



# Technical Assistance Report

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Transaction Technical Assistance (TRTA)  
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## Nepal: Enhancing Road Safety, Disaster Risk Reduction, and Project Implementation Capacity

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**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.

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## CONTENTS

	<b>Page</b>
I. THE PROPOSED PROJECT	1
II. THE TECHNICAL ASSISTANCE	1
A. Justification	1
B. Outputs and Activities	3
C. Cost and Financing	4
D. Implementation Arrangements	4
 APPENDIXES	
1. Cost Estimates and Financing Plan	6
2. List of Linked Documents	7

## 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.<sup>1</sup> 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%.<sup>2</sup> 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.<sup>3</sup>

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,<sup>4</sup> (ii) does not segregate slow-moving

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<sup>1</sup> 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.

<sup>2</sup> Government of Nepal, Nepal Police, Traffic Directorate. 2015. *Accidents Statistics*. Kathmandu.

<sup>3</sup> 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.

<sup>4</sup> 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.<sup>5</sup> 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–

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<sup>5</sup> 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.<sup>6</sup>

## 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,

<sup>6</sup> 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 <i>Technical Assistance Disbursement Handbook</i> (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.<sup>7</sup> 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
<b>International Experts</b>			
LMMS specialist and team leader	1	6.0	<b>6.0</b>
ITMIS specialist	1	5.0	<b>5.0</b>
Contract and procurement specialist	1	2.0	<b>2.0</b>
<b>Subtotal</b>			<b>13.0</b>
<b>National Experts</b>			
Geotechnical engineer and deputy team leader	1	7.0	<b>7.0</b>
Civil engineer	1	7.0	<b>7.0</b>
Information technology specialist	1	7.0	<b>7.0</b>
<b>Subtotal</b>			<b>21.0</b>
<b>Total</b>			<b>34.0</b>

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).

<sup>7</sup> Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 2).

**COST ESTIMATES AND FINANCING PLAN**  
(\$'000)

Item	Amount
<b>A. Asian Development Bank<sup>a</sup></b>	
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) <sup>b</sup>	20.0
3. Training, seminars, and conferences	67.8
4. Contingencies	40.0
<b>Total</b>	<b>500.0</b>

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.

<sup>a</sup> Financed by Asian Development Bank's Technical Assistance Special Fund (TASF 6).

<sup>b</sup> Including office equipment and survey equipment.

Source: Asian Development Bank estimates.

**LIST OF LINKED DOCUMENTS**

<http://www.adb.org/Documents/LinkedDocs/?id=52097-002-TARreport>

1. Terms of Reference for Consultants