

Department of Roads  
Ministry of Physical Planning & Works  
Federal Democratic Republic of Nepal

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT  
FOR CONSTRUCTION OF SINDHULI ROAD  
SECTION III (PHASE-2)  
IN  
FEDERAL DEMOCRATIC REPUBLIC OF NEPAL**

**January 2012**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)  
NIPPON KOEI CO., LTD.**

<b>EID</b>
<b>JR</b>
<b>12-006</b>

**Department of Roads  
Ministry of Physical Planning & Works  
Federal Democratic Republic of Nepal**

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT  
FOR CONSTRUCTION OF SINDHULI ROAD  
SECTION III (PHASE-2)  
IN  
FEDERAL DEMOCRATIC REPUBLIC OF NEPAL**

**January 2012**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)  
NIPPON KOEI CO., LTD.**

## **PREFACE**

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Nippon Koei Co., Ltd..

The survey team held a series discussions with the officials concerned of the Government of Federal Democratic Republic of Nepal, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Federal Democratic Republic of Nepal for their close cooperation extended to the survey team.

January 2012

Kiyofumi Konishi  
Director General  
Economic Infrastructure Department  
Japan International Cooperation Agency

## **SUMMARY**

### **1. Outline of the Country**

The Federal Democratic Republic of Nepal, with an area of approximately 147,000 km<sup>2</sup>, is a landlocked Himalayan country in Southwest Asia. It is bordered by China in the north and by India on the remaining three directions. The capital of Nepal is Kathmandu located in the Kathmandu Valley, which has a size of about 25 km from east to west and about 20 km from south to north. The total population of Nepal is about 28.58 million as of 2011 according to the Central Bureau of Statistics. Out of this population, the Kathmandu Valley has about 2.51 million. Terai Plain located along India's border is a major farm production area.

According to the latest data from the Ministry of Finance (MOF), Nepal's nominal gross domestic product (GDP) for the year 2010/11 is around US\$18.5 billion and per-capita nominal GDP is around US\$642. Primary industries such as agriculture cover almost 40% of the GDP and sustain about 80% of Nepal's population. Secondary industries such as manufacturing account for about 20% of the GDP, and tertiary industries such as tourism business and services comprise the remaining 40% of the GDP.

The road sub-sector has the lead role in the national transport system of Nepal. The development of road network started from the 1950s, and the length of the network has expanded up to 15,905 km by 2005. However, road network development in Nepal still has a long way to go since 12 among 75 districts of the entire nation still do not have a motorable roadway at all and 15 district headquarters are not linked to the road network as of December 2005. Furthermore, since there is no all-weather road in Eastern Nepal where Sindhuli Road is located, a population of over one million do not receive the benefits of social and economic development brought about by road development. Moreover, the service level of the road is insufficient since about 70% of the network is unpaved and the road network is weak against sediment-related disasters. Therefore, in order to achieve the National Plan, which primarily aims at poverty reduction, and to reduce the traffic cost from the viewpoint of the national economy, the expansion of the road network together with the maintenance and improvement of the existing roads are among the main concerns in Nepal.

### **2. Background and Outline of the Project**

The Government of Nepal (GON) prepared the First Five-Year Plan in 1956, and since then, has completed ten periodic plans. Meanwhile, the Temporary Three-Year Plan (July 2007 to July 2010) is currently being implemented.

The road system in Nepal is divided into the following five classifications: 1) national highways, 2) feeder roads, 3) urban roads, 4) district roads, and 5) village roads. Among these, the nationwide road network constitutes national highways consisting of 15 routes, and feeder roads consisting of five routes. These are under the jurisdiction of the Ministry of Physical Planning and Works (MOPPW) and are managed by the Department of Roads (DOR). The DOR has prepared the

Master Plan for Strategic Road Network (SRN) in December 2005 in order “to contribute toward the betterment of living conditions of the people through effective, efficient, safe and reliable strategic road connectivity”. The DOR has likewise identified the prioritized projects.

The issues related to the road network of Nepal are mostly attributed to Prithivi Highway. This highway, which is the only significant commercial route connecting Kathmandu to Terai area and India, is constantly in danger of being damaged due to sediment-related disasters that occur every year. Kathmandu was previously isolated for 20 days due to a sediment-related disaster caused by heavy rains in July 1993 and as a result, the transport of goods indispensable for local residents’ lives including oil and perishable foods was interrupted. Unstable transportation during the monsoon season has caused uncertainty in the supply of goods in the capital as well as disturbances and political uncertainty.

Hence, the GON expects that Sindhuli Road, which is the second major trunk road connecting Kathmandu to the Terai area and India’s boundary, will contribute to secure the safety and economic growth of Nepal. Utilizing this road will consequently shorten the travel distance and travel time, which will benefit both the transportation of agricultural production and long-distance bus trips. Furthermore, it is expected that the shortening of travel time to Sindhuli, Ramechhap and Kavrepalanchok districts will result in the reduction of travel cost and contribute to the stable transportation and industrial promotion along the road. Therefore, it is foreseen that its implementation will stimulate social and economic activities, leading to the improvement of the quality of life of local residents. DOR listed up Sindhuli Road as one of specific road projects that correspond to important routes and identified it as the prioritized highway route connecting Eastern Terai area to Kathmandu with the route number H06.

Sindhuli Road, with total length of 160 km, connects Dhulikel on the Arniko Highway (31 km eastward from Kathmandu) to Bardibas on the East-West Highway crossing the Terai Plain. The feasibility study (F/S) for the construction of Sindhuli Road was conducted in 1986, and this road was divided into four sections, namely: Section I (37 km, Bardibas – Sindhuli Bazar), Section II (25.8 km, Sindhuli Bazar – Khurkot, previously 39 km), Section III (36.8 km, Khurkot – Nepalthok, previously 32 km), and Section IV (50 km, Nepalthok – Dhulikel).

After completion of the F/S, the aftercare study was carried out in 1993. Construction of Sections I and IV commenced in 1996 and 1998, respectively. Meanwhile, the construction of Section II was implemented in 2001, with a scheduled completion in March 2009.

Section III is the last section to be implemented. Its early commencement and the overall opening of the road are highly necessary. Thus, the GON requested the Government of Japan (GOJ) in March 2001 for grant aid assistance to support the project. In response to the request, project formulation study, environmental impact assessment (EIA) by DOR and preparatory study mission dispatched by GOJ had been carried out. After that, the GOJ dispatched the basic design study of Section III from March 2008 to December 2008, and it was decided to divide the project site into two phases.

The detailed design of Section III was carried out by the GON under a grant agreement with the GOJ from March 6, 2009 to October 31, 2009. The scope of construction for Phase 1 of Section III was decided to include 14.3 km of Section III road and seven causeways. The GON commenced the construction of Phase 1 of Section III in November 2009 and it is expected to be completed in the middle of 2012.

### 3. Outline of Preparatory Survey and Main Features of Project Facilities

Meanwhile, construction of the remaining portion of Phase 2 of Section III (22.5 km) was planned to commence in 2011 as a three-year budgetary project through grant aid. However, it was still not decided to be implemented according to the planned schedule. It was proposed that the construction schedule and costs be reviewed since three years have already passed after the completion of the basic design study. The GOJ decided to review the construction plan and cost estimate through an additional site survey to investigate the procurement condition and latest unit costs in Nepal.

Considering the above situation, the GOJ decided to conduct a preparatory survey on the project for construction of Sindhuli Road Section III (Phase 2) and dispatch a survey team to Nepal from August 7 to 27, 2011 in order to review the above matters and the activities of environmental and social considerations for the ongoing Phase 1 of Section III, which is the recipient country's obligations. After the survey team returned to Japan, further studies were conducted and the draft final report was completed.

JICA consequently dispatched a preparatory survey explanation team to Nepal in November 2011 while the minutes of discussions, which mainly covered the results of the preparatory survey and the recipient country's obligations, were agreed by both sides.

The facilities designed in the survey are summarized below.

Category	Item	Contents / Scale
Road	Road length	22.5 km
	Road width	4.75 m of carriageway
	Design speed	30 km/hr (except for hairpin curves)
	Pavement	Standard: double bituminous surface treatment (DBST) (DBST, base course: 15 cm, sub-base: 15 cm) Hairpin curves: asphalt concrete (surface: 5 cm, binder: 2 x 5 cm, base course: 15 cm)
	Cross drainage	Box culvert: 13 units Pipe culvert: 145 units (including irrigation)
	Causeway	Type: Continuous box culvert, 5 units No. 3-2: 190 m No. 3-3: 20 m No. 3-4: 50 m No. 3-5: 90 m No. 3-9: 90 m
	Bus stop	14 stops
	Passing place	99 places
	Guard block	Precast concrete wall type: installed only at dangerous locations

#### **4. Construction Period and Estimated Project Cost**

Based on the implementation schedule of the project managed by the GOJ, Phase 2 of the project is divided into the following two parts: 1) single budgetary year program as part 1 and 2) three-year budgetary program as part 2 in accordance with the Japan Grant Aid Guideline.

The estimated duration for the construction of parts 1 and 2 of Phase 2 including the detailed design and tendering processes will be 12 and 28 months, respectively, under overlapping schedule in order to meet the anticipated project completion of 32 months.

The cost to be shouldered by the Nepalese side, separate from Japan's Grant Aid, is estimated at about NRs.285 million, which includes compensation of private lands and houses, relocation of electrical, communicational and water supply facilities, environmental mitigation measures, environmental monitoring, measures for local residents and traffic safety training, etc.

#### **5. Project Evaluation**

The population to receive the project benefits comprise of about 1.54 million residents living along Sindhuli Road, 5.83 million residents in Kathmandu Valley and Eastern Nepal, and users of bus and truck which are estimated at 30,000 per day and 10 million per year. The following effects are expected:

##### Quantitative Effect

- Running distance of traffic from Kathmandu to Bardibas in Terai Plain will be reduced by about 140 km after the whole Sindhuli Road is constructed.
- Roundtrip from Kathmandu to Central Terai area that requires two days of travel time will be reduced to just one day.

##### Qualitative Effect

- Risks of interception of transportation to Kathmandu Valley will be reduced and stable supply of goods will be realized. Thus, damage to capital functions will be avoided and lives of 2.5 million citizens will become stable.
- Farm villages will be connected to the market and thus, cash crop farming will be promoted and regional economy will be activated along the road.
- Through the opening of the all-weather road in the less developed area, commerce, development of fabrication and housing industries and investments will contribute to regional development and poverty reduction for 1.5 million citizens living along the road.
- Travel time will be reduced and the commuters will greatly benefit from safe transportation and traffic. As a result, stable supply of goods within the region will be promoted. Moreover, improvement of access to public services and welfare facilities such as hospitals can be expected.

## CONTENTS

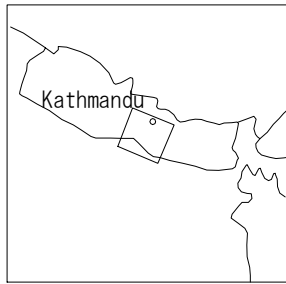
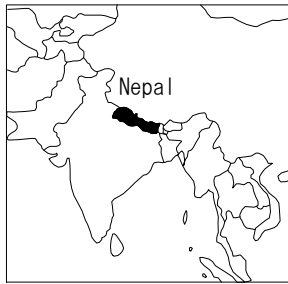
Preface	
Summary	
Contents	
Location Map/Perspective	
List of Figures and Tables	
Abbreviations	
<b>Chapter 1 Background of the Project.....</b>	<b>1</b>
1.1 Background of the Project.....	1
1.2 Natural Conditions .....	2
1.2.1 Current Condition of the Site .....	2
1.2.2 Current Condition of the Collapsed Area at the Site .....	2
1.2.3 Currently Collapsing Area.....	4
1.3 Implementations of the Environmental Management Plan and Monitoring Plan During the Construction Period.....	5
1.3.1 Current Environmental Management and Monitoring Works .....	5
1.3.2 Process of Public Consultation Meeting .....	12
1.3.3 Establishment of EMU and Its Function .....	13
1.3.4 Suggestions for Improvement of Environmental Management/Monitoring Works .....	14
1.3.5 Recommendations for Improvement on the Future Works.....	20
<b>Chapter 2 Contents of the Project.....</b>	<b>22</b>
2.1 Basic Concept of the Project .....	22
2.2 Outline Design of the Requested Japanese Assistance .....	23
2.2.1 Design Policy .....	23
2.2.2 Basic Plan.....	24
2.2.3 Outline Design Drawing.....	25
2.2.4 Implementation Plan .....	25
2.2.4.1 Implementation Policy .....	25
2.2.4.2 Implementation Conditions.....	26
2.2.4.3 Scope of Works .....	26
2.2.4.4 Consultant Supervision .....	26
2.2.4.5 Quality Control Plan .....	27
2.2.4.6 Procurement Plan .....	27
2.2.4.7 Implementation Schedule.....	29
2.3 Obligations of the Recipient Country.....	31
2.4 Project Operation Plan.....	31
2.5 Project Cost Estimation .....	31
2.5.1 Initial Cost Estimation.....	31



2.5.2	Operations and Maintenance Cost.....	32
<b>Chapter 3 Project Evaluations .....</b>		<b>34</b>
3.1	Preconditions.....	34
3.2	Necessary Inputs by the Recipient Country .....	34
3.3	Important Assumptions.....	34
3.4	Project Evaluations.....	35
3.4.1	Relevance .....	35
3.4.2	Effectiveness .....	35

## Appendices

Appendix 1	Member List of the Survey Team
Appendix 2	Survey Schedule
Appendix 3	List of Parties Concerned in the Recipient Country
Appendix 4	Minutes of Discussions
Appendix 5	Environmental Mitigation Measures
Appendix 6	Design Drawings (Plan and Profile, Typical Cross Section, and Causeway)

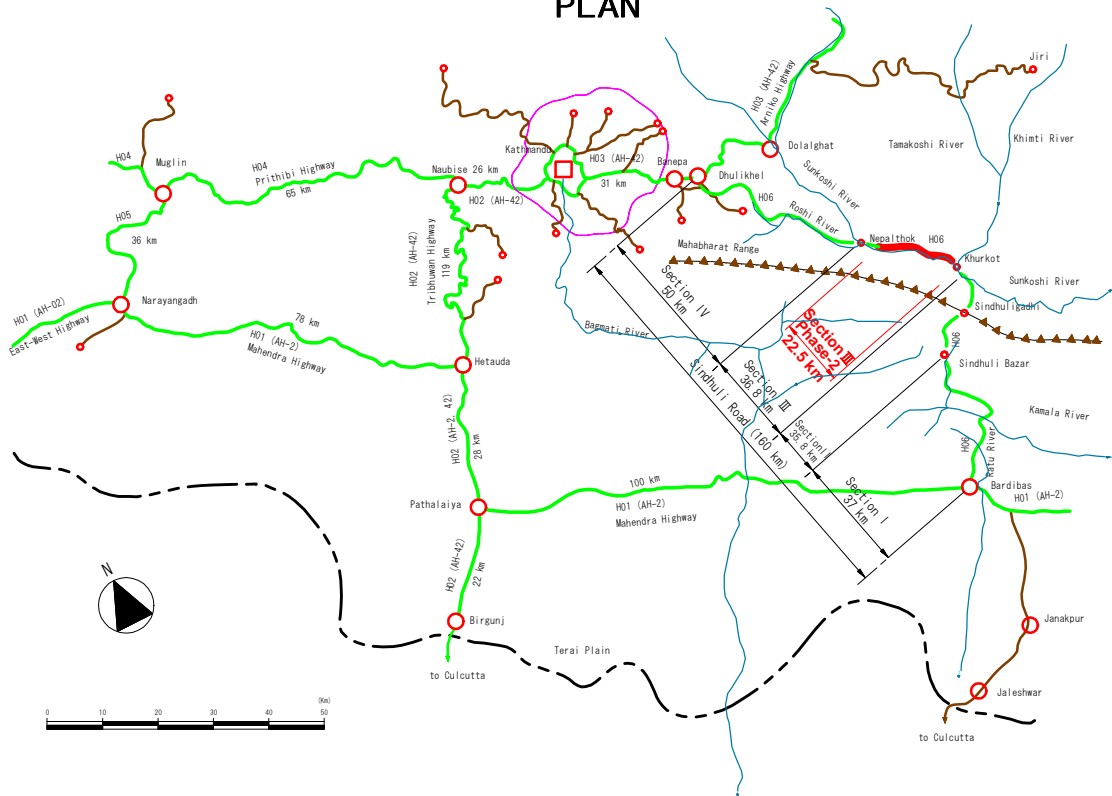


KEY PLAN

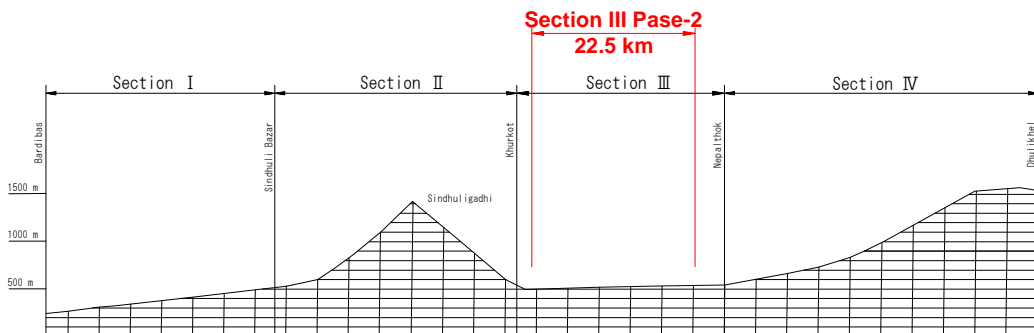
**LEGEND**

- Capital
- City
- Village
- Study Section
- National Highway
- National Highway
- Asian Highway
- Rural Road
- River
- Kathmandu Valley
- Range

PLAN



PROFILE



LOCATION MAP



Perspective View of the Sindhuli Road Section III Phase-2 (STA. 7+350)

## List of Figures

Figure 1-1 Suggested Reorganization of EMU .....	15
--	----

## List of Tables

Table 1-1 Impacts of Unstable slope Area at STA.11 - STA.15+800 .....	2
Table 1-2 Photos at Unstable Slope Area.....	4
Table 1-3 Currently being Collapsed Area .....	5
Table 1-4 Implementation of the Recommendations made during Supplemental Environmental Study .....	6
Table 1-5 Mitigation Measures Carried Out for Physical Environment.....	8
Table 1-6 Mitigation Measures on the Biological Environment.....	8
Table 1-7 Mitigation Measures on Social Environment .....	9
Table 1-8 Comparison of Environmental Monitoring Plan and Monitoring Report .....	10
Table 1-9 Changes of the Number of Households affected by the Project.....	16
Table 1-10 Payment of Compensation made to Date.....	17
Table 2-1 Scope of the Project for Phase-2 of Section III .....	23
Table 2-2 Detail of the Scope for Phase-2 of Section III.....	24
Table 2-3 Scope of Works undertaken by GOJ and the GON .....	26
Table 2-4 Indicative Procurement of Construction Materials .....	28
Table 2-5 Indicative Procurement of Construction Equipment .....	29
Table 2-6 Indicative Procurement Location of Labors.....	29
Table 2-7 Tentative Implementation Schedule .....	31
Table 2-8 Project Costs Required for the Undertakings by the GON.....	32
Table 2-9 Operation and Maintenance Costs for whole Sindhuli Road .....	33
Table 3-1 Preconditions for Implementation of the Project .....	34

## Abbreviation

## **Abbreviations**

ADB	:	the Asian Development Bank
B/D	:	Basic Design
CFC	:	Compensation Fixation Committee
DBST	:	Double Bituminous Surface Treatment
DDC	:	District Development Committee
DFID	:	Department for International Development
DFO	:	District Forest Office
DHM	:	Department of Hydrology and Meteorology
DOR	:	Department of Roads
EIA	:	Environmental Impact Assessment
E/N	:	Exchange of Notes
EMU	:	Environmental Management Unit
G/A	:	Grant Agreement
GDP	:	Gross Domestic Products
GESU	:	Geo-Environment and Social Unit
H01~H06	:	National Highway 01-06
IRC	:	Indian Road Congress
JICA	:	Japan International Cooperation Agency
MOPPW:		Ministry of Physical Planning & Works
NRs	:	Nepal Rupee
PAP	:	Project Affected Person
RCC	:	Road Coordination Committee
ROW	:	Right of Way
RTO	:	Road Transportation Organization
Rs	:	India Rupee
SDC	:	Swiss Agency for Development and Cooperation
SHM	:	Stakeholders Meeting
SPAP	:	Special Project Affected Person
Sta.	:	Station
SRN	:	Master Plan for Strategic Road Network
TCC	:	Track Construction Committee
US\$	:	US Dollar
VDC	:	Village Development Committee

# **PREPARATORY SURVEY REPORT**

# **Chapter 1      Background of the Project**

## **1.1      Background of the Project**

Sindhuli Road, with a total length of 160 km, connects Dhulikel on the Arniko Highway (31 km eastward from Kathmandu) to Bardibas on the East-West Highway crossing the Terai Plain. Considering local conditions such as topographical features, this road is divided into four sections, namely: Section I (37 km, Bardibas - Sindhuli Bazar), Section II (35.8 km, Sindhuli Bazar - Khurkot, previously 39 km), Section III (36.8 km, Khurkot - Nepalthok, previously 32 km), and Section IV (50 km, Nepalthok - Dhulikel).

The Feasibility Study (F/S) for the Construction of Sindhuli Road started in 1986. Subsequently, the aftercare study was carried out in 1993. Construction of Sections I, IV and II commenced in 1995, 1998 and 2011, respectively and was completed.

Section III is the last section to be implemented. Its early commencement and the overall opening of the road are highly necessary. Thus, the Government of Nepal (GON) requested the Government of Japan (GOJ) in March 2001 for grant aid assistance to support the project. In response to the request and prior to the basic design study, the GOJ dispatched experts to carry out the formulation study for the project, which aims to support the local consultants in conducting the environmental impact assessment (EIA). In January 2005, the GOJ then assisted the related survey works and drawing preparation. The EIA, which was conducted by the Department of Roads (DOR) in November 2004, was approved by the GON in May 2006. Based on the review of the JICA Council on Environmental and Social Considerations, which was reported in October 2006 regarding the result of the EIA submitted by the GON, the GOJ dispatched a preparatory study mission to Nepal in February 2007. Its purpose was to examine the scale of the project and its environmental impacts, and to assist the DOR in building consensus with the affected residents concerning the implementation of the project and its related resettlement issues. Consequently, a draft alignment was decided. The GOJ conducted the basic design study of the project from March to December 2008. It was decided to divide the project site into two phases.

The detailed design of Section III road was carried out by the GON under a grant agreement with the GOJ from March 6 to October 31, 2009. The scope of the construction for Phase 1 of Section III was decided to include 14.3 km of Section III road and seven causeways. The GON commenced the construction of Phase 1 of Section III in November 2009. The construction will be completed in the middle of 2012.

Meanwhile, construction of the last remaining portion of Phase 2 of Section III (22.5 km) was planned to be commenced in 2011 as a three-year budgetary project through the grant aid. However, it was still not decided to be implemented according to the planned schedule. It was

proposed that the construction schedule and costs be reviewed since three years have already passed after the completion of the basic design study. The GOJ decided to review the construction plan and cost estimate through an additional site survey to investigate the procurement condition and latest unit costs in Nepal.

Considering the above situation, the GOJ decided to conduct a preparatory survey on the Project for Construction of Sindhuli Road Section III (Phase 2) and dispatch a survey team to Nepal from August 7 to 27, 2011 in order to review the above matters and the activities of environmental and social considerations for the ongoing Phase 1 of Section III, which is the recipient country's obligations. After the survey team returned to Japan, further studies were conducted and the draft final report was completed.

## 1.2 Natural Conditions

### 1.2.1 Current Condition of the Site

Natural conditions of the project site, such as meteorological, topographical, geological and hydrological conditions, and land use are studied in Section 2.2.2.2 of the Basic Design Report and obvious differences are not confirmed. Survey of the topographical condition and landslide scar area at the principal sites are described as follows.

### 1.2.2 Current Condition of the Collapsed Area at the Site

The base rock of the project site consists of sedimentary rocks (sandstone and mudstone) of the Kuncha layer of the lower Nawakot layers of Paleozoic Era. The rock has suffered weak metamorphism and later, transformed into schistose. As for the basic and detailed designs, the geotechnical survey and alignment design have been carried out with the avoidance of cutting large areas at the loosened rock slope and colluvial deposit.

Almost two years have passed after these designs were completed and a survey has been conducted for the investment of the landslide area and to check the condition of the collapse between Sta. 11 and Sta. 15+800. The survey results are shown in Tables 1-1 and 1-2.

As a result of the survey, several partial collapses were found. However, it was confirmed that there was no significant slope failure to review the detailed design. Yet, the landslide block was too large for it to be avoided completely; thus, continuous monitoring of the displacement and/or deformation of the landslide block would be necessary.

**Table 1-1 Impacts of the Unstable Slope Area at Sta. 11 - Sta. 15+800**





















Station		Slope Type	Failure Type	Impact Evaluation	Remarks
1	Sta. 12+750 - Sta. 13+240	Ancient landslide	Collapse at the upper side of the overhanging block	Stable against complete landslide. possibly collapsed partially	Hairpin curve section



2	Sta. 13+250 - Sta. 13+270	Loosened rock slope	Wedge-slip of loosened rock slope	Stable against complete landslide. possibly collapsed partially	
3	Sta. 13+420 - Sta. 13+470	Talus	Collapse at the lower portion	Possibly collapsed partially	
4	Sta. 13+470 - Sta. 13+485	Loosened rock slope	No particular change	Possibly collapsed partially	
5	Sta. 13+570 - Sta. 13+800	Ancient landslide	Small-scale collapse	Stable against complete landslide	
6	Sta. 13+825 - Sta. 13+850	Loosened rock slope	No particular change	Possibly collapsed partially	
7	Sta. 13+920 - Sta. 14+220	Ancient landslide	No particular change	Stable against complete landslide. possibly collapsed partially	
8	Sta. 14+240 - Sta. 14+365	Talus and colluvial deposit	No particular change	Possibly collapsed partially	
9	Sta. 14+365 - Sta. 14+425	Talus	Small-scale erosion	Possibly collapsed partially	
10	Sta. 14+425 - Sta. 14+540	Talus, colluvial deposit, and loosened rock slope	No particular change	Possibly collapsed partially	
11	Sta. 14+570 - Sta. 14+600	Talus, colluvial deposit, and loosened rock slope	Small-scale collapse	Possibly collapsed partially	
12	Sta. 14+810 - Sta. 14+840	Loosened rock slope	Partial erosion	Possibly collapsed partially	
13	Sta. 14+840 - Sta. 15+020	Ancient landslide	Small-scale collapse	Stable against complete landslide. possibly collapsed partially	
14	Sta. 15+030 - Sta. 15+140	Ancient landslide	Collapse area widened at the top of the slope	Stable against complete landslide. possibly collapsed partially	
15	Sta. 15+140 - Sta. 15+350	Ancient landslide	Medium-scale collapse	Stable against complete landslide. possibly collapsed partially	
16	Sta. 15+400 - Sta. 15+460	Talus and colluvial deposit	No particular change	Possibly collapsed partially	Including Phase 1
17	Sta. 15+460 - Sta. 15+520	Ancient landslide	Small-scale landslide	Possibly collapsed partially	Including Phase 1
18	Sta. 15+540 - Sta. 16+000	Ancient landslide	Small-scale landslide	Possibly collapsed partially	Including Phase 1
19	Sta. 16+380 - Sta. 16+600	Ancient landslide	Small-scale landslide	Possibly collapsed partially	Phase 1 section
20	Sta. 16+760 - Sta. 17+110	Ancient landslide	Small-scale landslide	Possibly collapsed partially	Phase 1 section

Source: JICA Survey Team

**Table 1-2 Photos at the Unstable Slope Area**

				
1 Sta. 12+750	2 Sta. 13+260	3 Sta. 13+460	4 Sta. 13+480	5 Sta. 13+570
				
6 Sta. 13+850	7 Sta. 14+040	8 Sta. 14+280	9 Sta. 14+420	10 Sta. 14+480
				
11 Sta. 14+600	12 Sta. 14+840	13 Sta. 15+000	14 Sta. 15 full view	15 Sta. 15+200
				
16 Sta. 15+400	17 Sta. 15+500	18 Sta. 15+540	19 Sta. 16 full view	20 Sta. 16+900




Source: JICA Survey Team

### 1.2.3 Currently Collapsing Area

During the site survey of the Study, it was found that several small-scale collapses had occurred in the project site. Three portions of the collapsed area are shown in Table 1-3. All of the scales of these collapses were small and had no significant influence to the passing vehicles on the track roads as of now.

These slopes are stable against total landslide, however, there is a possibility for them to partially collapse since they are located in weathered cutting/bared talus at loosened rock with dip slope section. Therefore, continuous monitoring of displacement and/or deformation of the landslide block and early commencement of disaster prevention countermeasures are required and highly necessitated.

**Table 1-3 Currently Being Collapsed Area**

Station		Failure Type	Impact Evaluation	Remarks
21	Around Sta. 25+200	Collapse at the surface, sliding of dip slope at talus	Possibly collapsed partially	
22	Around Sta. 25+460	Collapse at the surface, sliding at loosened rock slope	Possibly collapsed partially	
23	Around Sta. 25+880	Collapse at the upper block of slope by erosion of talus	Possibly collapsed partially	
				
21 Around Sta. 25+200		22 Around Sta. 25+460	23 Around Sta. 25+880	

Source: JICA Survey Team

### 1.3 Implementation of the Environmental Management Plan and Monitoring Plan During the Construction Period

Review of the activities of environmental and social considerations for the ongoing Phase 1 of Section III was implemented in this survey.

#### 1.3.1 Current Environmental Management and Monitoring Works

##### (1) Implementation Based on the Comments of the Advisory Council of Environment and Social Considerations Review

Based on the comments made by the Advisory Council of Environment and Social Considerations Review in June 2008 on the update of the EIA study carried out by the DOR, further study on the environment was carried out in order to supplement further the countermeasures in August 2011. This survey focuses on the impact mitigation measures as well as the environmental monitoring plan for the Sindhuli Road Section III Project based on the following criteria.

- 1) Based on the road design criteria and the supplementary study on the environment, further road alignment would have to be reviewed as follows:
  - Fertile agricultural area and houses should be avoided as much as possible.
  - Where land acquisition is inevitable, minimum land acquisition should be considered.
  - Cutting of pipal tree (*ficus religiosa*) should be avoided as much as possible. Relocation of existing temple should also be avoided as much as possible.
- 2) Hold stakeholder meeting at the location where road alignment is reviewed; and

3) Review geotechnical engineering measures for the easy to break slopes.

As a result of the site survey, it appears that the environmental mitigation measures and monitoring works for Phase 1 of Section III have appropriately been carried out. Based on the three criteria above, the result of the comparison between the environmental mitigation measures carried out during the construction works and the items stated in the updated version of the EIA report released in June 2008 is presented in Table 1-4.

**Table 1-4 Implementation of the Recommendations Made during Supplemental Environmental Study**

No.	Location	Item	Result of the Supplemental Env. Study (August 2008)	Suggested Countermeasures	Implementation as of the time of Section III construction works
1	Around Sta. 1+250	Pipal tree	Avoid	Distance is about 12 m and is possible to be avoided. Due to good landscape, parking area could be created.	Avoided.
2	Around Sta. 1+730	Two trees	Avoid	They are 12 m and 19 m away from the alignment.	Avoided.
3	Sta. 4~Sta. 4+700	Avoid houses	Avoid	It is not possible to avoid the houses, but at least minimize the number of houses to be subjected to resettlement. Those to be resettled should be resettled in the nearby area.	Avoided.
4	Sta. 4+700	Farming area and causeway	Minimize the loss of farming land and soil erosion	Avoid bisecting the farming land. Causeway could be constructed in the upstream area.	Acquisition of farming land is reduced from 9,900 m <sup>2</sup> to 6,000 m <sup>2</sup> .
5	Sta. 4+900	Meeting place	Avoid	Avoid the meeting place since the distance is about 15 m away from the road alignment.	Avoided.
6	Around Sta. 5+800	Two pipal trees	Avoid	Avoid and change the alignment for about 30 m.	Avoided.
7	Around Sta. 6+100	Houses and pipal trees	Avoid. Consider countermeasures for traffic accident.	It is not possible to avoid the house since it is inside the right of way (ROW). Avoid the pipal tree and safeguard the root system while some branches might need cutting. Construction of walkway might be needed.	Avoided the pipal tree and safeguarded the root system with embankment. Some branches above the road might need cutting. Land acquisition of the farming area decreased from 5,500 m <sup>2</sup> to 3,000 m <sup>2</sup> .
8	Sta. 7+500 ~Sta. 8+900	Dry and strong wind area	Minimize cutting and filling. Diversify ancillary structures.	Minimize cutting and filling.	Avoided the landslide area. Cutting and filling was reviewed in order to efficiently balance the amount of cuts and fills.
9	Sta. 9+000 ~Sta. 10+000	Ghumaune Chainpur's Farming area	Avoid	In order to avoid the farming area, use of the south-facing slope should be considered.	Acquisition of farming land reduced from 28,500 m <sup>2</sup> to 4,500 m <sup>2</sup> .
10	ditto	Ghumaune Chainpur's Farming area	Minimize cutting.	Use structural measures to avoid cutting.	Cutting was minimized.
11	ditto	Religious structures in the village	Avoid. The house may have to be relocated.	Avoid both of them.	Avoided.
12	ditto	Pipal trees in the west of the village	Avoid	Make a detour in order to avoid the trees.	Avoided. However, the branches over the road are cut down and the measures have been agreed with Village Development Committee (VDC).
13	Around Sta. 11+600	Pipal trees	Avoid	Realign the road.	Avoided.

No.	Location	Item	Result of the Supplemental Env. Study (August 2008)	Suggested Countermeasures	Implementation as of the time of Section III construction works
14	Sta. 13 and beyond	Existing road	Five suggested measures	Implement the five suggested measures.	Implemented as per recommendations.
15	Sta. 13+800~Sta. 15+100	Forest area	Two suggested measures	Implement the two suggested measures	Implemented as per recommendations.
16	Sta. 15+500~Sta. 16+500	Village area of Mulkot	Widening of the existing bus stop area.	The road alignment might be changed to tea stall area. Avoid moving to the slope side. Parking area might be widened as much as possible. Consider construction of the banks on Bhote Khola.	Construction of the embankment protection on Bhote Khola is carried out.
17	Sta. 18+600~Sta. 21+300	Village of Ratmate	Avoid fanning area as well as the existing village road.	Use existing road in order to avoid resettlement, the pipal trees, and the village road.	Pipal trees have been avoided. Acquisition of farming area is reduced from 48,000 m <sup>2</sup> to 42,000 m <sup>2</sup> .
18	Sta. 21+800~Sta. 22+500	Forest area	Minimize cutting and carry out slope protection works.	Minimize cutting and carry out slope protection works.	Minimized cutting of trees. Acquisition of farming area is reduced from 27,600 m <sup>2</sup> to 20,000 m <sup>2</sup> .
19	Sta. 24+300~Sta. 25+100	Forest area	Carry out realignment and minimize cutting.	Alignment along the river may be the smallest. Consider this route.	Cutting was minimized.
20	Sta. 25+700~Sta. 27+900	Forest area	Minimize cutting. Consider realignment for the protection of the forest.	For the safety of road traffic, forest area should be cut. Cutting and filling with slope protection might be an option.	Carried out as per suggested. Acquisition of farming land with an unchanged area of 12,000 m <sup>2</sup> .

Source: JICA Survey Team

## (2) Implementation of Mitigation Measures During the Construction Period of Phase 1 of Section III

Based on the updated version of the EIA report issued in June 2008, mitigation measures are considered to be implemented as per Appendix 5-1. The Advisory Council of Environment and Social Considerations Review made comments that “the environmental management plan should be elaborated to narrow down its absolutely necessary measures and the proposal must detail in terms of the scale and operation procedure as broadly as possible”. Based on the comments of the Advisory Council of Environment and Social Considerations Review, this survey was made to inquire about the appropriateness and the possibility to implement matters on the environmental management plan for the Phase 1 of Section III of the Banepa-Sindhuli-Bardibas Road Project in Nepal.

As a result of the review of the above reports, it appears that the environmental mitigation measures carried out during the Phase 1 of Section III road construction works have been carried out comparatively in good terms. As shown in Tables 1-5, 1-6 and 1-7, the mitigating measures are broadly grouped together in the column at the leftmost side. They are then compared with the items of the mitigation measures that have appeared on the updated version of the EIA study released in June 2008 and their present implementation in the Section III of Banepa-Sindhuli-Bardibas Road Project.

**Table 1-5 Mitigation Measures Carried Out for the Physical Environment**

No.	Broadly Categorized Physical Environment	Items on the Mitigation Measures	Implementation
1	Impacts on the occupied house, land including farming area, changes on the natural landscape and drainage including borrow pit development, spoil bank construction, and solid waste disposal	Landscape disturbance, changes in land use, occurrences of landslide soil erosion, stockpiling of the construction materials and disposal of spoils, solid waste generation, and effect on irrigation schemes (under “socio-economic and cultural aspects”)	<ul style="list-style-type: none"> <li>a. Upon completion of land acquisition, minimum cutting and filling works are implemented.</li> <li>b. There are three work camps. Disposal of solid waste and sewage is managed through incinerator and septic tank-soak pit system, respectively.</li> <li>c. Where solid waste is in need of burying, burial pit is excavated within the camp.</li> <li>d. Materials excavated from the construction site are dumped in the spoil bank where necessary. Such spoil bank would be used for school buildings, etc. upon completion of the project.</li> <li>e. There is no landslide caused by poor workmanship, but with heavy rain in places on the steep slopes, it is possible. There will be a high risk of large-scale landslide if heavy rain is continued.</li> <li>f. Although great care has been provided, some excavated materials are sliding down the slope at the places where soil is loose and the slope is unstable. Excavators are trained not to cause any disposal of excavation to the slope on site.</li> <li>g. Construction materials are excavated at designated borrow pit. DDC designates such places for material excavation and the project office pays every month depending on the quantity of materials excavated. Half of the payment is sent to VDC from DDC for VDC’s development incentives.</li> </ul>
2	Impacts on the existing infrastructure including irrigation system, drainage and water supply system	Disruption on drainage system, effect on irrigation channel, and effect on other infrastructure	<ul style="list-style-type: none"> <li>a. There are no bridges or sewerage and water supply systems on Roshi Khola or Sunkoshi Nadi that are affected by the project. However, a number of causeways are constructed to go across the tributaries to Roshi Khola or Sunkoshi Nadi. There are no construction works that adversely affect these rivers.</li> <li>b. High voltage electric lines as well as distribution lines are installed along the road. However, there is no evidence of damages to them.</li> </ul>
3	Impacts on the air and natural drainage system in the project area	Air pollution and degraded water quality	<ul style="list-style-type: none"> <li>a. Excessive air pollution test has not been measured. However, it may not be required because the contractor operates construction machinery well with conditions based on the Japanese Standard services.</li> <li>b. There is no degradation of the surface water.</li> <li>c. The contractor is sprinkling water on the road as a part of contribution to the local communities against dust caused by construction vehicle’s mobilization.</li> <li>d. Total suspended solids particulate (TSP) has been measured during the monitoring period.</li> </ul>
4	Safety measures taken for the construction workers and the local people	Safety measures regarding occupational health and safety (under socio-economic and cultural aspects)	<ul style="list-style-type: none"> <li>a. All of the construction workers are using helmet and other safety equipment.</li> <li>b. There are a number of watchmen for traffic safety at the places where bend of the road creates difficult view on the incoming traffic.</li> </ul>

Source: JICA Survey Team

**Table 1-6 Mitigation Measures on the Biological Environment**

No.	Items	Items on the Mitigation Measures	Implementation
1	Impacts on the forest and plant species	Loss of forest and shrub land, pressure on forest for timber and firewood	<ul style="list-style-type: none"> <li>a. Trees felled under the license issued by the District Forestry Department for the project are recorded in terms of their size and volume after cutting. Depending on the size, trees are sent to the Nepal Timber Corporation or sold to the local community in</li> </ul>

No.	Items	Items on the Mitigation Measures	Implementation
		2.1.1 “Predicted Impacts: 14.69 ha of forest area is cleared and 1,040 trees and 2,676 poles need to be felled. Mitigation measures: make compensatory plantation for 37 ha”	<p>case their sizes are significantly small.</p> <p>b. There are seven locations of community forest for compensation planting. Planting is carried out on 43 ha of land. There are 25 saplings planted for every one tree felled. So far, there have been 138,700 saplings planted.</p> <p>c. In order to avoid, illegal cutting of trees, contractors provide patrol for the protection of the trees in the forest area.</p>
2	Impacts on the fauna and their habitat	N/A	<p>a. There is hardly a possibility to find endangered species of wild animals and plants in the project area, similar to the case reported in the basic design report.</p> <p>b. There is no area where fauna and flora are adversely affected by the project.</p>

Source: JICA Survey Team

**Table 1-7 Mitigation Measures on Social Environment**

No.	Items	Items on the Mitigation Measures	Implementation
1	Compensation for the housing structures including ancillary structures, farming area, and crops	Loss of agricultural land, loss of houses, loss of agricultural products, resettlement, and relocation and rehabilitation.	<p>a. There are 30 households involved in resettlement compensation negotiations and payment which have been completed for Phase 1. Negotiations on the small but many claims for crop damages and cracks on the walls of houses along the construction area are in progress. For Phase 2, there are 25 households in which the compensation negotiations are already completed and thus they are now waiting for payment. Negotiation for resettlement of the other 12 households is in progress.</p> <p>b. Compensation negotiations include houses cracked by the construction vehicles, and land and crops hitherto not considered within the ROW of the project but registered for compensation claims after the commencement of the road construction works.</p> <p>c. Record of each case of compensation negotiation is with the DOR and the claimer holds the original copy.</p> <p>d. List of compensation negotiation that is in progress is included in the monitoring report.</p> <p>e. In case of resettlement, cash payment of 50% of the total payable amount is disbursed before demolition of the house. The remaining 50% is paid after the completion of demolition.</p>
2	Impacts on the temples, structures of historical and cultural values	N/A	<p>a. Any temples and structures of historical and cultural values were put out in June 2008. However, there is a pair of pipal trees grown in each village for religious reasons. Thus, where the road alignment passes nearby the pipal trees, their branches are necessary to be cut down with the consent of VDC.</p> <p>b. In Vimeshowar VDC, a small local temple's pond blocks a part of the ROW. Approximately 1.5 m of its width is demolished and the size of the pond is reduced in order for the road to pass between the pond and the pipal trees.</p>
3	Impacts on the historical and archaeological values	N/A	N/A
4	Impacts on the religious events	N/A	N/A

Source: JICA Survey Team

**(3) Environmental Monitoring Works during the Construction Period of Phase 1 of Section III**

Environmental monitoring report produced in August 2011 by the DOR is a result of

monitoring works carried out in accordance with the monitoring plan elaborated in the updated version of the EIA report produced in June 2008. However, the Advisory Council of Environment and Social Considerations Review made comments in 2008 that “the environmental management plan should be elaborated to narrow down its absolutely necessary measures and the proposal must be detailed in terms of scale and operation procedure as broadly as possible”. The council also made a comment stating that “in terms of elaborating the environmental monitoring plan, it is necessary to carry out baseline monitoring works in the earliest stage”. Based on the obtained baseline monitoring data and present environmental standard, the objective and comprehensive environmental standard target for each item of the natural and social environment should be set out”. In view of these comments, this survey was made considering that if the environmental management plan was carried out on the basis of appropriateness, then it is actually possible to implement matters on the environmental management plan for the Phase 1 of Section III of the project.

Within the framework of the environmental management/monitoring works for the project, Environmental Management Unit (EMU) has been established in July 2011 and the monitoring report has been released in August 2011. This survey was therefore made whether or not the environmental management works and monitoring works are appropriately carried out in accordance with the environmental management and monitoring plan, bearing in mind the comments made by the Advisory Council of Environment and Social Considerations Review.

As a result of the comparative study of the abovementioned report, items important to monitor the environmental conditions on site are generally carried out well as planned. However, because the environmental monitoring plan elaborated on the standardized criteria and theoretical basis, some have not been able to be carried out in strict terms as the construction works begin. On the other hand, monitoring works carried out on site did not produce the appropriate result because of wrong parameters that might have been set out. Thus, as per Section 1.3.4, appropriate and practical method of monitoring works is suggested. The result of the study comparing the contents of the environmental monitoring report produced in July 2011 by the DOR and the environmental monitoring works on site is shown in Table 1-8.

Table 1-8 Comparison of Environmental Monitoring Plan and Monitoring Report

No.	Environmental Monitoring Plan (June 2008)	Monitoring Report (August 2011)	Result of Comparison
1	Total suspended solids particulate (TSP) and particulate matter (PM <sub>10</sub> ), sulfur dioxide, oxides of nitrogen, and noise level will be monitored at regular interval.	Only TSP was measured.	a. TSP is the measurement value of dust particles. Other items are not appropriate to be monitored considering the nature of the project.
2	Wind direction	Not carried out	a. It is not absolutely necessary to monitor the wind direction only among other parameters of meteorological disciplines.



No.	Environmental Monitoring Plan (June 2008)	Monitoring Report (August 2011)	Result of Comparison
3	Measurement on noise level is not listed.	Noise level has been measured in various locations.	a. Noise level measurement during the road construction works in the remote area might not be necessary because the contractor operates construction machinery well under conditions based on the Japanese Standard services.
4	Number and type of safety equipment such as mask, helmet, glove and ear plugs should be checked once a year.	It seems to be checked every day.	a. Checking is carried out every day for safety purpose. b. List on EIA report might have had irrelevant items.
5	Actual number of trees felled, volume of wood extracted, tree marking, felling and transportation, utilization of forest products, number of tea stalls and restaurants, fuel wood trade, and use of firewood or kerosene/month or LPG	a. No monitoring works were carried out for the actual number of trees felled, volume of wood extracted, tree marking, felling and transportation, and utilization of forest products b. For the number of tea stalls and restaurant, and fuel wood trade, the number of tea stalls has been counted. c. No monitoring work was carried out for the use of firewood or kerosene/month or LPG.	a. There are government-managed forests in six locations, community forests in three locations, leasehold forests in five locations, and private forests in three locations. In relation to the abovementioned four items, each forest area, number of trees felled, and sale of trees would be recommended as the measures. b. Other items not related to the forest areas affected by the project might not be absolutely required to be included in the monitoring list.
6	Wildlife killing, harassing and poaching events, and wildlife movement	a. No monitoring work was carried out.	b. It might not be significantly relevant for this item to be included in the monitoring list of the project.
7	Conditions of forest, and species survival rate and conditions of compensatory plantation site	a. No "conditions of forest" was carried out. b. There is a paragraph in the main text on "species survival rate and conditions of compensatory plantation site", but it is left out of the list.	a. "Conditions of forest" would be recommended to be monitored with the above items. b. "Species survival rate and conditions of compensatory plantation site" would be recommended to be included in the list to monitor the success of the compensatory plantation.
8	Fish diversity is in the list of monitoring works.	a. No monitoring was carried out for fish diversity.	a. There are no fishing activities for commercial or home consumption in the villages along the project area. Thus, no monitoring work is necessary.
9	Number of construction workers, percentage of local construction laborers, number of women employed, number of outside laborers and their dependents, and number of children employed	a. In the monitoring report, the result is shown in Annex 5.5, which is not attached.	a. Monitoring should be carried out according to the list included in the EIA report except for the inappropriate items.
10	Rate of compensation for land and property, and use of compensation	a. It is in the main text. b. No monitoring on the "use of compensation" was carried out.	a. Main text of the environmental monitoring report on the compensation for resettlement, land acquisition and crop compensation should be sufficient. b. It is inappropriate to monitor the "use of compensation".
11	Physical facilities in the school and number of teachers, number of laborers using public drinking water tap, and magnitude of damage to local infrastructure are not listed.	Physical facilities in the school and number of teachers, number of laborers using public drinking water tap, and magnitude of damage of local infrastructure are listed.	a. These items are not absolutely relevant to be monitored in the project.
12	Loss of agri-products is listed.	Loss of agri-products is listed.	a. It is monitored and stated as shown in Appendix. However, no monitoring data is attached.

No.	Environmental Monitoring Plan (June 2008)	Monitoring Report (August 2011)	Result of Comparison
13	Numbers of in-migration and out-migration are not listed.	Numbers of in-migration and out-migration are listed.	a. This item is not relevant to be monitored in the project.
14	Frequency of illness of the construction workers is not listed.	It is reported that there is no record on the frequency of illness of the construction workers.	a. There is a data attached to the report.
15	Type and number of accidents, first-aid and emergency services, and public awareness on occupational health and safety (OHS) are listed.	a. It is reported that the data is attached to Annex 5.8. However, the data is not attached.	a. It would be appropriate to report the type and number of accidents, and first-aid and emergency services together with the item as per No. 14 above. b. Public awareness on OHS might not be relevant to be monitored in the project.
16	Social disharmony and related disputes are listed.	a. Social disharmony and related disputes are reported as "no data".	a. There are a number of social disputes on site. However, main text covers most of it, of which compensation negotiations are the major social disharmony.
17	Influence of outside laborers on religion is listed.	a. It is reported as "no data".	a. Observation on site would be briefly stated.
18	Price of essential commodities is listed.	a. It is reported as "no data".	a. This item is not relevant to be monitored in the project.
19	Attitude of local people toward the project is listed.	a. "Attitude of local people toward the project" is reported.	a. This item is usually studied during the EIA study. Unless it is absolutely necessary to state in the main text, it may not be relevant to be monitored periodically.
20	Road damage is listed.	a. No monitoring is reported.	a. It would be appropriate to monitor the damages on the existing road together with road safety and accidents related to the general public's traffic conditions.
21	Rehabilitation of work camp and labor camp is listed.	a. No monitoring is reported.	a. It might not be relevant to be monitored periodically in the project.

Source: JICA Survey Team

### 1.3.2 Process of Public Consultation Meeting

A number of public consultation meetings were carried out based on the recommendations made in the supplementary study for the environment and social considerations in August 2008. Thereafter, the Road Coordination Committee (RCC) of the District Coordination Committee (DCC) assessed the implementation of the Phase 1 of Section III. Furthermore, the Compensation Fixation Committee (CFC), which will determine the rate of items related to compensation for land acquisition and resettlement, was created and instructed the Village Development Committee (VDC) to seek solution on problems regarding the land acquisition and resettlement.

Before the construction works begin, in principle, based on JICA Guidelines, the DOR and each landowner whose land is on the right of way (ROW) would have to complete compensation negotiations. In the case of the Phase 1 of Section III works, DOR's project office states that only a relatively small number of compensation negotiations has not been completed and still in progress. Therefore, the DOR's project office is being obliged to continue compensation negotiations to date. On the other hand, payment has been duly made

based on Nepalese laws and regulations without causing major havoc to the construction works of Phase 1 of Section III. This project has already begun before JICA Guideline of April 2004 was enforced; thus, the guideline is not strictly applied to the project for Section III. However, it is advisable to complete compensation negotiations before the Phase 2 of Section III begins. DOR's project office confirmed and agreed to act on the matter.

Furthermore, there have been additional claims made by the local residents on the cracks of house, crop damages and other minor claims caused by the moving construction equipment. Each claim has been well taken care of by the DOR's project office. Thus, there is a possibility that the number of claims might increase as the construction works for the project progress. However, these claims would not cause major havoc to the construction works as the DOR's project office would take care of them the way they are dealt with at present.

During the construction period, each land/house owner should negotiate with the contractor for minor cases. However, the villagers have to deal with DOR if formal compensation is involved. Thus, the DOR has been carrying out negotiations with the local residents based on the existing Land Acquisition Act and other Nepalese laws and regulation for land acquisition and damaged house and crop compensation.

DOR maintains all the original record of compensation negotiations and each individual claimer maintains the other original record. A list of the record of compensation negotiation is provided in the monitoring report by the DOR in August 2011.

### **1.3.3 Establishment of EMU and Its Function**

Establishment of EMU has been carried out in June 2011 by employing a Nepalese consulting firm. Environmental monitoring work was then carried out based on the data and guidance of the DOR's project office. Environmental monitoring report was then released in August 2011. However, as discussed in the previous sections, not only all of the monitoring parameters stated in the updated version of the EIA report that was released in June 2008 have been covered, but also other monitoring parameters that are not necessarily matching the conditions on site. It appears necessary to modify the monitoring parameters. If any modification was made, such statement should be incorporated in the first environmental monitoring report of the project. Thus, suggestions on methodology of environmental monitoring were made in Section 1.3.4.

On the other hand, the updated version of the EIA report released in June 2008 suggests establishing EMU within the DOR's project office as an integral unit of the project. However, because of the budget constraint, lack of preparedness on the concept of environmental management and monitoring as well as the lack of experience to establish such unit within the project office, no appropriate permanent unit of EMU was established to date.

Geo-Environment and Social Unit (GESU) is a unit established within DOR in 1998 in order to oversee environmental matters related to road construction project within Nepal. However, a present five-staff unit overseeing more than 250 projects across the country does not function as much as it is expected to in the first place. Thus, the environmental monitoring report released in August 2011 does not reflect the organizational force of the project office, GESU and the outsourced consultant to serve as an integrated unit of EMU. Consequently, the JICA Survey Team discussed the following with GESU and DOR's project office to seek for further solutions:

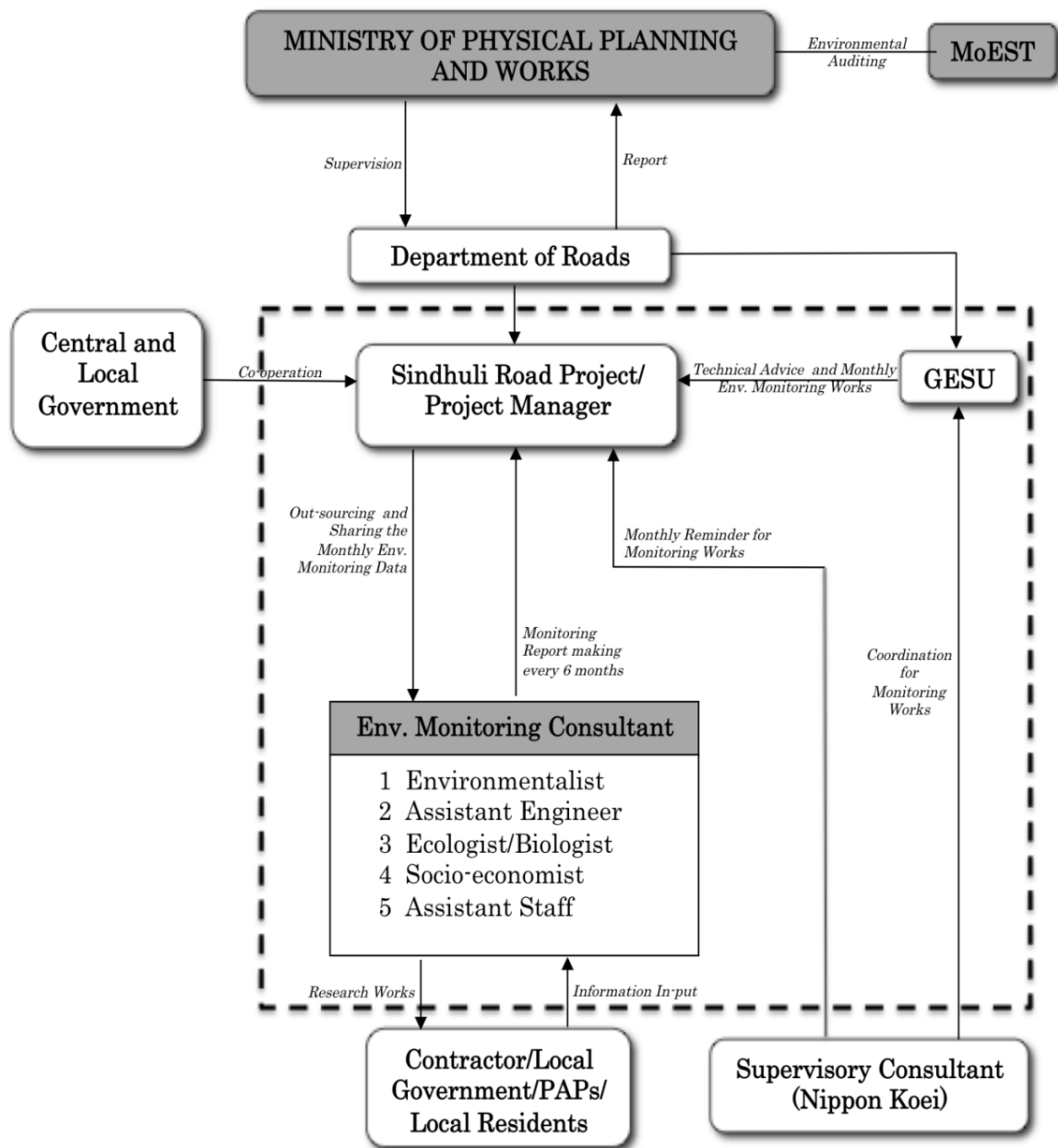
- GESU is formed at present with five people, i.e., director, deputy director, advisor, and two female field staff;
- GESU takes care of more than 250 road projects currently undertaken and there will be more than 450 road construction projects in 2012-2013. Thus, increasing the number of field staff is urgently needed;
- GESU might dispatch field staff where necessary, or outsourced local consultants may be dispatched;
- Increase of field staff or outsourced local consultant with limited amount of budget is difficult. Thus, GESU's staffs are sent to the project of high priority; and
- If there was budgetary support from Sindhuli Road Project, including logistics, GESU will be able to dispatch field staff or outsourced local consultants for environmental monitoring works.

Considering the abovementioned items, GESU in terms of being the Advisory Council of Environment and Social Considerations Review, the organization as stated in the EIA report has not been fully materialized. This might be changed during the latter half of Phase 1 of Section III and therefore, a new organizational arrangement will be made for Phase 2 of Section III road construction works as discussed in Section 1.3.4.

#### **1.3.4 Suggestions for Improvement of Environmental Management/Monitoring Works**

##### **(1) Improvement of EMU**

As discussed above, the present organization of EMU suggested to be established by the updated version of the EIA report released in August 2008 has not been practically established to meet its purposes. One of the reasons is that, despite the great effort, the mindset and preparedness of DOR's project office has not matured before it took action to establish a permanent EMU. Although it was ready to be established, manpower experienced in environmental monitoring works are not readily available in the Nepalese government or private sector. Thus, the organization of EMU has to be reconsidered and that it should function based on the present politico-economic conditions of the Nepalese government as shown in Figure 1-1.



Note: Thick dashed lines indicate the new structure of EMU.

Source: Modified from the “EIA Report, June 2008”

**Figure 1-1 Suggested Reorganization of EMU**

The new EMU is expected to function as follows:

- The “supervising consultants” indicated in the updated version of the EIA report released in August 2008 may no longer be practical to keep in the organizational chart. Instead, the “engineering service consultant” has to be able to function as a “monitoring work watch dog”, i.e., it reminds the DOR’s project office once a month of the implementation of the environmental monitoring works;
- DOR’s project office makes a request to GESU in terms of staff dispatch to the project

area in order to carry out the monthly monitoring works. They may take a few days to visit the site;

- Environmental monitoring parameters should be changed in accordance with the site conditions. Suggested format is shown in Appendix 5-4;
- GESU will oversee the way monitoring parameters are reviewed;
- DOR's project office maintains monthly and quarterly monitoring data and share it with outsourced local consultants;
- DOR's project office employs local consulting firm every six months in order to carry out the environmental monitoring works and submit it every six months to the engineering service consultant.

DOR's project office states that since GESU has a limited number of staff possible to visit the project site, earlier contact as well as carrying out of monthly and quarterly monitoring works with them should be made. Thereby, the project office, GESU and outsourced consultants will function as an appropriate EMU organization.

## (2) Land Acquisition and Resettlement of the Local Households

### 1) Number of PAP

According to the present JICA Environment Guidelines, public consultation meetings for the households subject to resettlement should be completed prior to the commencement of the construction works. However, because of the internal political and economic turmoil in Nepal during the past decade, this principle has not been fully met at the time of the commencement of project implementation works. On the other hand, the project office has been doing very well in terms of finding solutions for those subject to resettlement.

Table 1-9 shows the result of comparison of the number of project-affected people (PAP) between the updated version of the EIA report released in June 2008 and the environmental monitoring report released in August 2011. The number of households subject to resettlement is 67 and no change has been made between the EIA report of 2008 and monitoring report of 2011. At the time of the commencement of Phase 1 of Section III works, the number of land acquisition has been reduced from 398, which is the number previously known in the EIA report of 2008, to 365.

**Table 1-9 Changes in the Number of Households Affected by the Project**

Unit: No. of households

Classification	Environmental Monitoring Plan (June 2008)	Environmental Monitoring Report (August 2011)
Households subject to Resettlement	67	67
Land Acquisition	398	365
Total	465	432

Source : Sindhuli road project office

2) Progress on the Compensation Negotiation and Disbursement

In case compensation negotiation becomes necessary, the DOR's project office takes care of each individual case. If compensation payment becomes necessary, the DOR's project office duly pays as agreed. The CFC and the local people agree to set the rate of compensation. PAPs are classified as follows:

- In case a household loses 100% of the land, or the land after acquisition is less than 20% of the original area of land, and that the household does not possess any other land in the same district, this household is classified as severely project affected people (SPAP) II. There are four households under this category;
- In case a household loses 100% of the land, or the land after acquisition is less than 20% of the original area of land, and that the household possesses any other land in the same district, this household is classified as SPAP I. There are 38 households under this category; and
- In case a household loses less than 80% of the land, the household is classified as PAP.

As shown in Table 1-7, compensation payment to 30 households has been made during the construction of Phase 1 of Section III. For Phase 2, negotiation with 25 households in Ratmate has been completed while payment would be made as soon as the government budget is endorsed. Compensation negotiation for the other 12 households is yet to begin as soon as CFC is formed for that particular section of Phase 2.

**Table 1-10 Payment of Compensation Made to Date**

Unit: No. of households

Construction Section	Classification	Compensation Payment Made to Date		Total
		Completed	Not Completed Yet	
Phase 1 of Section III	Households subject to Resettlement	30	-	30
	Land Acquisition	193	29	222
Phase 2 of Section III	Households subject to Resettlement	25	12	37
	Land Acquisition	118	25	143
Total		338	69	432

Source : Sindhuli road project office

It is important to note that no grievance redress committee has been established to date. On the other hand, CFC is essentially functioning as grievance redress committee. The CFC is formed in each VDC including representatives of the local residents.

Thus, in principle, there is no grievance once the rate of compensation is agreed. If there is any claim on the compensation, the DOR's project office deals with it. In case absolute difficulty should hamper the case, the CFC could be called upon.

In case there were claims associated with compensation made after the construction works begin, the DOR's project office deals with it. If there were no compensations involved, the contractor should deal with the cases while they were not amicably solved. Consequently, road blockades would occasionally take place. At present, considering the socio-political conditions in Nepal and the attitude of the public, seeking solutions through amicable discussions is still not possible.

### 3) Calculation of Resettlement Compensation

Resettlement compensation is calculated based on the prices of house and land in 2006. Based on this price, depreciation on the housing structure is calculated and deducted from the compensation payment. Further, reusable material's cost is also deducted from the resettlement compensation payment. The latest JICA Guidelines do not recognize depreciation to be included in the payment for resettlement compensation. However, implementation of the other three sections of Banepa-Sindhuli-Bardibas Road Project began before the adoption of the latest JICA Guidelines. Thus, for reasons of fairness, the latest resettlement compensation should remain as it is. Accordingly, the current resettlement compensation is considered appropriate to be adopted for the resettlement compensation of the Phase 2 of Section III.

### **(3) Difference Between Environmental Monitoring Plan and the Actual Monitoring Works**

There are noticeable differences between the environmental monitoring plan discussed in the updated version of the EIA report released in June 2008 and the monitoring report released in August 2011 as follows:

- There is a number of discrepancies on the values of households to be resettled, area of forest subject to land acquisition and others;
- Monitoring parameters are noted as follows:
  - ✓ Environmental monitoring plan discussed in the updated version of the EIA report released in June 2008 contains relatively irrelevant parameters for the monitoring of the project;
  - ✓ The monitoring report released in August 2011 contains monitoring parameters irrelevant for the monitoring of the project;
  - ✓ The monitoring report released in August 2011 contains missing monitoring parameters that have to be monitored in the project; and
- In the monitoring report released in August 2011, much of the forest monitoring data are missing.

The above are generally caused by the lack of experience on environmental monitoring works of the DOR's project office. Since GESU would make frequent contact with the project office, it will be able to accumulate more experience and produce the appropriate



environmental monitoring report. It might be ideal if during the initial period, the DOR's project office would receive guidance on the environmental monitoring works from JICA.

#### **(4) Safety Measures for Construction Workers, Local Residents and General Traffic**

##### 1) Distribution of Traffic Safety Attendants

There is a number of traffic safety watchmen distributed throughout the stretch of Phase 1 of Section III, which contains a number of sharp bends on the road. Since the road width is narrow, passing by traffic such as buses are in need of traffic safety watchmen. Thus, in Phase 1 of Section III construction area, a large number of traffic safety watchmen at each bend of the road are distributed in order to maintain traffic safety. Some of them appear to be not appropriately trained and small flags are occasionally not clearly seen. Thus, improvement should be made on the traffic safety watchmen.

##### 2) Safety of the Local Residents and Water Supply Services

It appears that the safety of the local residents in relation to the construction works of the Phase 1 of Section III is maintained well. During the dry days, water sprinkling vehicles are mobilized in order to suppress the dust on the road. At the same time, the water sprinkling vehicles supply water to the villagers who demand such services. Otherwise, road blockade should be made if the contractor does not do it for the local residents.

##### 3) Public Hygiene Services

There are three construction worker camps along the road construction area. Each construction camp is equipped with first aide who takes care of a large number of construction workers. These first aides also take care of the local residents who are in need of first aid for light wounds and scratches.

These camps are equipped with incinerators for most of the solid wastes which can be burned. Toilet facilities are equipped with septic tank and soak pit. Rules of waste collection are very well maintained.

#### **(5) Format of the Environmental Monitoring**

There are a number of items on the environmental monitoring report that are in need of improvement as follows:

- It would be desirable to attach a couple of photographs associated with the parameters of environmental monitoring;
- Modification of monitoring parameters should be made in accordance with the nature of the project. Considering that modifications were made, description of changes from the parameters listed in the updated EIA report released in June 2008 would be required to be updated;

- Data on the measurement of TSP should be accompanied with the way the measurement device is set up such as the height of the device from the ground. Location of the measurement should be plotted on the map and reproduced in the monitoring report along with photographs taken at the time of measurement;
- Data on noise level should be accompanied with the distance between the source of noise and the measurement device. Location of the measurement should be plotted on the map and reproduced in the monitoring report along with photographs taken at the time of measurement;
- It would be desirable to attach maps showing the location of the houses subject to resettlement, land acquisition and crop compensation areas of each VDC;
- The list showing compensation paid to the households subject to resettlement, land acquisition and crop compensation should be modified.

Suggested modification of environmental monitoring parameters, format of tables, and map indicating location of monitoring parameters are shown in Appendix 5-3.

### **1.3.5 Recommendations for Improvement on the Future Works**

#### 1) Active Participation of GESU for Environmental Monitoring

It is essential that GESU participates actively for the DOR's project office to gain awareness on the importance of environmental monitoring. Further, periodical checking of the consulting firm for engineering services on the environmental monitoring work is necessary.

#### 2) Review of the Parameters of Environmental Monitoring

As active participation of GESU is achieved, parameters of environmental monitoring should be reviewed. If any irrelevant parameters are deleted despite the fact that the EIA report includes them, it is important to add parameters relevant to this particular project.

#### 3) Grievance Redress Committee

There is no grievance redress committee that has been established to date. On the other hand, the CFC is essentially functioning as a grievance redress committee. Thus, in principle, there is no grievance once the rate of compensation is agreed. If there is any claim on the compensation, the DOR's project office deals with it. In case absolute difficulty should hamper the case, the CFC could be called upon.

#### 4) Safeguarding of Forest Area

There are government-managed forest, community-managed forest, lease-hold forest and private forest affected by the project. These forest areas contain secondary growth of trees and no large size tree felling is involved. However, felling of approximately 10 m tall trees and smaller trees and bushes may be involved. Thus, activities on the safeguarding of forest

areas should be maintained including the following:

- a. Cutting forest should be restricted to minimum road width;
- b. Felling trees for fuel wood by the local residents and construction workers should be strictly prohibited;
- c. Compensation planting of 25 trees for every single tree felled should be continued to be carried out as follows:
  - Record quantity of tree felling in each forest area;
  - Record compensation planting carried out in each forest area;
  - Compile all of the data on felling trees and compensation planting for environmental monitoring works; and
  - In case of technical difficulties, consult always the Forestry Department of each DDC.

## **Chapter 2     Contents of the Project**

### **2.1     Basic Concept of the Project**

#### **(1) Overall Goal and Project Purpose**

The GON prepared the First Five-Year Plan in 1956, and since then, has completed ten periodic plans. Meanwhile, the Temporary Three-Year Plan (July 2007 to July 2010) is currently being implemented.

The DOR has prepared the Master Plan for Strategic Road Network (SRN) in December 2005 in order to contribute towards the betterment of living conditions of the people through effective, efficient, safe and reliable strategic road connectivity. The project for the construction of Sindhuli Road, which is recognized as one of the most important routes of the SRN, is prioritized as per the project list of the master plan. Furthermore, the road is part of National Highway No. 6 (H06), which links the highly populated eastern Terai Region with the capital, Kathmandu.

The issues related to the road network of Nepal are mostly attributed to Prithivi Highway. This highway, which is the only significant commercial route connecting Kathmandu to Terai area and India, is constantly in danger of being damaged due to sediment-related disasters that occur every year. It should also be realized that this road is a considerably a long detour from the Eastern Terai area, the major agricultural production area, to Kathmandu. Facts show that Kathmandu was previously isolated for 20 days due to a sediment-related disaster caused by heavy rains in July 1993, and has been subjected to damage due to disaster that occurs almost every year.

Hence, the GON expects that Sindhuli Road, which is the second major trunk road connecting Kathmandu to the Terai area and Indian boundary, will contribute to secure the safety and economic growth of Nepal. Utilizing this road will consequently shorten the travel distance and travel time, which will benefit both the transportation of agricultural production and long-distance bus trips. Furthermore, it is expected that the shortening of travel time to Sindhuli, Ramechhap and Kavrepalanchok districts will result in the reduction of travel cost and contribute to stable transport and industrial promotion along the road. Therefore, it is foreseen that its implementation will stimulate social and economic activities, leading to the improvement of the quality of life of local residents.

In this preparatory survey, the above concept is confirmed not to be changed.

#### **(2) Outline of the Project**

To achieve the abovementioned objectives, it was decided that the Sindhuli Road, which

connects Bardibas and Dhulikel, is to be constructed. Consequently, the running distance and travel time will be shortened while the lives of the local residents will be improved. The project, which required assistance, involves the construction of the last remaining Phase 2 of Section III, with total length of 22.5 km and standard width of 4.75 m, of the Sindhuli Road, including its ancillary facilities and five causeways. Table 2-1 shows the scope of the project.

**Table 2-1 Scope of the Project for Phase 2 of Section III**

Category	Item	Contents / Scale
Road	Road length	22.5 km
	Road width	4.75 m of carriageway
	Design speed	30 km/hr (except hairpin curves)
	Pavement	Standard: double bituminous surface treatment (DBST) (DBST, base course: 15 cm, sub-base: 15 cm) Hair-pin curves: asphalt concrete (surface: 5 cm, binder: 2 x 5 cm, base course: 15 cm)
	Cross drainage	Box culvert: 13 units Pipe culvert: 145 units (including irrigation)
	Causeway	Type: Continuous box culvert, 5 units No. 3-2: 190 m No. 3-3: 20 m No. 3-4: 50 m No. 3-5: 90 m No. 3-9: 90 m
	Bus stop	14 stops
	Passing place	99 places
	Guard block	Precast concrete wall type: installed only at dangerous locations

Source: JICA Survey Team

## 2.2 Outline of the Requested Japanese Assistance

### 2.2.1 Design Policy

The objective of the project is to construct the Phase 2 of Section III of the Sindhuli Road and complete the entire Sindhuli Road linking the remote northern area of Sindhuli District with East-West Highway and Arniko Highway. The GON would like to urgently complete the Sindhuli Road under the same basic design policy as in Phase 1 of Section III, which is under construction. It is confirmed to keep the condition in the project site without significant change and for it to remain almost the same when investigated in the basic design study and detailed design stages.

Considering the above situation, the preparatory survey was carried out without changing the basic concept and contents proposed in the basic design study and detailed design. However, the following items are reviewed in the survey:

- Project costs

The project cost is updated by investigating the latest procurement situation and obtaining

unit cost data such as construction materials, labor, etc. These main costs are collected after the new fiscal year's lowest unit rates for construction materials and labors in Sindhuli District were announced.

- Implementation schedule

Implementation schedule is studied based on the Japanese budgetary condition in 2011 and 2012. Investigation and review of the recipient country's obligation are also studied with reference to the modified implementation schedule.

- Activities of environmental and social considerations for Phase 1 of Section III

The activities of environmental and social considerations for Phase 1 of Section III, which is under construction, as the recipient country's obligations are reviewed.

The following sections studied in the basic design study and detailed design stages are significantly unchanged and confirmed to be discussed in Section 2.2.1 of the basic design report.

- (1) The Basic Design Policy
- (2) Policy on Natural Environment
- (3) Policy on Social Condition
- (4) Policy on Construction and Procurement
- (5) Policy on Application of Local Contractor
- (6) Policy on Implementation Agency for Management and Maintenance
- (7) Policy on Grades of Facilities
- (8) Policy on Construction Methods
- (9) Social and Environmental Consideration

### 2.2.2 Basic Plan

The project is implemented under two parts in one phase, taking into consideration the budgetary condition of the GOJ and social aspects at the project site. The revised scope of works for each phase to be undertaken by the GOJ is shown in Table 2-2.

**Table 2-2 Details of the Scope for Phase 2 of Section III**

Part	Detailed Item	Contents
Part 1	Road	Road Length: 3.6 km Road Sta. 19+300 - Sta. 22+900 Bus stop: 3 stops Passing place: 11 places Guard block Except pavement and ancillary works
	Cross drainage	Box culvert: 2 units Pipe culvert: 27 units (including irrigation)

	Causeway	Continuous box culvert: 1 unit No. 3-9: 90 m
Part 2	Road	Road Length: 18.9 km Sta. 39+320 - Sta. 39+700 (original area in Section II) Sta. 2+240 - Sta. 15+840 Sta. 17+940 - Sta. 19+300 Sta. 19+300 - Sta. 22+900 (pavement only) Sta. 22+900 - Sta. 26+160 Sta. 26+500 - Sta. 26+840 Pavement: DBST and asphalt concrete at hairpin curves for 22.5 km Bus stop: 11 stops Passing place: 88 places Guard block Ancillary works
	Cross drainage	Box culvert: 11 units Pipe culvert: 118 units (including irrigation)
	Causeway	Continuous box culvert: 4 units No. 3-2, No. 3-3, No. 3-4 and No. 3-5: total length 350 m

Source: JICA Survey Team

### 2.2.3 Outline Design Drawing

The design drawings are provided in Appendix 6 and the main titles of contents are presented as follows:

A	Location Map	(Attached in Appendix 6)
B	Plan and Profile	(Attached in Appendix 6)
C	Typical Cross Section	(Attached in Appendix 6)
D	Causeway	(Attached in Appendix 6)
E	Drainage Structures	
F	Retaining Wall	
G	Slope Protection	
H	Foot Protection	
I	Pavement	
J	Traffic Safety Facilities	
K	Miscellaneous	
L	Cross Section	

These drawings were prepared in the detailed design stage and there were no significant modifications on them in the survey.

### 2.2.4 Implementation Plan

#### 2.2.4.1 Implementation Policy

The implementation policy has been studied in the basic design report and there were no significant changes on it. However, the following items are found during the field investigation of the survey and reflected in the construction planning:

- Maximize the use of existing roads (track roads) already connecting the starting point of Section III (Khurkot) and its end point (Nepalthok) as construction roads and/or as project roads.

- The high priority section in the project, in order to complete construction at an early date, is around Ratmate Village at Sta. 22+000, which is a detour road of the village, because of additional claims made by the local residents on the cracks of houses along the track road caused by the passing construction equipment.

#### 2.2.4.2 Implementation Conditions

The implementation conditions studied and reported in the basic design study have no significant modification. However, the following items shall be reviewed under this survey:

- To investigate traffic control points for the safe transportation of pedestrian and vehicle on the existing roads used as construction roads; and
- To investigate water sprinkling section for the prevention of dust produced by construction equipment running on the existing roads in the project area.

#### 2.2.4.3 Scope of Works

The revised scope of works to be undertaken by the GOJ as well as the GON is shown in Table 2-3.

**Table 2-3 Scope of Works to be Undertaken by the GOJ and the GON**

Works, Facilities and Services to be provided by the GOJ	Works, Facilities and Services to be provided by the GON
<ul style="list-style-type: none"> <li>• Consulting services for the detailed design, preparation of tender documents, assistance to the DOR in the tender process, and construction supervision</li> <li>• Construction of road, subsidiary works and the five causeways shown in the drawings</li> <li>• Installation and removal of temporary facilities (construction yard)</li> <li>• Surface improvement and maintenance of existing roads that have been utilized as public roads during construction</li> <li>• Protective measures for environmental pollution in the execution of construction works</li> <li>• Procurement, import and transport of equipment/materials required for the improvement works and re-export of imported equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Free provision of site (land), temporary facilities and other construction activities for the execution of works</li> <li>• Execution of environmental monitoring</li> <li>• Compensation to private houses and land in the ROW, and removal of these houses</li> <li>• Removal and relocation of the existing public utilities</li> <li>• Free provision of traffic control and management for detour road and temporary roads</li> <li>• Execution of traffic safety awareness training for local residents, students, bus users, bus drivers and policemen</li> <li>• Proper operation and maintenance for all the completed facilities (excluding surface maintenance of road used for construction)</li> <li>• Advice and support for effective use of vacant land of local residents</li> </ul>

Source: JICA Survey Team

#### 2.2.4.4 Consultant Supervision

As stated in Section 2.2.2 of the basic design report, the project road is constructed in a severely mountainous terrain. Consequently, maximum consideration for the mitigation measures against environmental impacts and road disasters will be taken during the



construction stage similar during the construction of Section I, Section IV, Section II and on-going Phase-1 of Section III. Therefore, the supervising consultants of the project are required to realize the concept and design policy on the basic design study and detailed design on the basis of the general construction supervision works.

Considering the changes in the site in this kind of construction, it is assumed that design changes will be required frequently due to aberration of topographical maps during the survey or the unexpected change of geological conditions. However, the supervising consultant has to carry out the design change so as not to exceed the committed amount of project cost and to minimize it through investigating with various methods.

In the basic design study, maximum consideration for the mitigation measures against environmental impact and road disasters will be taken during construction stage.

Meanwhile, the design had been carried out to avoid large-scale landslides and slope failures, and scouring that could wash away the roads within the limited project budget. However, participation of the DOR in road maintenance, both during construction and after completion, would still be required. Therefore, the consultant will be requested to be involved with the operation and maintenance works extending over the handed-over sections which will be carried out by the DOR or the contractor through the advice to the project manager or instructions to the contractor. Therefore, the consultant has to keep close contact with the PM.

Taking into account the abovementioned points, the consultant supervision shall be carried out based on the following concepts:

- To respond flexibly to materialize the concept of environmental friendly construction and securing of disaster prevention in the Sindhuli Road at the construction site;
- To correspond flexibly with the change of topographical and geological site conditions; and
- To establish the efficient organization, which will realize the project qualities, cooperate between each construction site of the sections and establish the close relation with the DOR.

The consultant supervision personnel have no significant modification and confirmed to be discussed in Section 2.2.4.4 of the basic design report.

#### **2.2.4.5 Quality Control Plan**

The quality control plan has no significant modification and confirmed to be discussed in Section 2.2.4.5 of the basic design study report.

#### **2.2.4.6 Procurement Plan**

The main scope of the survey is investigation of the latest procurement situation and the latest

unit cost of labor, construction materials, etc. The basic design study was done in 2008 and almost three years have already passed after that. In the meantime, the cost of labor has increased as compared to that in the basic design study. The outline of the procurement plan based on the investigation is shown below.

**(1) Construction Materials**

The construction materials available in Nepal are natural resource materials, such as aggregate, stone, embankment materials and timber. Cement, reinforcing bars, gabion wires, bituminous material, fuel and prefabricated pipe culverts are also available in the local markets in Nepal. However, to ensure quality, special/quality items which are not available in the local markets, need to be imported from Japan, such as materials used for geotextile reinforced earthwall. The costs of these construction materials procured in Nepal is slightly different compared with those in the basic design stage except for the cost of bituminous materials.

Procurement plan of the major construction materials is shown in Table 2-4.

**Table 2-4 Indicative Procurement of Construction Materials**

Items of Construction Materials	Nepal	Third Country (India)	Japan	Note
Cement	○			Nepalese/Indian products available
Aggregate (Coarse, Fine), Boulder	○			
Concrete Admixture	○			
Steel Products (Re-bars, Gabion Wire)	○			Nepalese/Indian products available
Bituminous Materials	○			Imported items available
Wood/Plywood	○			
Fuel (Diesel, Gasoline)	○			Imported items available
Materials for Geotextile Reinforced Earthwall			○	Quality and durability reasons

Source: JICA Survey Team

**(2) Construction Equipment**

In Nepal, there is no equipment lease company and contractors own limited number of equipment, thus, equipment for the long-term construction project in the remote area of Sindhuli District shall be procured from Japan. These situations have not significantly changed in three years after the basic design study. Procurement location of the major construction equipment is shown in Table 2-5.

**Table 2-5 Indicative Procurement of Construction Equipment**

Items of Construction Equipment		Nepal	Third Country (India)	Japan	Note
Bulldozer	15 t			○	
Backhoe	0.8 m <sup>3</sup>			○	
Dump Truck	10 t			○	
Vibration Roller	3.0-4.0 t			○	
Road Roller	10 t			○	
Motor Grader	W=3.1 m			○	
Concrete Batching Plant	30 m <sup>3</sup> /hr			○	
Concrete Pump	90-110 m <sup>3</sup> /hr			○	
Truck Mixer	4.4 m <sup>3</sup>			○	
Portable Asphalt Mixing Plant		○			Possible to lease in Kathmandu

Source: JICA Survey Team

### (3) Labor Cost

All kinds of labor are available for procurement in Nepal and to quote, the unit rate of labor is based on the DDC rate (minimum required daily basis rate for the laborers) which is announced during every new Nepalese fiscal year in each district. Therefore, the collection of labor rates was commenced after the DDC rate for the year 2011/2012 was announced in September 2011. In these couple of years, all laborers' DDC rates have been increasing in Sindhuli District and especially, they show a sharp rise in terms of the unit cost of common laborers. This will lead to an increase in the construction cost, because of the labor-intensive construction work and inability to avoid employment of common laborers near the site. Indicative procurement location of main laborers is shown in Table 2-6.

**Table 2-6 Indicative Procurement Location of Laborers**

List of Laborer	Sindhuli District	Other Districts in Nepal	Third Country	Note
Foreman		○		
Skilled Laborer		○		
Common Laborer	○	○		
Rebar Worker		○		
Form Worker		○		
Heavy Equipment Operator		○		
Driver	○	○		
Traffic Controller	○	○		
Guard Man	○	○		

Source: JICA Survey Team

#### 2.2.4.7 Implementation Schedule

Based on the implementation schedule of the project managed by the GOJ, the project is divided into two parts in one phase as follows: 1) single budgetary year program as part 1 of

Phase 2, and 2) three-year budgetary program as part 2 of Phase 2 in accordance with the Japan Grant Aid Guideline. The basic concept of the implementation has no significant change. However, the revised implementation schedule based on the abovementioned situation of the phases is described below.

All causeways and most of the revetment/pavement works should not be conducted during the monsoon season from the viewpoint of quality control and safety. The monsoon season within the area occurs from late May to early October.

After the signing of the Exchange of Notes (E/N) and Grant Agreement (G/A) between the GON and GOJ concerning the detailed design and consultancy service for the construction supervision of the project, the consultant will immediately carry out the detailed engineering design and preparation of the tender documents for the construction works, under Japan's Grant Aid Scheme. The consulting services for the detailed design would be completed in two months in Nepal and in Japan. Correspondingly, the preparation of tender drawings and documents will also be carried out in Japan.

While the tendering period for part 1 of Phase 2 is in progress, another E/N and G/A for part 2 of Phase 2 will be signed between the two governments for the construction works and the consulting services for construction supervision. Initially, the consultant will assist the DOR for about four months in the tendering process for construction works, which includes detailed design, pre-qualification, tender opening and evaluation, and subsequent negotiations to conclude the contract between the DOR and the successful tenderer. The signed contract will then be verified by the GOJ.

After issuance of the notice to proceed (N/P), construction will commence. The estimated duration for construction of parts 1 and 2 of Phase 2 will be 12 and 28 months, respectively, under overlapping schedule, to meet the 32 months anticipated project completion. The tentative implementation schedule is shown in Table 2-7.

**Table 2-7 Tentative Implementation Schedule**

Stage	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
Detailed Design and Tender Assistance	Part-1	■	Site Survey																											
		□	Detailed Design in Japan																											
Detailed Design and Tender Assistance	Part-2	□	Preparation of Tender Documents in Japan																											
		■	Approval of Tender Documents	□	Pre-qualification	■	Tendering and Contract																							
Construction	Part-1	■	Preparation & Mobilization	■ Earthworks, Retaining wall, Pavement																										
		■	Causeways												■ Construction Period: 12 months															
Construction	Part-2	■	Preparation & Mobilization	■ Earthworks, Retaining wall, Pavement																										
		■	Causeways												■ Construction Period: 28 months											■ Demobilization				

**2.3 Obligations of the Recipient Country**

The obligations of the recipient country have no significant changes as discussed in Section 2.3 of the basic design report.

**2.4 Project Operation Plan**

The required operation and maintenance plan under the grant aid by the GOJ is studied in Section 2.4 of the basic design report which shows no significant changes.

**2.5 Project Cost Estimation**

**2.5.1 Initial Cost Estimation**

The project costs reviewed in the survey required for the undertakings of the GON are shown in Table 2-8.

**Table 2-8 Project Costs Required for the Undertakings of the GON**

Category	Item	Cost	
		x 1,000 NRs	x 1,000 JPY
(1) Benefit Augmentation	Dissemination of the project information	30	35
	Provide construction-related training to the local people	160	185
(2) Compensatory and Mitigation Measures	Tree plantation	150	173
	Compensatory plantation	2,000	2,308
	Maintenance of saplings	600	692
	Compensation for relocation of house	8,000	9,232
	Land acquisition	250,000	288,500
	Fruit trees	900	1,039
	Crop compensation	700	808
(3) Environmental Monitoring	Monitoring while construction period	3,000	3,462
(4) Relocation of Public Utilities	Electric line, electric pole, water facilities	230	265
(5) Payment of Royalty	Against raw materials from borrow pits	15,400	17,772
(6) Bank Commission	Authorization to pay (AP)	3,290	3,797
(7) Traffic Safety Training	Bus commuter, driver, traffic police	600	692
Total Cost to be borne by Sindhuli Road project office before and during construction		285,060	328,960
(8) Environmental Auditing	Auditing after two years of completion	660	762
Total Cost to be borne by the Nepalese side		285,720	329,722

Source: Sindhuli road project office

The Nepalese side would be responsible for the acquisition and compensation of private houses, forests and cultivated lands, relocation of public utilities, and environmental monitoring during and after the project implementation, and the related costs.

The above requires an indicative amount of NRs.285,720,000 (JPY 329,722,000), which corresponds to about 1.3% of the DOR's development budget for the fiscal year 2010/2011. As the road is one of the top priority projects in the country, such annual disbursement should be available.

## 2.5.2 Operation and Maintenance Cost

Daily operation and maintenance (O&M), which include cleaning of road facility surfaces and O&M for the road, would be about NRs.11,200,000 (JPY 12,925,000) per annum. In addition, DOR would have to bear the cost of maintenance works to be conducted once a year, and urgent rehabilitation works, if necessary. Annual maintenance cost to secure the soundness of the entire Sindhuli Road is NRs.73,550,000 (JPY 84,877,000). Since this corresponds to only about 3.7% of the DOR's maintenance budget for the fiscal year 2010/2011, annual disbursement is expected to be available.

**Table 2-9 Operation and Maintenance Costs for the Entire Sindhuli Road**

Category	Item	Cost	
		x 1,000 NRs	x 1,000 JPY
(1) Daily maintenance	Cleaning, reduction of deposit, grass cutting, etc.	11,200	12,925
(2) Annual repair	Repair of road surface, side-ditch, etc.	7,000	8,078
(3) Repair conducted once every five years (converted to annual cost)	Overlay, reshaping, repair of structures, re-painting for traffic signs and steel structures, etc.	38,000	43,852
(4) Urgent rehabilitation works	Removal of collapsed soil, urgent rehabilitation, construction of detour route, etc.	8,000	9,232
(5) Preventative works	Preventive works against rock-fall, collapse, scouring and mud flow, etc.	8,400	9,694
(6) Monitoring after completion	Monitoring after completion of construction	950	1,096
Total		73,550	84,877

Source: Sindhuli road project office

## Chapter 3 Project Evaluation

### 3.1 Preconditions

Preconditions of the project are summarized in the basic design report. The main preconditions are shown in Table 3-1.

**Table 3-1 Preconditions for the Implementation of the Project**

Item	Details of Precondition	Remarks
Land acquisition and compensation for relocation of houses	Completion of land acquisition and relocation of houses along the ROW	Refer to Sections 3.3.3 and 4.4.2 of the Basic Design Report
Cutting woods	Completion of cutting and carrying out woods along the ROW	ditto
Relocation of public utilities	Completion of relocation of public utilities, such as electric lines, telephone lines, their poles and drinking water fountains, outside of the ROW	ditto
Management of irrigation facilities	Resettlement, maintenance and repair of irrigation channels outside of the ROW	ditto

Unit: No. of households

Source : Sindhuli road project office

### 3.2 Necessary Inputs by Recipient Country

Necessary inputs by the recipient country for the management and maintenance of the project facilities are mentioned in Sections 2.2.1 and 3.3.4 of the basic design report.

### 3.3 Important Assumptions

After the completion of the construction of the Sindhuli Road, sufficient budget for future road management and maintenance will be required due to the increase in traffic volume, long distance (total length of 160 km) of the road, and the location of the site which is often subjected to severe natural conditions with high risks of disaster. Therefore, appropriate budget allocation for the continuous and steady future maintenance of the completed road is necessary to secure sustainable safety and smooth traffic. Detailed management and maintenance plan is studied in Section 3.3.4 of the basic design report.

The abovementioned effects of the project largely rely on safe traffic practices of the road users and avoidance of overloading of vehicles. Evidently, training courses are strongly required related to driving manners of bus and truck drivers, and for the local residents crossing the roads. Special emphasis should be placed on the preparation of a program by the DOR and Sindhuli District police regarding the above trainings.



### **3.4 Project Evaluation**

#### **3.4.1 Relevance**

The project for the construction of the Sindhuli Road, with a total length of 160 km connecting Dhulikel on the Arniko Highway (31 km eastward from Kathmandu) to Bardibas on the East-West Highway crossing the Terai Plain and which is recognized as one of the most important routes of the SRN, is prioritized as per the project list of the master plan. In the SRN, the project is stated as a support for poverty reduction and improvement of road network in Terai and middle hilly area in Sindhuli Road for the purpose of achieving the national development plan from a national economical point of view. Furthermore, the Sindhuli Road construction will contribute to the improvement of stability, safety and economic growth of Nepal.

#### **3.4.2 Effectiveness**

The project evaluation is summarized in Section 4.4.1 of the basic design report. Main descriptions of the effects are shown below.

##### **(1) Quantitative Effect**

- 1) Running distance of traffic from Kathmandu to Bardibas in Terai Plain will be reduced by about 140 km after the entire Sindhuli Road is constructed.
- 2) Roundtrip between Kathmandu-Central Terai Area that requires two days of travel time can eventually be done in just one day.

##### **(2) Qualitative Effect**

- 1) Risks of interception of transportation to Kathmandu Valley will be reduced and stable supply of goods will be realized. Thus, damage to capital functions will be avoided and lives of 2.51 million citizens will become stable.
- 2) Farm villages will be connected to the market. In effect, cash crop farming will be promoted and regional economy will be activated along the road.
- 3) Through the opening of the all-weather road in the less developed area, commerce, development of fabrication and housing industries, and improved investments will contribute to regional development and poverty reduction of 1.54 million citizens living along the road.
- 4) Travel time will be reduced and the commuters will greatly benefit from safe transportation and traffic. As a result, stable supply of goods within the region will be promoted. Moreover, improvement of access to public services and welfare facilities such as hospitals can be expected.

## **APPENDICES**

- Appendix -1 Member List of the Survey Team
- Appendix -2 Survey Schedule
- Appendix -3 List of Parties Concerned in the Recipient Country
- Appendix -4 Minutes of Discussions
- Appendix -5 Environmental Mitigation Measures
- Appendix -6 Design Drawings  
(Plan and Profile, Typical Cross Section and Causeway)

Appendix -1  
Member List of the Survey Team

Member List of the Survey Team

Field Survey From 7 August 2011 to 26 August 2011

	Name	Position	Organization
1	Mr. Toru TAKE	Leader	Nepal Office, JICA
2	Mr. Hiroshi Fujisawa	Chief Consultant /Road Design	Nippon Koei Co., Ltd.
3	Mr. Yuzo NAKANO	Construction Plan/Cost Estimate	Nippon Koei Co., Ltd.
4	Mr. Shunsuke MINATO	Environmental Specialist	Nippon Koei Co., Ltd.

Appendix -2  
Survey Schedule

Survey Schedule

Field Survey From 7 August 2011 to 26 August 2011

Date			JICA Member	Consultant Member		
			Team Leader	Chief Consultant / Road Design	Construction Plan / Cost Estimate	Environmental Specialist
No	Date	Day	<b>Mr. T. TAKE</b>	<b>Mr. H. FUJISAWA</b>	<b>Mr. Y. NAKANO</b>	<b>Mr. S. MINATO</b>
1	7	Sun		Tokyo – Bangkok – KTM		
2	8	Mon	Courtesy Call to JICA, Embassy of Japan (EOJ), MOPPW and DOR			
3	9	Tue	Meeting with DOR for Inception report			
4	10	Wed		Data collection and request of quotation		
5	11	Thu		- ditto -		
6	12	Fri		- ditto -		
7	13	Sat		- ditto -		
8	14	Sun		Internal Meeting/ Data analysis	Tokyo(Haneda) – Bangkok – Kathmandu	
9	15	Mon		Field Survey	Field Survey	Field Survey
10	16	Tue		Field Survey	Field Survey	Field Survey
11	17	Wed	Discussion and Signing of Minutes of Discussion with DOR		Field Survey data analysis	Field Survey data analysis
12	18	Thu	Discussion with EOJ and JICA			Meeting with DOR for Environmental Monitoring
13	19	Fri		Kathmandu – Bangkok–	Attendance for Security Meeting	Data analysis and reporting
14	20	Sat		Tokyo(Narita) arrive	Field Survey	- ditto -
15	21	Sun			Collection for quotation and analysis, Reporting	Data analysis and reporting
16	22	Mon			Field Survey	Meeting with DOR for GESU and EIA report
17	23	Tue			Field Survey	- ditto -
18	24	Wed			Field Survey data analysis	Data analysis and reporting
19	25	Thu			Data analysis and reporting	Meeting with DOR for Environmental matters
20	26	Fri			Kathmandu – Bangkok –	
21	27	Sat			Tokyo(Narita) arrive	

Remarks:

JICA: Japan International Cooperation Agency  
 EOJ: Embassy of Japan  
 MOPPW: Ministry of Physical Planning and Works  
 DOR: Department of Roads  
 GESU: Geo-Environment and Social Uni

List of Parties Concerned in the Recipient Country

(1) Ministry of Physical Planning and Works: MOPPW

Mr. Indu Sharma Dhakal, Director General, Department of Roads

Mr. Hari Om Srivastava, Former Director General, Department of Roads

Mr. Ram Kumar Lamsal, Deputy Director General, Department of Roads (DOR)

Mr. Bindu Shamsher Rana, Project Manager, Sindhuli Road Construction Project, DOR

Mr. Shiva Raj Adhikari, S. D. Engineer, Sindhuli Road Construction Project, DOR

Mr. Yam Narayan Yogi. Engineer, Sindhuli Road Construction Project, DOR

Haruhiro Kato, JICA Specialist, Department of Roads

(2) Embassy of Japan

Yasuhiro Nomura, Second Secretary

(3) Nepal Office, Japan International Cooperation Agency

Mitsuyoshi Kawasaki, Resident Representative

Toru Take, Deputy Resident Representative

Kenichiro Iizuka, Assistant Resident Representative

Sourab Rana, Program Officer

Appendix -4  
Minutes of Discussions

4-1 Field Survey 17 August 2011

4-2 Explanation on Draft Final report 1 November 2011

MINUTES OF DISCUSSIONS  
ON  
THE PREPARATORY SURVEY  
ON  
THE PROJECT FOR CONSTRUCTION OF SINDHULI ROAD SECTION III (PHASE-2)  
IN NEPAL

Based on the results of the Basic Design Study in 2008 and the following Detailed Design, the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Construction of Sindhuli Road Section III (Phase-2) (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Nepal the Preparatory Survey Team (hereinafter referred to as "the Team" ), which is headed by Mr. Toru Take, Senior Representative, JICA Nepal Office, and is scheduled to stay in the country from 8<sup>th</sup> to 26<sup>th</sup> August, 2011.

The Team held discussions with the officials concerned of the Government of Nepal and conducted a field survey at the study area.

In the course of discussions and field survey, both sides have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Kathmandu, 17<sup>th</sup> August, 2011



---

Toru Take  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency



---

Indu Sharma Dhakal  
Director General  
Department of Roads (DOR)  
Ministry of Physical Planning & Works  
(MOPPW)  
The Government of Nepal



## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to construct the Sindhuli Road Section III (Phase-2) (approximate road length is 22.5km) and complete the whole Sindhuli Road linking the northern remote area of Sindhuli district with East-West Highway and Arniko Highway.

### 2. Objective of the Survey

The objectives of the Survey are as follows:

- To update the project cost by investigating the latest procurement situation and the latest unit cost of labors, construction materials, fuel, etc.,
- To study the re-planned implementation schedule and the status of recipient country's obligation to be taken, and
- To review the activities of environmental and social considerations for Phase 1 of Section III under construction as recipient country's obligations.

### 3. Project site

The site of the Project is shown in Annex 1

### 4. Responsible and Implementing Agency

4-1. The Responsible Agency for executing the Project is the Ministry of Physical Planning & Works (MOPPW).

4-2. The Implementing Agency is the Department of Roads (DOR).

The organization charts of MOPPW and DOR are shown in Annex 2-1 and 2-2.

### 5. Japan's Grant Aid Scheme

5-1. Nepal side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex 3.

5-2. Nepal side will take the necessary measures, as described in Annex 4, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

### 6. Schedule of the Study

6-1. The consultants will proceed to further studies in Nepal until 26<sup>th</sup> August, 2011.

6-2. JICA will prepare the draft report in English and explain its contents in November 2011.

6-3. When the contents of the report are accepted in Principle by the Government of Nepal, JICA will complete the final report and send it to the Government of Nepal in February 2012.

### 7. Other relevant issues

- The Nepalese side agreed to deal appropriately with matters of Environment and Social



Considerations based on the Basic Design Study on 2008, continuously.

- The Nepalese side agreed to take proper safety measures for completion of work as mention in Project schedule.



## JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as “the GOJ”) is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

### 2. Preparatory Survey

#### (1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a

technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

## (2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

## (3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

## 3. Japan's Grant Aid Scheme

### (1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

### (2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

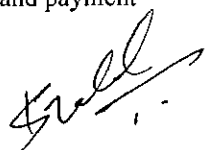
(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment



commissions paid to the Bank.

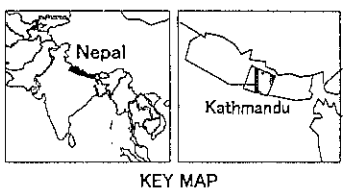
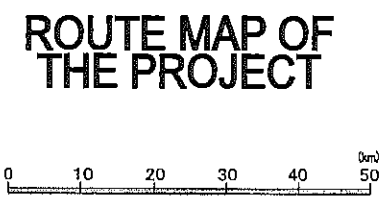
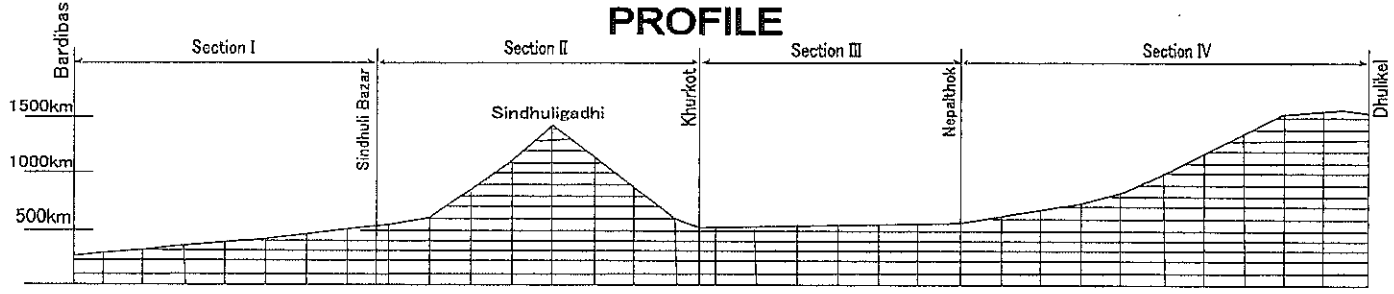
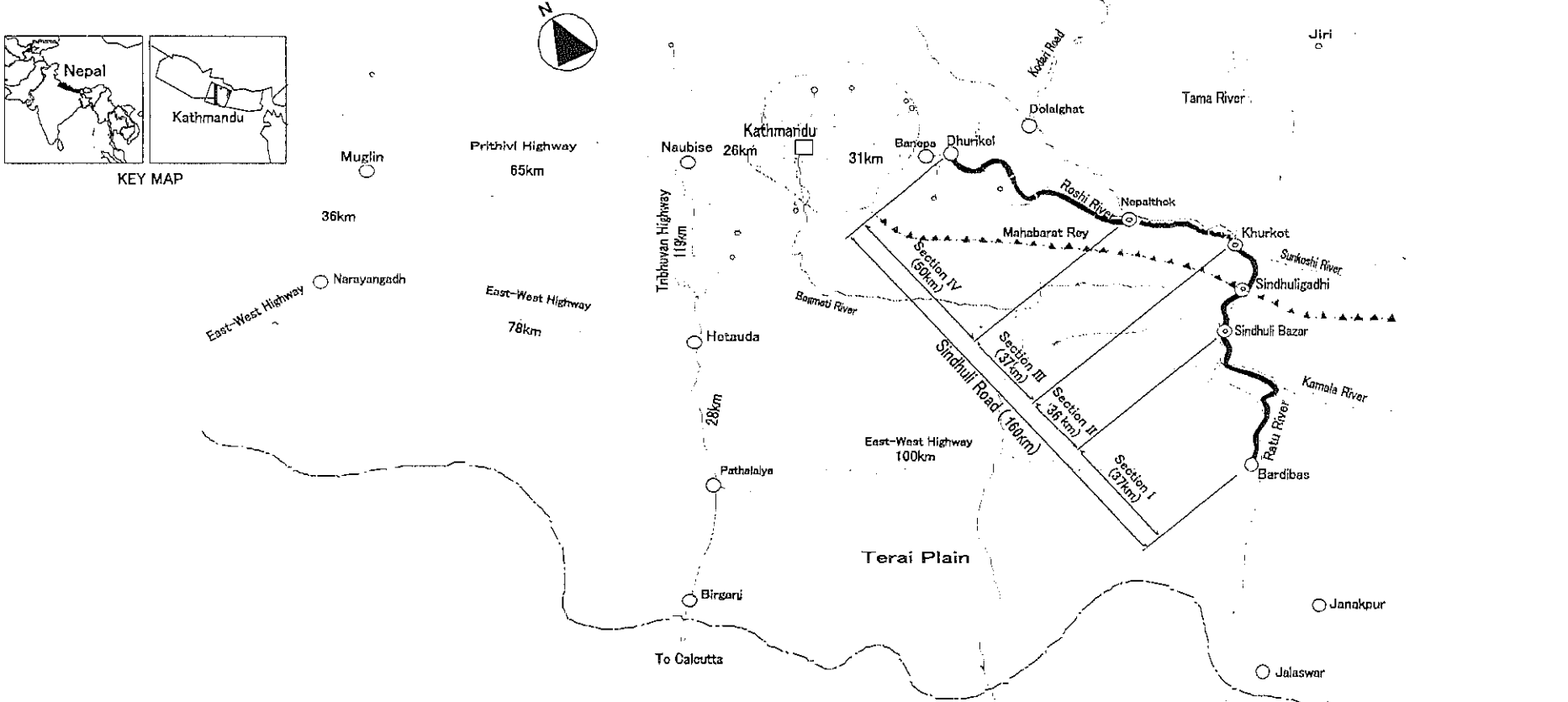
(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

2/1

*[Handwritten signature]*

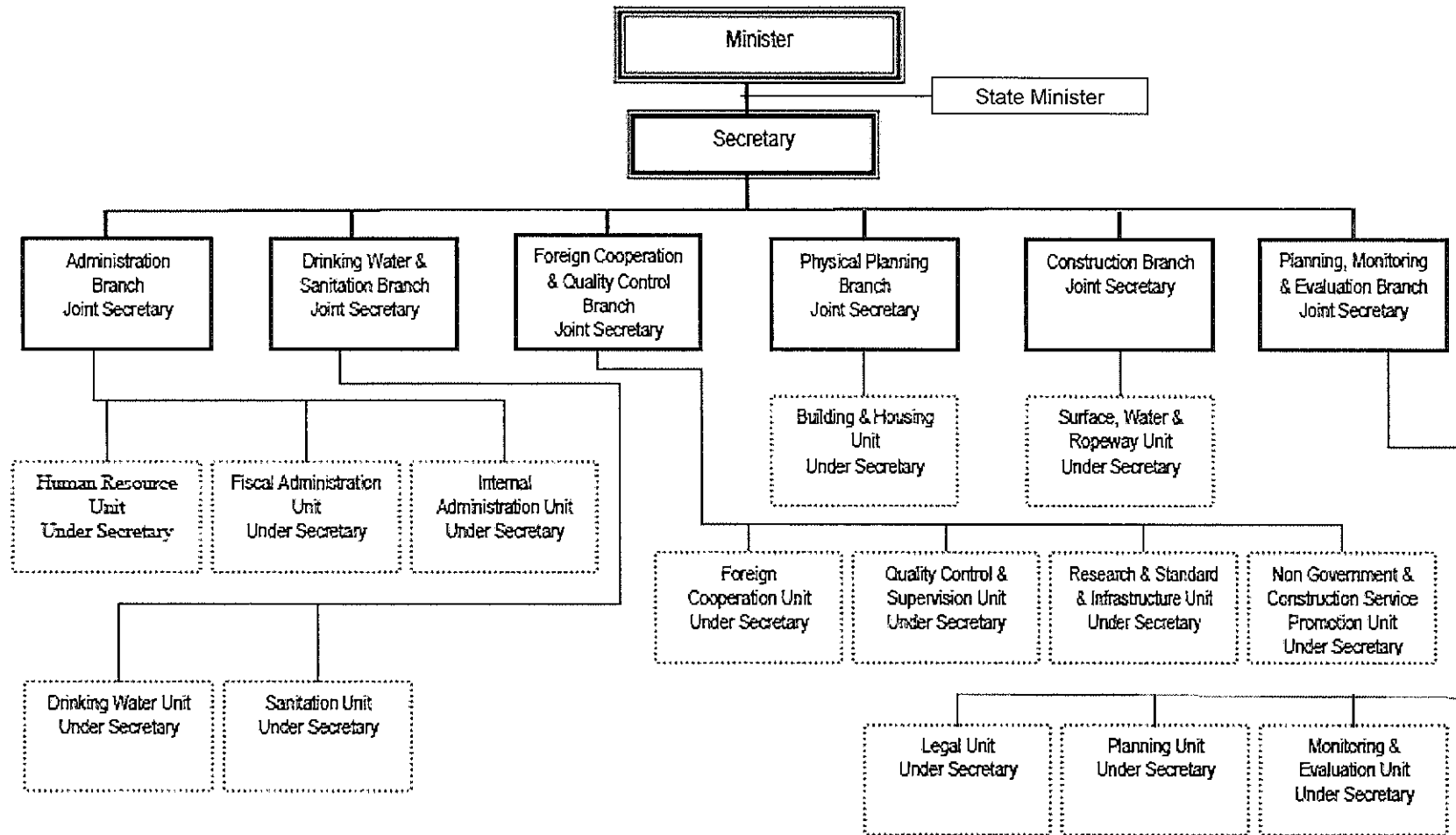
# LAYOUT PLAN



21.

*Handwritten signature*

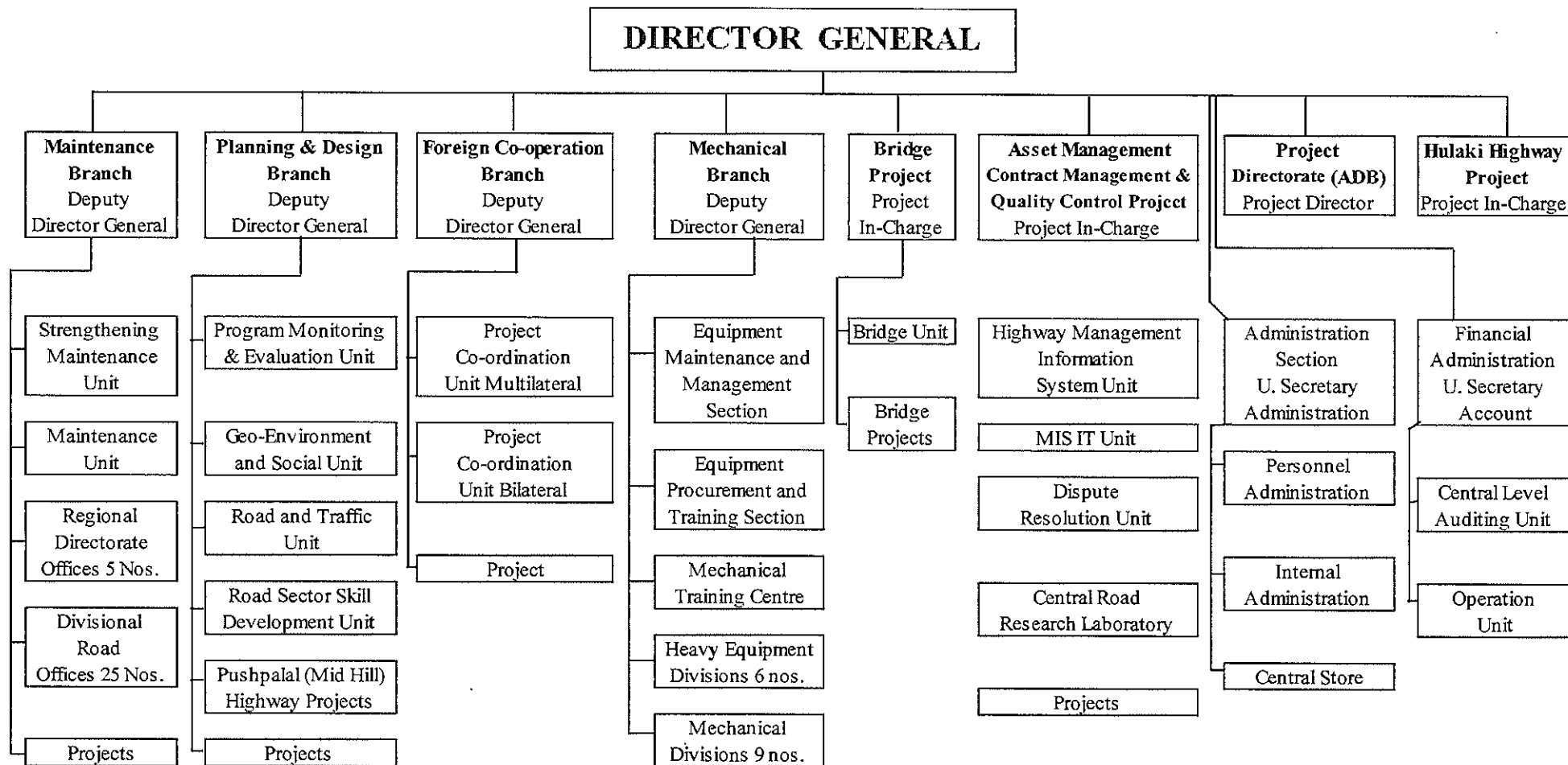
**Ministry of Physical Planning & Works  
Organization Chart**



*Handwritten mark*

*Handwritten signature*

## Department of Works Organization Chart

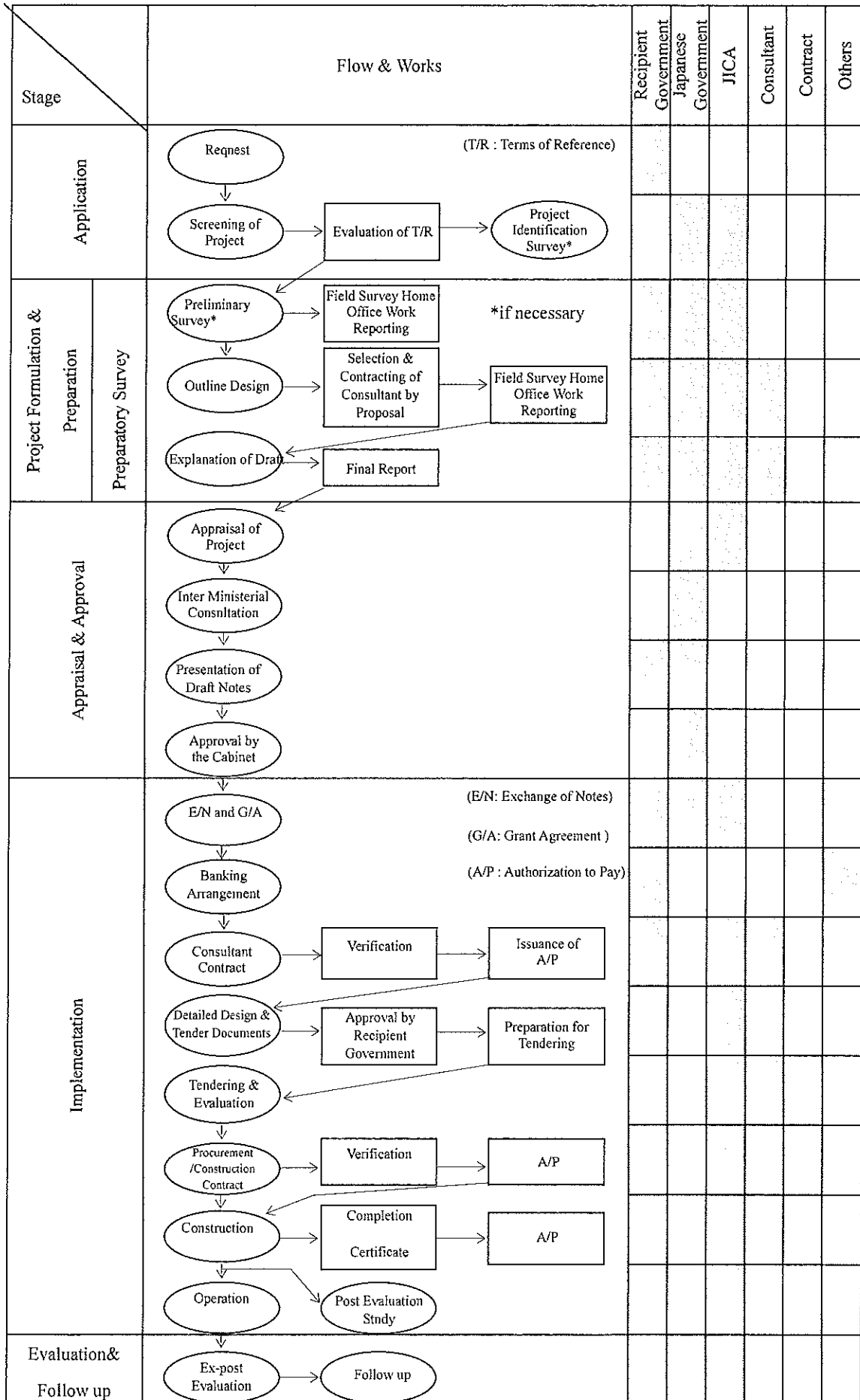


27/

*[Handwritten signature]*



## FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



21

Handwritten signature

## Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure lots of land necessary for the implementation of the Project and to clear the sites;		●
2	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [ be exempted] / [be borne by the Authority without using the Grant]		●
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
8	To give due environmental and social consideration in the implementation of the Project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

MINUTES OF DISCUSSIONS  
ON  
THE PREPARATORY SURVEY  
ON  
THE PROJECT FOR CONSTRUCTION OF SINDHULI ROAD SECTION III (PHASE-2)  
IN NEPAL  
(EXPLANATION ON DRAFT FINAL REPORT)

In August 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Teams on the Project for Sindhuli Road Construction Project Section III (Phase-2) (hereinafter referred to as "the Project") to Nepal, and through discussions, field surveys and technical examination of the results of the surveys in Japan, JICA prepared a Draft Final Report of the Outline Design.


In order to explain and to consult with the concerned officials of the Government of Nepal on the component of the Draft Final Report, JICA sent Nepal the Preparatory Survey Team for Draft Final Report Explanation (hereinafter referred to as "the Team"), which is headed by Mr. Toru TAKE, Senior Representative of JICA Nepal Office on November 1<sup>st</sup>, 2011.

And as a result of discussion, both sides confirmed the main items described on the attached sheets.

Toru Take  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency

Kathmandu, November 1<sup>st</sup>, 2011.

  
INDU SHARMA DHAKAL  
Director General  
Department of Roads (DOR)  
Ministry of Physical Planning & Works  
(MOPPW)  
The Government of Nepal



## ATTACHMENT

### 1. Title of the Project

The project title was agreed as "The Project for Construction of Sindhuli Road Section III (Phase-2)".

### 2. Project Components

After the explanation of the contents of the Draft Final Report by the Team, the Nepalese side and Japanese side agreed the project components included in it.

### 3. Japan's Grant Aid Scheme

The Nepalese side understood the Japan's Grant Aid scheme and the necessary measures to be taken by the recipient country as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both sides on August 17<sup>th</sup>, 2011.

### 4. Schedule of the Study

JICA will complete the final report and send it to the Government of Nepal by the end of February, 2012.

### 5. Schedule of the Construction

The Nepalese side understood that the construction period will be divided into two parts as shown in the Draft Final Report, due to the budget allocation of the Government of Japan for the Project.

### 6. Project Cost

The Nepalese side was informed that the Project cost should not exceed the upper limit of amount agreed on in E/N and G/A and understood that the Project Cost Estimate attached as Annex-1 is not final and is subject to change by the result of examination through revision of the Outline Design.

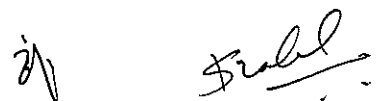
### 7. Environmental and Social Considerations

#### 7-1. Land Acquisition

Both sides reconfirmed that the Nepalese Side should complete the acquisition, compensation and resettlement before the commencement of the construction work, and the Nepalese side should report the progress of these activities to JICA Nepal Office.

#### 7-2. Monitoring of Environmental and Social Considerations

The Team explained the recommendations regarding Environmental and Social Considerations matters based on the policy of the JICA Guidelines (2010 April). In particular,



the Team recommended that DOR should establish an appropriate and accessible grievance mechanism and improve the organization of the Environmental Management Unit as shown in the Draft Final Report.

## 8. Proper Maintenance of the Sindhuli Road

### 8-1. Operation and Maintenance Cost

The Team explained the necessary cost for operation and maintenance of the whole Sindhuli Road after the completion of the Project as shown in Article 3, ANNEX 1. The Nepalese side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities constructed by the Project.

### 8-2. Maintenance Work

The maintenance work on not only the project section but also the other sections of Sindhuli Road shall be implemented properly by the Nepalese side, applying the improved abilities by the coming Japanese technical cooperation project, "the Project for the Operation and Maintenance of the Sindhuli Road".

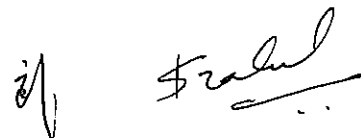
## 9. Other issues

### 9-1. Confidentiality of the Project

The Nepalese side agreed that all the information related to the Project such as detailed drawings, specifications, and the result of cost estimate shall not be released to a third party before conclusion of all the contract(s) for the Project, because they are confidential documents that contain information related to the tender.

<List of Annex>

Annex-1      Project Cost Estimate (Confidential)

Handwritten signature and initials in the bottom right corner of the page.



Appendix -5  
Environmental Mitigation Measures

5-1 Environmental Mitigation Measures

### Environmental Mitigation Measures

S. No	Likely Impacts	Predicated Impacts	Mitigation Measures	Location	Method	Responsibility
<b>1 Physical Aspects</b>						
1)	Land scape disturbance	Due to construction of Road side structures	Haphazard dumping of spoil will be prohibited. Designate the spoil disposal area. Provide bio engineering measures	Project area	Regulate spoil disposal.	Contractor
2)	Change in land use	Farm land / forest area used for road construction.	Make site clearance for the construction width only. Pay Cash compensation Carry out compensatory plantation Prepare plan for operation of quarry site and get approval from the consultant	Project area, Quarry site	Include in specification Prepare quarry operation plan	Contractor
3)	Land stability, landslide, soil erosion and sediment transport	With out proper slope stabilization measure slope failure occur due to E/W excavation	Road construction in balance depth, road slope protection works and water diversion at hill top	Hill slopes	Inclusion in detail design and bio-engineering treatments as per DOR's manual	Contractor, Consultant
4)	Air pollution	The construction activities like earthwork in excavation and filling will generate more amount of dust, operation of the construction equipment and the heavy vehicles on the earthen access road will	Vehicle maintenance and water spraying  Only emission tested vehicle will be allowed on the road	Project area	Workshop operation and water spraying	Contractor



		pollute by their emission, this will be temporary and site specific.				
5)	Degraded Water quality	The water quality may get degraded if the construction materials such as cement slurry, oil, diesel etc. are leaked into the water bodies	Provide drinking water and sanitation and in labour camps and work camps	Project area	Purification of water.	DoR/Contractor
6)	Solid waste generation	Large number of construction workers will generate substantial quantity of solid wastes in the labor camps and works camps. If the waste is not disposed timely, it will be nuisance to the surrounding areas	Provide wastes disposal facilities in labour camps and work camps.	Labour camps and work camps	Include in specification	Consultant / Contractor
7)	Stock piling of the construction materials and disposal of spoils	The construction materials will be stock piled near by the construction site. Production of these agricultural lands will be lost during the construction period or as long as the materials occupy.	Stock pile with consent of land owner Cash compensation for the loss of crops.	Designated places	Included in detail design	Contractor
8)	Disruption in natural drainage system	Road alignment crosses 110 number of natural drainage system	Drainage works and outlet management	Throughout the road alignment	Included in detail design	Contractor
9)	Effect on irrigation channel	Road alignment will affect 9167 m of irrigation channel at 12 different location	Relocation and restoration of irrigation channels during agricultural off season. Rehabilitation of irrigation channel.	Throughout the road alignment	Included in detail design	Contractor
10)	Effect on other infrastructures	14 electric pole, 174m dry wall, 117 m Gabion wall, 2 nos Chautara ( partially) will be affected.	Restoration of infrastructure facilities	Throughout the road alignment	Included in detail design.	DoR

11)	Safety measures	During construction time many equipment will be in operation and fresh cut slope will be unstable.	Provide safety gears such as helmet, masks, ear plugs, gloves, boots etc All the construction workers to be covered by accident insurance		Make accident insurance	Contractor
2	Biological Aspects					
1)	Loss of forest and shrub land	During construction of road, 14.69 Ha forest area required to clear. About 1040 trees and 2676 Poles need to be cut down for site clearance.	Make Compensatory plantation for 37 ha	Vicinity of the Road alignment, bare / thin bushes area.	Make actual measurement	DoR/DFO/CFUG
2)	Pressure on forest for timber and fire wood	Local people and laborers and/or their dependents may be involved in collecting, using and selling the forest products particularly the timber and firewood to meet their fuel demand.	Prohibition of unauthorized tree felling and fuel wood collection Monitor the use of energy for cooking in labour camp and work camp	Forest area Labour camp and work camp	Surveillance Keep records of monitoring	CFUGs/ DFO EMU
3	Socio-economic and Cultural Aspects					
1)	Loss of Agricultural land as apart of site clearance	There will be loss of , cultivated land and barren land. There is already 3m wide earthen road, to upgrade additional 27 m width required to acquired, this area will be 28.35 Ha ( for 32. 916 KM)	Compensation for the loss of agricultural land barren land, residential land	Farmland and settlement	Follow Land Acquisition Act for cash compensation	DoR
2)	Loss of houses	About 67 house are located within the proposed road corridor need demolished. Lose of houses creates a physical as well as social psychological insecurity.	Compensation for the loss of 57 no of permanent house and 10 no of temporary houses	Settlement	Follow Land Acquisition Act for cash compensation	DoR
3)	Loss of	Loss of cultivated land for	Compensation for the loss of	Settlement	Pay cash as	DoR

	agricultural products	construction of road will loss about 183.15 mt per year.	agriculture products		compensation	
4)	Resettlement, relocation and rehabilitation	About 10 households ( SPAF) are expected to be move in near by their area.	Cash compensation and land for land compensation as per wishes of SPAF	Settlement	Follow Land Acquisition Act for cash compensation	DoR
5)	Effect on Irrigation schemes	9167 m irrigation channel will be damaged during road construction.	Relocation of infrastructures within construction width of the road.	Along the road alignment	Construction	DoR
6)	Occupational health and safety	The dust and sound generated buy movement of vehicle and construction activities may cause health hazards to local / labours. Concentration of large number of people in small stretch may crate sanitation problem.	Health check up and medical facilities to workers and staff,	Work camp area	Operation of health clinic	Contractor

## 5-2 Environmental Monitoring

Monitoring Parameters, Method, Schedule and Responsibilities

<b>Parameters</b>	<b>Location</b>	<b>Schedule</b>	<b>Method</b>	<b>Responsibility</b>
Inclusion of mitigation measures in the design and tender document	Project office	During approval for project implementation	Detail design, tender document preparation and review process	DoR Supervisory Consultant
Integration of this report as a part of project administration	Project office	During approval	Review process	DoR
Allocation of adequate budget for environmental protection measures	Project office	During approval	Review process	DoR Supervisory Consultant
Budget allocation for compensation for land and property	Project office	Pre-construction stage	Review process, inquiry and consultation	DoR
Implementation of mitigation measures	Project site	Construction stage	Site inspection, inquiry, measurement	DoR, Supervisory consultant, Contractor
<b>Physical parameters/indicators</b>				
TSP	Project site	Once a month, during construction	HVAS	EMU
PM <sub>10</sub>	Project site	Once a month during construction	HVAS	EMU
SO <sub>2</sub>	Project site	Once a month during construction	HVAS/HACH DREL	EMU
NO <sub>x</sub>	Project site	Once a month during construction	HVAS/HACH DREL	EMU
Water sprinkling	Project site	Twice a week in dry season during construction	Observation, inquiry	EMU

<b>Parameters</b>	<b>Location</b>	<b>Schedule</b>	<b>Method</b>	<b>Responsibility</b>
Quantity of disposal materials	Project site	Once a week during construction	Truck record	EMU
Spoil bank reclamation	Site Specific	Once a year (pre-monsoon) during construction	Observation	EMU
Slope protection measure	Hill slope cutting	1 in 3 months, during construction	Observation	EMU
Drainage facility	Project site	1 in 3 months, during construction	Observation, measurement	EMU
Number and type of safety equipment such as mask, helmet, glove and ear plugs	Project site	Once a year, during construction	Record inspection inquiry, and observation	EMU
<b>Biological Parameters/indicators</b>				
Actual number of trees felled down	Forest/private land	After tree marking	Record inspection	EMU, District Forest Office
Volume of wood extracted	Forest/private land	After cutting trees	Measurement	EMU, District Forest Office
Tree marking, felling, transportation	Forest area	Pre- & during construction	Measurement, observation	DFO, CFUGs
Utilisation of forest products	Project site	After sale	Observation, inquiry	EMU, CFUGs
Numbers of tea stalls and restaurant, fuelwood trade	Project site	Once in 3 month, during construction	Observation, inquiry	EMU, CFUGs
Use of firewood or kerosene/month or LPG	Work camp	Once in 3 month, during construction	Record, inquiry	EMU
Wildlife killing, harassing and poaching events	Forests	Once in 3 month, during construction	Inquiry	EMU, CFUGs

<b>Parameters</b>	<b>Location</b>	<b>Schedule</b>	<b>Method</b>	<b>Responsibility</b>
Wildlife movement	Road corridor	Once in 3 month, during construction	Inquiry, observation	EMU, CFUGs
Condition of forest	Forests	Once in 3 month, during construction	Observation	EMU, DFOs, CFUGs
Species survival rate and conditions of compensatory plantation site	Plantation site	Once a year, after plantation	Measurement	Project, CFUGs/ GESU
<b>Socio-economic Parameters/indicators</b>				
Number of construction workers	Project site	Once in month, during construction	Record, inquiry and observation	EMU
Percentage of local construction labourers	Project site	Once in month, during construction	Record, inquiry and observation	EMU
Number of women employed	Project site	Once in month, during construction	Record, inquiry and observation	EMU
No. of outside labourers and their dependants	Project site	Once in month, during construction	Record, inquiry and observation	EMU
No. of children employed	Project site	Once in month, during construction	File record	EMU
Health and sanitation facilities in camp(s)	Project site	Once at the time of establishment	Observation	EMU
Number of children of construction workers enrolled in the local school	Project site	Once a year, during construction	School record	EMU
Rate of compensation for land and property	Project site	Pre-construction stage	File record, inquiry	EMU
Loss of agri- products	Project site	Twice a year, during construction	Inquiry	EMU

<b>Parameters</b>	<b>Location</b>	<b>Schedule</b>	<b>Method</b>	<b>Responsibility</b>
Type and number of accident	Project site	Once a month, during construction	File record	EMU
First-aid and emergency services	Project site	Twice a year, during construction	Observation	EMU
Public awareness on OHS	Settlement	Twice a year, during construction	Inquiry, information materials	EMU
Social disharmony and related disputes	Settlement	Once a month, during construction	Inquiry, file record	EMU
Influence of outside labourers on religion	Settlement	Twice a year, during construction	Inquiry	EMU
Road damage	Project site	Once a year after rainy season, during construction/post construction	Observation and measurement	EMU/ GESU
Rehabilitation of work camp and labour camp	Camp site(s)	Immediately after construction	Observation and inquiry	EMU

Note : HVAS = High Volume Air Sampler, Envirotech, India, Model APM 441

HACH DREL 2000/USA Spectrophotometer (calibrated in NBSM) for spectrophotometric analysis, SO<sub>2</sub> absorber is tetrachloromercurate solution, airflow rate is 2 L/min, and running time will be 24 hrs and OHAUS/USA Model AS 120 weighing balance will be used. For NO<sub>x</sub>, absorber will be 0.1N NaOH with sodium arsenite, with airflow rate of 1.5 L/min, and running time of 24 hrs.



5-3 Organization Chart of EMU (Environmental Monitoring Unit)

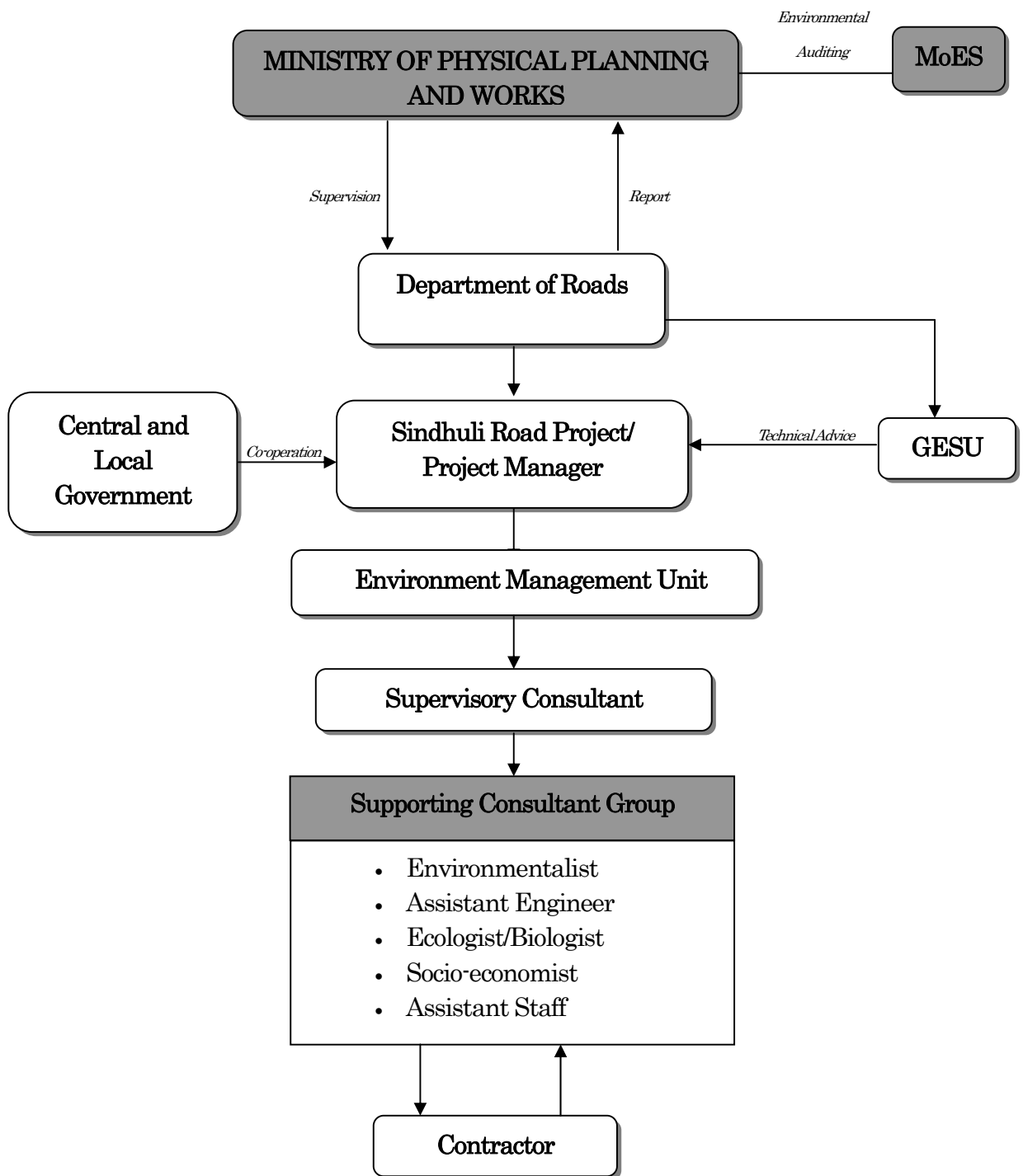


Figure 1 Organizational Structure of the Environmental Management Unit

#### 5-4 Suggested Table and Figure for Environmental Monitoring

Suggested List of Households Affected by the Sindhuli Road Project

Name of VDC: Vimashowar

Reporting Month: December, 2011

S.No.	Plot No.	Name of the Owner of Structure	Address	Classification of the Structure			Affected Area/Nature of House			Payable Amount (Rs)	Paid Amount (Rs.)	Percentage of the Paid Amount (%)	Date of the Completion of Compensation Payment (Rs)	Date of the Completion of Demolition	Remarks
				Permanent (Bricks & Concrete)	Semi-permanent (Mud and Mortar)	Temporary (Bamboo & Mud)	Demolition (Sq.m)	Cracks (Running m)	Other Nature of Damages						
1) Ward No.1															
1	16	Mr. A.K. Thapa													
2	74	Mr. K.C. Kollala													
3	77														
4	135														
5	158														
6	159														
7	165														
8	3														
9	4														
10	5														
Sub-total															
2) Ward No. 2															
11	31														
12	32														
13	33														
14	34														
15	35														
16	36														
17	37														
18	39														
19	41														
20	52														
21	54														
Sub-total															
Total															

SAMPLE

Suggested List of Crops/Fruits Trees Affected by the Sindhuji Road Project

Name of VDC: Vimeshowar

Reporting Month: December 2011

S.No.	Plot No.	Name of the Owner of Structure	Address	Name and Classification of Crops				Rate of Compensation			Payable Amount (Rs.)	Paid Amount (Rs.)	Percentage of the Paid Amount (%)	Date of the Completion of Compensation Payment (Rs.)	Remarks
				Name of Crop (Annual)	No./Area of Damage (sq.m.)	Name of Crop/ Tree (Perennial)	No./Area of Damage (sq.m.)	Rs/sq.m	Rs/tree	Rs/harvest					
1) World No. 1															
1	16	Mr. A.K. Thapa													
2	74	Mr. K.C. Kotala													
3	77														
4	135														
5	158														
6	159														
7	165														
8	3														
9	4														
10	5														
Sub-total															
2) World No. 2															
11	31														
12	32														
13	33														
14	34														
15	35														
16	36														
17	37														
18	39														
19	41														
20	52														
21	54														
Sub-total															
Total															

SAMPLE

5 - 14

Suggested List of Forest and Trees Affected by the Sindhuli Road Project

Reporting Month: December, 2011

Location			Acquired Area (Sq. m)	Activity of the Forest Clearing									Remarks
Station Starting	Station Ending	Road Length(m)		Marking (No.)			Felling (No.)			Quantity of Trees (No. of Bundles)			
				Size A (> 60cm Girth)	Size B (> 30cm Girth)	Size C (> 20cm Girth)	Size A (> 60cm dia)	Size A (> 30cm dia)	Size A (> 10cm dia)	Size A (> 60cm dia)	Size A (> 30cm dia)	Size A (> 10cm dia)	
1 Name of Forest:				Location of Forest: Vimeshowar VDC						Type of Forest: Government-managed Forest			
23+500	24+500	2,000	10,000	2	3	4	3	4	1	2	3	List general tree species felled down	
2 Name of Forest:				Location of Forest: Vimeshowar VDC									
23+500	24+500	2,000	10,000	2	4	2	3	4	1	2	3	List general tree species felled down	
3 Name of Forest:				Location of Forest: Vimeshowar VDC									
23+500	24+500	2,000	10,000	2	3	4	2	3	4	1	2	3	List general tree species felled down

**Suggested List of Monitoring Parameters (1/3)**

Reporting Month:

No.	Parameters	Location	Schedule	Method	Date of Monitoring	Remarks
<b>I. Physical parameters/indicators</b>						
1	TSP	Project site	Once a month, during construction	HVAS		
2	Noise Level	Project site	Once a month during construction	Noise Level Meter		
3	Water sprinkling	Project site	Once a week during dry conditions/season	Observation, inquiry		
4	Quantity of disposal materials	Project site	Once a month during construction	Truck record and Observation		
5	Spoil bank reclamation	Site Specific	Twice a year (pre-monsoon) during construction	Observation		
6	Quantity of Construction Materials Extracted from the Quarry Site	Site Specific	Once a month during construction	Truck record and Observation		
7	Slope protection measures	Hill slope cutting	Once every 3 months, during construction	Observation		
8	Road damage	Project site	Every month during construction/ once a year during the operation and maintenance	Observation and measurement		
9	Drainage facility	Project site	3 months, during construction	Observation, measurement		

- Note :
- 1) HVAS = High Volume Air Sampler, Envirotech, India, Model APM 441
  - 2) HACH DREL 2000/USA Spectrophotometer (calibrated in NBSM) for spectrophotometric analysis, SO<sub>2</sub> absorber is tetrachloromercurate solution, airflow rate is 2 L/min, and running time will be 24 hrs and OHAUS/USA Model AS 120 weighing balance will be used. For NO<sub>x</sub>, absorber will be 0.1N NaOH with sodium arsenite, with airflow rate of 1.5 L/min, and running time of 24 hrs.

Suggested List of Monitoring Parameters (2/3)

No.	Parameters	Location	Schedule	Method	Date of Monitoring	Remarks
<b>II. Biological Parameters/indicators</b>						
1	<b>Forest Area</b>					
	1) Tree marking	Forest area	Pre- & during construction	Measurement, observation		
	2) Number of trees fell down	Forest/ private land	After tree marking	Record inspection		
	3) Volume of wood extracted	Forest/ private land	After cutting trees	Measurement		
	4) Utilisation of forest products	Project site	After sale	Observation, inquiry		
	5) Condition of forest	Forests	Once in 3 month, during construction	Observation		
2	Wildlife killing, harassing and poaching	Forests	Once in 3 month, during construction	Inquiry		
3	Species survival rate and conditions of compensatory plantation site	Plantation site	Once a year, after plantation	Measurement		

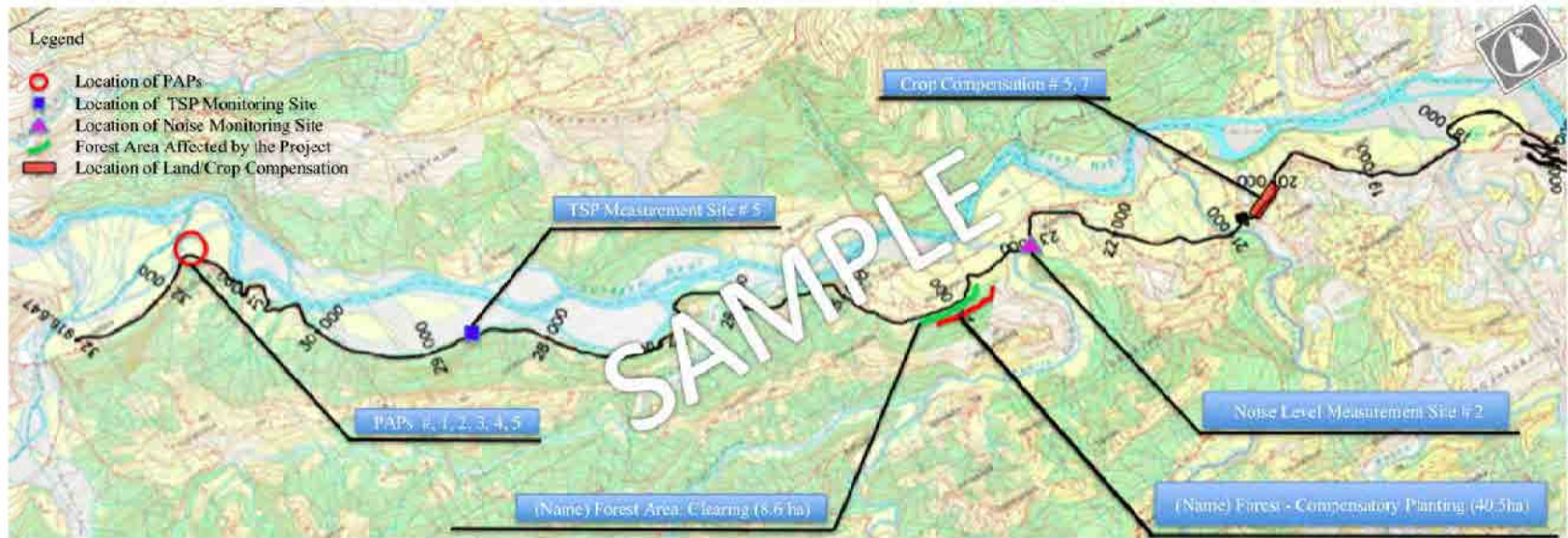


Suggested List of Monitoring Parameters (3/3)

No.	Parameters	Location	Schedule	Method	Date of Monitoring	Remarks
<b>III. Socio-economic Parameters/indicators</b>						
1	Number of construction workers					
	1) Percentage of local people to the total number of construction labourers	Project site	Once in month, during construction	Record, inquiry and observation		
	2) Number of women employed	Project site	Once in month, during construction	Record, inquiry and observation		
	3) No. of outside labourers and their dependants	Project site	Once in month, during construction	Record, inquiry and observation		
	4) No. of children employed	Project site	Once in month, during construction	File record		
2	Health and sanitation facilities in camp(s)					
	1) Type and number of accident,	Project site	Once a month, during construction	File record		
	2) Frequency of illness	Project site	Once a month, during construction	File record		
	3) Type of disease the construction workers are affected	Project site	Once a month, during construction	File record		
3	Social disharmony and related disputes	Settlement	Once a month, during construction	Inquiry, file record		
4	Influence of outside labourers					
	1) On religion	Settlement	Twice a year, during construction	Inquiry		
	2) On local economy	Settlement	Twice a year, during construction	Inquiry		
	3) On local society in general	Settlement	Twice a year, during construction	Inquiry		
5	Public awareness of road safety and construction safety	Project site	Once a month, during construction	Inquiry		
6	Number and type of safety equipment such as mask, helmet, glove and ear plugs	Project site	Once a year, during construction	Record inspection inquiry, and observation		
7	Maintenance of construction machinery	Camp site(s)	Once a month, during construction	Maintenance record of contractor's workshop		
8	Maintenance of work camp	Camp site(s)	Once a month, during construction	Observation and inquiry		
9	Road safety	Project site	Once a month, during construction	Observation of watchmen distributed for traffic safety		

### Suggested Map Indicating the Result of PAPs and Environmental Monitoring Works

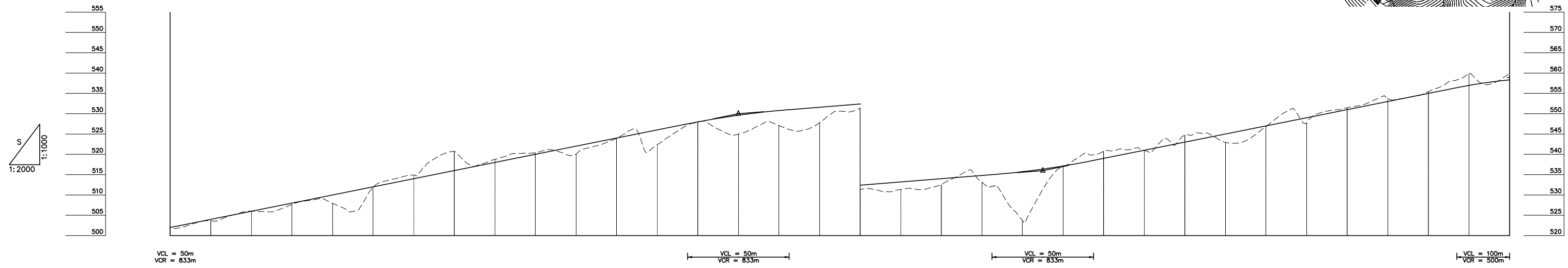
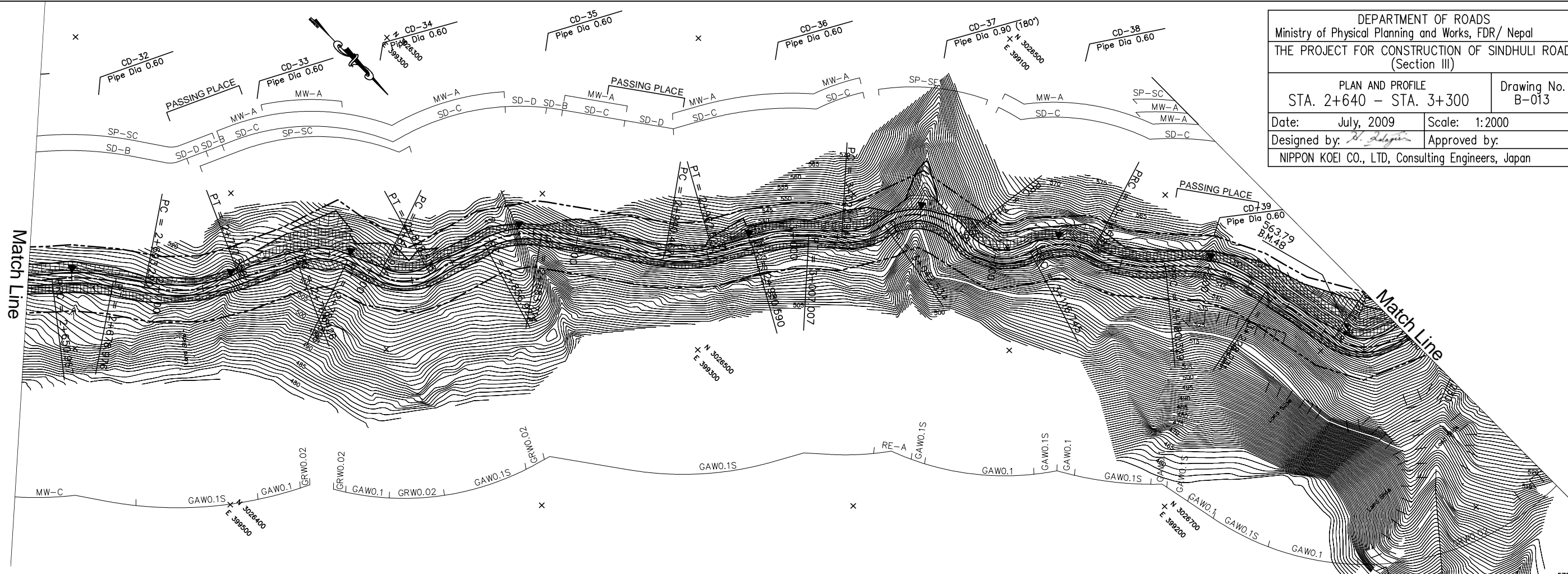
61 - 9 - 19



DEPARTMENT OF ROADS  
 Ministry of Physical Planning and Works, FDR/ Nepal  
 THE PROJECT FOR CONSTRUCTION OF SINDHULI ROAD  
 (Section III)

PLAN AND PROFILE  
 STA. 2+640 - STA. 3+300

Date: July, 2009 Scale: 1:2000  
 Designed by: *H. Dalgin* Approved by:  
 NIPPON KOEI CO., LTD, Consulting Engineers, Japan



GRADE																																		
PROPOSED HEIGHT	502.015	504.000	506.000	508.000	510.000	512.000	514.000	516.000	518.000	520.000	522.000	524.000	526.000	527.985	529.625	530.785	531.600	532.400	533.200	534.000	534.800	535.735	537.135	539.000	541.000	543.000	545.000	547.000	549.000	551.000	553.000	555.000	556.964	558.324
GROUND HEIGHT	501.597	503.713	506.025	507.699	507.942	511.896	514.929	520.754	518.777	520.421	520.069	523.953	522.367	527.922	524.980	527.092	527.810	531.333	531.373	532.576	533.174	523.696	537.049	540.789	540.986	544.715	542.944	546.815	547.819	551.469	553.861	555.426	559.982	559.792
STATION	2+640	2+660	2+680	2+700	2+720	2+740	2+760	2+780	2+800	2+820	2+840	2+860	2+880	2+900	2+920	2+940	2+960	2+980	3+000	3+020	3+040	3+060	3+080	3+100	3+120	3+140	3+160	3+180	3+200	3+220	3+240	3+260	3+280	3+300
CURVE ELEMENT																																		
SUPER ELEVATION																																		
WIDENING																																		
DESIGN SPEED	30 Km/h																																	