ADB

South Asia Department
Transport and Communications Division

30 October 2019

Mr. Shreekrishna Nepal
Joint Secretary & Chief
International Economic Cooperation Coordination Division
Ministry of Finance

Dear Mr. Nepal:

Subject: TA 9836-NEP: Technical Assistance for Enhancing Road Safety, Disaster Risk Reduction, and Project Implementation Capacity — Technical Assistance Approval

We are pleased to inform you that on 29 October 2019, the Asian Development Bank (ADB) approved the provision of technical assistance to the Government of Nepal (the Government) in an amount not exceeding the equivalent of US$500,000 for Enhancing Road Safety, Disaster Risk Reduction, and Project Implementation Capacity.

The Technical Assistance will be financed from ADB's Technical Assistance Special Fund (TASF-6) and will be carried out pursuant to (i) the Technical Assistance Framework Agreement between the Government and ADB dated 16 November 1995 (the Framework Agreement), and (ii) the arrangements described in paragraphs 7 to 17 of the Technical Assistance Report attached hereto as Annex 1. Please note that the Technical Assistance will be implemented from 1 January 2020 to 31 December 2022. As indicated in the Technical Assistance Report, the Ministry of Physical Infrastructure and Transport is to serve as the executing agency for the Technical Assistance.

The Technical Assistance will be provided entirely as a grant.

The approval of the Government and Ministry of Physical Infrastructure and Transport to these arrangements shall be deemed given unless ADB has received a written objection from the Government (addressed to the undersigned) within 21 calendar days from the date first above written.

As Director of the Transport and Communications Division, I will henceforth be responsible for all matters pertaining to the implementation of the Technical Assistance. All communications on this matter may, therefore, be addressed to my office.

Yours sincerely,

Ravi Peri
Director

ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
Tel +63 2 632 4444
Fax +63 2 636 2444

Annex: Technical Assistance Report for Enhancing Road Safety, Disaster Risk Reduction, and Project Implementation Capacity

cc: Mr. Devendra Karki, Secretary, Ministry of Physical Infrastructure and Transport
Mr. Gopal Prasad Sigdel, Joint Secretary (Foreign Cooperation), Ministry of Physical Infrastructure and Transport
Mr. Keshab Kumar Sharma, Director General, Department of Roads
Mr. Dipak Shrestha, Project Director, Project Directorate (ADB), Department of Roads
Mr. Harischandra Dhakal, Under Secretary, Ministry of Finance
Mr. Bamdeb Panthi, Section Officer, Ministry of Finance

Technical Assistance Report

Project Number: 52097-002
Transaction Technical Assistance (TRTA)
September 2019

Nepal: Enhancing Road Safety, Disaster Risk Reduction, and Project Implementation Capacity

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 6 September 2019)

Currency unit	–	Nepalese rupee/s (NRe/NRs)
NRe1.00	=	$0.0087
$1.00	=	NRs114.93

ABBREVIATIONS

ADB	–	Asian Development Bank
DOR	–	Department of Roads
FIDIC	–	Fédération Internationale des Ingénieurs-Conseil (International Federation of Consulting Engineers)
ITMIS	–	intelligent traffic management and information system
ITS	–	intelligent transport system
km	–	kilometer
LMMS	–	landslide monitoring and management system
MOPIT	–	Ministry of Physical Infrastructure and Transport
TA	–	technical assistance

NOTES

(i) The fiscal year (FY) of the Government of Nepal ends on 16 July. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2019 ends on 16 July 2019.

(ii) In this report, "$" refers to United States dollars.

Vice-President	Shixin Chen, Operations 1
Director General	Hun Kim, South Asia Department (SARD)
Director	Ravi Peri, Transport and Communications Division, SARD
Team leader	Johan Georget, Transport Specialist, SARD
Team members	Mikael Andersson, Financial Management Specialist, SARD Bhupendra Bhatt, Senior Project Officer (Transport), SARD Maria Iris Bombay, Associate Safeguards Officer (Environment), SARD Sin Wai Chong, Transport Specialist, SARD Cheska Llamas, Operations Assistant, SARD Yang Lu, Transport Specialist, SARD Vergel Medina, Senior Social Development Specialist, SARD Lyailya Nazarbekova, Principal Counsel, Office of the General Counsel Ma. Theresa Prado, Project Officer, SARD Dinesh Shiwakoti, Procurement Specialist, Procurement, Portfolio, and Financial Management Department Suman Subba, Senior Social Development Officer (Gender), SARD Mitzi Vina Tamayo, Operations Assistant, SARD[a] Karma Yangzom, Senior Environment Specialist, SARD
Peer reviewers	David Fay, Unit Head of Project Administration, Pacific Department

[a] Transferred to Central and West Asia Department on 18 August 2019.

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I. THE PROPOSED PROJECT

1. The Government of Nepal requested the assistance of the Asian Development Bank (ADB) to support the improvement of the capacity, reliability, and safety of road links between Pokhara, Nepal's second-largest city, and Mugling, a central junction of the strategic road network that further links to Kathmandu, the administrative and economic capital; and Bharatpur, Nepal's fourth-largest city and a gateway to the East–West Highway and international markets. The project will finance the first phase of upgrading the Mugling–Pokhara Highway, and will (i) rehabilitate and widen to four lanes the 81-kilometer (km) section between Abukhaireni and Pokhara, and (ii) increase awareness and strengthen the capacity of the Department of Roads (DOR) in road safety and disaster risk reduction.

2. The project will directly support economic growth by (i) lowering transport costs and reducing logistics constraints; (ii) improving accessibility to domestic markets, jobs, and social services; (iii) enhancing national connectivity between Pokhara and Kathmandu; and (iv) facilitating access to international markets through Bharatpur and India. Consequently, the project is expected to (i) promote the development of the private sector and competitive export supply chains in Pokhara and its hinterland, (ii) increase domestic and international trade, (iii) improve regional integration, and (iv) leverage Pokhara's tourism potential. The project will be supported by an attached technical assistance (TA) that will improve road safety and traffic management; develop a disaster risk reduction system for road sections between Pokhara, Narayanghat, and Naubise; and strengthen the capacity of the executing and implementing agencies in project implementation, procurement, and contract management.

II. THE TECHNICAL ASSISTANCE

A. Justification

3. **Road safety.** Vehicle sales increased by 17.5% annually during FY2007–FY2017, although vehicle ownership remains low, with only 0.11 vehicles per capita.[1] The vehicle fleet increased from about 0.7 million in FY2009 to 3.2 million in FY2018, and is expected to quadruple by 2029. The high proportion of motorcycles increases road safety risks, as the frequency and severity of motorcycle accidents exceed that of other vehicle classes, particularly on deteriorated pavement. Reported traffic accidents increased from 3,800 in FY2002 to 13,580 in FY2013, an annual increase of 12.3%, while fatalities increased from 879 in FY2002 to 2,385 in FY2017, an annual increase of 6.8%.[2] Accidents and fatalities are likely to be underreported, particularly in the case of minor accidents and injuries; there are about 15.9 traffic fatalities per 100,000 people.[3]

4. The project road includes an 81 km section of the Mugling–Pokhara Highway between Abukhaireni and Pokhara, and two major bridges at Madi and Seti. The project road is a two-lane carriageway that carries about 7,400 vehicles per day, including 14% of goods vehicles and up to 55% of motorcycles in urban areas. Daily traffic is forecast to increase to about 13,000 vehicles by 2040, and the rising number of motorcycles creates significant road safety risks, notably as the project road (i) has a pavement in poor condition,[4] (ii) does not segregate slow-moving

[1] Government of Nepal, Department of Transport Management. 2018. *Vehicle Registration Details up to Fiscal Year 2074–75 (2017-18)*. Kathmandu. Compared with 0.42 vehicles per capita in India and 0.83 in the United States.

[2] Government of Nepal, Nepal Police, Traffic Directorate. 2015. *Accidents Statistics.* Kathmandu.

[3] World Health Organization. 2018. *Global Status Report on Road Safety 2018*. Geneva. Compared with 15.3 fatalities per 100,000 people in Bangladesh, 17.4 in Bhutan, 22.6 in India and 14.9 in Sri Lanka.

[4] The average international roughness index along the road ranges from 4.1 to 26.2, compared to an index of 2.0–2.5 for a pavement in good condition.

vehicles and pedestrians in urban areas, and (iii) has winding hilly sections. The project will widen the road to four lanes to cater to increasing demand, and design standards feature enhanced geometry, pavement, structure, and drainage; and safety features to improve sustainability, safety awareness, and safety compliance. The road will be median divided, and service lanes in urban areas will improve safety, particularly for women and children who are more likely to walk, ride a bicycle, or use public transport than men.

5. **Intelligent transport system.** The detailed design of the project road includes several road safety considerations; however, it does not include an advanced intelligent transport system (ITS), in which the DOR has limited expertise. An ITS involves a combination of infrastructure and pioneering information and communication technologies used in transport and traffic management systems to improve the safety, efficiency, and sustainability of transport networks and enhance road users' experiences and attitudes toward safer mobility. ITS can involve (i) high-level infrastructure and services to assess and accommodate future changes in travel patterns, (ii) mid-level components to strengthen safety and traffic flows dynamically, and (iii) field-level components for basic traffic control and monitoring services. Key attributes used to determine the appropriate level of ITS deployments in a country may include available ITS technologies, existing physical elements, legal and institutional constraints, desired ITS services and levels of service, financial resources availability, and the social and cultural context.[5] This TA will assist in formulating an intelligent traffic management and information system (ITMIS) for the Mugling–Pokhara Highway, including for the major junctions within 5 km east of Mugling toward Kathmandu, and 5 km south of Mugling toward Narayanghat.

6. **Landslide monitoring and management system.** The project road traverses the mid-hill region of Nepal, and is within an inherently weak geological zone characterized by active tectonics, where triggers such as intense rainfall and earthquakes make the mountains highly vulnerable to landslides, floods, and other mass-wasting processes. In the past, landslides caused by earth movements, rainfall, or erosion along the project road have blocked sections and led to human casualties, property losses, and environmental degradation. Therefore, ensuring the stability of slopes is crucial for the prevention and forecasting of landslides. The project includes mitigation measures such as retaining walls, slope protection, and bioengineering techniques where relevant. However, monitoring the displacements of a slope can provide information about the dynamics of the landslide phenomenon. The landslide monitoring and management system (LMMS) may involve remote sensing techniques, photogrammetric techniques, ground-based survey, and/or real-time geotechnical monitoring. The TA will conduct a feasibility study to identify which techniques are recommended for implementation on the project road and other landslide-sensitive areas in Nepal, and design an LMMS to strengthen disaster risk resilience.

7. **ADB's intervention.** The project will address infrastructure bottlenecks in the mid-hill region of Nepal. The transaction TA will complement infrastructure improvements by (i) supporting capacity building and institutional strengthening of MOPIT and DOR; and (ii) supporting road safety and disaster risk reduction on the project road, as well as the Mugling–Narayanghat and Mugling–Naubise road sections where relevant. As ADB's pipeline in the strategic road sector is increasing, with large projects and contract packages, the TA also aims to strengthen the capacity of MOPIT and DOR in project implementation, mainly by providing training courses, workshops, and ad hoc expertise on procurement and contract management. The TA will implement the following key activities: (i) a feasibility study for an ITMIS for Mugling–Pokhara, Mugling–

[5] United Nations Economic and Social Commission for Asia and the Pacific. 2017. *Development of Model Intelligent Transport Systems Developments for the Asian Highway Network*. Bangkok.

Narayanghat, and Mugling–Naubise; (ii) a feasibility study for the preparation of an LMMS; and (iii) capacity strengthening of MOPIT and DOR in procurement and contract management.

8. **Technical assistance modality.** The TA has been prepared at the request of MOPIT, which sought ADB's assistance to increase the capacity of DOR in road safety, ITS, landslide monitoring and management, and procurement and contract management. ADB and MOPIT defined the TA objectives, scope, and implementation arrangements. The TA modality is proposed, rather than a loan subcomponent, because it will improve the likelihood of achieving the proposed outputs and outcome of the loan-financed activities by (i) continuing the long-term partnership of the government and ADB on policy dialogue and capacity development; (ii) strengthening the capacity of MOPIT and DOR with regard to identified knowledge and management gaps, particularly considering the negative impacts of landslides experienced during the construction and operation of Mugling–Narayanghat Road; (iii) identifying potential high-level technology options for future road designs; and (iv) enhancing project implementation capacity. The TA is included in ADB's country operations business plan for Nepal, 2019–2021.[6]

B. Outputs and Activities

9. **Output 1: Intelligent traffic management and information system for road safety developed.** The TA will review the design of the Mugling–Pokhara Highway and prepare technical and functional specifications of the ITMIS for the Mugling–Pokhara Highway, and will support feasibility and procurement preparation by undertaking the following activities:

(i) study and forecast traffic volumes and traffic flow patterns along the Prithvi (Naubise–Pokhara) and Mugling–Narayanghat highways;
(ii) conduct a road safety audit of Mugling–Pokhara Highway and propose suitable traffic safety features and road furniture including traffic signals, signs, markings, overhead sign boards, crash barriers, delineators, and service areas;
(iii) conduct an accident survey of the road section and propose necessary measures to reduce accidents, including recommendations for an accident response system;
(iv) recommend road safety measures at intersections and major settlement areas;
(v) identify suitable ITS and traffic control station locations, prepare a schematic design and technical specification for each component proposed, including traffic lights, sparkle studs, advanced traffic management system, average speed cameras, advance warning signs, a vehicle detection system, dynamic message signs, closed-circuit television, a road weather information system, weighbridges, and/or an emergency management system;
(vi) design the ITMIS for the road section, including technical specifications, cost estimates and bid documents for system procurement, installation, maintenance, and in-house training events;
(vii) prepare guidelines for the installation and operation and maintenance of the ITMIS; and
(viii) conduct ITS workshops for MOPIT, DOR, and other relevant stakeholders.

10. **Output 2: Landslide monitoring and management system for disaster risk reduction developed.** The TA will

(i) review and update the landslide management manual published by DOR and suggest necessary upgrades and improvements;
(ii) identify at least three possible locations along national highways that require an LMMS at potential landslide areas (including between Mugling and Kurintar,

[6] ADB. 2018. *Country Operations Business Plan: Nepal, 2019–2021.* Manila.

between Ramche and Rasuwa, and in other locations to be discussed in consultation with DOR personnel); and review geological data and profile along the roads;

(iii) conduct bimonthly physical monitoring of the identified locations during the monsoon season, monthly physical monitoring outside the monsoon season, and satellite image monitoring;

(iv) recommend and design appropriate management and mitigation measures for landslide prevention and monitoring, coordinating with the ITS experts to include ITS components in the design of Mugling–Pokhara Highway as necessary;

(v) prepare a comprehensive LMMS plan and guidelines for monitoring activities and mitigation measures that suit the proposed locations, including all necessary manpower; equipment (such as photogrammetric techniques, extensometers, piezometer, inclinometer, tiltmeter, time-domain reflectometry cables, and data logger); costs estimates; bidding documents; and an implementation plan for system procurement, installation, operation and maintenance, and in-house training;

(vi) design an alert, alarm, and action plan for the LMMS along the project roads in consultation with MOPIT and relevant stakeholders; and

(vii) conduct workshops to introduce the LMMS to MOPIT, DOR, and relevant stakeholders; and support institutional strengthening and capacity-building activities.

11. **Output 3: Procurement and contract management capacity enhanced.** The TA will strengthen the capacity of MOPIT and the DOR in procurement and contract management, and:

(i) develop a detailed training module on procurement of works, contract management, and dispute resolution under the International Federation of Consulting Engineers (FIDIC) Works;

(ii) conduct in-country and overseas training and workshops for DOR and MOPIT officials on accredited FIDIC modules for at least 30 personnel;

(iii) conduct training and site visits for procurement for the engineering, procurement, construction; and the design–build modules of FIDIC; and

(iv) provide international practice advice on preparing procurement, bid documents, and contract management.

12. The TA outputs will be provided in addition to a goods and equipment package under the loan to support the implementation of the ITMIS and LMMS.

C. Cost and Financing

13. The TA is estimated to cost $550,000, of which $500,000 will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF 6). Key expenditure items are listed in Appendix 1. The government will provide counterpart support in the form of counterpart staff, information materials, data, maps, and other in-kind contributions estimated to account for 10% of the TA total cost.

D. Implementation Arrangements

14. ADB will administer the TA and be responsible for the selection, supervision, and evaluation of consultants.

15. The implementation arrangements are summarized in Table 1.

Table 1: Implementation Arrangements

Aspects	Arrangements		
Indicative implementation period	January 2020–December 2022		
Executing agency	Ministry of Physical Infrastructure and Transport		
Implementing agency	Department of Roads		
Consultants	To be selected and engaged by ADB		
	Firm: quality- and cost-based selection with a 90:10 quality to cost ratio.	13 international and 21 national person-months	$500,000
Procurement	To be procured by consultants		
	Shopping for office equipment	1–10 contracts	$20,000
Advance contracting	Advance contracting is proposed for the recruitment of firm.		
Disbursement	TA resources will be disbursed following ADB's *Technical Assistance Disbursement Handbook* (2010, 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 TA activities.		

ADB = Asian Development Bank, TA = technical assistance.
Source: Asian Development Bank estimates.

16. **Consulting services.** ADB will engage the consultants and carry out procurement following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions.[7] Consultants will administer training, surveys, workshops, and seminars under the TA budget; and procure equipment as applicable. The consulting services requirements are summarized in Table 2.

Table 2: Summary of Consulting Services Requirements

Position	Number	Person-Months	Total Person-Months
International Experts			
LMMS specialist and team leader	1	6.0	**6.0**
ITMIS specialist	1	5.0	**5.0**
Contract and procurement specialist	1	2.0	**2.0**
Subtotal			**13.0**
National Experts			
Geotechnical engineer and deputy team leader	1	7.0	**7.0**
Civil engineer	1	7.0	**7.0**
Information technology specialist	1	7.0	**7.0**
Subtotal			**21.0**
Total			**34.0**

ITMIS = intelligent traffic management and information system, LMMS = landslide monitoring and management system.
Source: Asian Development Bank.

17. **ADB's procurement.** Procurement will follow the ADB Procurement Policy (2017, as amended from time to time) and the Procurement Regulations for ADB Borrowers (2017, as amended from time to time).

[7] Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 2).

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Amount
A. Asian Development Bank[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	283.4
ii. National consultants	52.5
b. Out-of-pocket expenditures	
i. International and local travel	23.3
ii. Office space rental and related facilities	10.0
iii. Reports and communications	3.0
2. Goods (rental or purchase)[b]	20.0
3. Training, seminars, and conferences	67.8
4. Contingencies	40.0
Total	**500.0**

Note: The technical assistance is estimated to cost $550,000, of which contributions from the Asian Development Bank are presented in the table above. The government will provide counterpart support in the form of counterpart staff, information materials, data, maps, and other in-kind contributions. The value of government contribution is estimated to account for 10% of the total cost of the technical assistance.

[a] Financed by Asian Development Bank's Technical Assistance Special Fund (TASF 6).

[b] Including office equipment and survey equipment.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/LinkedDocs/?id=52097-002-TAReport

1. Terms of Reference for Consultants

TERMS OF REFERENCE FOR CONSULTANTS

A. Background

1. **Road safety.** Vehicle sales increased by 17.5% annually during FY2007–FY2017, although vehicle ownership remains low, with only 0.11 vehicles per capita.[1] The vehicle fleet is estimated at 3.22 million as of FY2018, up from 0.7 million in FY2009, and is expected to quadruple in the next decade. The high proportion of motorcycles increases road safety risks, as the frequency and severity of motorcycle accidents exceed that of other vehicle classes, particularly on deteriorated pavement. Reported traffic accidents increased from 3,800 in FY2002 to 13,580 in FY2013, an annual increase of 12.3%, while fatalities increased from 879 in FY2002 to 2,385 in FY2017, an annual increase of 6.8%.[2] Accidents and fatalities are likely to be underreported, particularly in the case of minor accidents and injuries. The traffic fatality rate, estimated at 15.9 fatalities per 100,000 population by the World Health Organization.[3] In response, the government prepared a Road Safety Action Plan (2013–2020) aligned with the five pillars of road safety: (i) improved road safety management, (ii) safer roads and mobility, (iii) safer vehicles, (iv) safer users, and (v) improved post-crash response.[4] Most of the SRN and LRN is intermediate or dual lane, increasing the likelihood and severity of head-on collisions and side collisions with pedestrians, bicycles, and motorcycles.

2. The project road includes an 81-kilometer (km) section from Abukhaireni to Pokhara of Mugling–Pokhara Highway, and two major bridges at Seti and Madi. The project road is a two-lane carriageway and carries about 7,400 vehicles daily, including 14% of goods vehicles and up to 55% of motorcycles in urban areas. Traffic is forecast to increase to about 13,000 vehicles by 2040, and the rising number of motorcycles creates significant road safety risks, notably as the project road (i) has a pavement in poor condition,[5] (ii) does not segregate slow-moving vehicles and pedestrians in urban areas, and (iii) has perfectible geometry in hilly sections. The road will be widened to four lanes to cater to increasing demand, and design standards will feature enhanced geometry, pavement, structure, drainage and safety features to improve sustainability, safety awareness, and safety compliance. The road will be median-divided, and service lanes in urban areas will improve safety, particularly for women and children who are more likely to walk, ride a bicycle or use public transport than men.

3. **Intelligent transport system.** The intelligent transport system (ITS) is a combination of infrastructures, pioneering information and communication technologies used in transportation and traffic management systems to improve the safety, efficiency, and sustainability of transportation networks, and enhance the road users' experiences with safer roads and mobility.[6] The level of ITS infrastructure and services deployed can be classified into different levels, from high-level, the deployment of which would accommodate future changes in transport pattern, to low-level which is expected to provide only basic ITS services; while the middle-level would

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[1] Government of Nepal, Department of Transport Management. 2018. *Vehicle Registration Details up to Fiscal Year 2074–75 (2017-18)*. Kathmandu. This compares with 0.42 vehicles per capita in India and 0.83 in the United States.

[2] Government of Nepal, Nepal Police, Traffic Directorate. 2015. *Accidents statistics.* Kathmandu; and Department of Roads. December 2013. *Status Paper on Road Safety in Nepal, Europe–Asia Road Safety Forum*, New Delhi.

[3] Compared to 15.3 fatalities per 100,000 population in Bangladesh, 17.4 in Bhutan, 22.6 in India and 14.9 in Sri Lanka. World Health Organization. 2018. *Global Status Report on Road Safety 2018*. Geneva.

[4] Government of Nepal, MOPIT. 2013. *Nepal Road Safety Action Plan (2013–2020).* Kathmandu; and World Health Organization. 2010. *Global Plan for the Decade of Action for Road Safety 2011–2020*. Geneva.

[5] The average international roughness index along the road ranges from 4.1 up to 26.2.

[6] MOPIT. 2013. *Nepal Road Safety Action Plan (2013-2020).* Kathmandu. Pillar 2: Safer Roads and Mobility and Pillar 4: Safer Road Users

accommodate ITS components adopted for improving on mobility and also other parameters such as safety and comfort. The key attributes used to determine the level of ITS deployments in a country may include available ITS technologies, existing physical elements, legal and institutional constraints, desired ITS services and levels of service, financial resources availability, and social and cultural background.[7] This TA will assist to formulate a preliminary design of ITS for the project road.

4. **Landslide monitoring and management system.** Nepal is a highly mountainous country and the project road is geologically passing through crushed and jointed Kathmandu Nappe affected by numerous faults and folds. The project corridor is within an inherently weak geological zone characterized by active tectonics where triggering factors such as intense rainfall and earthquakes make the mountains highly vulnerable to landslides and other mass-wasting processes, including floods. Landslides, due to earth movement, rainfall or erosion along the project road had resulted to road blockage, human casualties, property losses and environmental degradation in the past. Therefore, ensuring the stability of slopes is crucial for the prevention and forecast of landslides. Monitoring the displacements of a slope can provide information about the dynamics of the landslide phenomenon. The landslide monitoring and management system (LMMS) may involve remote sensing techniques, photogrammetric techniques, ground-based survey or real-time geotechnical monitoring. [8] Each technique has its own advantages and limitation, and this TA will carry out a feasibility study to identify which techniques are recommended to be implemented on the project road.

B. Objectives

5. The technical assistance (TA) will support the improvement of the capacity of the implementing agency in (i) environmental management by landslide management and monitoring system; (ii) road safety by intelligent traffic systems, such as traffic lights and advance warning signs; and (iii) procurement and contract management.

C. Scope of Services

6. The consulting team is expected to produce the following outputs or deliverables:

7. **Output 1: Intelligent traffic management and information system (ITMIS) for road safety developed.** The TA will review the design of Mugling–Pokhara Highway and prepare technical and functional specifications of the ITMIS for Mugling–Pokhara, Mugling–Narayanghat, and Mugling–Naubise Highways, and will support the procurement process, including:

(i) study and forecast traffic volumes and traffic flow patterns along the Prithvi Highway (Naubise–Pokhara) and Mugling–Narayanghat Road;
(ii) conduct road safety audit and design suitable traffic safety features and road furniture including traffic signals, signs, markings, overhead sign boards, crash barriers, delineators, service areas etc.;
(iii) conduct an accident survey of the road sections and propose necessary measures to reduce accidents, including recommendations for an accident response system;

[7] United Nations Economic and Social Commission for Asia and the Pacific. 2017. *Development of Model Intelligent Transport Systems Developments for the Asian Highway Network*. Bangkok.
[8] School of Rural and Surveying Engineering, The Aristotle University of Thessaloniki, 2003. P. D. Savvaidis *Existing Landslide Monitoring Systems and Techniques*. Greece.

(iv) conduct necessary consultation with the local stakeholders, traffic police, local authorities, road users and experts working in the field of road safety;
(v) design road safety measures at the intersections and major settlement areas;
(vi) identify suitable ITS and traffic control station locations, prepare a schematic design and technical specification for each component proposed, including but not limited to traffic lights, sparkle studs, advanced traffic management system, average speed cameras, advanced warning signs, vehicle detection system, dynamic message signs, closed-circuit television, road weather information system, or emergency management system;
(vii) design the ITMIS for the road sections, including technical specifications, cost estimates and bid documents for the system procurement, installation, maintenance and in-house trainings;
(viii) prepare necessary guidelines for the installation, operation and maintenance of the ITMIS; and
(ix) conducting ITS workshops for MOPIT, DOR, and other relevant stakeholders.

8. **Output 2: Landslide monitoring and management system for disaster risk reduction developed.** The TA will look into the geological environment along the project road, prepare technical and functional specifications of the LMMS, and will support the procurement process by:

(i) reviewing and updating the landslide management manual published by Department of Roads and suggest necessary upgrades and improvements;
(ii) reviewing geological data and profile along the roads to identify possible locations that require LMMS at potential landslide areas, with a minimum of three locations along national highways, including one on Mugling–Pokhara Road, in consultation with DOR personnel;
(iii) conducting physical bimonthly monitoring during the monsoon season and monthly during non-monsoon season, and conduct satellite image monitoring of the identified locations.
(iv) recommending and designing appropriate management and mitigation measures to prevent the monitored landslides, coordinating with the ITS experts to include necessary ITS components in the design as necessary;
(v) preparing a comprehensive LMMS plan and set out guidelines for monitoring activities and mitigation measures that suit the specific proposed locations, including all necessary manpower, equipment (such as photogrammetric techniques, extensometers, piezometer, inclinometer, tiltmeter, time-domain reflectometry cables, data logger), costs estimates, bidding documents, and implementation plan for system procurement, installation, operation, maintenance and in-house trainings;
(vi) carrying out meetings with MOPIT and relevant stakeholders to prepare alert-alarm action plan for the LMMS along project roads; and
(vii) conducting workshops to introduce LMMS to MOPIT, DOR, relevant stakeholders and monitoring units and support the DOR officials/engineers in institutional strengthening and capacity building.

9. **Output 3: procurement and contract management skills and capacity enhanced.** The TA will strengthen the capacity of MOPIT and DOR in procurement and contract management by:

(i) developing detailed training module on procurement works, contract management and dispute resolution under FIDIC Works;

(ii) conducting training and workshop for at least 50 personnel of DOR and MOPIT officials on accredited FIDIC modules;
(iii) conducting training and site visits for procurement under engineering, procurement and construction and design–build Module under FIDIC; and
(iv) providing international practice advice on preparing and managing engineering, procurement, bid document and contracts.

D. Time Schedule and Personnel Input

10. The TA will require a total of 13 person-months for international consultants and 21 person-months for national consultants (Table 1).

Table 1: Summary of Consulting Services Requirement

Position	Number	Person-months	Total Person-months
International Experts			
LMMS specialist and team leader	1	6.0	**6.0**
ITMIS specialist	1	5.0	**5.0**
Contract and procurement specialist	1	2.0	**2.0**
Sub-Total			**13.0**
National Experts			
Geotechnical engineer and deputy team leader	1	7.0	**7.0**
Civil engineer	1	7.0	**7.0**
Information technology specialist	1	7.0	**7.0**
Sub-Total			**21.0**
Total			**34.0**

ITMIS = intelligent traffic management and information system; LMMS = landslide management and monitoring system.
Source: Asian Development Bank.

E. Implementation Arrangements

11. MOPIT is the executing agency of the TA, while DOR is the implementing agency and will coordinate day-to-day implementation through the Project Directorate. MOPIT and DOR will review consultants' reports, reconcile different views among agencies, provide feedback to the consultants, and guide implementation. The steering committee will meet the consultant at inception, workshops, and any necessary meetings to discuss on design and deliverables.

12. A firm will be recruited using the quality- and cost-based selection method with a 90:10 quality to cost ratio. Following the submission of full technical proposal, procurement for goods and equipment will be carried out by the consultants in accordance with the ADB Procurement Policy (2017, as amended from time to time) and the Procurement Regulations for ADB Borrowers (2017, as amended from time to time).[9] Consultants will administer training, surveys, workshops, meetings and seminars under the TA budget, and procure equipment as applicable. The proceeds of the TA will be disbursed in line with the Technical Assistance Disbursement Handbook (2017, as amended from time to time). Upon completion of the TA, equipment procured under the TA will be transferred to the executing or implementing agencies at TA completion.

13. ADB will administer the TA and be responsible for the selection, supervision, and evaluation of consultants. The TA will be implemented over 36 months from January 2020 to

[9] ADB. 2017. *Procurement Regulations for ADB Borrowers: Goods, Works, Nonconsulting and Consulting Services*. Manila.

December 2022. It is expected that the ITS and LMMS related activities will be carried out over 18 months from June 2020 until December 2021, and that procurement and contract management activities will be carried out on intermittent basis between January 2020 and December 2022.

F. Reporting and Deliverables

14. The consultants will provide ADB and DOR with monthly progress reports on the action plan, including achievements, problems, and recommendations. The consultants will prepare specific working papers and reports in accordance with each main item of the TOR and Table 2. Upon completion of their services, the consultants will prepare a final preliminary design, cost estimation, technical specification and bidding documents for ITS and LMMS to cover all tasks required by outputs 1-3 of the TOR. Workshops and meetings are conducted with MOPIT, DOR, ADB, the consultant teams, and other key government agencies and stakeholders as knowledge exchange and necessary collaboration to fulfil TOR's requirements.

Table 2: Reports and Deliverables

No.	Title	Deliverable Date
1	Inception report	Within 4 weeks from commencement
2	Progress reports	Monthly
3	Draft preliminary design and cost estimation report on ITMIS	Within 4 months from commencement
4	Final preliminary design and cost estimation report on ITMIS	Within 6 months from commencement
6	Technical specification and bidding documents for ITMIS	Within 8 months from commencement
7	Interim LMMS report, including baseline data collection, methodology, and outline monitoring and management plan	Within 6 months from commencement
7	Draft feasibility report, preliminary design and cost estimation report on LMMS	Within 18 months from commencement
8	Final feasibility report, preliminary design and cost estimation report on LMMS	Within 20 months from commencement
9	Technical specification, bidding documents and alert-alarm action plan for LMMS	Within 23 months from commencement

ITMIS = intelligent traffic management and information system; LMMS = landslide management and monitoring system.
Source: Asian Development Bank.

15. All deliverables will be submitted in the English language to ADB and DOR, in electronic and printed copies. Three printed copies of the deliverables will be provided to ADB, MOPIT and DOR. Final reports must be delivered on a compact disk to MOPIT, DOR, RBN and DOTM, along with the specified number of printed copies.

16. **Stakeholder workshops**. The consultants will organize a minimum of three national workshops during TA implementation. The consultants, in consultation with DOR, will prepare a training, seminar and workshop program including selection criteria for candidates, training objectives, and cost estimates. Additional workshops may be proposed as required by ADB, the government, or the consultants.

Table 3: Workshops

No.	Workshop	Content[a]	Deliverable date
1	Workshop on ITS	• Introduction of varies ITS; • Output of draft preliminary design report; • Received initial feedback from stakeholder on draft design.	Within 3 months after submission of draft preliminary design report
2	Workshop on LMMS	• Introduction of LMMS; • Operation and monitoring of LMMS; • Discussion on alert-alarm action plan; • Received initial feedback from stakeholder on draft design.	Within 4 months after submission of draft preliminary design report
3	Procurement and contract management workshop[b]	• Training on different types of international procurement contracts; • Risk allocation; • Case studies.	Within 18 months from commencement

ITMIS = intelligent traffic management and information system; LMMS = landslide management and monitoring system.

[a] Content of workshop not limited to activities listed in the table.

[b] In addition to other in-country and overseas country training to be discussed with ADB, MOPIT, and DOR.

Source: Asian Development Bank.

G. Position-based Tasks and Responsibilities

S.N.	Position	Task Assignment
1.	Team leader/ LMMS specialist (international)	The specialist shall have at least 15 years of experience in geotechnical assessment and landslide monitoring. The specialist should have a master's degree or higher in geotechnical, geology or a related field, and strong proficiency in English. The main tasks of the expert include, but are not limited to: • review the geological data and profile along the project road and road design by project preparatory consultants to identify locations that requires LMMS in road safety aspect; • prepare feasibility study and preliminary design of LMMS that suits specific proposed locations; • conduct workshops to introduce LMMS to MOPIT and relevant stakeholders; • prepare alert-alarm action plan for the LMMS along project roads; • prepare cost estimation and bid document for system procurement, installation, maintenance and in-house trainings; • conduct and manage site surveys visits; and • prepare inception and monthly reports.
2.	ITMIS specialist (international)	The team leader/ ITS specialist shall have at least 20 years of experience in transport planning and traffic engineering with minimum 15 years in integrated transport system, and with project management skills. The specialist should have a master's degree or higher in transport planning and traffic engineering or related field, and strong proficiency in English. The main tasks of the expert include, but are not limited to: • manage overall progress of the TA activities; • lead and coordinate with international and national team members; • review the current road policy related to ITS and make recommendations; • conduct and manage site surveys visits;

S.N.	Position	Task Assignment
		• review road design by project preparatory consultants and conduct preliminary ITS design and cost estimation; • prepare technical specification and bidding documents for ITS; • formulating the relevant workshops for the participants from the different relevant agencies with close coordination of the executing and implementing agency; • handle training and technology transfer; • guide and/or supervise the work of key personnel & support staff to achieve the project objective; and • prepare inception and monthly reports.
3.	Contract and procurement specialist (international)	The specialist shall have at least 15 years of experience in engineering contract and procurement experiences, with a master's degree or higher in business administration, economics, engineering, public procurement, public policy, or other related fields; strong proficiency in English and FIDIC conditions of contract. Work experience in infrastructure and/or transport projects is an advantage. The main tasks of the expert include, but are not limited to: • conduct detailed technical and analytical review of ITS and LMMS bid documents; • conduct workshop to train 30 MOPIT personnel on procurement and contract management; and • prepare inception and monthly reports.
4.	Deputy team leader (National)	The expert shall have at least 15 years of experience in civil and geotechnical engineering with project management skills; and shall have preferably a master's degree in civil engineering, geotechnical engineering, engineering project management or related fields, and strong proficiency in English. The main tasks of the expert include, but are not limited to: • assist to monitor overall progress of the TA activities; • assist to lead and coordinate international team members, MOPIT, DOR and other stakeholders; • assist the preparation and submission of all deliverables in the TOR; • assist to arrange meetings, site visits, workshops and related logistics locally; • provide logistics arrangement for ex-country and in-country training of MOPIT, DOR and/or stakeholders' staff; • prepare inception and monthly reports; and • produce and submit deliverables, reports and any necessary materials.
5.	Civil engineer (national)	The expert shall have at least 15 years of experience in civil and geotechnical engineering with project management skills; and shall have preferably a master's degree in civil engineering, geotechnical engineering, engineering project management or related fields, and strong proficiency in English. The main tasks of the expert include, but are not limited to: • assist to monitor overall progress of the TA activities; • assist to lead and coordinate international team members, MOPIT, DOR and other stakeholders; • assist the preparation and submission of all deliverables in the TOR; • assist to arrange meetings, site visits, workshops and related logistics locally; • provide logistics arrangement for ex-country and in-country training of MOPIT, DOR and/or stakeholders' staff; • prepare inception and monthly reports; and

S.N.	Position	Task Assignment
		• produce and submit of deliverables, reports and any necessary materials.
5.	Information technology specialist (national)	The expert shall have at least 15 years of experience in information technology projects, with 5 years of experience in transport planning and traffic engineering, and strong proficiency in English. The main tasks of the expert include, but are not limited to: • assist to monitor overall progress of the TA activities; • assist to lead and coordinate international team members, MOPIT, DOR and other stakeholders; • assist the preparation and submission of all deliverables in the TOR; • assist to arrange meetings, site visits, workshops and related logistics locally; • provide logistics arrangement for ex-country and in-country training of MOPIT, DOR and/or stakeholders' staff; • prepare inception and monthly reports; and • produce and submit of deliverables, reports and any necessary materials.

FIDIC = Fédération Internationale Des Ingénieurs-Conseils (International Federation of Consulting Engineers); ITS = intelligent traffic system; ITMIS = intelligent traffic management and information system; LMMS = landslide monitoring and management system; MOPIT = Ministry of Physical Infrastructure and Transport; TA = technical assistance; TOR = terms of reference.
Source: Asian Development Bank.

H. Data and Assistance to be Provided by the Client

17. The government will provide the consultant with the following:

(i) access to data, records, and other information required to perform the assigned tasks; and
(ii) counterpart staff on a necessary basis.

18. Office space, including furniture and utilities, will need to be arranged by the consultants.