

Date: 21 December 2020

Environmental and Social Considerations in Detailed Planning Survey  
(Technical Cooperation for Development Planning)

1. Full title of the Project

Project on Integrated Power System Development Plan

2. Type of the study (e.g. Master Plan, Feasibility Study, Detailed Design, etc.)

Master Plan

3. Categorization and its reason

The Project is categorized as “B” under the ‘JICA Guidelines for Environmental and Social Considerations (April 2010)’ because the project is not likely to have significant adverse impact on the environment under the JICA guidelines for environmental and social considerations (April 2010) in terms of its sectors, characteristics and areas.

4. Agency or institution responsible for the implementation of the project

Ministry of Energy, Water Resources and Irrigation (MOEWRI)

5. Outline of the Project (objectives, justification, location, proposed activities, and scope of the study)

(1) Expected Goals which will be attained after implementing the proposed Project

The capacity of MOEWRI for formulating the long-term power system development plan is enhanced.

(2) Outputs

The Integrated Power System Development Plan of Nepal is formulated.

(3) Activities

The Project will carry out the following ten (10) tasks jointly by the Nepalese Counterpart and the JICA Experts. During the course of the Project implementation, the tasks and the associated activities may change as per the requirements from the Project members, subject to consensus at the JCC.

Task 1: Review the current situation and future prospects of power sector in Nepal and surrounding countries,

Task 2: Domestic load forecast (power and energy) at different economic growth rate

and probable demand at the neighboring market

Task 3: Formulation of the vision, guiding principle and scenarios for power development

Task 4: Improvement of the transmission system development plan

Task 5: Study the Interconnection with neighboring countries,

Task 6: Financial schemes and economic and financial analysis for project implementation,

Task 7: Formulation of the governance mechanism for power sector development,

Task 8: The environmental and social considerations,

Task 9: The formulation of the Integrated Power System Development Plan of Nepal,

Task 10: Capacity Development for the formulation of Integrated Power System Development Plan of Nepal.

6. Description of the project site (maps, environmental and social condition, current issues, etc.)

#### 6.1 Meteorology

Nepal has an area of 147,182 km<sup>2</sup>. The east-west length is about 885 km and the north-south width varies between 150 km and 200 km. About 83% of the total area is the mountains and the rest 17% is the plains.

The High Himalaya is located on the northern side. The Mahabharat range and Churia Hills lie south and parallel with it. The Midland is located between the High Himalaya of the north and the Mahabharat range of the south. The Dun is the wide valley between the Mahabharat range and Churia Hills. The Terai belt lies in the south of Churia Hills and the northern border of the Ganges plain. The Himalaya contains not only the highest peak of the world but also great number of high peaks which have altitudes that go beyond 7,000 m. The highest peak, Sagarmatha (Mt. Everest) is 8,848 m. The elevation of the Midland and Mahabharat range is between 2,000 m and 3,000 m. The lowest elevation of the Terai belt in the southern part of Nepal is 62 m. The difference of elevation is more than 8,000 m in the land of 200 km in the north and south width.

The geography varies widely. The variation of the geography effects the complicate variation of the regional climate.

## 6.2 Map



**Location Map**

## 6.3 Climate

The climate of Nepal varies along with the altitude and changes from the subtropical climate in the southern part to the alpine climate in the northern part. In Nepal, five characteristic climatic parallel belts are distinguishable from the south to north as follows.

- 1) Subtropical climate in Terai
- 2) Warm temperate monsoon climate in the Mahabharat range and beyond up to a height of about 2,000 m with a warm and wet summer and a cool and dry winter.
- 3) Cool temperate monsoon climate in the Mahabharat range and beyond up to a height of about 3,500 m with a mild wet summer and a cold dry winter.

- 4) An alpine climate is found in the highest mountain region up to a height of about 5,000 m with low temperature in the summer and extremely frosty conditions in the winter.
- 5) Tundra climate lies above the snow line where there is perpetual snow and also cold desert conditions.

Inside the belts above, deeply incised valleys of the major rivers which run north and south have a tropical monsoon climate or warm temperate monsoon climate within the Alpine or Tundra belts.

#### **6.4 Season**

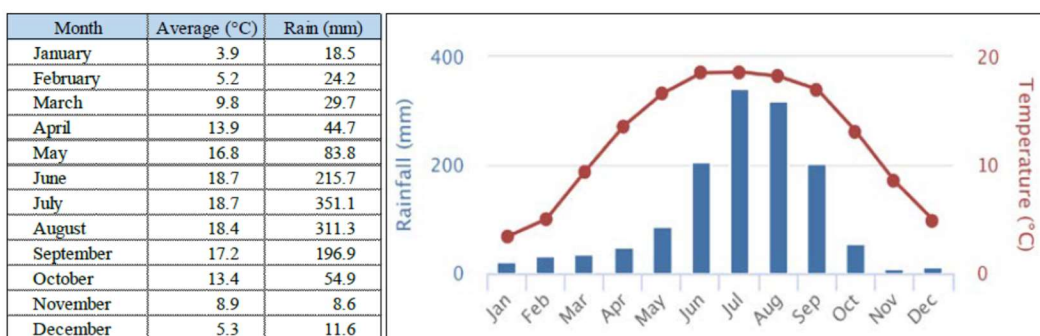
According to the temperature and rainfall, the Nepalese terrain has four seasons in a year. They are spring, summer, rainy and winter. The period of each season is three months. The beginning time of each season has a lag and lead according to the terrain, latitude and longitude of the area.

The year is divided into two seasons, monsoon season and dry season by monsoon. The monsoon season starts in June and ends in October in the mountains. The monsoon season starts July and ends in November in the plains of the south.

#### **6.5 Rainfall**

Rainfall is by monsoons and westerlies. About 90% of the annual precipitation is brought by monsoons and the other 10% is by westerlies.

When a monsoon cloud touches eastern Nepal, it first hits the Mahabharat range which has an average height of 2,000 m and starts to precipitate in that part of the Terai. The cloud climbs the Mahabharat range and the southern face is heavily precipitated, whereas the northern face gets less. A part of the clouds reach the High Himalaya and the southern face is heavily precipitated, whereas the northern face gets less. When some streams of clouds touch the Koshi gorge, they follow the river valleys to east Tamur, north Arun and west Sun Koshi. The excess clouds move to the west and the same cycles happen in the Gandaki valley. As there are no wells developed in the Mahabharat range before the Annapurna range, most of the clouds find easy access to reach Pokhara, which is located in the east of the Annapurna range, compared to other regions. As the result, Pokhara experiences maximum rainfall in Nepal which is 4,500 mm.



<http://sdwebx.worldbank.org/climateportal/Code=NPL>

## 6.6 Glacial Lake Outburst Flood (GLOF)

An inventory of glaciers and glacial lakes in Nepal was prepared by the ICIMOD (International Centre for Integrated Mountain Development) in 1999/2000 with support from the United Nations Environment Programme, Regional Resources Centre for Asia and the Pacific (UNEP/RRC-AP).

When the monsoon cloud touches eastern Nepal from Bay of Bengal, it hits the Himalaya and starts precipitation on the southern slope of the Himalaya. As 80% of annual precipitation occurs during the monsoon season, from June to September, the glacier cultivation occurs by precipitation. The precipitation is rainfall below 5,200 m and becomes snow above 5,200 m. As the temperature is the highest during the monsoon season, the glacier ablation occurs during the monsoon season. The glaciers of Nepal are cultivated and ablated at the same time.

While a glacier flows downstream, debris is carried downstream and deposited at the end of glacier. A pile of debris which is deposited and surrounded at the end of glacier is called a moraine. During the so-called Little Ice Age (from the 16th century to the 20th century) glaciers thickened and advanced, and moraines with heights from 10m to 150m were formed at the end of glacier.

As glacier tongues thinned and retreated after Little Ice Age, melt water became trapped in the trough between the glacier terminus and its end moraine, and a glacial lake was formed.

## 6.7 Protected Area

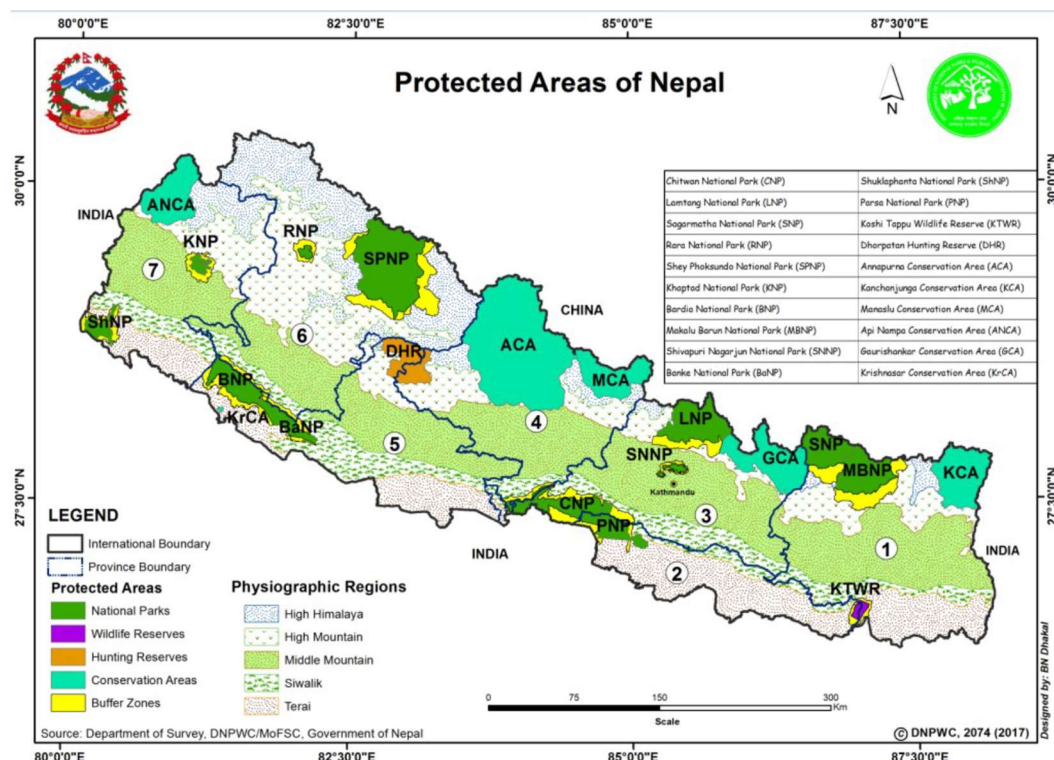
Protected areas in Nepal have two types such as international protected areas and national protected areas.

There are a total of 20 protected areas including 12 national parks, 1 wildlife reserves, 6 conservation areas and 1 hunting reserve, and 11 buffer zones covering an area of 31,029.67 km<sup>2</sup> that is 21.08% of the total area of the country.

International protected areas include World Heritage Sites such as Chitwan national park and Sagamatha national park, registered wetlands under the Ramsar Convention, and

Key Biodiversity Areas (KBA). National protected areas designated by the National Parks and Wild Conservation Act 2029 (1973) are National Parks, Wildlife Reserves, Hunting Reserves, Conservation Areas and National Park/Wildlife Reserve Buffer Zones. Development approval will be needed before hydro-electric development is done and additional regulation will be adapted for environmental flow.

If hydropower sites are located in the upstream of the protected area, the protected area will be affected by development of the project.



## 6.8 Ethnicity

Nepal has various ethnic groups. There are 130 caste/ethnic groups reported in the 2011 census. Chhetri is the largest caste/ethnic group having 16.6% (4,398,053) of the total population followed by Brahman-Hill (12.2%; 3,226,903), Magar (7.1%; 1,887,733), Tharu (6.6%; 1,737,470), Tamang (5.8%; 1,539,830), Newar (5%; 1,321,933), Kami (4.8%; 1,258,554), Musalman (4.4%; 1,164,255), Yadav (4%; 1,054,458) and Rai (2.3%; 620,004). These ethnic groups are classified in six groups such as Adivasi/Janajati, BCTS (Brahmin, Chhetri, Thakuri, Sanyashi Dalit), Dalit, Madhesi, religious minorities, and others. Adivasi/Janajati are indigenous people. BCTS are high caste people. Dalit are bottom caste people. Madhesi are people living in the Terai plain. Religious minorities mean Islamic people.

Democracy was established in Nepal in 1990. Even in the democratic polity, the caste systems continue to structure access to political influence and economic opportunities.

That is one of the factors complicating ethnic classification.

## 7. Legal Framework of Environmental and Social Considerations

(1) Laws, regulations and standards related to environmental and social issues including requirements and procedures of Environmental Impact Assessment (EIA), stakeholder participation, and information disclosure.

EIA procedures in Nepal are stipulated in the Amendment (January 27, 2010) of Environment Protection Regulation (1997) and National Environment Impact Assessment Guidelines (1993). Amendment (2020) requires IEE for transmission projects of more than 132 kV and hydropower projects whose output is from 1MW to 50 MW and construction of Outdoor substation tapping from existing 220kV or above Transmission line. EIA is required for hydropower projects which have an output of more than 50 MW. In addition, EIA is required if project is inside National Parks, Wild life Reserves, Hunting Reserves or forest areas of 5 ha or more.

National protected areas are designated by the National Parks and Wild Conservation Act 2029 (1973). Other related laws and regulations such as Environment Protection Act (1997), Environment Protection Rules (1997), Forest Act (1992), Water Resources Act (1992) and Land Act (1964) will be also referred to for the environmental and social considerations.

In addition to acts and rules, there are three EIA Guidelines: National EIA Guidelines (1993), EIA Guidelines for the Forestry Sector (1995) and EIA Guidelines for the Industry Sector (1995).

### (2) Relative agencies and institutions

Ministry of Forests and Environment is responsible for the conservation of forests and management of environment in Nepal.

## 8. Provisional Scoping (types and magnitudes of possible adverse impacts)

### 8.1 Formulation of Integrated Power System Development Plan

The project aims to formulate the integrated power system development plan and the capacity of Ministry of Energy, Water Resources and Irrigation (MOEWRI) for formulating the long-term power system development plan is enhanced.

### 8.2 Comprehensive Scoping

(1) Hydropower Plant

Items		Possible Impact	
		Construction Period	Operation Period
Physical	Air	Exhaust gas from construction vehicles and machines	-
	Water quality	Turbid water	Eutrophication in the reservoir
	Water flow	-	Dewatering area, water flow changing downstream of the powerhouse, flood near the back water of the reservoir, reducing flood at the downstream of the powerhouse
	Waste	Cut trees in the reservoir, left buildings in the reservoir	Waste inflow the reservoir
	Soil pollution	-	-
	Topography and geology	Topographic change by earth work	Landslide around the reservoir, changing erosion and sedimentation pattern downstream of the powerhouse
	Noise and vibration	Noise and vibration from construction vehicle and construction machines, and blasting	-
	Subsidence	-	-
	Odor	-	Odor by eutrophication and sludge in the reservoir
	Bottom sediment	-	Sedimentation of the sludge in the reservoir
Natural	Protected area	-	Impact by changing water flow
	Terrestrial ecosystem	Forest loss, habitat loss	Segmentation of the corridors, Increasing of the illegal logging and hunting Cumulative impact of ecosystem
	Aquatic ecosystem	Barrier on fish migration route	Habitat change by water flow, water temperature, water quality, Increasing of the illegal fishing



Items		Possible Impact	
		Construction Period	Operation Period
			Cumulative impact on the protected area downstream Cumulative impact on migration fishes
Social	Resettlement	Resettlement, land acquisition, structure loss	-
	Water use	Damage on water sources and water supply system	Decreasing of the irrigation water at the dewatering area and downstream of the powerhouse
	Accident	Accidents by construction vehicles and blasting	Drowning by peak generation
	Life and livelihood	Loss of job by land acquisition	Income loss by changing water flow
	Land use and natural resource use	Loss of Farm land, agroforestry, quarry, intake, and pasture area	Land loss by landslide
	Infrastructure	Fragmentation of road, bridge, electricity line, water pipe, irrigation, and telephone line	-
	Culture	Temple, worship places	-
	Landscape	-	Landscape impact by weir
	Ethnic minority and indigenous people	Diaspora by resettlement	-
	Working environment and work safety	Infectious disease by workers	-

(2) Transmission line

Items		Possible Impact	
		Construction Period	Operation Period
Pollution	Air	Exhaust gas from construction	-

Items		Possible Impact	
		Construction Period	Operation Period
Control		vehicles and machines	
	Water quality	Landfill for towers and temporary road Waste water from construction site, heavy equipment, construction vehicles and construction quarters.	Contamination of insulating oil for transformer.
	Waste	Construction waste and waste soil	-
	Soil	Outflow of construction oil.	Contamination of insulating oil for transformer.
	Noise and vibration	Construction equipment and vehicles	Operation of substations
	Subsidence	-	-
	Odor	Wastes and sewage from construction sites	-
	Bottom sediment	-	-
Natural Environ ment	Protected area	Buffer zone Biological corridor	-
	Ecosystem	Habitat of aquatic biota Habitat of flora and fauna	Flying birds
	Hydrology	-	-
	Topography / Geography	Soil erosions and slope failures in mountainous areas	Soil erosions and slope failures in mountainous areas
Social Environ ment	Land Acquisition / Resettlement	Location of substations and overhead transmission lines.	-
	Poverty Group	Compensation for resettlement and land acquisition include poverty	-
	Ethnic Minority / Indigenous People	Various ethnic group Traditional culture	-
	Local Economy (Employment	Employment of local people Reduction of cash crops such as cropland and fishery due to land	Unemployment after the completion of the construction. Reduction of cash crops such as

Items	Possible Impact	
	Construction Period	Operation Period
and Livelihood, etc.)	acquisition for tower sites.	cropland and fishery due to land acquisition for tower sites.
Land Use / Use of Regional Resource (including Traffic)	Restriction of land use under overhead lines.	Restriction of land use under overhead lines.
Water Use	turbid water under construction	-
Existing Social Infrastructure , Social Service	Traffic jam due to the roadblock	Improvement of the social service such as school and hospital.
Social Capital / Local Social Organization of Decision-making	Consultation and assessment of compensation for land acquisition impact on social capital and organization.	-
Uneven distribution of benefits and damage	Restriction of land use under overhead lines for land owners	Restriction of land use under overhead lines for land owners
Conflict of Interest in the Region	Consultation and assessment of compensation for land acquisition cause a conflict of interest.	-
Cultural Heritage	-	-
Landscape	Loss of local landscape by construction of overhead lines.	Soil erosions and slope failures along access roads depending on topography and geology.
Gender	-	-

Items		Possible Impact	
		Construction Period	Operation Period
	Children's Rights	-	-
	Infections (HIV/AIDS, etc.)	Inflow of external construction workers	-
	Working Condition	Accidents of workers Diseases caused by dust	-
Others	Accidents	Accidents including traffic accidents Accidents such as slope failures Electrocution	Short-circuit accidents at substations and fires accompanying short-circuit accidents. Accidents such as traffic accidents during maintenance Slope failures along access roads
	Impact across the Border, Climate Change	Emissions from heavy machines and vehicles	Reduction of carbon emissions at regional level by exporting electricity to neighboring.

### 8.3 Strategic Environmental Assessment (SEA)

The Project conducts Strategic Environmental Assessment (hereinafter referred to as "SEA") in accordance with the Guideline. The relevant Nepalese laws and guidelines shall also be applied. The project shall pay special attentions to all aspects of natural and social environments, and to make maximum efforts to avoid, minimize and mitigate adverse impacts induced by the implementation of the Project.

### 9. Result of the consultation with recipient government on environmental and social consideration including roles and responsibilities.

They have basically understood the essence of JICA "Guidelines for Environmental and Social Considerations".

### 10. Terms of Reference for Environmental and Social Considerations

The Project includes a Terms of Reference (TOR) for Environmental and Social

Considerations including comparative analysis of alternative proposed plans based on the concept of SEA in line with the “JICA Guidelines for Environmental and Social Considerations (April 2010)”. Specifically, a comparative study will be conducted including the impact of environmental social aspects of multiple alternatives, after implementing scoping that is clarifying the environmental and social impact items that are extremely important in decision-making of policies, plans and programs, and their evaluation methods. The main survey items are as outlined below (For the items (1) – (3), conduct a survey taking environmental and social consideration into account) ;

- (1) Reviewing the objectives and goals of policy and plan.
- (2) Considering alternatives to achieve the purpose within the constraints.
- (3) Reviewing policy and plan contents (development forecast, list of measures, route and map of future development area, etc.).
- (4) Conduct scoping (clarify extremely important items on environmental and social impacts and its evaluation methods at the time of decision making such as policy, plan, and program levels).
- (5) Confirming baseline environmental and social conditions, land use, natural environment, indigenous peoples' living areas and economic and social conditions.
- (6) Confirming the legal framework and institution of Nepal on environmental and social considerations, including
  - a) Laws, regulations, and standards related to environmental and social considerations (ex. environmental impact assessment, resettlement, public participation, information disclosure, and others);
  - b) Gaps between the JICA Guidelines and the legal framework of Nepal on environmental and social considerations;
  - c) Relevant organizations responsible for implementation of projects and their roles on environmental and social considerations including EIA and SEA;
- (7) Identifying and assessing possible environmental and social impacts associated with implementation of the Master Plan and predicting impact.
- (8) Analyzing possible alternatives including zero options.
- (9) Proposing measures to mitigate adverse impacts (to be avoided, minimized, and compensated) that might be resulted from the implementation of the Master Plan
- (10) Proposing environmental and social monitoring methods (monitoring items, frequencies, and methods) based on the mitigation measures
- (11) Assisting Nepal counterpart personnel in organizing stakeholder consultation in order to provide wide-open opportunities to local residents and individuals / groups having

wide knowledge and opinions.

11. Other relevant information

None