Date: 11 October 2023

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

1 Full Title of the Project

Project on Kathmandu Valley Urban Transport System Master Plan

2 Type of the study

Master Plan

3 Categorization and its Reason

The project is classified as a “Category B” because it is not likely to have significant adverse impact on the environment under the JICA Guidelines (hereinafter referred to as “JICA Guidelines”) for Environmental and Social Considerations (January, 2022) in terms of its sectors, characteristics and areas.

4 Agency or Institution Responsible for the Implementation of the Project

Ministry of Physical Infrastructure and Transport (MOPIT).

5 Outline of the Project

5.1 Background

The Kathmandu Valley, consisting of Kathmandu District, Lalitpur District, and Bhaktapur District, is the largest political, economic, and social center of Nepal. The population of the Kathmandu Valley is expected to increase from approximately 1.6 million in 2001 to approximately 3.03 million in 2021 and to reach approximately 3.74 million by 2030. Kathmandu Valley is an ancient city that has existed since the 5th century, and it is difficult to expand the road network due to geographical restrictions by the elevation differences. Currently, the only public transportation system in the region is bus transportation operated by private companies, which is unable to absorb the traffic demand sufficiently, and traffic congestion in the region is getting worse. Under such situation, a comprehensive public transportation system including track system is desired.

JICA implemented the "The Project on Urban Transport Improvement for Kathmandu Valley" in response to a request from the Government of Nepal, and in 2017, an Urban Transport Master Plan (Target Year 2030) (hereinafter referred to as “JICA MP") was formulated. Additionally, the "Data Collection Survey on Urban Transport in Kathmandu Valley " was conducted in 2019, with several proposals including the implementation of a track-based public transport system by 2030

to meet the increasing traffic demand in the long term. In addition to JICA MP and the Survey, other international donors have conducted several surveys on public transportation in Kathmandu Valley in the past, and each survey has made proposals for various modes and routes of public transportation and their necessity. Considering these circumstances, not only by reviewing these previous surveys but also by examining the current traffic condition and demand forecast taking into account the demographics after the earthquake, it is necessary to make a plan for optimal transportation network and system in Kathmandu Valley.

For the situation of urban transportation management in Nepal, in addition to Ministry of Physical Infrastructure and Transport (hereinafter referred to as "MOPIT"), various organizations are involved and play own roles and responsibilities, such as Ministry of Urban Development (hereinafter referred to as "MOUD"), Kathmandu Valley Development Authority (hereinafter referred to as “KVDA”), Investment Board Nepal (hereinafter referred to as “IBN”), Prime Minister's Office and Metropolitan City (each municipality).

In addition, due to the federal system introduced with the enforcement of the new constitution in 2015, functions are distributed to local governments, and projects related to urban transportation are being carried out without sufficient consistency with the urban planning of the central government. For this reason, it is also necessary to organize the contents and scope of the jurisdiction of each organization and to propose and realize a cooperation system between organizations in order to develop the operation and management system of the public transportation system that will be required in the future.

Geographically and climatically, Nepal suffers from many and frequent natural disasters such as floods, cyclones, drought, landslide, avalanches and earthquake. In recent years, global warming has intensified these natural disasters. As a result, floods and landslides during the monsoon season leave serious damages.

5.2 Objective of the Project

The objective of the Project is to formulate comprehensive, sustainable, and updated urban transportation master plan in Kathmandu Valley focusing on Mass Rapid Transit with cooperation among relevant organizations. Aiming for implementation of the project, the Detailed Planning Survey is to confirm the background and content of the request from the Government of Nepal, discuss with the relevant government authorities, formulate a plan for the technical support, and collect and analyse information necessary to carry out ex-ante evaluation of the project.

5.3 Location of the Project

the Kathmandu Valley.

5.4 Proposed Activities

The Project will be carried out in the following three (3) stages step-by-step together with technology transfer during the entire period of the Project:

Stage-1: To prepare a comprehensive, sustainable, and updated Urban Transportation Master Plan in Kathmandu Valley.

Stage-2: To identify the high-priority mass transit route and mode in Kathmandu Valley through pre-feasibility study.

Stage-3: To develop appropriate coordination mechanism and launch it during the period of the Project for comprehensive urban transportation planning and management, and realization of the MP.

Stage-1:

1-1 Analyse transport and traffic data, current plans, and policies on urban transportation and public transportation.

1-2 Develop a traffic demand forecast model along with a manual and hands-on training on traffic survey and data analysis.

1-3 Create an urban transportation master plan with a suitable vision and strategy including a future public transportation network and a priority project list.

1-4 Design the institutional framework with organizational structure to implement the MP.

Stage-2:

2-1 Prioritize mass transit routes in Kathmandu Valley based on the priority project list in the MP.

2-2 Select the high priority route and mode of mass transit for pre-feasibility study.

2-3 Conduct the pre-feasibility study and prepare the report.

Stage-3:

3-1 Review the current situation of the coordination mechanism including existing committees or councils related to urban transport and urban planning in Kathmandu Valley and identify issues and challenges.

3-2 Propose provisional committee as a coordination mechanism among relevant organizations.

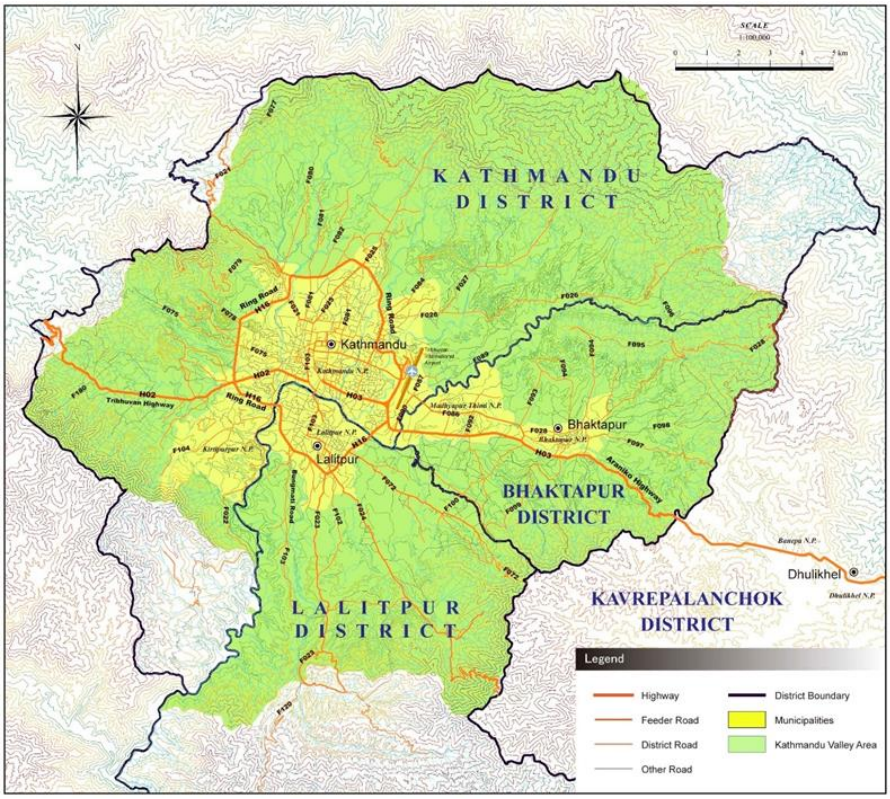
3-3 Hold meetings regularly to review and discuss urban transport policies and measures for realization of the projects proposed in the MP.

3-4 Discuss how this coordination mechanism could have continuous effect after the conclusion of the Project.

6 Description of the Project Site

6.1 Location

The project site is the Kathmandu Valley.



Source: KUTMP

Figure 1. Project Target Area

6.2 Socio Economic Condition

6.2.1 Population

1) Population of Nepal

As of 2011, Nepal's population was approximately 26 million people. When looking at the population growth rate, from 1961 to 2001, Nepal consistently experienced a population growth rate exceeding 2% annually. However, in the 10 years from 2001 to 2011, the population growth rate significantly dropped to 1.36%, well below the 2% mark.

The table below shows the population of Nepal.

Table 1. Population of Nepal (1961-2011)

	1961	1971	1981	1991	2001	2011
Population	9,412,996	11,555,983	15,022,839	18,491,097	23,151,423	26,494,504
Increase rate per year (%)		2.07	2.66	2.10	2.27	1.36

Source: National Population and Housing Census, CBS

2) Population of the Kathmandu Valley

The total population of the three districts comprising the Kathmandu Valley was 2.51 million people as of 2011. The growth rate in the 10 years from 1971 to 1981 was relatively moderate at an annual rate of 2.16%. However, from 1981 to 1991, it increased significantly at an annual rate of 3.73%, from 1991 to 2001 at 4.06%, and in the most recent period from 2001 to 2011, it grew even more rapidly at an annual rate of 4.34%.

Table 2. Population of Three Districts in the Kathmandu Valley

		1971	1981	1991	2001	2011
Population	Nepal	11,555,983	15,022,839	18,491,097	23,151,423	26,494,504
	Lalitpur	154,998	184,341	257,086	337,785	468,132
	Bhaktapur	110,157	159,767	172,952	225,461	304,651
	Kathmandu	353,756	422,237	675,341	1,081,845	1,744,240
	3 Districts	618,911	766,345	1,105,379	1,645,091	2,517,023
Ratio in Nepal	Nepal	100.00	100.00	100.00	100.00	100
	Lalitpur	1.34	1.23	1.39	1.46	1.77
	Bhaktapur	0.95	1.06	0.94	0.97	1.15
	Kathmandu	3.06	2.81	3.65	4.67	6.58
	3 Districts	5.36	5.10	5.98	7.11	9.50
Increase rate per year (%)	Nepal		2.66	2.10	2.27	1.36
	Lalitpur		1.75	3.38	2.77	3.32
	Bhaktapur		3.79	0.80	2.69	3.06
	Kathmandu		1.79	4.81	4.82	4.89
	3 Districts		2.16	3.73	4.06	4.34

Source: National Population and Housing Census, CBS

6.2.2 Economy

1) GDP

Nepal is one of the eight countries composing SAARC (South Asian Association for Regional Cooperation) which was formed to promote and sustain mutual trade and economic cooperation by Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Among the SAARC countries, Bhutan is the smallest and Nepal is the second smallest in terms of Gross Domestic Product (GDP). In terms of GDP per capita, Nepal is the lowest. On the other hand, Nepal's GDP growth rate is in the middle among SAARC countries: Bangladesh and Pakistan are lower than Nepal. General condition of economy from 2001 to 2011 in Nepal is shown in Table 2.2.1. In this decade, real GDP increased by 1.46 times from 441.5 billion NPR to 642 billion NPR, whereas real GDP per capita increase was 1.19 times.

Table 3. Major Indices of National Accounts and Government Finance of Nepal

Description	Unit	2001	2011
Population	Person	23,151,423	26,253,828
Annual increase rate	%		1.27
Real GDP at 2001 price	Billion NPR	441.5	642.6
	Billion USD	5.9	642.6
Growth rate per year	%	5.9	8.9
Nominal GDP	Billion NPR		4.23
	Billion USD	441.5	1,368.4
Growth rate per year	%	5.9	19.0
Real GDP per capita	NPR/person	17,678.3	21,077.1
	USD/person	235.9	292.3
Growth rate per year	%		2.17
Nominal GDP per capita	NPR/person	17,678	44,887
	USD/person	236	622
Growth rate per year	%		10.19
General government revenue	Billion NPR	53.1	241.6
Percent of GDP	%	12.0	17.7
General government total expenditure	Billion NPR	65.1	255.0
Percent of GDP	%	14.7	18.6
General government net lending/borrowing	Billion NPR	-12.0	-13.4

Source: Central Bureau of Statistics, IMF.

2) Industry

Major industry in Nepal is the tertiary sector which accounts for 49.7% of the total Gross Added Value, while the primary sector and the secondary sector account for 34.5% and 14.9% respectively. In the tertiary sector, wholesale and retail trade occupies the largest proportion followed by transport and communications, and real estate and renting. Underdeveloped secondary sector which is caused mainly by insufficient supply of electricity is one of the sources of low developed economic status of Nepal. The fastest growing sector is other community, social and personal service activities, followed by health and social work and education.

Table 4. Gross Value Added by Industry (at 2000/01 Prices)

NPR in ten million

Industry	2006/07	Ratio in 2006/07	2011/12	Ratio in 2011/12	Annual increase rate (%)
Agriculture and forestry	18,195.80	35.30%	22,095.00	34.50%	4.0
Fishing	283.8	0.60%	378.1	0.60%	5.9
Mining and Quarrying	238.3	0.50%	277	0.40%	3.1
Primary sector	18,717.90	36.30%	22,750.00	35.50%	4.0
Manufacturing	3,989.10	7.70%	4,344.50	6.80%	1.7
Electricity, gas and water	1,306.50	2.50%	1,469.00	2.30%	2.4
Construction	3,145.30	6.10%	3,720.70	5.80%	3.4
Secondary sector	8,440.90	16.40%	9,534.20	14.90%	2.5
Wholesale and retail trade	6,429.20	12.50%	7,896.70	12.30%	4.2

Industry	2006/07	Ratio in 2006/07	2011/12	Ratio in 2011/12	Annual increase rate (%)
Hotels and restaurants	827.8	1.60%	1,100.00	1.70%	5.9
Transport, storage and communications	4,409.40	8.60%	6,216.00	9.70%	7.1
Financial intermediation	2,210.30	4.30%	2,707.10	4.20%	4.1
Real estate, renting and business activities	4,124.00	8.00%	5,034.60	7.80%	4.1
Public Administration and defence	926.2	1.80%	1,120.30	1.70%	3.9
Education	3,073.80	6.00%	4,201.90	6.60%	6.5
Health and social work	688.8	1.30%	959.1	1.50%	6.8
Other community, social and personal service activities	1,664.30	3.20%	2,616.30	4.10%	9.5
Tertiary sector	24,353.90	47.30%	31,852.00	49.70%	5.5
Total GVA	51,512.70	100.00%	64,136.20	100.00%	4.5

Source: Central Bureau of Statistics, IMF.

6.2.3 Culture

1) Religion

Nepal on the whole hosts a multitude of religions. Based on the 2011 census data, Hindus make up the majority of Nepal's population at 81.3%, followed by Buddhists at 9%, Muslims (predominantly Sunni) at 4.4%, and Christians (primarily Protestant with some Roman Catholics) at 1.4%. Other smaller religious groups, accounting for less than 5% of the population, include Kirats (influenced by Hinduism), animists, Bon adherents (a Tibetan tradition), Jains, Baha'is, and Sikhs. Many Nepalis practice syncretic faith, blending elements of Hinduism, Buddhism, and folk traditions.

Hinduism and Buddhism have thrived in the Kathmandu Valley, creating a distinctive artistic and architectural heritage that include monuments and buildings inscribed in the UNESCO World Heritage. The UNESCO cultural world heritage site includes Kathmandu Durbar Square, Patan Durbar Square, Bhaktapur Durbar Square, Swayambhunath, Boudhanath, Pashupatinath, Changunarayan and Lumbini. Seven Cultural World Heritage Sites are situated within 20 km of radius, in the Kathmandu Valley except Lumbini.

2) Language

There are 123 languages spoken as mother tongue reported in census 2011. Nepali is spoken as mother tongue by 44.6 percent (11,826,953) of the total population followed by Maithili (11.7% 3,092,530), Bhojpuri (5.98%; 1,584,958), Tharu (5.77%; 1,529,875), Tamang (5.11%; 1,353,311), Newar (3.2%; 846,557), Bajjika (2.99%; 793,418), Magar (2.98%; 788,530), Doteli (2.97%; 787,827), Urdu (2.61%; 691,546).

3) Caste and indigenous ethnic people

Over the years, Kathmandu metropolitan developed into economic and social center. Historically known as Newar settlement, it is now highly complex in terms of its caste/ethnic composition.

According to the 2001 Census, there are 67 significant castes/indigenous ethnic and religious groups residing in the metropolitan area. Notably, the Newar group is the largest, comprising 31.8% of the population, followed by Brahmin (Hill) at 21.5% and Chhetri at 16.4%. These three groups collectively make up nearly 70% of the total metropolitan population. Tamang and Gurung account for 5.3% and 3.7%, while Sherpa and Magar each constitute 3.2%. Together, these seven groups make up 85% of the total population, with several other groups also having significant shares in the municipal population, including Rai, Muslim, Marwadi, Thakuri, and Tharu, each having 1% or more representation.

Caste/ethnic group	**Share in total metropolitan population**			**Sex ratio**
	Number	**%**	**Cumulative %**	
Newar	213337	31.8	31.8	102.1
Brahman – Hill	144713	21.5	53.3	124.7
Chhetri	110180	16.4	69.7	118.0
Tamang	38491	5.7	75.4	113.3
Gurung	21849	3.3	78.7	102.0
Sherpa	21619	3.2	81.9	105.8
Magar	21360	3.2	85.1	116.5
Rai	14464	2.2	87.3	106.7
Muslim	10729	1.6	88.9	208.0
Marwadi	9750	1.5	90.4	116.6
Thakuri	7871	1.2	91.6	115.6
Tharu	6850	1.0	92.6	171.1
Limbu	3934	0.6	93.2	115.0
Unidentified Caste	3666	0.6	93.8	107.6
Damai/Dholi	3260	0.5	94.3	151.6
Baniya	2707	0.5	94.8	107.8
Yadav	2355	0.4	95.2	155.4
Teli	2342	0.4	95.6	245.3
Kami	2288	0.3	95.9	206.1
Kalwar	2102	0.3	96.2	126.8
Sunuwar	1687	0.3	96.5	261.2
Thakali	1549	0.3	96.8	103.3
Brahman – Tarai	1491	0.2	97.0	180.3
Sonar	1472	0.2	97.2	121.4
Majhi	1338	0.2	97.4	117.6
Bangali	1317	0.2	97.6	319.4
Sarki	1273	0.2	97.8	111.5
Unidentified Dalit	1246	0.2	98.0	120.9
Gharti/Bhujel	1128	0.2	98.2	123.8
Kayastha	1000	0.15	98.4	133.1
Other (36 + groups)	10501	1.6	100	154.4
Total	671846	100	-	115.5

Source: Population census, 2011

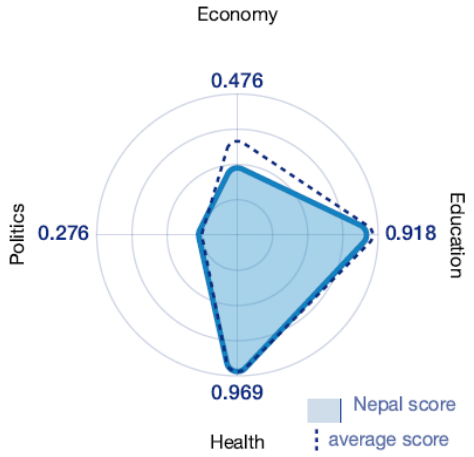
4) Gender

According to the World Economic Forum's Gender Gap Index (2023), Nepal ranks 3rd out of 9

countries in South Asia but only 116th out of 146 countries globally. In the political sphere, Nepal's gender index surpasses the world average, likely due to a constitutional provision from the 2015 constitution (amended in 2020) that mandates 33% of parliamentary seats for women. However, in the economic sphere, Nepal falls below the global average, which can be attributed to the significant influence of societal factors. Nepal's culture, influenced by Hinduism, still maintains practices like early marriage, dowry, and low status of wives in their husband's households, hindering the mainstreaming and empowerment of women in the economic sector.

Southern Asia

Country	Rank		Score
	Regional	Global	
Bangladesh	1	59	0.722
Bhutan	2	103	0.682
Sri Lanka	3	115	0.663
Nepal	4	116	0.659
Maldives	5	124	0.649
India	6	127	0.643
Pakistan	7	142	0.575
Iran (Islamic Republic of)	8	143	0.575
Afghanistan	9	146	0.405



Source: Global Gender Gap Report 2023, World Economic Forum

Figure 2. Gender Gap Score of Nepal

In Nepal, as of 2019, the labour force participation rate for women is less than half of that for men. Furthermore, the unemployment rate for women is approximately 1.3 times higher than that for men, and the proportion of women in managerial positions is lower than that of men (see the table below).

Table 5. Labor Profile by Gender in Nepal

	Women	Men
Population (age 15 and older)	11,537,000 (55%)	9,208,000 (44%)
Labour force participation rate	26.3%	53.8%
Unemployment rate	13.1%	10.3%
Employers	6%	11%
Own-account workers	26%	22%

Source: Country Gender Equality Profile, 2023. UN Women

Looking at employment by industry sector in Nepal, women have a higher representation than men in agriculture, wholesale and retail trade, education, food services, and healthcare and

welfare industries. This indicates a significant presence of female labour in agriculture and a growing involvement of women in small-scale family businesses within the wholesale and retail trade sector, likely influenced by shifts in the economic landscape (see the table below).

Sector	Women	Men
Agriculture, forestry and fishing	33%	14.7%
Wholesale and retail trade	20.6%	15.6%
Manufacturing	13.4%	16.2%
Construction	4.2%	19.5%
Education	9.6%	6.8%
Accommodation and food services	6.3%	4.6%
Transportation and storage	0.3%	7.1%
Human health and social work	3.5%	1.8%
Other service activities	1.4%	2.7%
Public administration and defense	1.1%	2.4%
Others	6.5%	8.9%

Source: Country Gender Equality Profile, 2023. UN Women

Figure 3. Labor Profile by Gender in Various Industrial Sectors in Nepal

5) Education

According to National Population and Housing Census 2021, the literacy rate of population aged 5 years and above in Nepal is 71.15% in 2021, while that of Kathmandu district is 89.2%. The literacy rate shows significant difference between men (83.6%) and women (69.4%) in Nepal. Kathmandu district shows higher literacy rate for men (94.2%) and women (84.2%). The table below shows literacy rate of Nepal from 1995 to 2011.

Table 6. Literacy Rates of Adult Male and Female (1995-2011)

Timeline	1995-96, Nepal Living Standard Survey (NLSS) I			2003-2004, NLSS II			2010-2011, NLSS III			2001, National Population & Housing Census			2011, National Population & Housing Census		
Age Group	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total
15 years and above	19.42	53.49	35.57	33.8	64.5	48.8	45.0	72.0	57.0	34.9	62.7	48.6	48.8	71.7	59.6
6 years and above	24.35	52.15	37.82	38.9	63.5	50.6	51.0	72.0	61.0	42.8	65.5	54.1	57.8	76.0	66.6

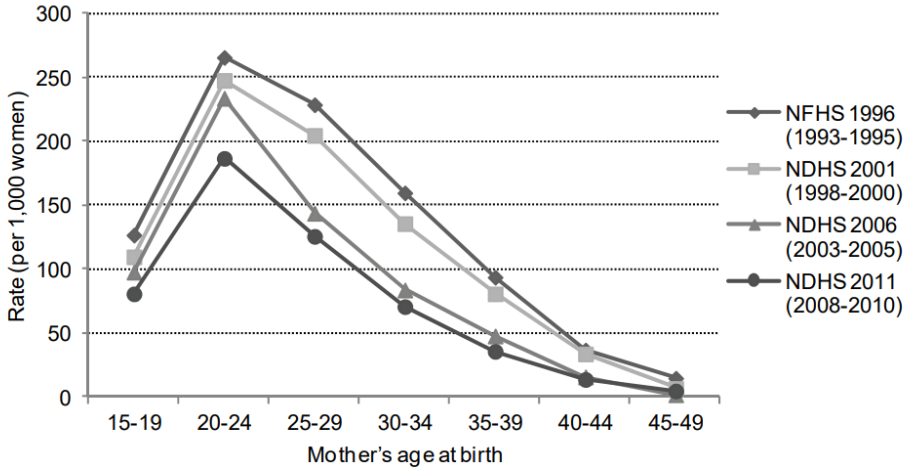
Source: Gender, Jobs and Education, Prospects and Realities in Nepal, UNESCO 2014

The table above shows that over two decades, the literacy rate among females aged 15 and above surged by 30%, surpassing the 19% increase seen among males of the same age group. Likewise, for those aged 6 and above, females' literacy rates rose by 34%, outpacing the 24% increase in males' rates. Nevertheless, a significant gender gap in literacy persists because females initially

had lower literacy rates compared to males. Despite ongoing efforts to enhance female literacy, this gender disparity is more pronounced among the population aged 15 and above.

6) Health

The total fertility rate in Nepal is 2.0 in 2019, while that for Bagmati Province, in which Kathmandu is located, is the lowest among all provinces at 1.6 in 2019. The figure below compares fertility trends from 1993 to 2010 in Nepal. Fertility has declined in every age group over the span of 15 years. Nepal Demographic and Health Survey 2011 attributed the factors of this decline to improved communication and greater access to modern methods of contraception. Other factors may be a decline in the ideal number of children, increasing age at marriage, and increasing use of safe abortion services.



Source: Nepal Demographic and Health Survey 2011

Figure 4. Trends in Fertility

6.2.4 Natural condition

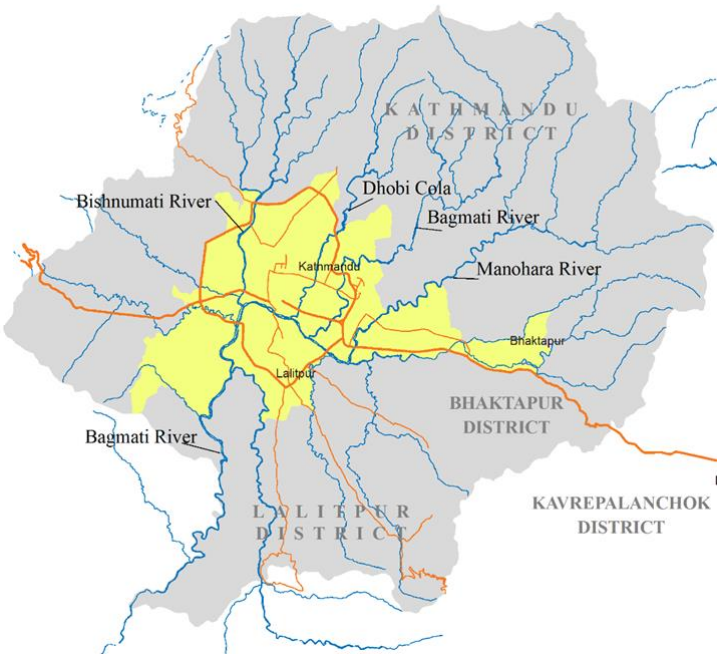
1) Geography

The Kathmandu Valley is encircled by four mountains or mountain ranges. To the north is the 2,800-meter-high Shivapuri Mountain, to the southeast is the 2,795-meter-high Phulchowki Mountain, to the north is the 2,825-meter-high Nagarjun Mountain, and to the southwest is the 2,300-meter-high Chandragiri Mountain.

This valley, surrounded by these mountains or ranges, spans at an elevation of approximately 1,300 meters. Within the valley, rivers such as the Bagmati River, a tributary of the Ganges, flow, and fertile land suitable for cultivation extends. The Kathmandu Valley also serves as a crucial trade hub connecting Tibet and India.

The hydrographic map below illustrates the major river systems in the Kathmandu Valley. There are four rivers flowing through the Kathmandu Valley. The Bagmati River is the main river, with

the Bishnumati, Manohara River, and Dhabi Cola River serving as its tributaries. The Bagmati River flows from the northeast to the south through the Kathmandu Valley, eventually converging into the Chobar Gorge.



Source: JICA Study Team

Figure 5. Rivers in the Kathmandu Valley

2) Geology

Geologically, Kathmandu Valley consists of Gokarna Formation (gkr) of Plio-Pleistocene, Kalimati Formation (klm) of Pio-Pleistocene, Chapagaon Formation (cpg) of Pio-Pleistocene, Recent alluvial soil (sal) of Quaternary and Alluvial fan deposit (salf) of Quaternary.

Recent alluvial soil consists of temporal sediment of a flood plain and fill terrace. The northern section consists of sand and gravel in the site river rocks. Silt, sand, and gravel can be found at the central and southern section. Density is low and the consistency of the soil is soft and clayish. It is easily eroded, settled, or flooded. The bearing capacity is expected to be poor and will be easily flooded.

Gokarna Formation consists of bright brown gray and dense rectangular silt with poor grain size distribution. Total thickness is 330 m or thicker and the bearing capacity is expected to be between mid to high degree.

3) Climate

Kathmandu Valley has a mild, sub-tropical climate. The rainfall in the valley is affected by the Southwest monsoon during the summer. The average monthly precipitation varies from 8.3mm in November to 365.4mm in July. Rainy season in Nepal is caused by the monsoon and almost

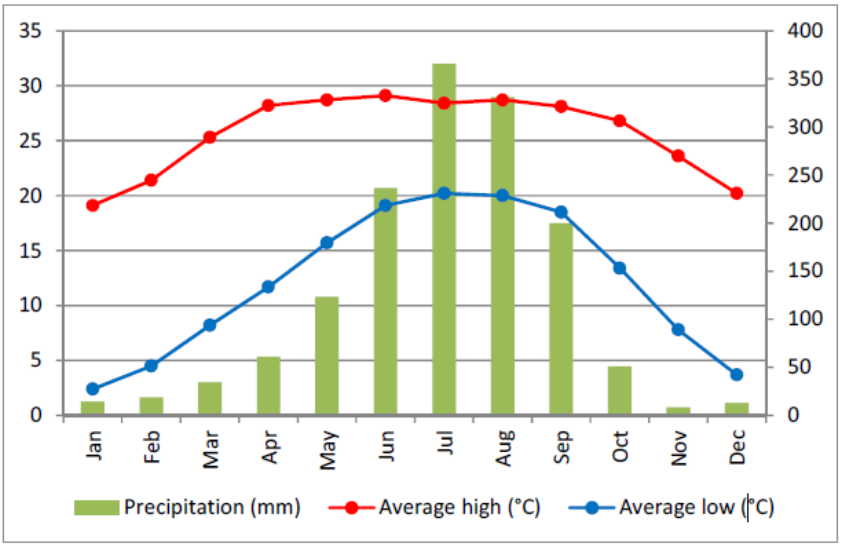
80% of the annual precipitation falls in the rainy season from June to September. The monsoon thus affects agricultural production in Nepal. In the years with less rainfall, harvests of farm produce decrease considerably.

The temperature in Kathmandu is characterized as the continental climate with a large difference between day and night temperatures. The temperature ranges from a minimum of -2.4 ºC in January to a maximum of 29.1 ºC in July. The temperature variation is the largest in winter from 19 ºC to 2.4 ºC in January. The table and figure below show the monthly variation in temperature and precipitation.

Table 7. Temperature and Precipitation in the Kathmandu Valley

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average high (°C)	19.1	21.4	25.3	28.2	28.7	29.1	28.4	28.7	28.1	26.8	23.6	20.2	25.5
Average low (°C)	2.4	4.5	8.2	11.7	15.7	19.1	20.2	20	18.5	13.4	7.8	3.7	12.1
Precipitation (mm)	14.4	18.7	34.2	61	123.6	236.3	365.4	330.8	199.8	51.2	8.3	13.2	1454.9

Source: Department of Hydrology and Meteorology.



Source: Department of Hydrology and Meteorology.

Figure 6. Temperature and Precipitation in the Kathmandu Valley

4) Land Use and Vegetation

In the Kathmandu Valley's land use in 2011, agricultural land accounted for 42% of the total, forests covered 28%, and urban areas comprised 25%. Notably, from 1967 to 2011, urban areas increased approximately eightfold, growing from a mere 3% to 25%. In contrast, agricultural land decreased by 10 percentage points, declining from 52% in 1967 to 42% in 2011. This shift reflects the progressive urbanization of agricultural land in the vicinity as the city expanded outward.

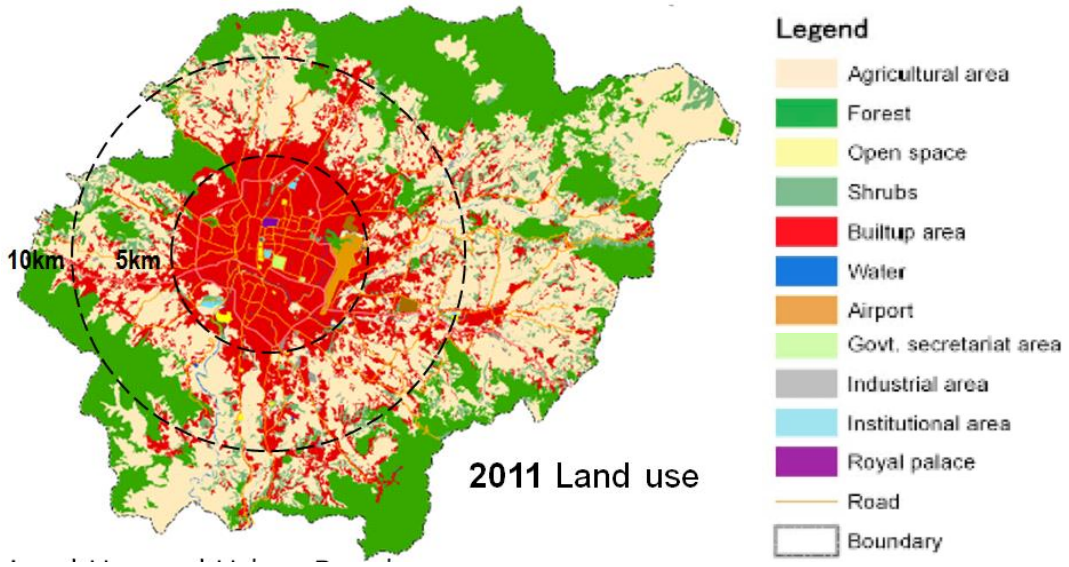
Land Use Type	1967		1978		1991		2000		2011	
	ha	%	ha	%	ha	%	ha	%	ha	%
Shrubs	13,563	19.81	12,124	17.71	8,129	11.87	7,150	10.44	33,67	5.13
Forest	15,800	23.08	16,311	23.82	13,887	20,29	13,301	19.43	18,156	27.66
Water	1,337	1.95	1,380	2.02	1,341	1.96	1,266	1.85	235	0.36
Urban/built-up area*	2,010	2.94	3,362	4.91	6,313	9.22	9,717	14.19	16,216	24.70
Open space	100	0.15	95	0.14	135	0.20	171	0.25	105	0.16
Agricultural area	35,648	52.07	35,186	51.40	38,653	56.46	36,853	53.84	27,567	41.99
Total	68,458	100.00	68,458	100.00	68,458	100.00	68,458	100.00	65,646	100.00

*Includes built-up areas, industrial areas, roads, airport, institutional areas, government secretariat areas and the Royal Palace.

Source: Thapa & Murayama 2009 (1967-2000) and JICA Survey Team 2012 (2011)

The map below shows the land use pattern in the Kathmandu Valley for 2011.

It is evident from the map that land use in the Kathmandu Valley is predominantly urbanized within approximately a 5-kilometer radius from the central city of Kathmandu. In the belt spanning 5 to 10 kilometers from the city center, urban areas extend outward from the central core, primarily along major roads. However, a significant portion of the land in this zone remains designated for agricultural and open space purposes. Beyond roughly 10 kilometers from the city center, the landscape is characterized by mountains and hills, resulting in a substantial portion of the land being covered by forests.



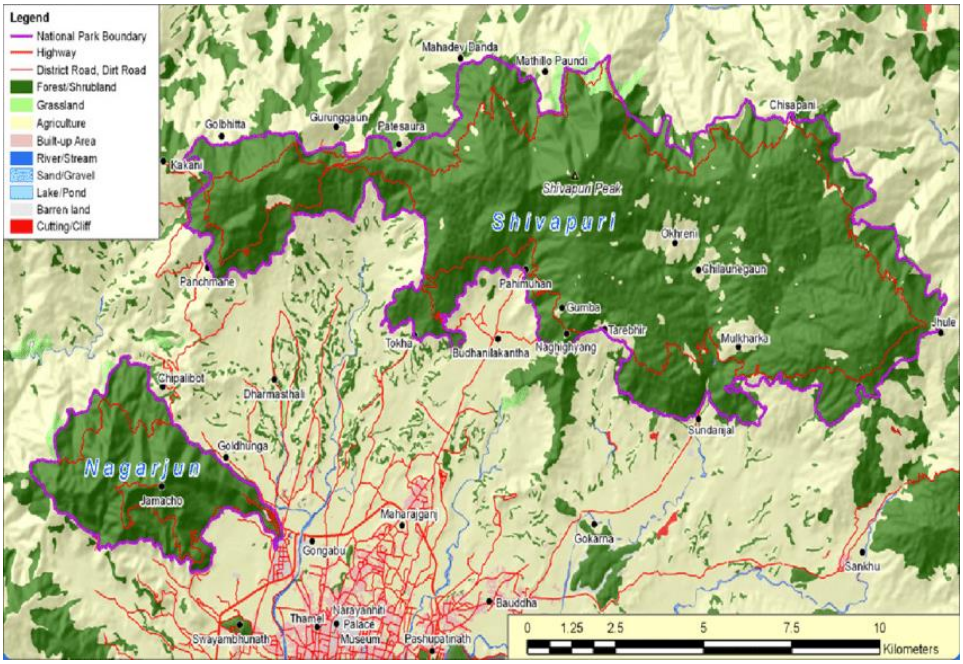
Source: JICA Study Team 2012

Figure 7. Land Use of the Kathmandu Valley (2011)

5) Protected area/National Park

Though there is no protected area in the Kathmandu Valley metropolitan area, a national park namely Shivapuri Nagarjun National Park (SNNP) lies in the northwestern ridge of the valley and about 12km away from the centre of capital city. The park, an area of 159km2 with a peak

of 2,732m, is one of the 20 protected areas in Nepal, and was gazetted as the Nepal's nineth national park in 2002 and later declared as Shivapuri Watershed and Wildlife Reserve.



Source: International Centre for Integrated Mountain Development

Figure 8. Map of Shivapuri Nagarjun National Park

6.2.5 Administrative Boundaries and Population

The Kathmandu Valley spans across three districts and five municipalities, including:

- The majority of the Kathmandu district, encompassing Kathmandu city and Kirtipur city.
- Approximately one-third of Lalitpur district, including Lalitpur city.
- The entirety of Bhaktapur district, including Bhaktapur city and Madhyapur Thimi city.

6.2.6 Pollution Control

National Ambient Air Quality Standards of 2012 sets the air quality, water quality, and noise standards. The table below is the environmental standards accompanying with other standards of Japan and IFC/WHO.

Table 8. Environmental Standards in Nepal

Item	Unit	Environmental Standards		
		Nepal	Japan	IFC/WHO
Air Quality				
SO2	ppm μg/m^3	<70μg/m^3(24hours) <50μg/m^3(1year)	<0.04 ppm (Daily ave.) <0.1 ppm (/hour)	<20μg/m^3(24hours) <500μg/m^3(10minutes)
NO2	ppm μg/m^3	<80μg/m^3(24hours) <40μg/m^3(1year)	<0.04-0.06 ppm (Daily ave.)	<40μg/m^3(1year) <200μg/m^3(1hour)
PM10(SPM)	mg/m^3	<0.12(24hours)	<0.10 (Daily ave.) <0.20 (/hour)	<0.02(1year) <0.05(24hours)
PM2.5(SPM)	mg/m^3	<0.04(24hours)	<0.015(1year) <0.035(24hours)	<0.02(1year) <0.025(24hours)

Item	Unit	Environmental Standards					
		Nepal		Japan		IFC/WHO	
CO	ppm mg/m^3	<10mg/m^3(8hour-ave.)		<10mg/m^3(daily ave.) <20mg/m^3(8hour-ave.)		-	
Ozone(Ox)	ppm μg/m^3	<157μg/m^3(8hours)		<0.06 ppm(/hour) (≈120μg/m^3)		<100μg/m^3(8hours)	
Water Quality		Discharge Water(treated)		Category B (Agricultural)	Category C (Industrial)	Effluent Water	
pH	pH	5.5-9		6-8.5	6-8.5	6-9	
SS	mg/l	<100		<25	<50	<50	
BOD	mg/l	<100		<8	<10	<30	
COD	mg/l	<250		<5	<8	<125	
Coliform-Faecal	MPN/100ml CFU/100ml	—		<1000CFU/100ml		<400 MPN/100ml (sanitary sewage)	
Noise		Urban Residential	Industrial	Residential	Industrial	Residential	Industrial
dB(A)	dB(A)	<55(day) <50(night)	<75(day) <70(night)	<55(day) <45(night)	<60(day) <50(night)	<55(day) <45(night)	<70(day・night)
Vibration		Residential	Industrial	Residential	Industrial	Residential	Industrial
dB	dB	-		55-65	75	-	

Source: JICA Study Team

7 Legal Framework for Environmental and Social Considerations

7.1 Laws, Regulations and Standards Related to Environmental and Social Issues

The table below lists the legal framework of Nepal related to environmental considerations.

Table 9. Laws related to Environmental Considerations

Category	Theme	Laws and Regulations	Relevant Agency
Investigation and approval of development activities	EIA/IEE/ SEA	Environmental Protection Act, 2076 (2019) Environmental Protection Rules, 2077 (2020)	MOFE
		Environmental and Social Management Framework, 2064 (2007) amendment 2013	DOR/GESU
Pollution control	Environmental Standards	Environmental Standards and Collection of Related Information 2075 (2018)	MOFE, MOPIT
	Soil disposal	Environmental and Social Management Framework, 2064 (2007) amendment 2013	DOR/GESU
	Waste control	Environmental and Social Management Framework, 2064 (2007) amendment 2013	DOR/GESU
natural environment	Forest clearance, Biodiversity conservation	Nepal Forest Guidelines, 2063 (2006) Forest Products Collection & Sales Distribution Guidelines, 2058 (2001) Watershed Conservation Rule, 2042 (1985) Local Self-Governance Act, 2056 (1999)	MOFE, Local Government
	Rivers	Water Resources Act, 2049 (1992) Local Self-Governance Act, 2056 (1999)	MOWS, Local Government
	Nature conservation	National Parks and Wildlife Conservation Act, 2030 (1973) Soil and Watershed Conservation Act, 2039 (1982)	MOFE
cultural heritage	Conservation of cultural heritage	National Parks and Wildlife Conservation Act, 2030 (1973) Soil and Watershed Conservation Act, 2039	MOCTCA

Category	Theme	Laws and Regulations	Relevant Agency
		(1982)	

Source: Data Collection Survey on Urban Transport in Kathmandu Valley, 2019

The table below lists the legal framework of Nepal related to social considerations.

Table 10. Laws related to Social Considerations

Category	Theme	Laws and Regulations	Relevant Agency
Social Considerations	Land acquisition and compensation	Land Acquisition Act, 2034 (1977) Land Acquisition Guidelines, 2046 (1989) Land Acquisition, Resettlement & Rehabilitation Policy, 2072 (2015) Immovable Property Acquisition Act, 2013 (1956)	DOR/GESU
	Community forest	Forest Act, 2049 (1993) Forest Rules, 2053 (1995)	MOFE, District FUGs
	Drinking water	Nepal Water Supply Corporation Act, 2046 (1989) Drinking Water Regulation, 2055 (1998) Essential Commodity Protection Act, 2012 (1955)	DWSS
	Indigenous groups	National Foundation for Upliftment of Aadibasi /Janjati Act, 2059 (2002)	DOR/GESU
	Dalit groups	Caste-based Discrimination and Untouchability (Offence and Punishment) Act, 2068 (2011)	MOWCSC/ DOR/GESU
	Additional assistances	Environmental and Social Management Framework, 2064 (2007)	DOR/GESU

Source: Data Collection Survey on Urban Transport in Kathmandu Valley, 2019

7.2 Relevant Agencies and Institutions

7.2.1 MOPIT (Ministry of Physical Infrastructures and Transport)

The organizational structure of MOPIT is positioned under the Minister, with the Secretary serving as the Minister's assistant. Below the Secretary, there are four Joint Secretaries, each responsible for one of the following areas:

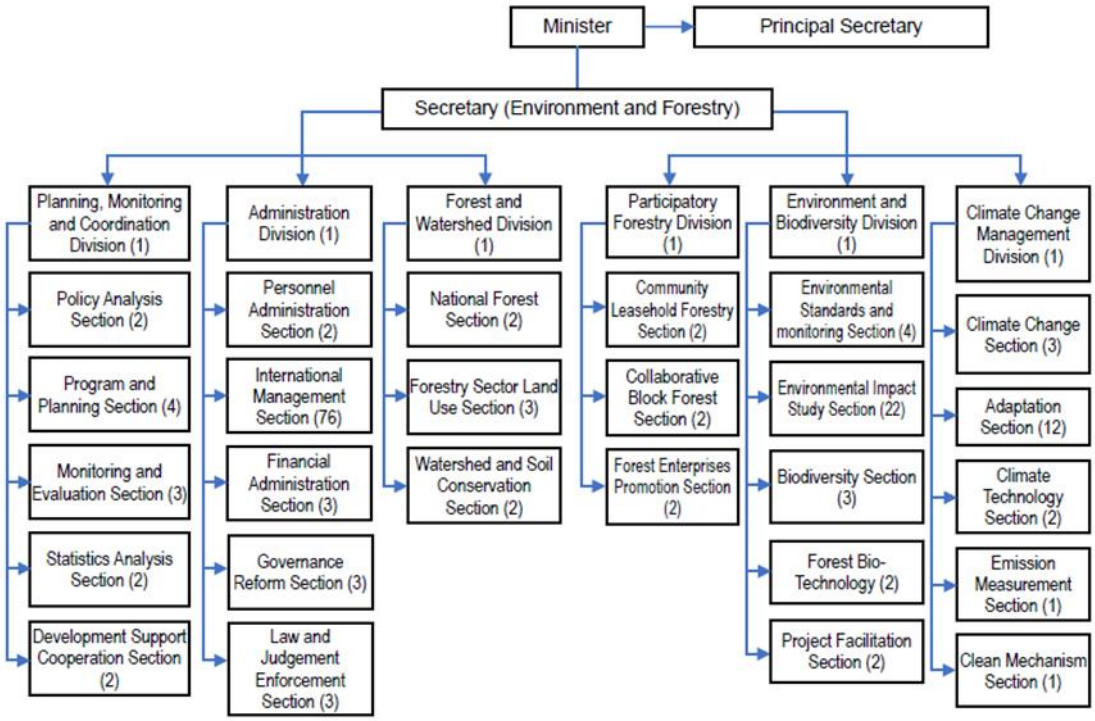
・Administration Division
・Infrastructure Construction and Transportation Division
・Planning Monitoring and Evaluation Division
・Development Assistance Coordination and Quality Division

The review process for Environmental Impact Assessments (EIA) and Initial Environmental Examinations (IEE) is managed within relevant departments such as the Department of Roads (DOR) under MOPIT. The reports compiled by these departments are submitted to MOPIT's Planning Monitoring and Evaluation Division. Subsequently, these reports are thoroughly examined by the Environment and Social Sector within the Division. Following this internal

review, the reports undergo an approval process involving coordination with the Ministry of Forests and Environment (MOFE). (The EIA approval process is described further in later section.)

7.2.2 MOFE (Ministry of Forests and Environment)

Below is the organizational chart for MOFE (Ministry of Forests and Environment). The review of the scoping report required for the Strategic Environmental Assessment (SEA) process and the thorough examination of SEA reports are conducted by the Environment and Biodiversity Division. Similarly, for EIA and IEE, the respective sectors within the Environment and Biodiversity Division analyse and evaluate the reports by their specific domains. They also engage in interactions with the implementing agencies for revisions and improvements as needed.



Source: MOFE

Figure 9. Organization Chart of the Ministry of Forests and Environment

7.2.3 Capacity of Environment and Social Sector of MOPIT

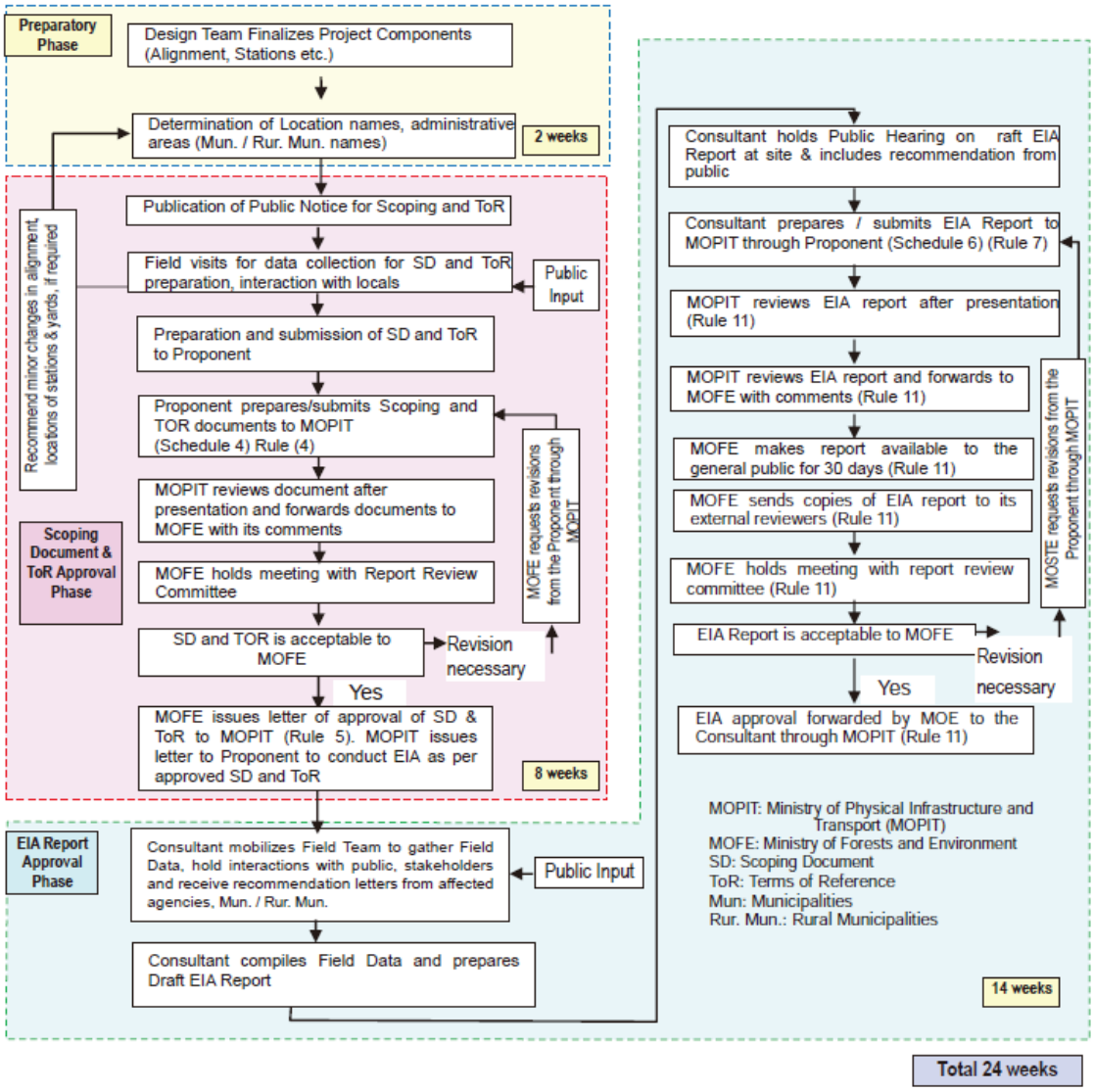
MOPIT's Environment and Social Sector responsible for the main project in the SEA consists of one manager, one environmental engineer, and one assistant, totalling three members. On the other hand, MOFE's Environmental Impact Study Sector, responsible for EIA, comprises a total of 22 members. Considering the workload of technical personnel involved in EIAs, it is expected that MOPIT's environmental engineers would be relatively numerous. However, when conducting the main project's SEA, there is a need for additional staff on MOPIT's side, such as increased environmental personnel or appointments of concurrent roles, as well as securing support

personnel from other departments.

Moreover, regarding implementation capabilities, since MOPIT lacks experience in formal SEA application procedures in Nepal, efforts are required to establish a Technical Working Group, including support personnel from MOFE with expertise and experienced environmental engineers. This initiative aims to enhance the capacity to undertake activities related to environmental and social considerations, particularly in SEA.

7.2.4 Flow of Environmental Impact Assessment and Environmental Clearance

The approval process for EIA in Nepal is outlined below. The EIA study and approval process takes approximately 3.5 months.



Source: Data Collection Survey on Urban Transport in Kathmandu Valley, 2019

Figure 10. EIA Flow in Nepal

The approval process for SEA in Nepal is outlined below. The SEA study and approval process takes approximately 7 months.

#	Details	Necessary time
1	The implementing agency submits a list of projects subject to the Strategic Environmental Assessment (SEA) to the Office of the Prime Minister.	1 week
2	The National Planning Commission (NPC) within the Office of the Prime Minister thoroughly reviews and approves this.	2 weeks
3	The implementing agency conducts the scoping study and submits its report to MOFE.	3 weeks
4	MOFE reviews and approves the scoping results within 30 days, during which necessary revisions are made.	4 weeks
5	After approval by MOFE, the implementing agency submits the scoping report and results to the Office of the Prime Minister.	1 week
6	The Office of the Prime Minister approves the scoping results. Subsequently, the implementing agency publicly discloses the scoping results through means such as the web and institutional publications and solicits public input for a period of 30 days.	4 weeks
7	The implementing agency compiles the SEA report, taking into account the opinions of citizens and others, and submits it to MOFE.	12 weeks
8	MOFA reviews and approves the SEA report within 30 days, during which any necessary revisions are made.	4 weeks
9	The implementing agency submits the SEA's final report to the Office of the Prime Minister.	1 week
10	The Office of the Prime Minister approves the SEA's final report.	2 weeks
	Total necessary time	30 weeks

Source: Environmental Protection Regulations (2020)

8 Provisional Scoping of Environmental and Social Considerations

8.1 Target of Environmental and Social Considerations

For the main Project, the following infrastructure developments are tentatively considered as subjects for environmental and social considerations, with the impact factors used based on JICA Guidelines for the road and bridge sector projects:

Potential New Infrastructure:

- Bus-exclusive lane development (elevated)
- Bus park development
- AGT (Automated Guideway Transit) development (elevated)
- MRT (Mass Rapid Transit) development (elevated)
- Yard development
- Station-area redevelopment related to Transit-Oriented Development (TOD)

Improvement of Existing Facilities:

- Road improvements related to BRT (Bus Rapid Transit) implementation (including road widening)
- Road improvements related to LRT (Light Rail Transit) implementation (including road widening)

- Intersection improvements (including flyover construction)

8.2 Provisional Scoping

Below is the provisional scoping for the development plan envisaged in the aforementioned main project.

Table 11. Provisional Scoping (P: Planning, C: Construction, O: Operation)

Category	#	Environmental Component	Evaluation		Reason for evaluation
			P/C Phases	O Phase	
Measures against pollution	1	Air pollution	−/✓	✓	P Phase: There are no activities that would cause air pollution. C Phase: Deterioration in air quality is anticipated when traffic congestion occurs. Temporary deterioration in air quality (including particulate matters) is expected with the operation of heavy machinery and construction equipment. O Phase: An improvement in air quality due to a reduction in vehicle emissions and particulate matter resulting from the increased use of public transportation is expected.
	2	Water pollution	−/✓	−	P Phase: There are no activities that would cause water pollution in the river. C Phase: There is a possibility of river water pollution due to the use of heavy machinery and construction equipment. O Phase: There are no activities that would cause water pollution in the river.
	3	Waste	−/✓	−	P Phase: There are no activities that would generate waste. C Phase: The generation of general waste, construction debris, and similar waste is anticipated as a result of the construction workers' daily activities. O Phase: Waste generation is not anticipated.
	4	Noise and vibration	−/✓	✓	P Phase: There are no activities that would increase noise or vibration. C Phase: Noise resulting from the operation of heavy machinery and construction equipment, among other things, is expected. O Phase: There are concerns about the noise and vibration produced by public transportation vehicles.
	5	Ground subsidence	−/✓	✓	P Phase: There are no activities causing ground subsidence, such as large-scale groundwater pumping. C/O Phases: In cases involving large-scale excavation work, there is concern about subsidence due to a decrease in groundwater levels from the loss of water in the excavated soil during construction and gradual leakage of groundwater during operation period.
Natural environment	6	Protected areas	−/✓	−	P Phase: There are no protected areas within the Kathmandu Valley. C Phase: When procuring construction materials for embankment and crushed stone from regions outside the Kathmandu Valley, it is essential to be mindful of the potential impact on protected areas. O Phase: There are no affected protected areas.
	7	Ecosystem	−/✓	✓	P Phase: There are no activities in the project area and its vicinity that would have impact on the ecosystem. C/O Phases: There is concern about the potential negative impact on the river's ecosystem due to oil spills form the heavy machinery during construction and operating vehicles during operation period when construction of structures within the river is involved.
	8	Hydrological conditions	−/✓	✓	P Phase: There are no activities that would impact the hydrological conditions.

Category	#	Environmental Component	Evaluation		Reason for evaluation
			P/C Phases	O Phase	
					C/O Phases: There is concern about the potential negative impact on the river channel resulting from changing the water flow when construction of structures within the river is involved.
	9	Topography and geology	−/✓	✓	P Phase: There are no activities that would affect the topography or geology. C Phase: There is concern about the potential negative impact based on the necessity of excavation and embankment. O Phase: There is concern about negative impact such as slope erosion when road development involving road embankment is carried out.
Social environment	10	Land acquisition and resettlement	✓/−	−	P Phase: In case where land acquisition is required for activities such as road widening, vehicle depot development, and construction yard provision, there is a possibility of resettlement and land acquisition. C/O Phases: There are no elements that would trigger resettlement and land acquisition because activities related to them have been completed before the commencement of construction.
	11	Local economy such as employment and livelihood	−/✓	✓	P Phase: No impact on the local economy is anticipated during the planning stage. C Phase: Positive effects on the local economy are expected, including increased distribution of consumer goods due to employment promotion and an influx of workers associated with construction activities. A deterioration of the local economy would be expected when the project involves involuntary resettlement. O Phase: The optimization of human and material flow is expected to result in the revitalization of the local economy, leading to a positive impact on the local economy. A deterioration of the local economy would be expected when the project involves involuntary resettlement.
	12	Cultural Heritage	✓/✓	✓	P Phase: Due to the presence of seven major archaeological sites and numerous cultural facilities deeply rooted in the Kathmandu Valley, which are registered with UNESCO, it is essential to be mindful of the potential negative impact on these cultural heritage sites and facilities resulting from the project. C Phase: There is concern about the potential impact on cultural heritage and related events due to access control measures associated with the construction activities. O Phase: The negative impact on significant cultural heritage and facilities is limited. If the structures are constructed adjacent to the cultural heritage, indirect negative impacts would be concerned due to some environmental change such as in the movement of people or wind.
	13	Landscape	−/✓	✓	P Phase: There are no activities that would impact the landscape. C/O Phases: When constructing structures such as a flyover or elevated structures for railways in urban areas, there is concern about the potential impact on the landscape as a cultural heritage city.
	14	Ethnic minorities and indigenous peoples	−	−	There are no ethnic minorities or indigenous peoples in the project area and its vicinity.
	15	Working conditions (including work safety)	−/✓	−	P Phase: There are no activities anticipated to impact the working environment. C Phase: If technically challenging tasks arise that are difficult for local construction workers to handle, there is a potential impact on labour safety. O Phase: There are no elements that would worsen the working

Category	#	Environmental Component	Evaluation		Reason for evaluation
			P/C Phases	O Phase	
					environment.
	16	Impoverished classes	✓/—	✓	P Phase: There is a possibility that the target of resettlement may include impoverished individuals. C Phase: By taking appropriate considerations for the impoverished individuals during the planning phase, negative impacts on the impoverished individuals can be avoided. O Phase: Positive effects such as increased employment opportunities are expected as a result of the revitalization of the local economy initiated by the improvement of the urban transportation system.
	17	Existing social infrastructures and social services	✓/✓	✓	P/C Phases: There is concern about the potential negative impact associated with the relocation of healthcare facilities, educational institutions, religious facilities, as well as the relocation of utilities such as water supply, telecommunications, and electricity. O Phase: The enhancement of the urban transportation system, accompanied by improved public transportation, will lead to increased accessibility to the city centre and enhanced road safety.
	18	Social capital and social structure of regional decision-making bodies	—/—	—	P Phase: There is no anticipation of negative impacts on the social capital in the vicinity of the project area. C/P Phases: There would be no impact on social capital or local decision-making bodies.
	19	Local conflict of interests	✓/—	—	P Phase: In the event of station-area development associated with the construction of the urban transportation system, there is a possibility of conflicting interests arising within the region surrounding the project area. C/O Phases: No negative impacts are expected after the commencement of construction.
	20	Gender	✓/✓	—	P Phase: There is a concern that insufficient attention to gender mainstreaming may occur during the decision-making process at the planning stage. This could potentially lead to issues concerning the rights of women and the fairness of social minorities in terms of compensation for land acquisition, resettlement, and livelihood restoration. C Phase: There is a possibility that gender balance may not be considered in relation to employment opportunities for local residents in construction work. O Phase: There are no anticipated negative impacts on gender resulting from this project.
	21	Children's rights	✓/✓	—	P Phase: There is a possibility of issues arising regarding the rights of children in terms of compensation for land acquisition, resettlement, and livelihood restoration. C Phase: There is a possibility of issues arising regarding the rights of children in relation to labour force recruitment for the construction work. O Phase: There are no anticipated negative impacts on the rights of children resulting from this project.
	22	Infectious diseases such as HIV/AIDS (including hygiene condition)	—/✓	—	P Phase: There are no anticipated impacts of HIV/AIDS or other infectious diseases resulting from this project. C Phase: There is a possibility that infectious diseases could spread due to the influx of construction workers. O Phase: There are no anticipated impacts of HIV/AIDS or other infectious diseases resulting from this project.
Others	23	Accidents	—/✓	✓	P Phase: There are no activities that would lead to accidents.

Category	#	Environmental Component	Evaluation		Reason for evaluation
			P/C Phases	O Phase	
					C Phase: The increase in construction-related vehicle traffic may raise the likelihood of accidents involving construction workers and residents in the vicinity. O Phase: Pedestrian safety will be ensured through the effective management of traffic flow as a result of improvement in the urban transportation system.
	24	Trans-boundary impacts and climate change	ー/ー	✓	P Phase: There are no activities that would lead to negative impacts. C Phase: The trans-boundary impacts and climate change are limited. O Phase: The improvement of the urban transportation system is expected to lead to a decrease in greenhouse gas emissions, as it ensures a smooth road traffic environment.

Source JICA Study Team

8.3 Terms of References for Environmental and Social Considerations

During the Project on Kathmandu Valley Urban Transport System Master Plan (hereinafter referred to as 'Project'), a Strategic Environmental Assessment (SEA) should be carried out in accordance with the JICA Guidelines. The SEA study will be positioned as a preliminary environmental impact assessment of strategic actions, plans and programs proposed in the Project aiming to ensure that environmental aspects are effectively considered at the early stage of decision-making periods.

Addition to the SEA study, an Initial Environmental Examination (IEE) study for the prioritized projects in a pre-feasibility study should be carried out in accordance with the JICA Guidelines for future implementation of the proposed prioritized projects to be implemented based on the environmental legal framework in Nepal.

Terms of Reference for the SEA and IEE study on the Project is summarized below. Tasks include the followings, but not limited to;

(SEA study)

(1) Establishing SEA study team consisted of the personnel in charge of environmental and social consideration issues from Ministry of Physical Infrastructure and Transport (MOPIT) cooperating with JICA Experts.
(2) Conducting analysis of goals and objectives of the Project.
(3) Clarifying components of the prioritized projects or structural measures to be defined in the Project.
(4) Conducting environmental scoping analysis.
(5) Conducting baseline surveys related with environmental and social considerations in the Project, including land use, natural environment, social environment such as socio-economic condition and existence of vulnerable people.
(6) Confirming the legal and institutional framework of Nepal on environmental and social

considerations, including;

a) Laws, regulations, and standards related to environmental and social considerations (e.g. environmental impact assessment procedure, land acquisition and resettlement procedure, pollution control standards, public participation, information disclosure, and others);

b) Gaps between the JICA Guidelines and the legal framework of Nepal on environmental and social considerations; and

c) Relevant organizations responsible for implementation of projects and their roles on environmental and social considerations.

(7) Conducting analysis of environmental impact assessment of the prioritized projects or structural measures to be defined in the Project.

(8) Conducting comparative analysis on alternative scenarios of the prioritized project or structural measures in terms of environmental, social, technical, economic, and financial aspects. This analysis includes 'Without Option' as one of the alternative scenarios for doing nothing. Evaluation of prioritized projects or structural measures is carried out from the aspect of environmental and social consideration, and Items reflected to the master plan will be clarified.

(9) Conducting analysis of mitigation measures to avoid, minimize the potential negative impacts clarified in the analysis carried out in the previous or relevant studies.

(10) Examination of environmental monitoring methods (monitoring items, frequencies, and methods).

(11) Holding stakeholder meetings (namely as 'public hearing' in Nepal) through the certain preparatory activities followed by the environmental legal frameworks in Nepal including stakeholder analysis. The meetings will be held on the following stages;

a) Stage of scoping analysis for public transportation development that could potentially be applied in the future; and

b) Stage of preparation of the draft SEA report

Effectiveness, validity of methodology and timing of meetings shall be considered.

(12) Circulating the draft SEA report to relevant institutions/authorities for their comments, and finalizing the SEA report by incorporating the comments.

(IEE study)

(1) Establishing IEE study team consisted of the personnel in charge of environmental and social consideration issues from Ministry of Physical Infrastructure and Transport (MOPIT) cooperating with JICA Experts.

(2) Conducting additional baseline surveys for the project selected in the pre-feasibility study to complement the one conducted for the SEA study.

(3) Conducting analysis of alternatives which includes "without project" situations, prediction, and assessment of environmental and social impacts for the project selected in the pre-

feasibility study.

(4) Conducting development of mitigation measures including avoidance, minimization, reduction, mitigation, a compensation for the project selected in the pre-feasibility study.

(5) Drafting a monitoring plan including institutional arrangement for the project selected in the pre-feasibility study.

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

To be determined during the Project.

END