Technical Assistance Report

PUBLIC

Project Number: 56001-001
Knowledge and Support Technical Assistance (KSTA)
May 2022

Kingdom of Bhutan: Master Plan for National Highways Connectivity

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 4 May 2022)

Currency unit	–	ngultrum (Nu)
Nu1.00	=	$0.013
$1.00	=	Nu76.46

ABBREVIATIONS

ADB	–	Asian Development Bank
CNDP	–	Comprehensive National Development Plan
COVID-19	–	coronavirus disease
DOR	–	Department of Roads
HDM-4	–	fourth highway development and management software
km	–	kilometer
RSMP	–	Road Sector Master Plan
SASEC	–	South Asia Subregional Economic Cooperation
TA	–	technical assistance

NOTES

(i) The fiscal year (FY) of the Government of Bhutan and its agencies ends on 30 June. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2020 ends on 30 June 2020.
(ii) In this report, "$" refers to United States dollars.

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KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data — **Project Number:** 56001-001

Project Name	Master Plan for National Highways Connectivity	**Department/Division**	SARD/SATC
Nature of Activity	Capacity Development	**Executing Agency**	Department of Roads
Modality	Regular		
Country	Bhutan		

2. Sector

	Sector	Subsector(s)	ADB Financing ($ million)
✓	Transport	Road transport (non-urban)	2.000
		Total	**2.000**

3. Operational Priorities

- ✓ OP1: Addressing remaining poverty and reducing inequalities
- ✓ OP2: Accelerating progress in gender equality
- ✓ OP3: Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability
- ✓ OP5: Promoting rural development and food security
- ✓ OP6: Strengthening governance and institutional capacity
- ✓ OP7: Fostering regional cooperation and integration

Climate Change Information

GHG Reductions (tons per annum)	0
Climate Change impact on the Project	Low
ADB Financing	
Adaptation ($ million)	0.020
Mitigation ($ million)	0.000
Cofinancing	
Adaptation ($ million)	0.000
Mitigation ($ million)	0.000

Sustainable Development Goals

SDG 1.4
SDG 5.b
SDG 9.1
SDG 13.a

Gender Equity and Mainstreaming

Some gender elements (SGE) ✓

Poverty Targeting

Geographic Targeting ✓
Household Targeting ✓

4. Risk Categorization Complex

5. Safeguard Categorization Safeguard Policy Statement does not apply

6. Financing

Modality and Sources	Amount ($ million)
ADB	**2.000**
Knowledge and Support technical assistance: Technical Assistance Special Fund	2.000
Cofinancing	**0.000**
None	0.000
Counterpart	**0.000**
None	0.000
Total	**2.000**

Currency of ADB Financing: US Dollar

I. INTRODUCTION

1. The knowledge and support technical assistance (TA) for the Master Plan for National Highways Connectivity will enhance the planning capacity of the road transport sector in Bhutan by (i) reviewing the road network's connectivity and maintenance plan, (ii) developing the master plan for national highways up to 2040, and (iii) supporting the Department of Roads (DOR) of the Ministry of Works and Human Settlement in strengthening its planning capacity.

2. The objective of the TA project is identified as one of the three pillars in the country partnership strategy of the Asian Development Bank (ADB) for Bhutan, 2019–2023: improved connectivity to provide access to information and markets.[1] The TA will support deeper regional cooperation and integration by improving physical connectivity.

II. ISSUES

3. **Transport in Bhutan.** Bhutan is a landlocked nation with a small population of about 756,000 dispersed throughout its mostly mountainous terrain.[2] Formidable geographic and weather conditions make it difficult and expensive to deliver services and to build and maintain vital infrastructure. Road transport is by far the dominant mode of transport, followed by air transport. The number of registered vehicles increased by 30% from 88,227 in fiscal year (FY) 2017 to 114,646 in FY2021.[3] Most of the vehicles are considered light vehicles (65%), followed by heavy vehicles (10%) and two-wheelers (10%).[4]

4. **Existing road networks.** The construction in 1968 of the country's first national road, the Thimphu–Phuentsholing Highway, expedited the expansion of the road network. As of 2020, Bhutan's road network has a total road length of 18,355.62 kilometers (km), comprising primarily of farm roads (11,257.16 km or 61%), followed by national highways (2,840.93 km or 15%) and *dzongkhag* (district) roads (2,072.86 km or 11%).[5] As of June 2020, almost 90% of the overall road network in Bhutan is single-lane carriageway. However, only 30% of this is blacktopped or sealed, of which about 80% are national highways and *dzongkhag* roads.[6]

5. The national highways form the backbone of the country, comprising (i) a northern east–west highway that passes through the center of the country and the capital, Thimphu; (ii) a series of north–south corridors on the border with India, including the main access highway between Thimphu and Phuentsholing, part of Asian Highway 48, and the South Asia Subregional Economic Cooperation (SASEC) road corridor 3;[7] and (iii) an incomplete southern east–west highway that runs along the border with India in the south. The highway remains inadequate in coverage and condition. Travel between the east and west regions of Bhutan relies on the single east–west

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1 ADB. 2019. *Country Partnership Strategy: Bhutan, 2019–2023—Fostering Diversification and Reducing Disparities*. Manila. The TA first appeared in the business opportunities section of ADB's website on 24 February 2022.

2 Government of Bhutan, National Statistics Bureau. 2021. *Projected Population for 2021*. Thimphu.

3 Government of Bhutan, Road Safety and Transport Authority. 2021. *Annual Report 2020–2021.* Thimphu; and Government of Bhutan, Road Safety and Transport Authority. 2017. *Annual Report 2016–2017*. Thimphu.

4 The rest of the vehicles include taxis (5%), earth moving equipment vehicles (3%), power tillers (3%), medium vehicles (1.4%), and others (heavy buses, tractors, medium buses, and electric vehicles) (1.4%).

5 Government of Bhutan, Ministry of Works and Human Settlement. 2020. *Road Classification and Network Information of Bhutan*. Thimphu. The other types of roads include thromde (municipality) roads (417.09 km or 2%), and access roads (1,767.58 km or 10%).

6 Government of Bhutan, National Statistics Bureau. 2021. *Statistical Yearbook of Bhutan 2021.* Thimphu.

7 ADB. 2020. *SASEC Operational Plan 2016–2025 Update*. Manila. SASEC Road Corridor 3 (The India–Association of Southeast Asian Nations East–West Corridor): Kolkata–Siliguri–Guwahati–Imphal–Moreh/Tamu–Mandalay–Bago–Myawaddy, with spurs Hasimara–Phuentsholing–Thimphu and Bago–Yangon.

national highway running through the northern part of the country or through Indian road connections south of the Bhutan–India border.[8]

6. **Logistics and trade.** The country relies heavily on its roads for domestic and international trade. About 95% of freight is transported by road to and from the border crossing points between Bhutan and India. The country's main border check post is in Phuentsholing and accounts for 76% of the total trade with India. Other crossing points are Gelephu, Samdrup Jongkhar, and Samtse, which handle significantly lower volume because they (i) are farther from major transit corridors leading to Kolkata, India, or Burimari, Bangladesh; and (ii) have insufficient connectivity and trade facilities. The government will strengthen these crossing points by supporting the upgrade of border connecting roads and infrastructure.[9] The absence of critical roads in southern Bhutan, leading to longer travel time, has constricted trade integration.[10] This missing link has complicated the logistics of emergency equipment distribution during the national lockdown due to the coronavirus disease (COVID-19) pandemic.

7. **Rural-to-urban migration.** The 2017 population and housing census of Bhutan reveals that depopulation started in the eastern and central parts of the country: 46,700 people moved from rural to urban areas in 5 years preceding the census, comprising 29.3% of recent internal migrants.[11] The National Statistics Bureau noted the net rural-to-urban migration narrowed compared with the previous census in 2005, but the transition to an urban society can nevertheless be expected to continue in the 2020s.[12] With the continuing rural–urban shift, which is a consequence of better social opportunities and employment, an increased demand for inter-*dzongkhag* travel is expected. Inter-*dzongkhag* connectivity and traffic management are deemed to (i) support accessibility of people, supplies, and domestic trade; (ii) provide opportunities to deliver benefits to rural communities; and (iii) ensure balanced development in the primary (agriculture), secondary (industry), and tertiary (services) sectors of the economy.

8. **Road maintenance and asset management.** For FY2021, the budget allocation for the road sector is Nu4,226 million, about 6% of the total national budget.[13] However, the recurrent nature of road maintenance works remains a key structural weakness in the sector. Periodic maintenance works and monsoon restoration works managed by the DOR were reportedly underachieved during FY2014–FY2018 because of the lack of systematic prioritization of road maintenance and proper asset records.[14]

9. Several attempts have been made to strengthen road asset management capacity in the DOR. This included the introduction of the maintenance management system in the 1990s, an information system in 2006, and the fourth highway development and management software

[8] For example, the travel distance and time from Paro International Airport to Samdrup Jongkhar, in southeastern Bhutan, is about 650 km (a 20-hour drive) or, if routed through the border with India, 510 km (a 12-hour drive).
[9] Government of Bhutan, Ministry of Information and Communications. 2016. *National Transport Policy 2017 (Second Draft)*. Thimphu.
[10] Government of Bhutan, Ministry of Economic Affairs. 2020. *Diagnostic Trade Integration Strategy Update 2020*. Thimphu.
[11] Government of Bhutan, National Statistics Bureau. 2018. *Rural-Urban Migration and Urbanization in Bhutan*. Thimphu.
[12] Government of Bhutan, National Statistics Bureau. 2020. *Policy Brief: Rural–Urban Migration and Urbanization in Bhutan*. Thimphu.
[13] Government of Bhutan, Ministry of Finance. 2020. *National Budget Financial Year 2020–21*. Thimphu.
[14] Government of Bhutan, Royal Audit Authority. 2019. *Performance Audit Report on Road Maintenance Works, Department of Roads, Ministry of Works and Human Settlement*. Thimphu.

(HDM-4) in 2009.[15] However, these systems were discontinued based on the diagnosis that (i) the DOR has insufficient understanding of the scope of road asset management, (ii) only a few staff were trained, (iii) follow-up trainings were inadequate, and (iv) equipment and guidelines to collect uniform data from field divisions were insufficient.

10. **Climate-resilient road construction.** Because of geography as well as inadequate preventive maintenance activities and limitations on other modes of transportation, Bhutan's road network is vulnerable to increasing threats from climate change and risks from natural hazards. Longer monsoon seasons triggering landslides with heavy snow in winter demand a whole range of asset management activities. The DOR is committed to providing reliable and resilient road infrastructure through the implementation of the 2019 guidelines on design, construction, and maintenance of climate- and disaster-resilient road infrastructures that incorporate climate change adaptation and disaster risk reduction measures at all stages in road development.[16]

11. **Sector road map.** The sector is mainly guided by the Comprehensive National Development Plan (CNDP) for Bhutan 2030; the Road Sector Master Plan (RSMP), 2007–2027; the Road Act of Bhutan 2013; the Twelfth Five-Year Plan, 2018–2023; the Bhutan Transport 2040 Integrated Strategic Vision; and the Road Classification and Network Information.[17] The RSMP is a 20-year program developed in 2006 focusing on network expansion, upgrades, and maintenance. In 2009, the sector has undergone rapid developments such as delineation of responsibilities in planning, construction, and maintenance, and reclassification of roads in 2013. The country's long-term strategic vision of transport sector development was reconfirmed by the Bhutan Transport 2040 Integrated Strategic Vision, prepared in 2011. It comprises an overall goal, supporting objectives, and a series of integrated strategies to guide government policy and investment planning in road network development, road transport, urban transport, civil aviation, and regional connectivity. Between 2013 and 2020, the construction of new roads has leaned toward farm roads with an increase in length of 114%, and *dzongkhag* roads with a 76% increase, compared with only 16% growth in national highways.

12. The CNDP indicated the need to develop an efficient and reliable network to (i) provide alternative routes, (ii) address rural-to-urban migration and promote regionally balanced development, and (iii) reduce travel times for the north–south corridors to 8 hours and for the east–west corridor to 16 hours or less. The current thrusts of the road sector in the Twelfth Five-Year Plan are to (i) improve the road network through consolidation, enhance the national highway grid, and complete the missing road links; (ii) improve national highways using environment-friendly road construction and climate-proofing technology; and (iii) reduce travel time with bypass roads and tunneling options. An updated master plan for the national highway network would help the DOR to budget and plan resources to achieve the long-term plan.

13. **Alignment with ADB's Strategy 2030.** The TA will help achieve ADB's operational priorities of addressing remaining poverty and reducing inequalities, promoting rural development

[15] ADB. 2009. *Capacity Building in Road Safety Audit and Road Asset Management*. Consultant's report. Manila (TA-4658-BHU); and ADB. 2013. *Completion Report: Road Network Project in Bhutan*. Manila.

[16] Government of Bhutan, Ministry of Works and Human Settlement. 2019. *Guidelines on Design, Construction and Maintenance of Road Infrastructure Incorporating Climate-Resilient Features.* Thimphu.

[17] Government of Bhutan, Ministry of Works and Human Settlement. 2019. *The Project for Formulation of Comprehensive Development Plan for Bhutan 2030*. Thimphu; Government of Bhutan, Ministry of Works and Human Settlement. 2006. *Road Sector Master Plan (2007–2027)*. Thimphu; Government of Bhutan. 2019. *Twelfth Five-Year Plan (2018–2023)*. Thimphu; Government of Bhutan. 2013. *The Road Act of Bhutan 2013*. Thimphu; ADB. 2013. *Bhutan Transport 2040 Integrated Strategic Vision*. Manila; and Government of Bhutan, Ministry of Works and Human Settlement. 2020. *Road Classification and Network Information of Bhutan*. Thimphu.

and food security, and fostering regional cooperation and integration by improving road connectivity nationally and regionally. Hence, this will also generate economic activities, job opportunities, and access to basic services. The TA will tackle climate change, build climate and disaster resilience, and enhance environmental sustainability by early consideration of disaster risk and environmental impact at the planning stage. It will also strengthen governance and the DOR's institutional capacity to identify and implement quality infrastructure investments. Gender equality will be assured by encouraging gender-oriented thinking and participation of female staff in capacity building.

14. **ADB contribution to the Bhutan transport sector.** Since 1993, ADB has assisted in six road projects.[18] These helped improve the northern east–west highway and north–south connections, expand feeder roads, construct parts of the southern east–west highway, and improve connectivity with the border crossing. ADB also helped the DOR develop a road safety audit manual in 2017. In 2019, under an ADB grant, the DOR purchased a system collecting road roughness data, now in use by the DOR's maintenance team.[19] Additionally, ADB provided 10 TA projects to Bhutan in sector strategy development, road asset management, and road safety.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

15. The TA is aligned with the following impact: road network connectivity in Bhutan improved.[20] The TA will have the following outcome: planning and programming of road transport sector managed by the DOR in Bhutan improved.[21] The TA supports planning and investment programming for national highway expansion and road maintenance that foster systematic development of critical roads, thereby enhancing connectivity within the country and with its neighbors.

16. The TA is designed to capture a balance of government plans and policies, user needs, economic benefits, and social and environmental impacts. With lessons from previous works on road asset management, the TA will ensure that the concept of evidence-based road work planning is transferred and provide adequate trainings to the DOR to use specific tools to identify road sections and assign maintenance or improvement options.

B. Outputs, Methods, and Activities

17. **Output 1: Road maintenance plan up to 2040 developed.** The TA aims to support the development of a systematic road maintenance plan for recurrent, periodic, and emergency maintenance to improve asset road life and its quality. More specifically, the TA will

(i) collaborate with the DOR maintenance division to understand the maintenance schedule of DOR-administered national highways and access roads;[22]

[18] ADB. 1993. *Technical Assistance to the Kingdom of Bhutan for the Development of a Maintenance Management System*. Manila; ADB. 2005. *Kingdom of Bhutan for the Road Network Project*. Manila; ADB. 2009. *Kingdom of Bhutan: Road Network Project II*. Manila; ADB. 2014. *Kingdom of Bhutan: SASEC Road Connectivity Project*. Manila; ADB. 2016. *Kingdom of Bhutan: SASEC Transport, Trade Facilitation, and Logistics Project*. Manila; and ADB. 2016. *Kingdom of Bhutan: Thimphu Road Improvement Project*. Manila.

[19] ADB. 2014. Bhutan: South Asia Subregional Economic Cooperation Road Connectivity Project. The road safety audit manual, climate change-resilient road design training, and road roughness collection system were supported under the SASEC Road Connectivity Project.

[20] Defined by the TA.

[21] The design and monitoring framework is in Appendix 1.

[22] Regional corridors are categorized as national highways.

(ii) review the current plan, funding allocation, maintenance manual, performance of road asset management systems, guidelines on maintenance of road infrastructure incorporating climate-resilient features (footnote 19), and performance audit report on road maintenance works (footnote 14);
(iii) set up a systematic mechanism for recurrent and periodic maintenance;
(iv) review the operating procedure for emergency road maintenance and delineation of works;
(v) review and collect data for analysis using HDM-4, and forecast different maintenance budget scenarios;
(vi) identify (a) additional improvements as required to ensure sustainable operation and maintenance of road asset, and (b) alternative funding arrangements for periodic maintenance;
(vii) develop a plan to strengthen the road asset management system (e.g., setting up a database with available resources), and propose new technologies to be adopted; and
(viii) conduct consultations and workshops to disseminate the outputs of the TA.

18. **Output 2: Master plan for national highway up to 2040 developed.** The TA aims to produce a master plan for national highways to improve national and regional connectivity, build up urban and rural accessibility, and enhance existing corridors with climate-resilient features. More specifically, the TA will

(i) review and assess the available traffic data and traffic demand;
(ii) conduct a gender equality and social inclusion-responsive traffic survey for passengers and goods, showing origins and destinations along study roads;[23]
(iii) review and incorporate relevant sector plans and development policies;[24]
(iv) conduct traffic surveys and forecasts for national highways and inter-*dzongkhag* roads, and conduct network modeling with various strategies;
(v) collaborate with the DOR planning division, propose potential projects of new roads and/or upgrade of existing ones, with consideration not limited to balance among new roads and upgrading existing roads, economic benefits, travel time reduction, domestic and regional connectivity, geography, environmental and social sensitivity, and climate and disaster risks;[25]
(vi) compare different budget scenarios with HDM-4 and determine an appropriate level of expenditure on investments for construction, upgrading, and rehabilitation, with consideration of projected climate and disaster risks;
(vii) formulate a master plan for national highways, including regional trade corridors, with a priority investment plan and an estimated budget for up to 2040;
(viii) conduct strategic environmental assessment for the master plan;[26] and

[23] If road users survey is proposed, the survey group shall include persons with disabilities and older people, disaggregated by sex, and consultations with relevant representative civil society organizations of these groups.
[24] These include but are not limited to (i) CNDP; (ii) RSMP, 2007–2027; (iii) Twelfth Five-Year Plan, 2018–2023; (iv) Bhutan Transport 2040 Integrated Strategic Vision; (v) SASEC Economic Corridor Investment Plan; (vi) Protocol of 2016 India–Bhutan Agreement on Trade, Commerce and Transit and its addendum; (vii) Bay of Bengal Multi-Sectoral Technical and Economic Cooperation Master Plan for Transport Connectivity; and (viii) South Asian Association for Regional Cooperation Regional Multimodal Transport Study.
[25] Social sensitivity includes, but is not limited to, social safety, political or religious disputes, indigenous settlements, and existing or planned public goods. Climate change plans and/or priorities in other sectors, such as logistics, agriculture, and tourism, shall be considered.
[26] The Strategic Environmental Assessment Regulation 2002 requires that any agency that formulates, renews, modifies, or implements any policy, plan, or program, which may have a significant effect on the environment, shall perform a strategic environmental assessment before the proposal is adopted or submitted to the Government of Bhutan.

(ix) conduct consultations and workshops to disseminate this output of the TA.

19. **Output 3: Planning capacity of the Department of Roads enhanced.** The TA aims to enhance the DOR's capacity on transport planning and road asset management. More specifically, the TA will train DOR engineers in

(i) using HDM-4 for maintenance management and project planning; and
(ii) road asset management with climate change adaptation measures, road safety audit with additional gender equality and social inclusion features, and contract management.

C. Cost and Financing

20. The TA financing amount is $2,000,000, which will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF 7). The key expenditure items are listed in Appendix 2.

21. The government will provide counterpart support in the form of counterpart staff; access to TA-relevant data, information, and maps; staff time to review outputs of consultants; necessary coordination with stakeholder agencies; support for organizing committee meetings, workshops, and trainings; and other in-kind contributions.

D. Implementation Arrangements

22. ADB will administer the TA. Implementation arrangements are summarized in the table. ADB's South Asia Department will select, supervise, and evaluate consultants.

Implementation Arrangements

Aspects	Arrangements		
Indicative implementation period	June 2022–October 2024		
Executing agency	DOR[a]		
Implementing agency	DOR		
Consultants	To be selected and engaged by ADB		
	Firm: QCBS with a 90:10 quality–cost ratio	45.25 international and 43 national person-months	$2,000,000
Procurement	To be procured by consultants		
	Request for quotation for office and survey equipment, software, or software license[b]	10 contracts	$25,000
	Request for quotation for survey services[c]	10 contracts	$145,000
Disbursement	Disbursement of TA resources will follow ADB's *Technical Assistance Disbursement Handbook* (2020, as amended from time to time).		
Asset turnover or disposal arrangement upon TA completion	All assets and equipment procured under the TA will be handed over to the executing agency after completion of the TA activities.		

ADB = Asian Development Bank, DOR = Department of Roads, QCBS = quality- and cost-based selection, TA = technical assistance.

[a] The Department of Roads is under the Ministry of Works and Human Settlements.

[b] Software purchase is part of the consulting firm's $2.0 million contract, and includes but is not limited to computer-aided drawing tool, traffic demand modeler, and the fourth highway development and management software (HDM-4).

[c] Survey services are part of the consulting firm's $2.0 million contract. They include but are not limited to traffic counting, road condition survey, origin and destination survey, road user survey, axle load survey, and environmental survey.

Source: Asian Development Bank.

23. **Consulting services.** ADB will engage the consultants following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions.[27] An international consulting firm will (i) conduct surveys, collect and analyze data, and provide recommendations; (ii) arrange and conduct training, workshops, and seminars; and (iii) procure and install the required software or software license to deliver the TA outputs.

IV. THE PRESIDENT'S DECISION

24. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of $2,000,000 on a grant basis to the Government of Bhutan for the Master Plan for National Highways Connectivity, and hereby reports this action to the Board.

[27] Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 3).

DESIGN AND MONITORING FRAMEWORK

Impact the TA is Aligned with
Road network connectivity in Bhutan improved[a]

Results Chain	**Performance Indicators**	**Data Sources and Reporting Mechanisms**	**Risks and Critical Assumptions**
Outcome Planning and programming of road transport sector managed by the DOR in Bhutan improved	By 2024: a. National highway network expansion plan and road maintenance plan endorsed by the MoWHS (2022 baseline: Not applicable) (OP 1.3.1; OP 3.2.4; OP 3.2.5; OP 5.1.1; OP 7.1.2)	a. MoWHS administrative order and/or issuance	R: Prolonged government consultation process may delay the MoWHS's adoption of the proposed national highway plan. A: Funds will be available to implement projects.
Outputs 1. Road maintenance plan up to 2040 developed	By 2024: 1a. Road maintenance protocol with systematic mechanism for recurrent, periodic, and emergency road maintenance prepared with consideration of climate-resilient measures (2020 baseline: Not applicable) 1b. Road maintenance plan up to 2040 with recommendations to ensure sustainable operation and maintenance of road assets developed (2020 baseline: Not applicable)[b] (OP 1.3.1; OP 3.2.4; OP 3.2.5; OP 5.1.1; OP 6.1.1; OP 7.1.2)	1a.–b. Consultant's reports	R: Continuous prevalence of the COVID-19 pandemic could affect the recruitment and the implementation of consulting services.
2. Master plan for national highway up to 2040 developed	By 2024: 2a. Traffic forecast and transport network modeling conducted (2020 baseline: Not applicable)[b] 2b. Master plan for national highway up to 2040 with priority investment plan developed (2022 baseline: Not applicable) (OP 1.3.1; OP 5.1.1; OP 7.1.2) 2c. SEA for the national highway master plan 2040 conducted (2022 baseline: Not applicable)	2a.–c. Consultant's reports	

Results Chain	Performance Indicators	Data Sources and Reporting Mechanisms	Risks and Critical Assumptions
3. Planning capacity of the DOR enhanced	By 2024: 3a. At least 80% of DOR engineers trained (of which 30% are female) report increased knowledge in HDM-4, road asset management, traffic forecasting and network modeling, climate change adaptation, and road safety audit with GESI features [c] (2022 baseline: 0) (OP2.3.1; OP3.2.4; OP 6.1.1)	3a. Consultant's reports; pre- and post-workshop surveys	

Key Activities with Milestones

1. Road maintenance plan up to 2040 developed

1.1 Mobilize consultants (October 2022)
1.2 Review all relevant data and conduct consultation with the DOR (December 2022)
1.3 Establish systematic mechanism for periodic maintenance, manual, and schedule for routine maintenance (February 2023)
1.4 Develop 3-year periodic maintenance plan (March 2023)
1.5 Develop road maintenance plan up to 2040 (together with road master plan) (March 2024)

2. Master plan for national highway up to 2040 developed

2.1 Collect data and conduct survey required by network modeling and HDM-4 model (March 2023)
2.2 Develop draft network analysis (August 2023)
2.3 Develop the final master plan up to 2040 (March 2024)
2.4 Complete SEA (May 2024)

3. Planning capacity of the DOR enhanced

3.1 Conduct training programs, seminars, workshops, or other capacity-building activities (May 2024)

TA Management Activities

Throughout the life of the TA:
Manage consultants regularly through assessment of outputs completed and approval of timesheets and expenses, conduct annual TA reviews to monitor utilization of TA funds and progress on TA performance indicators, and monitor implementation of capacity development activities.

Inputs

ADB: $2,000,000 (TASF 7)
Note: The government will provide counterpart support in the form of counterpart staff; access to TA-relevant data, information, and maps; staff time to review outputs of consultants; necessary coordination with stakeholder agencies; staff support for organizing committee meetings, workshops, and training; and other in-kind contributions.

A = assumption, ADB = Asian Development Bank, COVID-19 = coronavirus disease, DOR = Department of Roads, GESI = gender equality and social inclusion, HDM-4 = fourth highway development and management software, MoWHS = Ministry of Works and Human Settlement, NA = not applicable, OP = operational priority, R = risk, SEA = strategic environmental assessment, TA = technical assistance, TASF = Technical Assistance Special Fund.

[a] Defined by TA.

[b] The need for additional surveys, if any, will be selectively assessed within the given time frame and budget.

[c] Minimum of 20–25 DOR staff will participate in each of the trainings to be conducted. Ratio of male to female engineers in the DOR is 80:20 as of 2021.

Contribution to Strategy 2030 Operational Priorities:

The expected values and methodological details for all OP indicators to which this TA will contribute results are detailed in Contribution to Strategy 2030 Operational Priorities (accessible from the list of linked documents in Appendix 3).
Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Amount
Asian Development Bank[a]	
1. Consultants	
a. Remuneration and per diem[b]	
i. International consultants	1,305.73
ii. National consultants	223.23
b. Out-of-pocket expenditures	
i. International and local travel	75.18
ii. Office space rental and related facilities[b]	17.10
iii. Reports and communications	10.00
2. Goods (rental or purchase)[c]	25.00
3. Surveys	145.00
4. Training, seminars, workshops, forum, and conferences	80.00
5. Contingencies	118.77
Total	**2,000.00**

Notes:
1. The technical assistance (TA) is estimated to cost $2,110,000, of which contributions from the Asian Development Bank are presented in the table. The government will provide counterpart support in the form of counterpart staff; access to TA-relevant data, information, and maps; staff time to review outputs of consultants; necessary coordination with stakeholder agencies; staff support for organizing committee meetings, workshops, and training; and other in-kind contributions. The value of the government contribution is estimated to account for 5.5% of the total TA cost.
2. Numbers may not sum precisely because of rounding.

[a] Financed by the Asian Development Bank's Technical Assistance Special Fund (TASF 7).
[b] Disbursement as progress payment of deliverables.
[c] Includes office equipment, software and software license, and survey equipment. All assets and equipment procured under the TA will be handed over to the executing agency after completion of the TA activities.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/LinkedDocs/?id=56001-001-TAReport

1. Terms of Reference for Consultants
2. Contribution to Strategy 2030 Operational Priorities