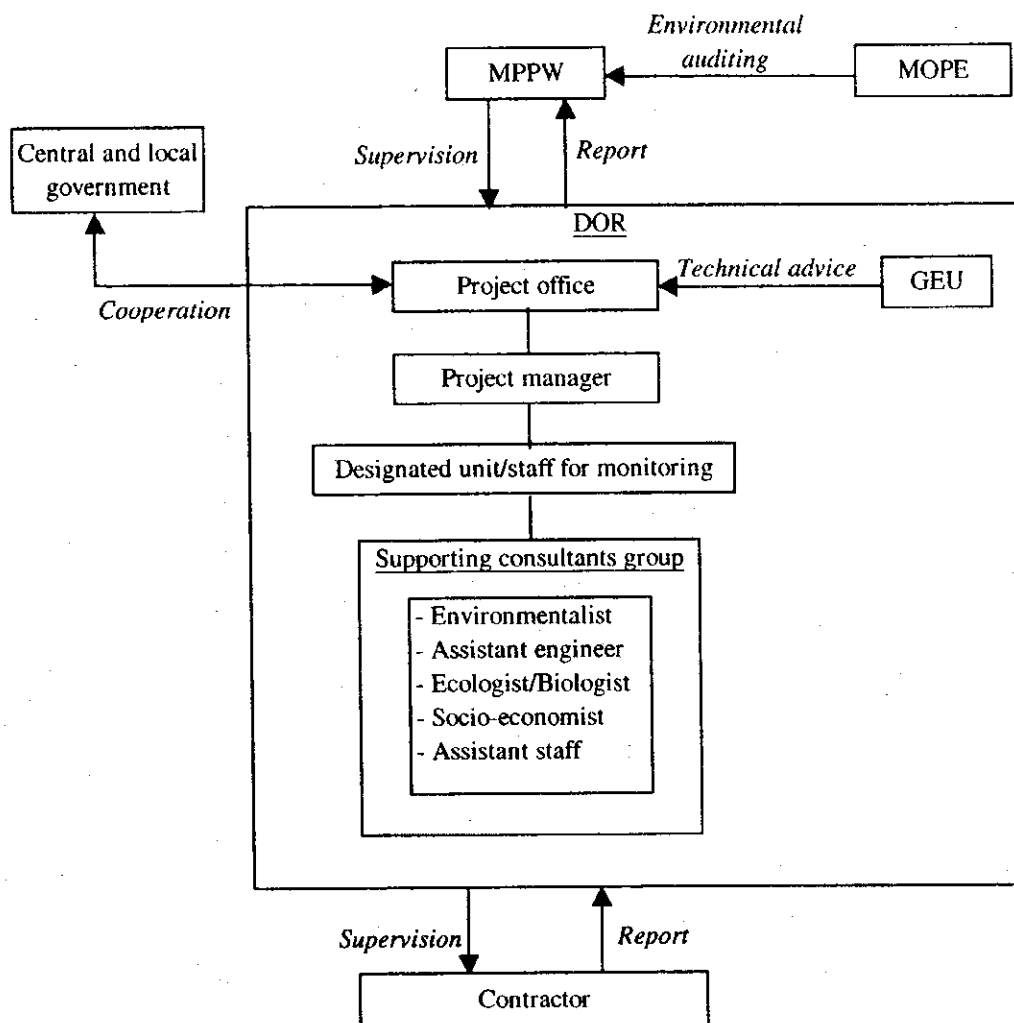
Considering the above, overall framework of environmental monitoring is proposed as shown in Table 15.17. Detailed plan of environmental monitoring is described in Initial draft EIA report prepared separately. Moreover, MOPE has the authority to conduct the environmental auditing in accordance with Rule 14 of EPR 1997. Although the responsibility for environmental auditing lies with MOPE, an indicative framework is also spelled out in the Initial EIA draft report.

Table 15.17 Framework of Environmental Monitoring

Elements	Monitoring issues	Method	Remark
Landscape	The effectiveness of mitigation measures should be monitored.	Observation	Typical parameters are tree belt, and remaining forest or other green.
Slope stability and erosion	The effectiveness of the measures for slope protection should be monitored. Serious consideration of monitoring activities should be given in rainy season.	Observation	
Air pollution	During both construction and post construction stage, observation should be made on level of air pollution. The effectiveness of mitigation measures for TSP reduction should be monitored.	Measurement, observation	Typical parameters are TSP, PM ₁₀ , SO ₂ , and NO ₂ .
Noise	During both construction and post construction stage, observation should be made on noise level. Effectiveness of mitigation measures for sensitive receptors should be monitored.	Measurement, observation, inquiry	Traffic volume should be also counted.
Water quality	Deterioration of water quality should be monitored. The effectiveness of protection measures and facilities for turbidity reduction should be monitored.	Measurement, observation	Serious consideration should be given in rainy season.
Water resource	Damage of water supply volume for local people, if any, should be identified. State of restoration of reduced water should be monitored.	Observation, inquiry	
Forest, flora and fauna	Effectiveness of mitigation measures should be monitored. Pressure and condition of remaining forest should be identified. Damage on local bio-diversity, if any, should be identified.	Observation, measurement, inquiry	
Resettlement and land acquisition	(mentioned in Chapter 16)		
Economic activities	Change of economic activities of local communities and people should be monitored during both construction and post construction stage.	Observation, inquiry, recording file review	State of workers employment should be also monitored.
Social/living facilities	Damage on local infrastructures and restoration state should be monitored. Improvement level of social services should be identified.	Observation, inquiry, recording file review	Typical parameters are water supply, electric, medical/education services, etc.
Health and sanitation	Health and sanitary state of workers and campsite should be monitored during construction stage. In post construction stage the monitoring is also required.	Observation, inquiry, recording file review	
Others	Safety state not only of construction workers but also of local people should be monitored.	Observation	Effectiveness of road safety facilities should also be monitored.

Source: JICA Study Team

The organisations related to environmental monitoring will be MPPW, MOPE, other central/local governments, contractors, and DOR (including the project office, GEU, and supporting consultants group). For implementation of environmental monitoring, relationship among these organisations is proposed as shown in Figure 15.4.



Source: JICA Study Team

Figure 15.4 Relationship among Related Organisations

CHAPTER 16 LAND ACQUISITION AND RESETTLEMENT PLAN

16.1 Introduction

The preliminary plan for land acquisition and resettlement was developed based on the related Acts and Regulations in Nepal and on the policies of donors. The roles and responsibilities of DOR and other organizations were identified and proposed in this plan. The cost for land acquisition and resettlement was also estimated.

16.2 Legal Frame on Land Acquisition and Resettlement

Prior to 1990 there was no legal obligation for the government to pay compensation for the acquisition of personal property. To get compensation was not a fundamental right. Now the Constitution of the Kingdom of Nepal 2047 (1990) ensures the fundamental right to property. The compensation procedure for any property acquired by the government shall be implemented according to the current related laws.

There are several laws and decrees regarding the land acquisition and resettlement in Nepal. The following describes the legal frame and the outline of legislation related to the project.

16.2.1 Land Act 2021 (1964)

This Act deals with the landowner and the tenant regarding land acquisition. If the land is under the registered tenancy, the Act provides the land ownership to the tenant partially. As per the provision made by the latest amendment (in 1997), 50% of land ownership shall be entitled to the registered tenant.

Another relevant issue to the acquisition process over this Act is on the aspects of land ceiling. The Act provides the ceiling of land to be held by one landowner at one time by regions. If an owner happens to have the excess land beyond the ceiling, the compensation shall be determined under this Act on the occasion of the acquisition.

16.2.2 Land Acquisition Act 2034 (1977)

This Act is the main legislation to guide the compulsory acquisition of the land in Nepal. The main features of the Act are shown below.

- The Act empowers the government to acquire any land on the payment of the compensation for the public purposes.
- The acquisition of the privately-owned assets and compensation for them shall be undertaken according to a formal procedure, consisting of i) initial procedure, ii) preliminary investigation process, iii) notice of acquisition, and iv) compensation.
- Compensation Determination Committees (CDCs) shall be established at the

district level to ascertain the compensation rates for land and other assets. The CDC consists of i) Chief District Officer (CDO, heading the committee), ii) Chief of District Land Administration or Revenue Office (DLRO), iii) DDC representative, and iv) project manager.

- Compensation shall be made i) for the damages caused as a result of the preliminary investigation process, and ii) for the land and assets permanently acquired by the project, including the crops, trees, and houses in acquired land.
- Two separate rates of compensation shall be determined, these are i) for the titleholders who will lose all their land, and ii) for the titleholders who will lose only some part of their land.
- In determining the rates or amount of compensation, CDCs shall consider the following conditions, i.e., i) the price of the land prevailing at the time of the notice of acquisition, and ii) the damage incurred during the time for shifting one's residence or place of business.
- Compensation shall be made by cash, or by providing the replacement land to the titleholders who will lose all their land if available.
- The person who has the right to claim for the compensation shall submit an official land registration certificate at the time of compensation.
- Titleholders are required to submit the compensation claims or the complaints within a specified period after the land acquisition notice is issued by the CDO. Compensation is paid after the determination of rates and the verification of the list of the entitled applicants by the CDCs.

16.2.3 Land Acquisition Rules 2026 (1969)

This Rules deal with the compensation rates, designation of competent authority (officers and Committee) for compensation, and determination of the compensation amount. Some of its features are shown below.

- CDCs shall take into account the market value of the nearby land.
- The government has the right to issue guidelines in order to maintain the uniformity in the determination of the amount of compensation for building structure.
- The government obliges the project to consider the opinion from Department of Archaeology, while determining the compensation for the land of the historical or archaeological significance if any.

This Rules were set up under the Land Acquisition Act 2018 (1961). Although this

Act has been replaced anew by the Land Acquisition Act 2034 (1977) mentioned in the previous clause, the Rules have not been updated.

16.2.4 Public Road Act 2031 (1974)

This Act empowers DOR to acquire any land on a temporary basis for storage facilities, construction camps, etc., during road construction and upgrading. The temporary acquisition of the land containing any buildings such as houses, sheds, schools, and temples shall be avoided wherever possible. DOR is required to pay the compensation for any damage caused by his work at the land acquired temporarily. The compensation shall be negotiated between DOR and the titleholder, involving the officials from the relevant VDC and DDC.

16.2.5 Guthi Corporation Act 2033 (1976)

If the Guthi land (religious trust land) happens to be acquired, the compensation shall comply with this Act. The Act requires that, in case of acquisition of any Guthi land, the project is obliged to provide alternative land rather than the compensation in cash.

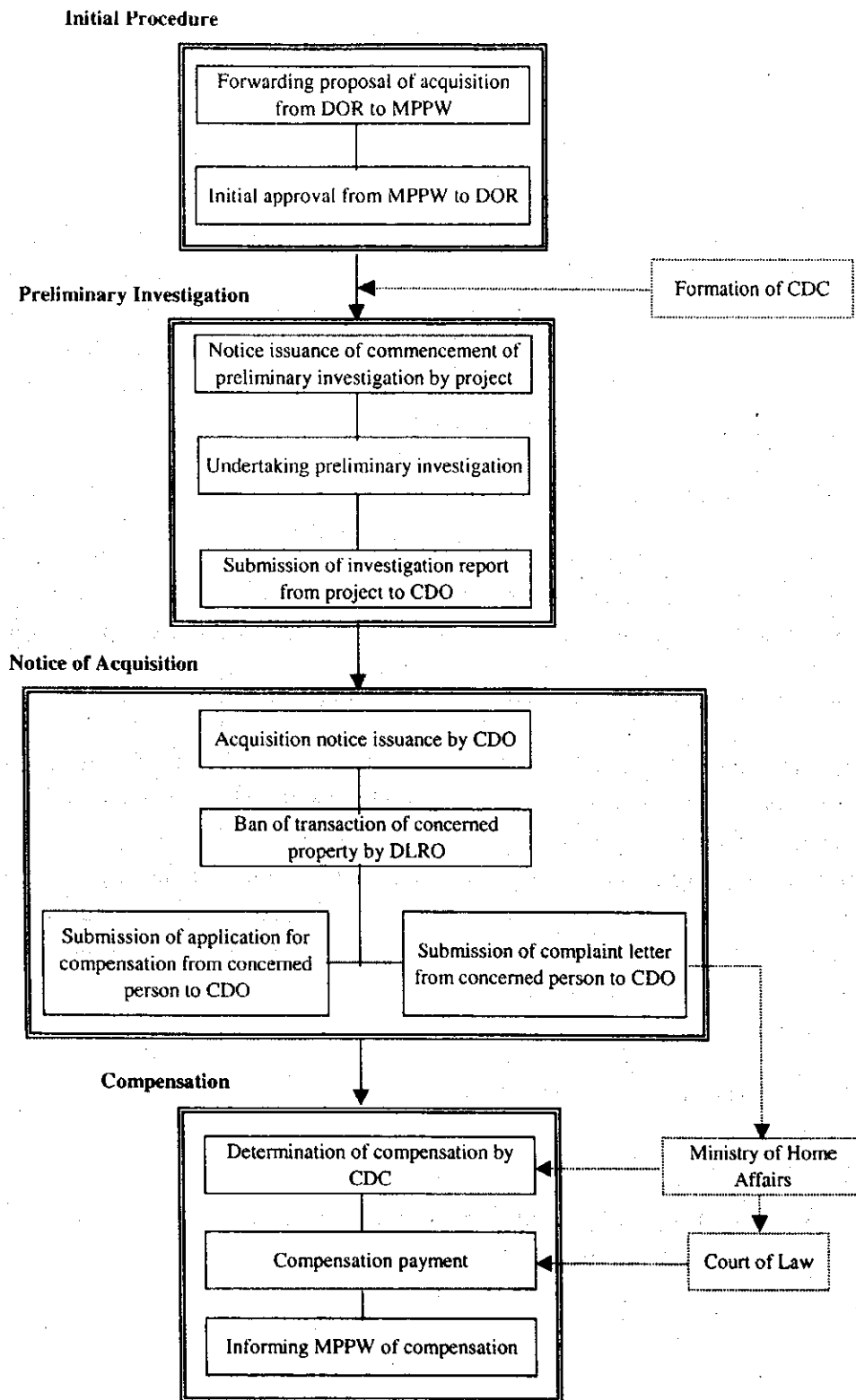
16.3 Legal Procedure for Land Acquisition and Compensation

The procedures detailed in the Land Acquisition Act 2034 (1977) form the overall framework for the acquisition of land and other assets. The Act specified the roles and responsibilities of the related institutions. DOR's roles and responsibilities are to meet an initial approval from its superior agency (MPPW) by forwarding the proposal for acquisition, and to undertake the requisite preliminary studies in order to indicate required land area. After completion of these studies, the process is transferred to CDO, whose role and responsibility are to follow the legal and administrative procedures for acquiring the land.

The legal procedure is shown in Figure 16.1.

1) Initial procedure

A proposal forwarded to MPPW by DOR is to show the purpose, location, area of land required, and maps. To meet the initial approval generally takes about one month.



Source: Land Acquisition Act 1977

Figure 16.1 Legal Procedure for Land Acquisition

2) Preliminary investigation process

The preliminary investigation process conducted by a project officer responsible for it starts with the issuance of a notice to inform the landowners of the investigation. The investigation can commence within 3 days after the notice has been issued. The project officer prepares a report within 15 days of issuing the notice. The points of this process are summarized as follows.

- Setting up the centerline, and determining land requirement and other affected property.
- Undertaking the census of the affected persons
- Preparing the list of the affected land parcels, other affected property, and the entitled owners/persons.
- Identifying the investigated results with the DLRO officials.
- Preparing the investigation report, including the compensation amount for the damage incurred during the investigation itself.
- Submitting the investigation report from the project officer to the CDO.

3) Notice of acquisition

The CDO issues a notice of acquisition, which indicates the property under the consideration to be acquired, after receiving the investigation report from the project officer. The points of this phase are summarized as follows.

- Issuance of an acquisition notice at the suitable places by the CDO with the details of type and location of the required property.
- Ban or suspension of any transactions of the concerned property by the DLRO.
- Submission of the application for compensation or of a complaint letter, from the concerned owners/persons to the CDO.
- Taking possession of the concerned property by the CDO and handing over it to the project, after lapse of the granted period, or after disposing of the complaint.

The concerned owners are granted at least 15 days from issuing the acquisition notice to submit an application for compensation, or 7 days to submit a complaint letter. The Ministry of Home Affairs, receiving the complaint letter through the CDO, is required to make a decision on the complaint within 15 days, unless the further information is required, or unless the complaint is to be solved in a court

of law.

4) Compensation

In general, the Land Acquisition Act provides the cash-compensation concept. The CDCs at the district level are established in order to assess the list of the compensation claims (submitted to CDO from the project officer), and in order to determine the compensation rates for the acquired property.

In case an entitled person fails to receive the compensation after the first acquisition notice, the CDO is to issue a notice of acquisition again with a final limit time of 3 months for receiving the compensation. If the entitled person fails to receive the compensation again, then the amount is deposited in the government treasury and he will not be entitled to any compensation.

Besides, as per Section 27 of Land Acquisition Act, the government can acquire the land for the purpose of public work by directly negotiating with the concerned landowner. In this case, it is not necessary to comply with the procedure laid down in the Act.

16.4 Other policies to be referred on involuntary resettlement

Where the financial assistance provided by Japan Bank for International Cooperation (JBIC) is expected for implementation of the project, the followings on involuntary resettlement as shown below are to be also referred.

- Consideration is required in the planning and implementation of the project for loss of income of residents for whom involuntary relocation and resettlement is required.
- Serious consideration must be given to investigation of alternative proposals to minimise the number of residents to be relocated, during the planning process.
- Planning for the project requiring involuntary resettlement must be such as to reduce disruption.
- Planning to reduce the disruption of relocated residents must be directed towards recovery of the livelihood and income of such residents.
- Such groups as indigenous peoples, ethnic minorities, and the poor, who are already disadvantaged in both economic and cultural terms, are to be given particular consideration in the basis of their livelihood of these people.
- In order to reach a fundamental resolution of the problems of relocation in squatter cases, it is necessary to take a positive approach.

- Resettlement plans must guarantee not only the physical relocation, but also a standard of living and psychological stability at least equal to that prior to relocation.
- Practical measures to be incorporated into the resettlement plans must include positive support for residents to ensure that their standard of living is the same or higher than that before relocation.
- A committee should be established to act as the central organisation in promoting and supporting compensation and resettlement to ensure the smooth and trouble-free involuntary resettlement.
- When developing the compensation plan and implementing it, the methods and amounts of compensation required for long-term reconstruction of the lifestyle of the residents should be investigated based on a consideration of those liable for compensation, the items for which compensation is to be paid, and the social background etc of the residents to be relocated.
- When developing the resettlement plan and implementing it, the demographic procedure and participation of residents are required. Also, the communication and coordination with various organisations such as central/local government, regional community, and NGOs are required.
- Monitoring and evaluation of the residents involved in the relocation are required to determine whether resettlement is progressing appropriately, and to be able to develop suitable measures if necessary.

Other donors, i.e. World Bank (WB) and Asian Development Bank (ADB), also have their own policies regarding involuntary resettlement and land acquisition. Basic principles and framework presented in these documents are similar to those of JBIC.

16.5 Magnitude of Land Acquisition and Resettlement

Based on the field survey, land area to be acquired, in case of ROW of 50 m width, was calculated as shown in Table 16.1. Among total estimated area of approximately 103 ha (excluding the tunnel portion) to be acquired, about 92 ha area is currently used as agricultural land (Khet and Bari). Barren land, orchard and forest are a very small portion of the total acquired land.

The house structures within ROW of 50 m width were also counted by the field survey (excluding tunnel portion). And results are shown in Table 16.2. 185 house structures exist within the ROW, and 132 of them are recorded as traditional houses (as of November 2000).

Table 16.1 Magnitude of Land Acquisition (ROW=50 m)

					(ha)
	Package-1-1	Package-2	Package-3	Package-1-2	Total
Khet	21.5	1.2	15.6	10.9	49.2
Bari	3.7	6.1	22.0	11.2	43.0
Barren land	0.2	0.2	1.2	4	5.6
Forest	1.0	1.3	1.7	0.1	4.1
Orchard	0.0	0.0	1.1	0.0	1.1
Total	26.4	8.8	41.6	26.2	103.0
Concerned VDC	Sitapaila, Ramkot, Bhimdhunga	Bhimdhunga, Chhatre Deurali	Chhatre Deurali, Jiwanpur	Jiwanpur, Naubise	Total 6VDC

Source: Field survey

Note: Except tunnel portion

Khet: Agricultural lowland Bari: Agricultural upland

Table 16.2 House Structures within ROW (50m width)

					(nos.)
	Package-1-1	Package-2	Package-3	Package-1-2	Total
House type-1	19	8	59	46	132
House type-2	7	0	0	7	14
House type-2c	9	0	0	3	12
House type-3	18	1	0	1	20
House type-4	0	0	3	4	7
Total	53	9	62	61	185
Concerned VDC	Sitapaila, Ramkot, Bhimdhunga	Bhimdhunga, Chhatre Deurali	Chhatre Deurali, Jiwanpur	Jiwanpur, Naubise	Total 6VDC

Source: Field survey

Remark: Nos. of house structures is as of November 2000.

Note: Except tunnel portion

House type-1 is a traditional structure with material of stone, brick, mud, tile, thatch, etc.

House type-2 is a semi-modern structure with material of stone, brick, cement, tile, slate, etc.

House type-2c is a semi-modern structure with same material as type-2 and concrete roof.

House type-3 is a RCC framed structure.

House type-4 is a temporary hut or shed.

16.6 Land Acquisition and Resettlement Plan

A project-specific plan for the land acquisition and resettlement was preliminarily studied based on the existing conditions in the Project area, characteristics of the project, legal framework in Nepal, and other donors' policy requirement. The main points of plan are summarized in Table 16.3.

Table 16.3 (1/2) Summarised Issues of Land Acquisition and Resettlement Plan

Basic Principles

- Land acquisition and resettlement should be avoided where possible, or be minimized through incorporating the social consideration into the project design.
- Where the land acquisition and resettlement is unavoidable, any person who will lose his property and livelihood should be adequately compensated and assisted so that he can at least restore his former economic and social conditions.

	General Issues (Based on current legal frame in Nepal)	Particular Issues (Additionally proposed for the project)
Policy and procedure	<ul style="list-style-type: none"> a. CDCs should evaluate all affected assets due to the project. b. CDCs should determine compensation rate and amount referring to market price. c. Special attention should be given to SPAFs. d. Property to be compensated should be fixed in preliminary investigation stage. e. Time gap between acquisition notice and compensation payment should be minimized. f. Construction works should commence only after compensation determination and payment. 	<ul style="list-style-type: none"> a. CDCs should consider such allowances as housing/business displacement and transportation etc. b. Public involvement of stakeholders should be considered before and after implementation of procedure. c. Affected or resettled people should be given public facilities for restoration of their former condition (electricity, water supply, irrigation canal, etc). d. Special attention should be given to vulnerable groups if any in preliminary investigation stage. e. Non-registered land/house owner and tenant should be given possible minimum compensation or other measures to restore their former living standard if any in preliminary investigation stage.
Entitlement to be compensated	<ul style="list-style-type: none"> a. Loss of agricultural and privately owned land b. Loss of crops and trees in acquired land c. Loss of private houses and other structures d. Temporary land acquisition for construction work 	<ul style="list-style-type: none"> a. Loss of community facilities and assets such as electricity transmission, water supply, irrigation schemes, and small shrines. b. Displacement allowances such as transportation expenses, standstill of running business, etc c. Other restoration measures (mentioned in next column)

Table 16.3 (2/2) Summarized Issues of Land Acquisition and Resettlement Plan

	General Issues (Based on current legal frame in Nepal)	Particular Issues (Additionally proposed for the project)
Restoration of living standard		<ul style="list-style-type: none"> a. Members of SPAFs and vulnerable groups should be given the priority for employment opportunities during construction. b. Members of SPAFs and vulnerable group should be entitled to skill training to obtain employment. Supporting system for them should be created. c. To restore living condition of affected people, they should be provided additional supporting schemes for counseling and assistance, if required.
Public involvement	<ul style="list-style-type: none"> a. DDC representative should be included in CDCs. 	<ul style="list-style-type: none"> a. VDC officials should be included in CDCs. b. Liaison office should be established in each VDC office. c. Explanatory meeting at the local level should be held. d. Mechanism of consultation with affected people should be developed regarding restoration of their living condition.
Monitoring and evaluation		<ul style="list-style-type: none"> a. Monitoring and evaluation mechanism of compensation procedure and restoration should be developed.
Others	<ul style="list-style-type: none"> a. Detailed program for resettlement, land acquisition, and compensation should be developed based on preliminary investigation result. 	<ul style="list-style-type: none"> a. Measures for restoration of living condition of affected people should be included in detailed program. b. Liaison office and project office should consider providing SPAFs the suitable replacement land if available.

Remark: The particular issues in this table are proposed based on the requirement of donors' policies.

Note

CDC: Compensation Determination Committee

VDC: Village Development Committee

Source: JICA Study Team

SPAF: Severely Project Affected Family

DDC: District Development Committee

16.6.1 Policy for the Project

Basic principles

- Land acquisition and resettlement should be avoided where possible, or be minimized through incorporating the social consideration into the project design.
- Where the land acquisition and resettlement is unavoidable, any person who will lose his property and livelihood should be adequately compensated and assisted so that he can at least restore his former economic and social conditions.

Policies

On the basis of the above basic principles, the following policies are recommended on the occasion of the land acquisition and resettlement.

- a. CDCs should evaluate all affected assets due to the construction of the Project Road, and should determine the compensation rate and amount for losses with reference of the market price.
- b. CDCs should also take account of such allowances as housing/business displacement and transportation etc. These allowances should be included in the compensation amount in addition to the compensation for lost assets.
- c. CDCs should include the concerned VDC officials in addition to the prescribed members under the legislation, so as to reflect the opinions and suggestions raised by local communities and affected individuals in the process of determination of the compensation rate or amount.
- d. A liaison office headed by VDC official should be established in each affected VDC office. The functions of liaison offices are to consult with the affected stakeholders in regard to the question, request, and complains on compensation and resettlement. The VDC official heading his liaison office should propose the issues to his superior CDC based on the consultation with the local people.
- e. Public participation and involvement of stakeholders should be considered before and after the implementation of land acquisition or resettlement procedures. This mechanism should include an explanatory meeting at the local level, and consultation with affected people regarding the restoration of their living standard.
- f. The property to be compensated should be fixed in preliminary investigation stage.
- g. The time gap between the notice of acquisition and the payment of the compensation to the entitled persons should be minimised to avoid inconvenience.

- h. Construction works should commence only after the compensation determined between CDC and the entitled persons have been paid.
- i. Affected/resettled families should be given public facilities (electricity, water supply, irrigation canal, etc) for restoration of their living standards to the pre-project levels.
- j. Although the household survey conducted by JICA Study Team shows that the ethnic or religious minority groups seem very few in the Project area, special attention should be given to the vulnerable groups such as widow-headed household and other economical or social minority if any found by the preliminary investigation.
- k. None of caste, religion, and ethnicity should be a bar to the compensation and rehabilitation assistance.
- l. Special attention should be given to the Severely Project Affected Families (SPAFs). Households coming under the following conditions should be classified as SPAFs.
 - Landowners or registered tenants who will lose all their land.
 - Landowners or registered tenants whose remainder parcel of land are no longer viable for agricultural or economical activities as a result of land losses, even if their land will not be wholly acquired.
- m. Any households whose land or houses are non-registered were not recorded in the household survey conducted by JICA Study Team. However, if any found by the preliminary investigation, the possible minimum compensation or other measures to restore their former living standard should be considered by CDCs and the project, although the current legal framework does not give them the entitlement. In case of non-registered tenants, this policy should be also followed.

16.6.2 Entitlement to be compensated

The entitlements for losses to be compensated or considered are proposed as follows.

- Loss of agricultural and other privately owned land, including crops and trees
- Loss of private houses and other structures
- Loss of community facilities and assets
- Displacement allowances
- Other restoration measures

a. Land losses

In general, land losses are compensated by cash in Nepal. And also, in the Project area, the land-for-land compensation is not a feasible option because of the following reasons.

- Most of arable land area is under private land holdings in and around the Project area.
- Private land holdings are small parcels and fragmented, and any additional land taking from other private landholders may also affect them in the long run in and around the Project area.
- Arable quality land in the government ownership is under forest. Clearance of forest for resettlement will cause further degradation of environment and natural resources in and around the Project area.

The Project can not provide resettlement site for all affected people in the way of the land-for-land compensation scheme. The affected people will find their preferable site by themselves with assistance of the Project.

Therefore, the entitlement for land losses will be mainly in the form of cash compensation. However, some additional considerations need to be given especially for SPAFs. In general, SPAFs are dependent on agriculture, and don't have alternative source of regular income for their livelihood. Accordingly, CDCs and the Project are required to make all possible efforts to provide SPAFs suitable replacement land in the vicinity with less impact on non-concerned landholders. If unavailable and impossible, each SPAF should be given additional measures mentioned later besides cash compensation for land, in order to restore to its pre-project living standard.

The land acquisition should avoid the main harvest season as far as possible. However, if unavoidable and the harvested crops would be required to be damaged in acquired land, the Project should pay the compensation as determined by CDCs. Other resources such as timber and fruits, etc., from privately owned lands should be also compensated as valued by CDCs.

Temporary land acquisition for construction work will be undertaken within the framework of Public Road Act. In this case, the privately owned land should be contracted out between the contractor and the landowners, specifying:

- Period and area of occupancy;
- Compensation amount including crop production losses;
- Frequency of compensation payment; and
- Land protection and rehabilitation measures.

In addition, registered tenants will be eligible for 50% of the compensation paid to the landowners as per the latest amendment of Land Act, 2021 (1964). Therefore, the

cash amount of the above compensation should be divided equally between the landowner and the tenant, and CDCs and the Project should direct them correctly.

b. Losses of houses and other structures

Owners of houses and other structures such as sheds will be compensated in cash for full or partial losses at the amount as determined by CDCs. Registered tenants who have built their own houses in rented land should be compensated in same manner. The compensation for these entitlements should be paid in cash in lump sum, so as to facilitate an immediate restoration by reconstructing their houses.

The owners should be given the right to salvage reusable materials from the affected structures. The deduction rate of the value of these materials should be determined by CDCs through the consultation with the concerned owners.

Since the Project is a linear development, the resettlement of large numbers of households to new settlements involving host communities is not anticipated. However, if this would happen, resettlement assistance should be given to ensure effective integration with host communities, and adequate facilities, services, and infrastructures should be provided.

c. Losses of community facilities and assets

The affected community facilities and assets should be rehabilitated to their previous conditions, or be relocated in areas identified in consultation with affected communities, by the Project. These entitlements include irrigation schemes, water supply pipes and taps, electricity poles and lines, and small shrines.

d. Displacement allowances

In the terms of resettlement action, the affected households will be compelled to pay some expenses. For example, owners of commercial enterprises who are required to relocate will stop running their business during resettling and restoring action, whereas displaced households will bear the expenses for transporting their belongings and salvaged materials. Therefore, these displacement allowances should be taken into account by CDCs, and should be given to the affected households as a part of the compensation amount in addition to the compensation for lost assets.

e. Other restoration measures

- The members of SPAFs and vulnerable groups should be given the priority for the employment opportunities of construction. Because these persons may not qualified for the available jobs, the provision of training and hiring plan should be included in the contract specifications. The Project should undertake consultations with contractors and local communities to establish mutually agreeable conditions for employment of the local people.

- The members of SPAFs and vulnerable groups should be entitled to skills training that would help in obtaining employment and/or earning livelihood. The Project should assist them to investigate training programs or institutions based on their preference. The supporting system for their skills training, such as subsidy or low-interest loan, should be created for recovering their expenses somewhat.
- To restore the living conditions for SPAFs, vulnerable groups, and other affected households, they, if required, should be provided the additional supporting schemes such as:
 - counselling regarding the project impacts;
 - counselling regarding the process, alternatives, and risks of compensation, and resettlement options;
 - counselling on saving schemes and cash management;
 - assistance to seek the replacement land or settlement;
 - assistance to establish small-scale income-generating schemes, if feasible; and
 - assistance to gain access to the national poverty alleviation or credit program.
- The current legal frame in Nepal does not provide any systems to relieve the encroachers, squatters, and non-registered tenants who may be damaged due to the Project. However, if any, they should be to the extent possible given an entitlement for receiving the minimum possible compensation or for choosing the options of restoration measures, from the view point of policies mentioning that any affected persons should be assisted to restore at least their former living conditions.

16.6.3 Organisational framework

The proposed organisational chart for the land acquisition and compensation procedures of the Project is shown in Figure 16.2. The following shows the roles and responsibilities of each related organisation for implementation of plans and programs regarding resettlement, land acquisition, compensation, and restoration.

The main points on the roles and responsibilities of the related organisations are summarised in Table 16.4.

Table 16.4 (1/2) Roles and Responsibilities of Related Organisations

	General Roles and Responsibilities (Based on current legal frame in Nepal)	Particular Roles and Responsibilities (Additionally proposed for the project)
MPPW	<ul style="list-style-type: none"> a. Granting initial approval for commencement of procedures b. Supervising whole procedure and progress 	<ul style="list-style-type: none"> a. Coordinating among related agencies
DOR	<ul style="list-style-type: none"> a. Development of detailed programs regarding resettlement, land acquisition, and compensation b. Supervising procedure and progress of programs implementation 	<ul style="list-style-type: none"> a. Consideration of restoration measures for affected people during detailed programs development b. Coordinating with other organisations to ensure effectiveness of restoration measures c. Participating in CDCs
Project office	<ul style="list-style-type: none"> a. Issuing notice of preliminary investigation and implementing it b. Reporting preliminary investigation result to CDO c. Executing programs developed by DOR d. Participating in CDCs 	<ul style="list-style-type: none"> a. Providing service window for direct consultation and counseling with affected people b. Directly supporting SPAFs to obtain replacement lands or to restore their living standard c. Providing supporting schemes to restore living conditions of affected people d. Monitoring procedure and progress of land acquisition, transfer, compensation payment, and reconstruction of houses or facilities
CDC	<ul style="list-style-type: none"> a. Verifying and evaluating list of entitlement and claim on compensation b. Determining compensation rate and amount for acquired land and houses/structures 	<ul style="list-style-type: none"> a. Consideration of displacement allowances in determination of compensation amount b. Assessing monitored results reported by project office or liaison office, and suggesting the additional rehabilitation measures to the Project, if necessary c. Consideration of possible minimum compensation for non-registered land/house owner and tenant
CDO	<ul style="list-style-type: none"> a. Heading CDCs b. Issuing notice of acquisition based on preliminary investigation result c. Making decision on complaint from stakeholders d. Taking possession of concerned property and handing over it to the Project 	

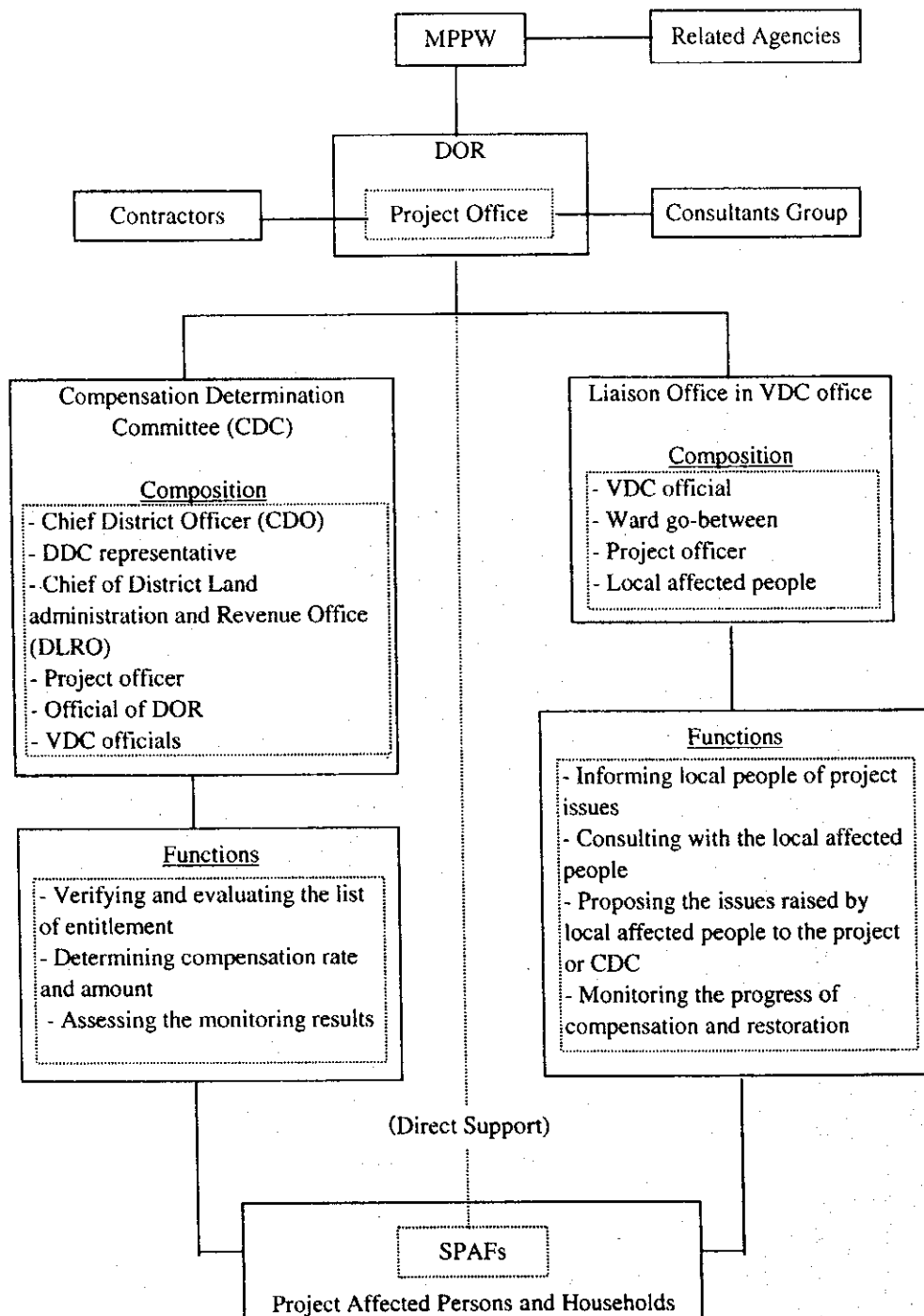
Table 16.4 (2/2) Roles and Responsibilities of Related Organisations

	General Roles and Responsibilities (Based on current legal frame in Nepal)	Particular Roles and Responsibilities (Additionally proposed for the project)
DLRO	a. Identifying preliminary investigation result b. Banning transaction on concerned property after acquisition notice c. Participating in CDCs	
VDC and liaison office		a. Informing to and consulting with local people on project activities and acquisition/compensation issues b. Counseling with affected people on restoration of their living conditions c. Directly supporting SPAFs to obtain replacement lands or to restore their living standard d. Providing supporting schemes to restore living conditions of affected people e. Proposing issues raised by affected people to the project or CDC f. Monitoring compensation and restoration progress g. Participating in CDC

Remark: The particular roles and responsibilities in this table are proposed based on the requirement of donors' policies.

Note

MPPW: Ministry of Physical Planning and Works DOR: Department of Roads CDC: Compensation Determination Committee
 CDO: Chief District Officer SPAF: Severely Project Affected Family VDC: Village Development Committee
 DLRO: District Land Administration and Revenue Office
 Source: JICA Study Team



Source: JICA Study Team

Figure 16.2 Proposed Organisational Chart

a. MPPW

- Supervising the whole procedure and progress regarding the project implementation
- Coordination among the related agencies according to requirement from DOR or the project office
- Granting an initial approval to DOR or the project office to commence the resettlement, land acquisition and compensation procedures

b. DOR

As the project authority, DOR will assume overall responsibility for implementation of programs. Its main roles and responsibilities include:

- Development of the detailed programs regarding resettlement, land acquisition, compensation, and restoration, based on the preliminary investigation result;
- Supervising the procedures and progress of programs implementation; and
- Coordinating with other government line agencies and non-governmental organisations to ensure effectiveness of restoration measures.

The official of DOR responsible for the program implementation of the Project should be designated as a member of CDC.

c. Project office

Under the direct supervision of DOR, the project office will play an important role in executing the programs actually. Its main roles include:

- Issuing notice of preliminary investigation and implementing it;
- Providing the service window for direct consultation or negotiation with the local people;
- Counselling with the affected people on restoration of their living condition;
- Coordinating with and supervising the contractors for the execution regarding the restoration measures to be provided by the contractors;
- Supporting SPAFs to obtain the suitable replacement lands if available;
- Providing the assistance and supporting schemes as restoration measures for the affected households to restore their living conditions, and
- Coordinating among DOR, the related agencies, and local organisations to ensure

the implementation of assistance and supporting schemes.

d. CDC

As per Land Acquisition Act, 2034 (1977), CDC established at each district level should consist of CDO (heading CDC), DDC representative, chief of DLRO, and project officer. However, the official of DOR should participate CDCs, to facilitate execution of the acquisition and compensation procedures, and also to coordinate smoothly with other related governmental and non-governmental organisations. Moreover, VDC officials, who will be heading the liaison office of each VDC, should be included as members of CDCs, so as to involve the opinions and suggestions of project-affected people in the discussion and determination on compensation rate, amount, and payment.

CDCs should be extensively responsible for, especially, cash-compensation issues with reference of market value, and with consideration of an existing living standard of each affected household and its restoration. The main roles and responsibilities of CDCs include:

- Verifying and evaluating the list of entitlement and claim on compensation, based on the preliminary investigation results and other information;
- Determination of compensation rate and amount in regard to acquired lands, losses of houses and other structures, and displacement allowances, etc., caused by the project implementation; and
- Assessing the monitored results on the compensation payment and restoration levels of project-affected people, at the construction and post-construction stage (mentioned later), and suggesting the additional rehabilitation manners to the Project, if necessary.

In addition, CDCs are proposed to take account of the possible minimum compensation amount for squatters or non-registered tenants, if any, to assist them to restore their living conditions as far as possible.

e. CDO

The main roles and responsibilities of CDOs are to follow the required legal and administrative procedures for acquiring the land, including:

- Heading the CDCs;
- Issuing notice of land acquisition based on the preliminary investigation report submitted from the project office;
- Notifying DLROs of the commencement of land acquisition for prescribed

management of the concerned property;

- Making decision on the complaints filed from the concerned stakeholders; and
- Taking possession of concerned property and handing over it to the Project.

f. DLRO

The main roles and responsibilities of DLROs are to manage the registration issues of the concerned property following the related legislation, including:

- Identifying the preliminary investigation result with the project office;
- Managing and supervising ownership of property during the related procedures;
- Banning or suspending the transaction on concerned property according to the notification from CDOs; and
- Participating CDCs.

g. VDC and liaison office

In order to facilitate the resettlement, land acquisition, compensation, and restoration activities, and also to ensure the public involvement of stakeholders these activities, a liaison office headed by VDC officials should be established in each VDC office. The main functions of the liaison offices is to meet an effective local-level consultation mechanism, including:

- Informing the local people of the project activities and of acquisition and compensation procedures/progress;
- Consulting with the local affected stakeholders in regard to the question, request, and complains on compensation and resettlement at all phases;
- Counselling with the affected people on restoration of their living condition;
- Supporting SPAFs to obtain the suitable replacement lands if available;
- Proposing the issues to the project or to superior CDCs, through the VDC officials based on the consultation with the local people; and
- Monitoring the compensation and restoration progress at the construction and post-construction stage (mentioned later).

The project officer and the ward go-between under VDC should participate in this mechanism, where VDC official recognises its necessity.

16.6.4 Monitoring and evaluation

In order to ensure that the plans and programs mentioned above are implemented adequately, and that the affected household/persons restore their former living conditions, a monitoring and evaluation mechanism should be developed. The range of these activities will include:

- Monitoring the procedures and progress of land acquisition and transfer;
- Monitoring the compensation payment and reconstruction of displaced houses, structures, and living facilities;
- Monitoring the restoration levels of the project-affected households; and
- Monitoring effectiveness of the assistance and supporting schemes of restoration.

The liaison offices of each concerned VDC seem to be suitable as actual monitoring bodies, because they will be close to the affected people in their VDCs, and be able to easily collect the available data and information for monitoring and evaluation. The project officer should participate in these monitoring activities. CDCs is recommended to have a function to evaluate the monitoring results reported by the liaison offices, and to call on the Project to prepare any additional supports for the affected people if necessary.

16.6.5 Others

The detailed programs for resettlement, land acquisition, compensation, and restoration measures should be developed based on the preliminary investigation results, after pegging the centreline of the Project Road, determining of required lots for the road, and identifying the particular project-affected persons.

In the field study of EIA, none of Guthi lands (religious trust lands) were recorded. However, these lands should be acquired as per Guthi Corporation Act 2033 (1976), if any would be found at the preliminary investigation stage.

16.7 Cost Estimate of Land Acquisition and Resettlement

The cost for the land acquisition and resettlement was estimated by the governmental rate (DRLO) as shown in Table 16.5.

Table 16.5 Cost Estimate of Land Acquisition and Resettlement

(million NRs)

	Package-1-1	Package-2	Package-3	Package-1-2	Total
Land acquisition cost	49.9	1.5	23.2	19.2	93.8
Resettlement cost	29.2	2.6	11.6	12.0	55.4
Concerned VDC	Sitapaila, Ramkot, Bhimdhunga	Bhimdhunga, Chhatre Deurali	Chhatre Deurali, Jiwanpur	Jiwanpur, Naubise	

Note: Except tunnel portion

Source: JICA Study Team

The compensation rate and amount for other entitlement such as displacement allowance, damage for the standing crops, and so on should be adequately determined by CDCs, taking account of market trend and the preference of the affected persons.

According to the area to be acquired, the loss of agricultural production was provisionally estimated. Based on the productivity, cropping intensity and unit market price raised by focus group discussion with local people, the amount of annual loss would reach approximate 24.5 million NRs.

CHAPTER 17 CONSTRUCTION PLAN

17.1 General

The construction plan must be formulated so as to ensure completion of the works safely and economically, paying attention to such local condition as topography, geology, workable days, etc. Especially in regards to those construction works which have a critical effect on the construction schedule, the optimum construction method must be carefully selected and determined.

The main future considerations for the construction plan for the Project are as follows;

- The Project should be divided into contract packages in consideration of the proper scale.
- So far as practical, locally available construction materials are planned to be used as much as possible to save the construction cost and to create job opportunity in and around the Project area.
- Construction works are assumed to be conducted by the qualified international contractors that have sufficient capability to perform the work.

17.2 Proposed Contract Packages

Appropriate scale of the each contract package for the construction should be established in consideration of the following conditions;

- Proper scale of construction cost
- To secure access roads from Tribhuvan Highway and Ring Road to the each contract package
- Earth work balancing in each package
(The mass haul of the Project is shown in Figure 17.1)

General descriptions of each contract package, which are determined in consideration of the above conditions, are as follows:

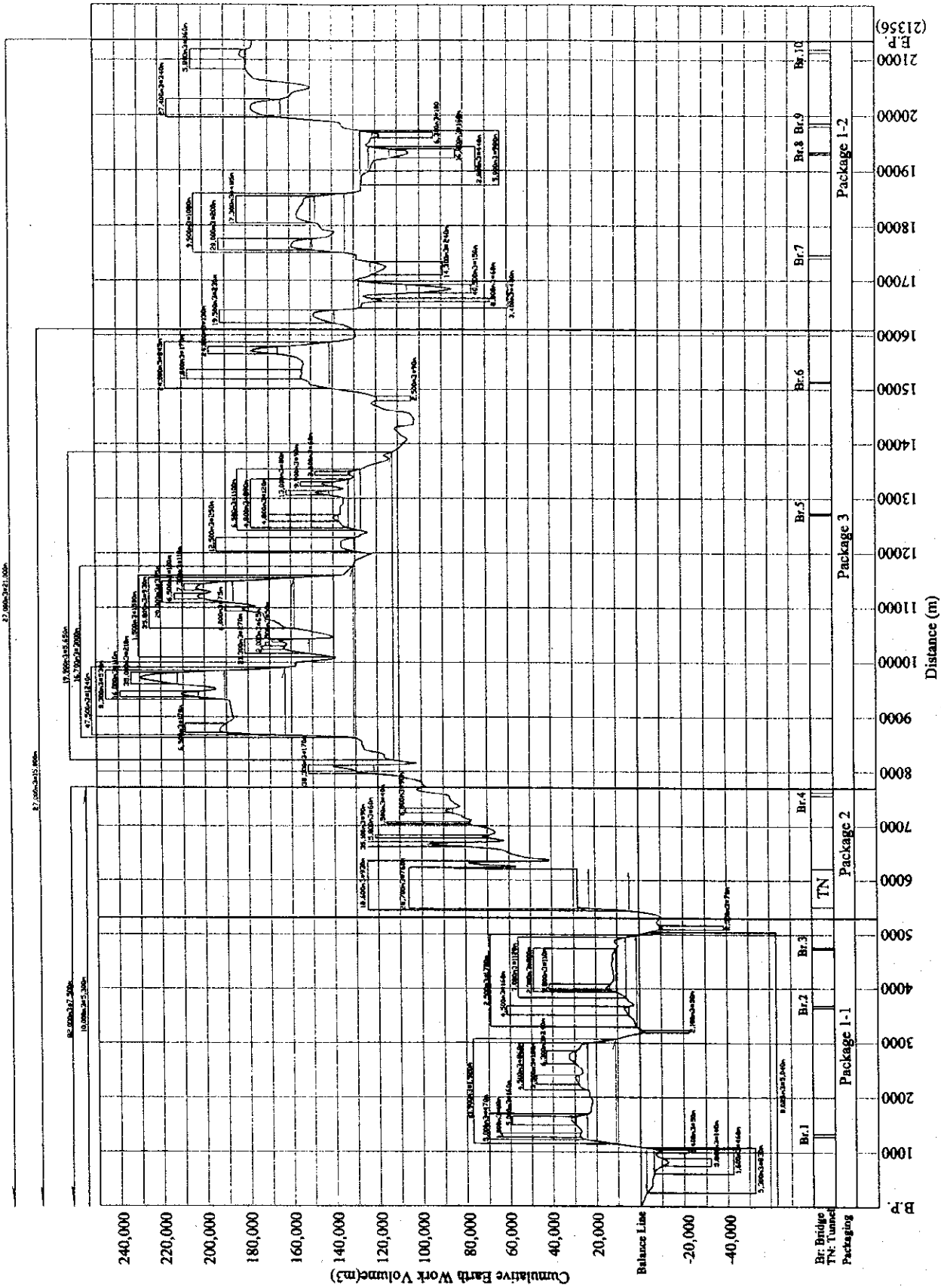


Figure 17.1 Mass Haul Diagram of the Project

Package 1

Package 1 is started from the beginning point of the Project Road (Sta. 0+000). If the tunnel section is included in this package, the scale of this package will be enormous, so the Study Team had determined that package 1 is up to Sta. 5+300 from the beginning point. In this section, shortage of embankment material was calculated to be approximately 10,000m³. In addition, there is much available land for the spoil bank in this section. The candidates of the spoil bank are as follows:

- Widening of unpaved shoulder by additional embankment
- Utilization of embankment for the facilities in and around Kathmandu City (ex. embankment for truck terminal)

This section has gentle terrain and not so many structures, so the work scale will be much smaller than that of other packages.

Considering these situations, it is proposed that package 1 consists of package 1-1 and 1-2. Package 1-1 starts from the beginning point to Sta. 5+300 and package 1-2 starts from Sta. 16+100 to the ending point. The surplus excavation material of package 1-2 will be used in package 1-1.

The general description of package 1 is as follows:

(Road)

B.P.- Sta. 5+300 and Sta. 16+100- E.P. (Total length 10.5km long)

(Structure)

- a) 7 bridges : total length 258m
- b) Box culvert (4.0m² to 24.0m²) : 358m
- c) Pipe culvert (dia. 900 to 1200) : 812

Package 2

The specific character of package 2 is to include the tunnel. It means that the cost of this package will be higher than other packages, so the length of package 2 must be shorter than that of other packages. There is a bridge at Sta.7+500 and it is difficult to access this bridge from Dharke side because the access from Dharke side must pass very steep terrain and has long distance. So the end point of package 2 was decided at Sta.7+700 including this bridge. The volume of surplus spoil is approximately 82,000m³ excluding the tunnel excavation. The spoil surplus from package 2 will be used in package 1-1. The excavated spoil of the tunnel is planned to be used as subbase course material for the Project.

The general description of package 2 is as follows:

(Road)

Sta. 5+300 - Sta. 7+700 (Total length 2.4km long)

(Tunnel)

705m long tunnel

(Structure)

- a) 1 bridge: length 61m
- b) Box culvert (4.0m²): 42m
- c) Pipe culvert (dia. 900 to 1200): 92
- d) T-shaped retaining wall: 6,183m³

Package 3

This package has mountainous terrain including four (4) hairpin bends. The volume of surplus spoil is approximately 27,000m³. This surplus spoil also will be utilized in package 1-1.

The general description of package 3 is as follows:

(Road)

Sta. 7+700 - Sta. 16+100 (Total length 8.4km long)

(Structure)

- a) 2 bridges: total length 55m
- b) Box culvert (4.0m² to 24.0m²): 272m
- c) Pipe culvert (dia. 900 to 1200): 571m
- d) T-shaped retaining wall: 8,815m³

17.3 Access to the each contract package

The Project site is located near Kathmandu City and the Project Road will connect to Ring Road and Prithvi Highway. The description of the access plan for each contract package is as follows:

Package 1

Package 1-1 and package 1-2 will connect directly to Ring Road and Prithvi Highway, respectively. Furthermore, there are existing jeepable roads along the Project route. The access to package 1 can be secured without a large-scale new access road.

Package 2

So far as Bhindunga pass, the existing road along the Project route can be used as an access road, however, it must be used jointly with the contractor(s) of package 1. And

then, a new access road also may be necessary for approach to the west tunnel portal. After completion of this access road, construction yard is required around the west tunnel portal. Excavated spoil at the beginning of package 2 will be used for filling the valley to make the construction yard.

Based on the rough design, the alignment of this access road may have approximately 8% vertical gradient and 7 hairpin bends. These criteria are applicable for temporary construction road.

Package 3

It is possible to gain access to package 3 by using the existing jeepable road. However, this existing road has steep vertical gradient (over 10%), narrow width, and existing traffic for carrying agricultural products. These conditions may be an obstacle for the progress of construction work. The Study Team recommends the new construction of an access road from Tribhuvan Highway for package 3. Since the proposed access road is located in cultivated area, negotiation with land owner regarding lease of land will be necessary.

17.4 Procurement Sources of Crushed Stone Material

There are 13 crusher plants along the Tribhuvan Highway within Thankot to Mahadev Bensi. By interview survey and site reconnaissance, the daily production capacity of these plants is assumed as approximately 30m³/day.

Total product quantity of these crusher plants was roughly estimated as approximately 292,500m³ (=30m³/day*13plants*300days*2.5years). And necessary total quantity of crushed stone for the Project was calculated as approximately 195,000m³. This means 67% of the sum of maximum product quantity of these crusher plants can run the Project. One of the 13 plants plans to purchase a new plant with 200m³/day product capacity in February 2001. The Study Team considers that the necessary quantity of crushed stone for the Project can be procured around the Project site only.

17.5 Workable day

Generally, construction works will not be done Saturdays and national public holidays. Nepalese national public holiday is subject to the Nepalese calendar and the exact date is not fixed. However, the number of the national public holidays is almost the same every year. In this Study, the number of public holiday was assumed to be 38 days in a year.

Nepalese climate can be broadly classified into rainy season and dry season. During rainy season, some of construction work is restricted. Rainy season starts from June and end in September. Considering holiday and rainy days, the workable day for the Project was calculated by following table.

Table 17.1 Calculation Sheet of Workable Days

Month	Calendar day	Saturday	Public holiday	Workable days	Rain fall days at Panipokari in Kathmandu dist.				Workable days by type of work		Unit: days
					0 mm	1-9.9mm	10-24.9mm	>25mm	Earthworks	Asphalt concrete works	
					b	c	d	e	f	g	
Jan.	31	5	3	23	30.0	1.0	0.0	0.0	22.5	22.5	
Feb.	28	4	2	22	25.0	3.0	0.0	0.0	20.5	20.5	
Mar.	31	4	4	23	31.0	0.0	0.0	0.0	23.0	23.0	
Apr.	30	5	3	22	28.0	1.0	0.0	1.0	20.0	20.0	
May	31	4	1	26	25.0	5.0	1.0	0.0	22.5	22.5	
June	30	4	1	25	71.0	8.0	6.0	5.0	7.5	7.5	
July	31	5	0	26	14.0	6.0	7.0	4.0	10.0	10.0	
Aug.	31	4	3	24	16.0	6.0	8.0	7.0	12.5	12.5	
Sep.	30	5	4	21	18.0	6.0	5.0	1.0	11.5	11.5	
Oct.	31	4	13	14	28.0	2.0	0.0	1.0	11.5	11.5	
Nov.	30	4	2	24	30.0	0.0	0.0	0.0	24.0	24.0	
Dec.	31	5	2	24	31.0	0.0	0.0	0.0	24.0	24.0	
Average Tunnel workable day				23	Average workable day				17.0	17.0	

(Source : Climatological Records of Nepal 1995-1996 Published in June 1999)

a=A-B-C

f=a-(b*0+c*0.5+d*1+e*1.5)

g=a-(b*0+c*0.5+d*1+e*1.5)

Rainy Season (June to September)

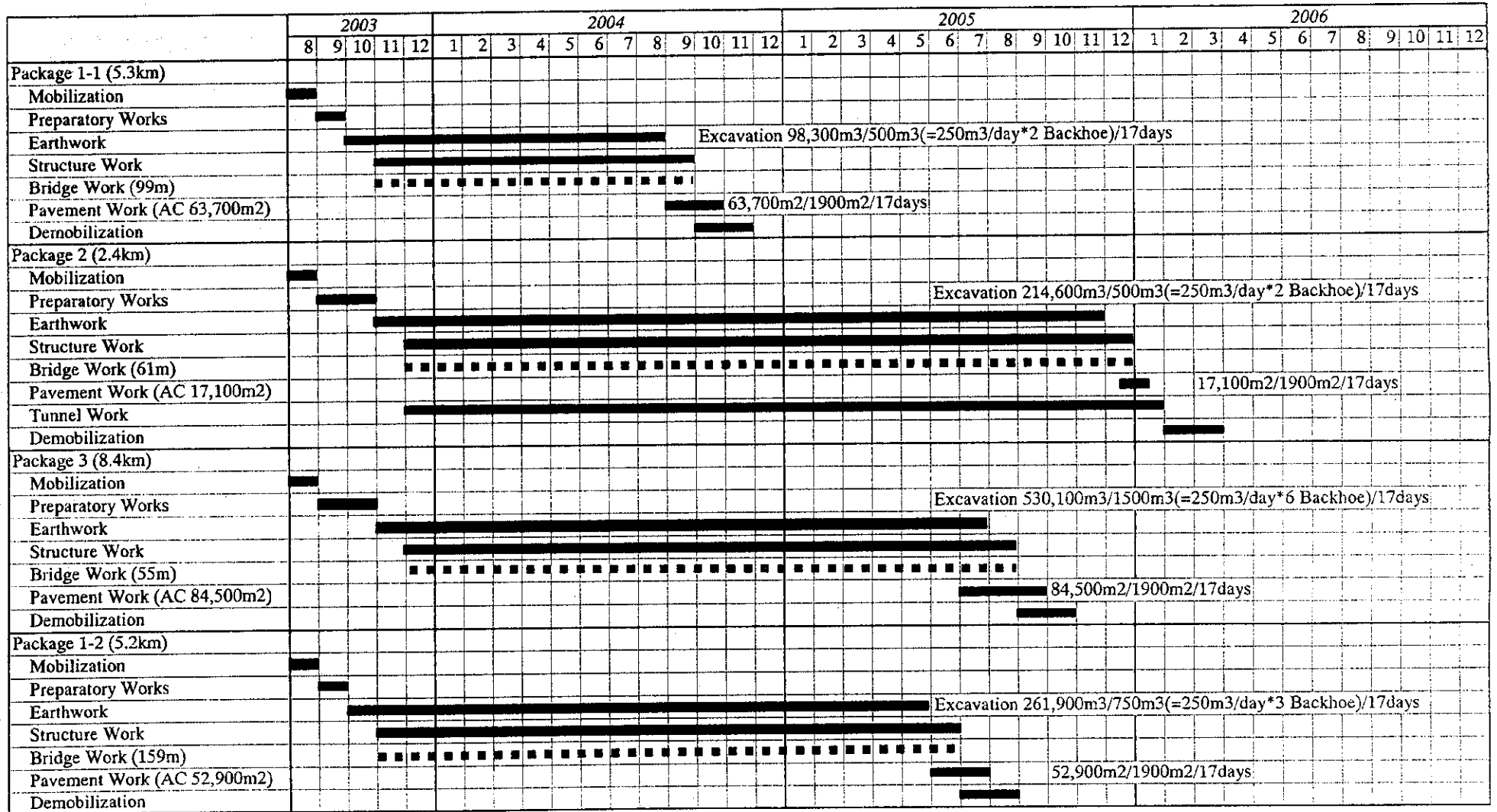
17.6 Construction Schedule

The overall construction period of the Project is estimated at 32 months including mobilization period and site cleaning period. Estimated overall construction schedule is shown in Table 17.2.

The major issues of the proposed construction schedule are as follows:

- Construction of all contract packages will be commenced simultaneously to secure the access roads for each package.
- The pilot roads should be constructed first to enable several construction parties to work simultaneously.
- From economical reason, the tunneling works will be done from west portal only, so the tunnel construction work will be the critical path. The detailed construction schedule of the tunnel is shown in Table 17.3.
- New Austrian Tunneling Method (NATM) with excavation by blasting is assumed to be applied. Possibility of other method (e.g., side drift tunnel excavation method) should be considered in detailed design stage.

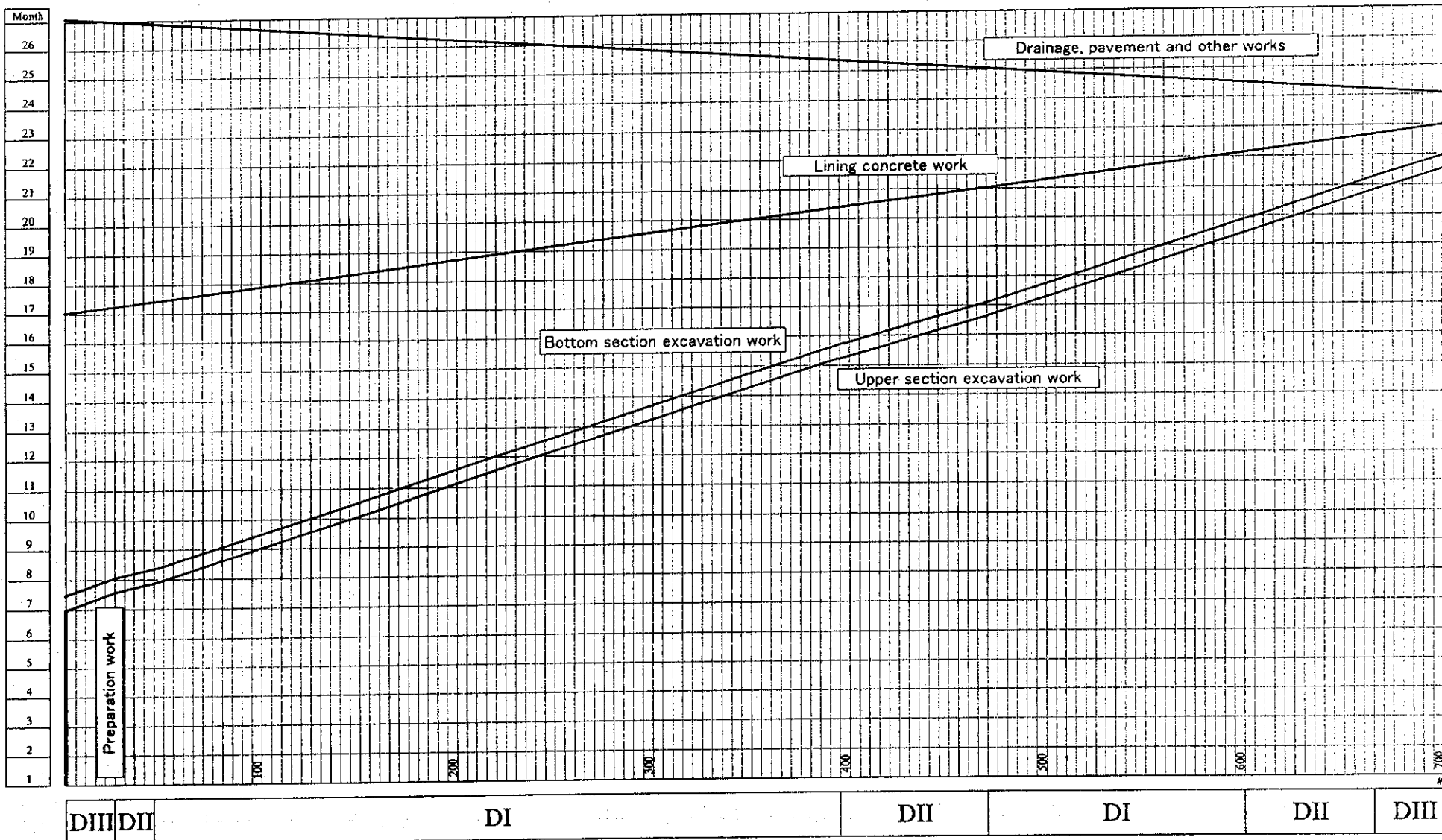
Table 17.2 Overall Construction Schedule



17-7

Monthly workable day was calculated in consideration of rainy days.

Table 17.3 Construction Schedule of the Tunnel



17.7 Annual Requirement of Material, Manpower and Equipment

Annual requirement of material, manpower, and equipment is tabulated as follows:

Table 17.4 Annual requirement of material, Manpower and Equipment

Item	Unit	2003	2004	2005	2006	Total
(Material)						
Cement	ton	1,600	15,100	11,300		28,000
Fine Aggregate	m ³	4,000	36,500	26,700		67,200
Crushed Stone	m ³	13,700	110,500	70,600		194,800
Boulder	m ³	6,100	54,400	37,000		97,500
Asphalt	ton		950	2,500	150	3,600
Diesel	litre	302,400	2,888,600	2,096,500		5,287,500
Re-bar	ton	200	1,400	1,000		2,600
Plywood	pcs.	1,500	14,700	10,800		27,000
(Manpower)						
Manpower	m.day	158,000	379,100	310,800	23,000	870,900
(Equipment)						
Bulldozer	hr	3,000	15,100	8,800	200	27,100
Backhoe	hr	4,300	22,000	13,500	400	40,200
Dump Truck	hr	8,700	44,500	28,100	900	82,200
Tire Roller	hr	2,200	10,800	6,200	100	19,300

