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Report No: PAD3331

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US\$500 MILLION

TO

THE REPUBLIC OF INDIA

FOR A

GREEN NATIONAL HIGHWAYS CORRIDOR PROJECT

FEBRUARY 27, 2020

Transport Global Practice
South Asia Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective Dec 28, 2019)}

Currency Unit = Indian Rupee (INR)

INR 71.40 = US\$1

INR 1 = US\$0.014

FISCAL YEAR

April 1 - March 31

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ABBREVIATIONS AND ACRONYMS

APA	Alternate Procurement Arrangement
BOT	Built Operate Transfer
BPP	Bharatmala Pariyojna Program
CAAA	Comptroller of Aid Accounts and Audit
CERC	Contingent Emergency Response Component
CGA	Controller General of Accounts
CNG	Compressed Natural Gas
CO2	Carbon Dioxide
CPF	Country Partnership Framework
CQS	Consultant Qualification Selection
CSC	Construction Supervision Consultants
DLI(s)	Development Linked Indicator(s)
DS	Direct Selection
EAP	Externally Aided Project
EE	Executive Engineer
EEP	Eligible Expenditure Program
EIA	Environment Impact Assessment
EIRR	Economic Internal Rate of Return
EMF	Environment Management Framework
EMP	Environment Management Plan
ENPV	Economic Net Project Value
EPC	Engineering Procurement Construction
ERP	Enterprise Resource Planning
ESHS	Environment Social Health and Safety
ESMP	Environment and Social Management Plan
ESO	Environment and Social Officer
FBS	Fixed Budget Selection
FI	Financial Intermediaries
FM	Financial Management
GBV	Gender Based Violence
GDP	Gross Domestic Product
GeM	Government e Marketplace
GHG	Green House Gas
Goi	Government of India
GRC	Grievance Redressal Committee
GRM	Grievance Redressal Mechanism
HDM	Highway Development and Management Model
IA	Implementing Agency
IAC	Internal Audit Consultant
IAHE	Indian Academy of Highway Engineers

IBRD	International Bank for Reconstruction and Development
ICT	Information and Communication Technology
IDA	International Development Agency
IPDF	Indigenous Peoples Development Framework
IPDP	Indigenous Peoples Development Plan
IPF	Investment Project Financing
IRC	Indian Road Congress
IRR	Internal Rate of Return
IT	Information Technology
ITI	Industrial Training Institute
IUFR	Interim Unaudited Financial Reports
LCS	Least Cost Selection
LMP	Labour Management Plan
LPG	Liquefied Petroleum Gas
MDR	Major District Road(s)
MoRTH	Ministry of Road Transport and Highways
MPA	Multiphase Programmatic Approach
MVAA	Motor Vehicles (Amendment) Act
NCB	National Competitive Bidding
NH	National Highway(s)
NHAI	National Highway Authority of India
NHDP	National Highway Development Plan
NHIDCL	National Highway Infrastructure Development Corporation Limited
NHIIP	National Highways Interconnectivity Improvement Project
NHSS	National Highway Safety Service
NIC	National Information Center
NRSB	National Road Safety Board
ODR	Other District Road(s)
OHS	Occupation Health and Safety
OP/BP	Operations Procedures/Bank Policy
PAP	Project Affected People
PCU	Passenger Car Units
PDO	Project Development Objective
PFMS	Public Financial Management Software
PFS	Project Financial Statements
PIU	Project Implementation Unit
PMC	Project Management Consultant
PPP	Purchasing Power Parity
PPP	Public Private Partnership
PPSD	Project Procurement Strategy for Development
Pr CCA	Principal Chief Controller of Accounts

PSI	Project Safety Impact
PWD	Public Works Department
QCBS	Quality and Cost Based Selection
R&D	Research and Development
RAP	Resettlement Action Plan
RFB	Request for Bids
RFQ	Request for Quotations
RFQ	Request for Quotations
RO	Regional Officer
RPAO	Regional Pay and Accounts Officer(s)
RPF	Resettlement Policy Framework
RSSAT	Road Safety Screening and Analysis Tool
SDM	Sub Divisional Magistrate
SE	Supervision Engineer
SEA	Sexual Exploitation and Abuse
SH	State Highway(s)
SHG	Self Help Group
SIA	Social Impact Assessment
SMP	Social Management Plan
SOP	Series of Projects
SORT	Systematic Operations Risk-Rating Tool
SPIUs	State Project Implementing Agency
STEP	Systematic Tracking and Exchanges in Procurement
TA	Technical Assistance
TDP	Tribal Development Plan



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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
India	Green National Highways Corridor Project	
Project ID	Financing Instrument	Environmental Assessment Category
P167350	Investment Project Financing	A-Full Assessment

Financing & Implementation Modalities

<input type="checkbox"/> Multiphase Programmatic Approach (MPA)	<input type="checkbox"/> Contingent Emergency Response Component (CERC)
<input type="checkbox"/> Series of Projects (SOP)	<input type="checkbox"/> Fragile State(s)
<input checked="" type="checkbox"/> Disbursement-linked Indicators (DLIs)	<input type="checkbox"/> Small State(s)
<input type="checkbox"/> Financial Intermediaries (FI)	<input type="checkbox"/> Fragile within a non-fragile Country
<input type="checkbox"/> Project-Based Guarantee	<input type="checkbox"/> Conflict
<input type="checkbox"/> Deferred Drawdown	<input type="checkbox"/> Responding to Natural or Man-made Disaster
<input type="checkbox"/> Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
20-Mar-2020	18-Mar-2025

Bank/IFC Collaboration

No

Proposed Development Objective(s)

The Project Development Objective is to demonstrate safe and green National Highway corridors in selected States and enhance the institutional capacity of the Ministry of Road Transport and Highways in mainstreaming safety and green technologies.



Components

Component Name	Cost (US\$, millions)
Green Highway Corridor Improvement and Maintenance	1,001.00
Institutional Capacity Enhancement	34.50
Road Safety	59.00

Organizations

Borrower: India
 Implementing Agency: Ministry of Road Transport and Highways

PROJECT FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	1,095.75
Total Financing	1,095.75
of which IBRD/IDA	500.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	500.00
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Non-World Bank Group Financing

Counterpart Funding	595.75
Borrower/Recipient	595.75

Expected Disbursements (in US\$, Millions)

WB Fiscal Year	2020	2021	2022	2023	2024	2025
Annual	0.00	45.00	95.00	100.00	120.00	140.00



Cumulative	0.00	45.00	140.00	240.00	360.00	500.00
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INSTITUTIONAL DATA

Practice Area (Lead)

Contributing Practice Areas

Transport

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	● Low
2. Macroeconomic	● Low
3. Sector Strategies and Policies	● Moderate
4. Technical Design of Project or Program	● Substantial
5. Institutional Capacity for Implementation and Sustainability	● Substantial
6. Fiduciary	● Substantial
7. Environment and Social	● Substantial
8. Stakeholders	● Moderate
9. Other	
10. Overall	● Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

Yes No



Does the project require any waivers of Bank policies?

Yes No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36	✓	
Pest Management OP 4.09	✓	
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10	✓	
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37		✓
Projects on International Waterways OP/BP 7.50		✓
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

Sections and Description

Schedule 2, Section I, A 1 (a): The Borrower shall maintain, throughout the period of implementation of the Project a project steering committee headed by the Secretary of MORTH and comprising of the Secretaries of the PWDs of all Project States.

Sections and Description

Schedule 2, Section I, A 1 (b): The Borrower shall maintain, throughout the period of implementation of the Project an externally aided projects cell (EAP Cell) within the MORTH headed by a project director and assisted by competent staff.

Sections and Description

Schedule 2, Section I, A 2 (a): The Borrower shall select and engage by no later than three (3) months after the Effective Date, and thereafter maintain throughout the period of implementation of the Project, the services of a project management consulting firm (PMC).

Sections and Description

Schedule 2, Section I, A 2 (b): The Borrower shall select and engage by no later than three (3) months after the Effective Date, and thereafter maintain throughout the period of implementation of the Project, the services of a



Technical Audit Consultancy firm (TAC).

Sections and Description

Schedule 2, Section I, A 2 (c): The Borrower shall select and engage by no later than three (3) months after the Effective Date, and thereafter maintain throughout the period of implementation of the Project, the services of an Internal Audit Consultancy firm (IAC) in order to: (i) carry out semi-annual internal audits and report to the EAP Cell and the PSC; and (ii) furnish such audits to the Bank for its review within ninety (90) days after the completion/issuance of the audit report, including, if any, the recommendations made by the internal auditors.

Sections and Description

Schedule 2, Section I, B 1: The Borrower shall implement the Project in accordance with the financial management arrangements set forth in the PFM Manual.

Sections and Description

Schedule 2, Section I, C 2: For each Selected Road, prior to the selection of any contractor for activities on such road, the Borrower shall establish, and thereafter maintain throughout the period of implementation of Project activities in such Selected Road, a road-specific Project implementation unit (PIU).

Sections and Description

Schedule 2, Section I, C 3: For each Selected Road, prior to the commencement of civil works, the Borrower shall select, engage and thereafter maintain throughout the period of implementation of such activities, the services of a Construction Supervision Consultant for works other than those procured under EPC Contracts, Authority Engineer for works procured under EPC Contracts, and RAP Implementation Support Agency

Sections and Description

Schedule 2, Section I, D 1 (a): The Borrower shall, and shall cause the Project States to carry out the Project in accordance with the EMF, RPF, including the LMP and GAP, and including the Tribal Development Framework, and the EIAs, EMPs, SIAs, RAPs and TDPs prepared and/or to be prepared in accordance with the objectives, policies, procedures, guidelines, time schedules, compensation arrangements and other provisions set forth in the EMF and RPF.

Sections and Description

Schedule 2, Section I, D 3: The Borrower shall ensure that, prior to commencing any civil works on a Selected Road, all resettlement measures set forth in the applicable RAP shall have been fully executed, including the full payment of compensation prior to displacement and/or the provision of relocation assistance to all Affected Persons, as per the entitlements provided in the RPF and/or the applicable RAP.

Sections and Description

Schedule 2, Section I, D 5 (b): The Borrower shall furnish to the Bank quarterly reports prepared by the EAP Cell on the physical and financial progress of Project activities, quarterly reports prepared by the respective Construction Supervision Consultants or the Authority Engineers, and the RAP Implementation Support Agency.

Sections and Description

Schedule 2, Section I, D 9: The Borrower shall maintain and publicize throughout the period of Project



Implementation the availability of a grievance mechanism.

Sections and Description

Schedule 2, Section II, 2: The Borrower shall furnish to the Bank no later than thirty-six (36) months from the Effective Date, a consolidated mid-term review report.

Conditions



I. STRATEGIC CONTEXT

A. Country Context

1. **India continues to remain one of the fastest growing major economies in the world despite a slight moderation in its GDP growth in the past three years.** The current slowdown is primarily due to unresolved balance sheet issues in the banking and corporate sectors, compounded by stress in the non-banking segment of the financial sector. These issues have prevented a sustainable revival in private investment and private consumption growth has also slowed in FY19/20. As a result, growth is expected to reach 5 percent in FY19/20. To address the slowdown, the government has introduced various economy-wide and sectoral reforms (including a cut in corporate taxes, as well as steps to support the automobile and real estate sectors, non-banking financial companies and medium and small enterprises). As a result, growth is expected to pick-up gradually from FY20/21 onwards and revert toward potential. On the fiscal side, the general government deficit is estimated to have widened to above 6 percent of GDP in FY18/19 and it is expected to rise further in FY19/20, owing to recently adopted tax cuts and the impact of slower economic growth on tax proceeds. The current account balance is expected to improve in FY19/20, reflecting mostly a sizeable contraction in imports. Given this and robust capital inflows, India's foreign exchange reserves rose to US\$457.5 billion at end-December 2019 (equivalent to more than 11 months of imports).

2. **Since the 2000s, India has made remarkable progress in reducing absolute poverty.** Between FY11/12 and 2015, poverty declined from 21.6 percent to an estimated 13.4 percent at the international poverty line (2011 PPP US\$1.90 per person per day), continuing the earlier trend of fast poverty reduction. Thanks to robust economic growth, more than 90 million people escaped extreme poverty and improved their living standards during this period. Despite this success, poverty remains widespread. In 2015, 176 million Indians were living in extreme poverty, while 659 million – half the population – were below the higher poverty line commonly used for lower middle-income countries (2011 PPP US\$3.20 per person per day). Implementation challenges of indirect tax reforms, stress in the rural economy and a high youth unemployment rate in urban areas, may have moderated the pace of poverty reduction since 2015.

B. Sectoral and Institutional Context

3. **India's road network of 5.48 million kilometers carries 65 percent of freight traffic and 85 percent of passenger traffic. The traffic volume on the network has been growing at a Compound Annual Growth Rate of 10.8 percent in the last sixty years.** The network comprises a primary network of 132,000 km of National Highways (NH), a secondary network of 160,000 km of State Highways (SH) and Major and Other District Roads (MDR and ODR), and a tertiary network of Rural Roads. The NH network carries about 40 percent of the road traffic but about 40 percent of this network is in poor condition.

4. **The responsibility for policy, planning and regulation of the road network lies with the Ministry of Road Transport and Highways (MoRTH).** The construction, maintenance and management of the NH network also lies with the MoRTH. The SH network is managed by the respective state Public Works Departments



(PWD) or State Highways Authorities and its agencies, while the rural road network is managed by the Ministry of Rural Development.

5. **The MoRTH undertakes the construction and maintenance of the NH primarily through its three implementing agencies; the National Highways Authority of India (NHAI); the state PWDs; and the National Highways and Infrastructure Development Corporation (NHIDCL).** Other key institutions include the Indian Roads Congress (IRC), which formulates the codes and standard specifications; the Central Road Research Institute (CRRI), which is engaged in carrying out research and development; and the Indian Association of Highway Engineers (IAHE), which is associated with training. Over the last two decades, the MoRTH has systematically applied the best practices, most of which were supported through the Bank-financed projects, in the areas of: (a) planning and prioritization; (b) resource mobilization through tolls, levies on fuel and commercial borrowing; (c) innovative contracting structures and private sector investments; (d) efficiency in expenditure through systems and asset management; (e) dedicated organizational set-up with operational flexibility; and (f) road safety management. These have made a large part of the NH network comply with the attributes of the road sector modernization agenda.

6. **The Government of India (GoI) launched the National Highways Development Program (NHDP), in 1998 to upgrade the NH and reform the road sector.** The NHDP, covering the upgrading of 56,000 km of NH at a cost of more than US\$50 billion was carried out primarily through the NHAI, which used improved contracting modes such as Build-Operate-Transfer (BOT) Concessions and lumpsum Engineering-Procurement-Construction (EPC) contracts. The NHDP was funded primarily through tolls and from a levy on motor fuel (ring fenced into a non-lapsable Central Road Fund). The NH network which is not covered under the purview of the NHDP, called the Non-NHDP Network, is facing challenges of poor quality and capacity. Construction and maintenance of the non-NHDP network is delegated to the State PWDs.

7. **The GoI has recently launched the Bharatmala Pariyojana Program (BPP) to improve the Logistics Performance of the network,** as the cost of logistics in India is about 14 percent of GDP as against about 8-9 percent of GDP in developed countries. The BPP aims to enhance the effectiveness of built infrastructure, multi-modal integration, and bridging infrastructure gaps. GoI has approved Phase 1 of this program, which is to develop 24,800 km of these highways at a cost of US\$108 billion.

8. **It is critical that carbon emissions are limited in the implementation of BPP by adopting suitable green technologies, as well as materials that are resource-efficient and low in carbon footprint and ensure the development of a greener transport infrastructure.** Natural resource efficient pavements and green technologies in road construction may offer a solution. The IRC has published some guidelines on greening and resource efficiency aspects; however, they are yet to be mainstreamed and their performance monitored and evaluated with Research and Development support. Pavements are still designed traditionally, without the use of alternate materials. Consequently, natural resources required for road construction (such as soil, aggregates and sand) are becoming scarce, and are increasingly being brought to the construction site over long distances. This could be minimized by using local and marginal materials, industrial by-products, bio-engineering solutions and green technologies by appropriately integrating them in the designs. Some of these



have been piloted, mostly on low-volume roads and on small sections of high-volume highways; however, they were not subjected to systematic evaluation over a long period.

9. **India is highly vulnerable to climate change risks and successive, increasingly frequent, extreme climate-related events have disrupted economic activity.** The NH network is in varying geo-climatic conditions and is exposed to vulnerabilities related to slope failures/landslides and flooding. It is necessary to ensure that the transport infrastructure is resilient to the impacts of disasters and climate change. The current IRC codes and guidelines need updating to adequately incorporate these in designs and in mainstreaming them.

10. **Road accidents and fatalities in India are the highest in the world.** The World Health Organization estimated that in 2016 India had 299,091 fatalities (although according to MoRTH there were 151417-fatalities in 2018) at a fatality rate of 22.6 per 100,000 population. About 30 percent of the accidents and 35 percent of the fatalities occurred on the NH network. The GoI has enacted the Motor Vehicles (Amendment) Act (MVAA), 2019, to, *inter-alia*, address road safety issues. The MoRTH is undertaking several measures under the ongoing Bank-funded National Highways Interconnectivity Improvement Project (NHIIIP) to enhance its institutional capacity in addressing road safety challenges. These include the development of a Road Safety Audit Manual, a comprehensive road crash database management system, National Highway Safety Services (NHSS), and training and capacity building through a center of excellence. MoRTH has also started several initiatives to improve road safety at both operational and management levels. The MVAA has mandated the creation of a National Road Safety Board (NRSB) as the lead road safety agency. Once established, NRSB will require support for its operationalization and building capacity for undertaking multi-sectoral interventions.

11. **The proposed Project seeks to institutionalize safety and green technologies in the sector by implementing pilots, and through systematic monitoring and evaluation, as well as policy interventions.** The institutionalization process will be realized by: (a) mainstreaming the green technologies, namely: (i) enhancing the efficient use of scarce natural resources, (ii) reducing GHG emissions from the construction and maintenance of highways, and (iii) making highways climate resilient; (b) enhancing road safety management; and (c) building the policy framework. The project will apply green technologies in project highways in four states (Andhra Pradesh, Uttar Pradesh, Himachal Pradesh and Rajasthan) that have varying geo-climatic conditions and are exposed to slope failures/landslides, flooding and intense solar radiation, and partner with academia and research organizations in monitoring and evaluation. It will carry out studies and develop policies, guidelines, contract documents and manuals for the adoption, implementation and systematic mainstreaming of green technologies in the NH network. The project will also support the updating of IRC codes through the knowledge and experience gained from the pilots and studies, encourage the application of green technologies in 2,500 km of non-project roads and help mainstream good practices in the entire highway network.

12. **Historically, the transport sector in India has offered limited employment opportunities for women.** Low women's labor force participation rate of 27 percent is a challenge to the country's competitiveness - the spread across project states of Andhra Pradesh, Rajasthan, Himachal Pradesh and Uttar Pradesh is respectively



47 percent, 22 percent, 17 percent and 11 percent respectively¹. Transport is generally a male dominated sector, both in terms of employment and for the values it embodies. Female participation in transport sector workforce as operators, drivers, engineers and leaders remains low. As per ILO Working paper 298 in 2007, only 6.8 percent women worked in transport and related sectors. GoI prioritizes participation in the labor force as well as the creation of employment and entrepreneurship opportunities for women. Supportive regulations like Maternity Benefits Act, and Sexual Harassment of Women at Workplace Act streamline the focus on female workforce. In the ongoing NHIP, the MoRTH started a skill development program and has trained a total of 80,434 people (including 23,984 women) since 2017 through its various projects in activities such as carpentry, masonry, bar bending, scaffolding, plumbing and painting. Making transport policy more responsive to the needs of women requires a structured understanding of the needs, instruments to address the needs, and establishing an appropriate policy framework. The Project would undertake a study on various aspects of gender in highway sector and help policy development.

13. Enhanced road safety features would support gender informed design and planning which impact women's access to transport services. Safe transport services impact higher female workforce participation². The project will help evolve gender-informed design specifications for works including amenities, junction improvements, toilets, lighting, and passenger amenities.

C. Relevance to Higher Level Objectives

14. The proposed project is fully aligned with the GoI's vision of providing green and safe transport. The project will help mainstream safety and green technologies in the highway network by demonstrating resource efficiency, climate resilience, green and safety aspects in the design and construction of the project highways and complement them with research and development, and development of policies and systems.

15. The proposed project will support the achievement of the core focus area and objectives of the World Bank Group Country Partnership Framework (CPF, 2018-2022) for India discussed by the Board on September 20, 2018 (Report No. 126667-IN), primarily by: (i) promoting resource efficient growth; (ii) enhancing competitiveness and creating jobs; and (iii) investing in human capital. It would substantially contribute to improvement under the connectivity and logistics pillar of the CPF. The project is aligned to the focus areas through: (i) resource-efficient construction and maintenance technologies; (ii) climate resilient designs; (iii) competitiveness and enabling job creation by improving connectivity; and (iv) strengthening public sector institutions by mainstreaming safety and green technologies and practices in MoRTH.

16. The proposed project contributes to the World Bank's twin goals – ending extreme poverty and promoting shared prosperity – by investing in effective and sustainable solutions that build green and resilient highways. The proposed project design also incorporates the elements of Climate Change and Gender, two priority areas for the Bank.

¹ https://www.sattva.co.in/wp-content/uploads/2019/06/Sattva_UNDP_Female-Work-And-Labour-Force-Participation-In-India.pdf

² CSE Working Paper 2019-20, Towards Higher Female Work Participation in India: What can be done? – Mehrotra and Sinha



II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

17. The Project Development Objective is to demonstrate safe and green National Highway corridors in selected States and enhance the institutional capacity of the Ministry of Road Transport and Highways in mainstreaming safety and green technologies.

PDO Level Indicators

18. The PDO indicators are:
- (a) Natural resource efficiency gains in construction of project highways
 - (b) Reduced carbon emissions in construction of project highways
 - (c) Reduced Vehicle Operating Costs on project highways
 - (d) Reduction of fatalities on project highways
 - (e) Safety and green highway technologies applied on 2,500 km of non-project highways
 - (f) Green National Highways Policy and Guidelines developed and implemented
 - (g) National Highways Climate Adaptation Policy and guidelines developed and implemented

B. Project Components

19. Based on the foregoing, and in line with the PDO, this operation will have the following three components.

20. **Component A: Green Highway Corridor Improvement and Maintenance (Total Cost: US\$1,001 million, including IBRD US\$423.95 million).** This component includes upgradation and maintenance for 5 years of about 783 km of selected existing National Highways in the states of Rajasthan, Himachal Pradesh, Uttar Pradesh and Andhra Pradesh incorporating green technologies and demonstrating resource efficiency, climate resilience, green and safety aspects, through: (a) civil works for construction and maintenance; (b) consulting services for supervision during construction and maintenance periods; (c) consultants/non-governmental organizations to assist the MoRTH in the implementation of the Resettlement Action Plans; (d) consulting services for overall project management (Project Management Consultant); (e) a Technical Audit Consultancy for independent verification of Disbursement Linked Indicators and to perform an annual integrated performance audit covering, among others, engineering designs, management of social and environmental issues and quality assurance; (f) a Road User Satisfaction Survey consultant to carry out baseline, midterm, and end-stage user satisfaction surveys; (g) a study on gender-based challenges and issues in the transport sector; and (h) land acquisition, resettlement & rehabilitation, shifting of utilities, implementation of Environmental Management Plans, tree cutting, afforestation and agency charges.



21. The loan would provide 50 percent of the construction cost of civil works and 80 percent of the cost of construction supervision during the construction period, the Project Management Consultancy and the Technical Audit Consultancy. All remaining costs will be met through government funds. The NHs proposed for upgradation and maintenance have configuration of a single or intermediate or non-standard two-lane pavements. Several sections of these highways have poor horizontal and vertical geometrics, distressed or weak pavements, inadequate capacity, narrow and/or weak cross-drainage structures, steep gradients, formation levels below the High Flood Levels, poor riding quality and black spots prone to accidents. The scope of work under upgradation will include the widening of formation width, pavement strengthening and widening, rehabilitation of existing structures, construction of new pavement, structures, drainage facilities, bypasses and realignments, improvement of junctions, and provision of road safety features. The designs will confirm to the relevant codes of the Indian Roads Congress and will include aspects of natural resource efficiency, use of local materials and stabilization (cement, lime), use of cut material for embankment filling and pavement layers, use of waste products (fly ash), recycling (asphalt and granular pavement), use of bio-engineering solutions (for treatment of embankment slopes, landslide zones, dumping and quarry sites' reinstatement and protection works), water conservation (redevelopment/enhancement of ponds, water harvesting structures, water channelization structures to protect stream beds and store storm runoff water), borrow area development, plantation and renewable energy sources for lighting (solar).

22. **Component B: Institutional Capacity Enhancement (Total Cost: US\$34.5 million, including IBRD US\$27.6 million).** This component will support capacity enhancement of MoRTH in its pursuit to conserve natural resources and improve climate vulnerability of the National Highways network and reduce GHG emissions, *inter alia*, by developing policies and guidelines, and mainstreaming green technologies, climate resilience, and safety aspects in the design, construction and maintenance of highways, as well as support for the implementation of enterprise resource planning (ERP) solution in MoRTH and its implementing agencies. This component will have the following six sub-components:

- (a) **Sub-component B1: Development and implementation of a Climate Adaptation Policy and guidelines and mainstreaming climate resilience in National Highways design and construction processes (Total US\$8 million, IBRD US\$6.4 million).** This sub-component will support disaster risk and impact assessment of about 5,000 km of the NH network, preparation of a Climate Adaptation Policy, updating key standards and manuals, and mainstream climate resilience in project design and implementation.
- (b) **Sub-component B2: Development and implementation of policy for reducing emissions from transport services (Total US\$2 million, IBRD US\$1.6 million).** This involves undertaking a study to map the freight volume and movement pattern on the entire NH network and identify constraints for efficient use of trucks, designing physical and digital freight management platforms for freight consolidation and interoperability, and recommend complementary innovative logistics solutions as well as transport operators' and regulators' coordination mechanism.
- (c) **Sub-component B3: Research and Development and mainstreaming green technologies in National Highways design and construction processes (Total US\$18.5 million, IBRD US\$14.8 million).** This sub-component will support systematic monitoring and evaluation, and documentation of results of the pilot



works undertaken in the project for a period of five years through reputed educational/research institutions or universities and inputs provided for updating relevant standards and manuals.

- (d) **Sub-component B4: Development and implementation of guidelines and model documents for mainstreaming safety and green technologies (Total US\$1 million, IBRD US\$0.8 million).** This sub-component will support identifying gaps and documenting good practices in the design, implementation and maintenance stages for mainstreaming safety and green technologies and preparation of documents such as the template Terms of Reference for design and supervision of construction, bidding documents and project management process of the EPC contracts including options for involvement of private sector in innovations in the design and construction aspects.
- (e) **Sub-component B5: Mainstreaming safety and green technologies in the development of highways (Total US\$2.5 million, IBRD US\$2 million).** This sub-component will support MoRTH in mainstreaming safety and green technologies by replicating these in about 2,500 km of non-project highways in NH network.
- (f) **Sub-component B6: Implementing ERP solution in MoRTH and its implementing agencies (Total US\$2.5 million, IBRD US\$2 million).** This sub-component will support implementation of ERP in MoRTH and its implementing agencies, which are currently ongoing under the National Highways Interconnectivity Improvement Project, upon its closure.

23. **Component C: Road Safety (Total Cost: US\$59 million, including IBRD US\$47.2 million).** This component will support mainstreaming of safety interventions through capacity enhancement of MoRTH in road safety management, *inter alia*, in the areas of crash database, operationalization of the lead agency for road safety, strengthening safety enforcement and emergency medical response on the National Highways, capacity building and training. This component will have the following four sub-components.

- (a) **Sub-component C1. Support to improve road safety data analytics and highway safety monitoring and implementation (Total US\$37.5 million, IBRD US\$30 million).** This sub-component will support the ongoing road safety activities under the National Highways Interconnectivity Improvement Project, upon its closure, in development and implementation of (i) the Integrated Road Accident Database Management System for recording and analysis of road accidents, (ii) the National Highway Safety System for road safety enforcement, and (iii) updating codes and manuals.
- (b) **Sub-component C2. Support for operationalization of the National Road Safety Board (Total US\$3 million, IBRD US\$2.4 million).** This sub-component will support the operationalization of the National Road Safety Board, and its activities in the initial startup phase, through expert support as part of an interim secretariat, including (i) monitoring and evaluation, (ii) drafting of rules for the Motor Vehicles (Amendment) Act, and (iii) data analysis and recommendations.
- (c) **Sub-component C3. Strengthening highway patrol and emergency response along the project highways (Total US\$16.5 million, IBRD US\$13.2 million).** This sub-component will support establishment of



combined enforcement and emergency response outposts at critical locations to improve enforcement and post-crash care, through equipping outposts with patrol vehicles, advanced life-saving ambulances, cranes, tow trucks, communication system, and surveillance and other enforcement equipment to deter speeding, drink driving and other risky user behaviors.

(d) **Sub-component C4: Capacity building & training (Total US\$2 million, IBRD US\$1.6 million).** This sub-component will support training and capacity building of the officials of MoRTH, implementing agencies of MoRTH, and the NRSB in road safety management, crash investigation, safety audit, and monitoring and evaluation.

24. **Lending Instrument: The lending instrument is Investment Project Financing (IPF) with Disbursement Linked Indicators (DLI).** Disbursements will be triggered by the documented execution of eligible expenditures and verification of achievement of the DLIs, which will provide incentives for achieving results. The project will have a total of 14 DLIs. Section VI: Results Framework and Evaluation provides the details of the DLIs and the verification protocols. The entire loan of US\$500 million (except for the Front-End Fee) will be disbursed based on achievement of results linked to DLIs (in addition to statements of expenditure). An independent Technical Audit Consultancy will be responsible for verification of DLIs.

25. The 14 DLIs, listed in the table below, are split into three parts: linked to Component A – US\$250 million; linked to Component B – US\$200 million; and linked to Component C – US\$48.75 million.

DLI No.	DLI	IBRD Financing allocated to DLI (US\$, million) (% of IBRD financing)	Outcomes / Outputs linked to the DLI
1	Project National Highways constructed incorporating green technologies	200 (40%)	Component A
2	Updated design and contract documents for construction and maintenance of highways developed and mainstreamed	25 (5%)	Sub-component B4
3	Project National Highways constructed incorporating bio-engineering solutions	50 (10%)	Component A
4	National Highways Climate Adaptation Policy and guidelines developed and implemented	40 (8%)	Sub-component B1
5	Green National Highways Policy and Guidelines developed and implemented	40 (8%)	Sub-component B3
6	Policy for reducing vehicular emissions developed and implemented	20 (4%)	Sub-component B2
7	Physical and digital freight management systems and models developed and adopted	15 (3%)	Sub-component B2
8	Highway safety monitoring and data analytics improved	15 (3%)	Sub-component C1
9	National Highway Safety System implemented	15 (3%)	Sub-component C1



DLI No.	DLI	IBRD Financing allocated to DLI (US\$, million) (% of IBRD financing)	Outcomes / Outputs linked to the DLI
10	Mainstream safety and green technologies in the development of highways	50 (10%)	Sub-component B5
11	Enforcement of safety and emergency response along the project highways improved	14.75 (2.95%)	Sub-component C3
12	National Road Safety Board capacity enhanced	2.4 (0.48%)	Sub-component C2
13	Training imparted in road safety	1.6 (0.32%)	Sub-component C4
14	An integrated ERP system implemented in MoRTH and its two implementing agencies	10 (2%)	Sub-component B6

26. **Eligible Expenditure Program (EEP):** The EEP consists of project related expenditures on goods, works, non-consulting services, consulting services, and training. These expenditures will include (i) cost of construction of National Highway infrastructure; (ii) technical assistance to support research and development and mainstreaming of green technologies in the design, construction and maintenance of NHs; (iii) improving road safety including the completion of some unfinished components under the ongoing NHIIP; and (iv) project management support, including consultancies to support the implementation of project components.

27. **Gender Actions:** Under component A, the project will undertake a study to understand the challenges faced by women as transport users and transport providers. This would enhance gender informed policy making and decisions to support gender in transport sector. Under sub-component C1, the project would help create jobs for women in the transport sector by assuring 30 percent participation of women in the project highway Safety workforce. To reach this target, the project will incentivize technical training in road safety management for women-owned establishments. This would enhance safety of women on highways and create job opportunities.

28. The project will also prioritize training and employment of women-led micro enterprises and women collectives in implementing green technologies under upgradation and maintenance of roads. Through the Project Implementation Units (PIUs), the project will incentivize technical skill training of 2,500 women in specialized areas, such as bio-engineering solutions and various aspects identified under natural resource efficiency. This will increase the career progression and job advancement opportunities of women employed in the highway sector. To promote micro-enterprises owned by women, the project, through the PIUs, will undertake technical training of women-owned establishments in maintenance tasks associated with resilience enhancing measures. The PIUs will be directed by the MoRTH to build capacity of women-led self-help groups (SHGs) in at least Himachal Pradesh and Andhra Pradesh to undertake maintenance tasks. Provision of skills training will adopt a holistic approach to include intensive technical as well as life skills training in digital, financial and legal literacy. Such trainings will be offered to women-led groups through collaboration with government Industrial Training Institutes (ITIs). The PIUs in Himachal Pradesh will identify synergies with women-led producer groups/women farmers functional in the horticulture belt and develop an action plan to increase participation of women in SME logistics.



29. Through Components A and C, the project will ensure that areas near habitations are well-lit and hoardings are placed to dissuade eve-teasing, and sexual harassment and help-line numbers are prominently displayed to register complaints against eve-teasers/bullies. Further, to enhance perceptions of safety amongst communities, the PIUs will work with SHG groups in improving associated infrastructure (toilets for women, bus shelters) on roads that connect secondary schools, and primary health-care centers. The PIUs will conduct user satisfaction surveys (at mid-term and end-of-project) to monitor improvement in access to secondary schools, degree colleges, hospitals and ‘travel for work’ by women.

30. **Maximizing Finance for Development (MFD).** MoRTH will toll the project highways after completion of construction. India has had extensive experience with different variants of PPP in the road sector (with the World Bank supporting the piloting and mainstreaming of several related innovations in both national and state-level projects during the last decade). In the case of the investments supported by this Project, after due consideration of the options, it has been decided that tolls from the project highways will accrue to MoRTH and the highways will be constructed through public finance using EPC contracts. This reflects in part a recognition of the low appetite of the private sector for PPPs in road sector due to liquidity concerns in the banking sector. From an MFD perspective, the need is to move from project-specific PPP efforts to a broader sectoral approach to tap both international and domestic financial markets. The World Bank is in a strategic dialogue with MoRTH and NHA on addressing these financing challenges and new related initiatives including funding sources and the overall architecture of road sector financing, are under discussion.

31. **Citizen Engagement:** The project will implement a selection of citizen engagement interventions to ensure active and focused dialogue between citizens and the implementing agency. The project will undertake regular citizens/road user satisfaction surveys to gauge the perception of road users and communities on the performance of the contractors and the project overall. To promote accountability and enhance transparency, the project will partner with relevant academia, research organizations, and nongovernment organizations (NGOs) during project implementation. The project will also have a grievance redress and beneficiary feedback mechanism.

C. Project Beneficiaries

32. **The primary beneficiaries of the project are the people living within the influence area and the natural environment.** The local road users and the truckers will benefit from more efficient transportation at a lower cost, which requires less time and offers a safer ride. Industry, agribusiness, and service providers will benefit from the reduced travel time and logistics that will lower the cost of transportation of goods and people. The natural environment will benefit from the efficient use of construction materials and water that will reduce the depletion of scarce natural resources and contribute to a reduction in GHG emissions.

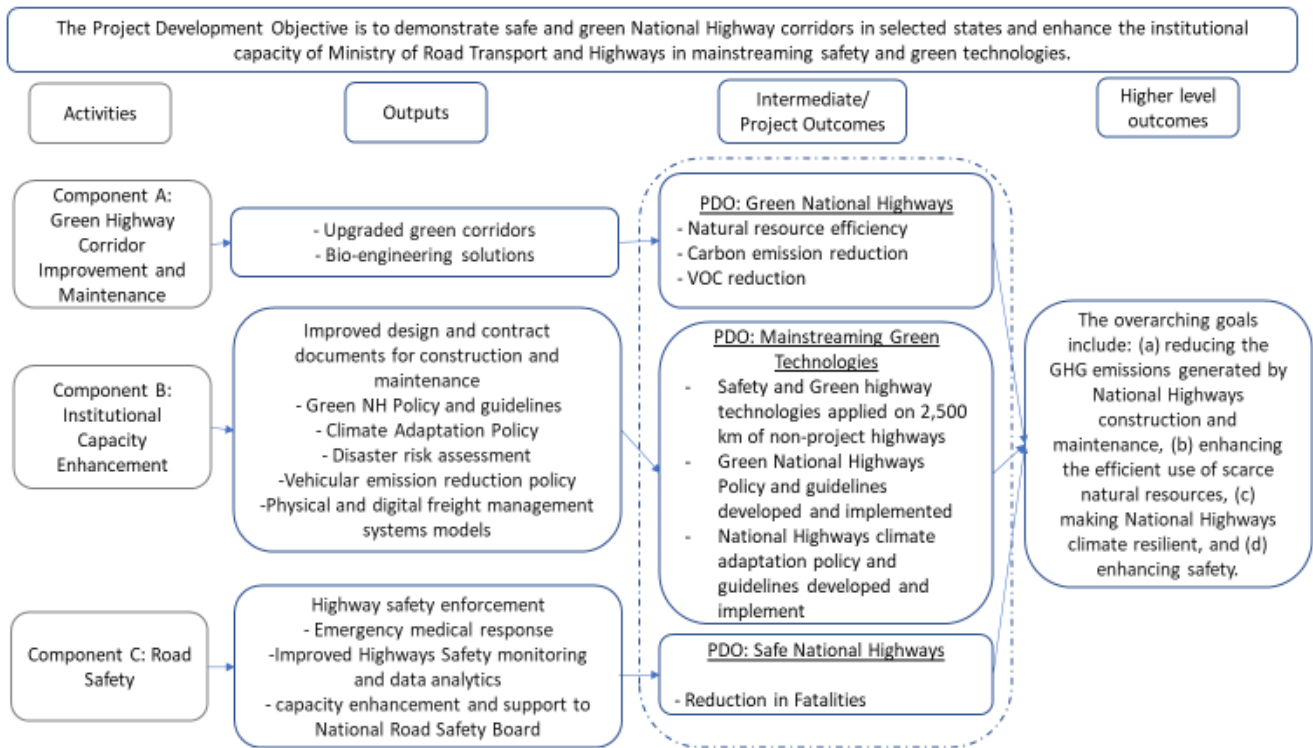
33. **The MoRTH and its implementing agencies, state PWDs, professional societies, and the academia will benefit from the construction pilots and research outcomes in adopting natural resource-efficient, climate-resilient, and green technologies.** Utilization of fly ash, recycled pavement, soil etc. in the pavement and the road embankments, as well as bio-engineering solutions, would have a positive impact on the



environment. The project will create job opportunities for communities living around the influence area and for those involved in construction industries.

D. Results Chain

34. Theory of Change. The change management theory that delivers the results chain is presented in the figure below. The challenges to develop green, resilient, and safe highways are multifaceted; the most important binding constraints are: (i) inefficiencies in the use of natural construction materials, bio-engineering solutions and energy efficient construction technologies; (ii) designs and standards that do not adequately address climate change risks; and (iii) in-effective road safety management. The critical assumptions are: (i) safety and green highway technologies are incorporated in highway design and construction standards; (ii) MoRTH mainstreams safety and green technologies in the NH network; and (iii) wider application/mainstreaming of safety and green technologies in the highway network through collaboration with relevant stakeholders.



E. Rationale for Bank Involvement and Role of Partners

35. The World Bank has been a key player in the development of the road sector in India. The Bank has been supporting the MoRTH in the development of NH since 1992 and has supported seven projects including a TA project. Through these projects, best practices on asset management, road safety infrastructure, innovative contracting models, and IT-ICT interventions for process improvements have been introduced and mainstreamed in MoRTH and its implementing agencies.



36. **The Bank is eminently positioned to disseminate global and domestic best practices and knowledge in application of resource efficiency and climate resilient strategies in the NH network through the project.** The Bank will leverage its global knowledge in green transport and help in transferring good practice and cutting-edge knowledge. Further, the mainstreaming of climate resilience, resource efficiency, and green solutions in the development and maintenance of National Highways will be based on research on the project pilot highways and replicated on other highways. The benefits accrued from this project could be extended to the rest of the road network as both the training and technologies will be used beyond the NH network.

37. **Role of partners:** No other development partners are involved in this project; however, MoRTH will engage with other development partners, state PWDs, professional societies and the construction industry to disseminate the learnings from the project on the development of green highways.

F. Lessons Learned and Reflected in the Project Design

38. **The broader institutional and sector development aspects of a highway project will likely have more impact on the entire sector if they are implemented by the central sector ministry.** In Bank-funded state highway projects, which are implemented by the states, some good practices in the areas of asset management, road safety, and contracting structures were introduced, but replication of these practices in other states was difficult. On the other hand, initiatives such as the implementation of EPC contracts and Hybrid-annuity contracts, that were under taken by MoRTH were mainstreamed and replicated. Successful implementation of the proposed project by the MoRTH will lead to sector-wide policy initiatives that will mainstream resource-efficient, climate-resilient, green and safe aspects in all classes of highways, since MoRTH is responsible for policy and planning in the highway sector.

39. **Research and development, systematic long-term monitoring of the performance of alternate technologies, and endorsement by the regulatory institutions through codes and standards, are key for their wider use in highway construction and maintenance.** While some of the green technologies have been piloted in the country, mostly on low-volume roads and on small sections of high-volume highways, these were not subjected to a systematic evaluation over a long period and did not result in their being mainstreamed. Activities under the proposed project will ensure partnering with academia, research organizations and professional societies for long-term evaluation and in mainstreaming the alternate technologies that promote resource efficiency, climate resilience and green aspects in highway construction and maintenance, as well as to critically review their performance and offer improved solutions.

40. **Studies and activities in emerging areas need to continue for addressing the challenges in a systematic and on-going manner.** Activities proposed under the road safety component of the project include the rolling out of the accident database management system and implementation of the National Highways Safety System, which are currently being developed under the ongoing NHIP.



41. **Time and cost overruns are common in the highway sector and the use of contracting structures such as EPC contracts in recent projects have improved in these aspects.** Civil works under the proposed project will be undertaken through lumpsum EPC contracts which will include design, construction, and maintenance for five years. These are expected to reduce overlapping responsibilities, delays, and cost overruns.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

42. Implementation arrangements for the project will be the same as for NHIP except for the involvement of state PWDs in project execution. A Project Steering Committee comprising of the Secretaries of the PWDs of all project states will be constituted under the chairmanship of the Secretary, MoRTH for project oversight. MoRTH will implement the project through its Externally Aided Projects (EAP) Cell. The EAP Cell will have the overall responsibility for all aspects of the project including financial management, procurement, contract monitoring, environment & social safeguards, road safety and institutional strengthening. MoRTH will have PIUs in each of the four states, which will be responsible for the execution of civil works and for day-to-day contract management. Project activities will be implemented in collaboration with the respective partner agencies, e.g., regional offices of the MoRTH in each of the states (for civil works), the Road Safety Cell of MoRTH and the National Road Safety Board once established (for road safety activities), Indian Road Congress (for developing standards and sector guidance), and Indian Academy of Highway Engineers (for training).

43. MoRTH will engage a Project Management Consultant (PMC, a consulting firm) to assist the EAP Cell in planning and implementation of the Project. An independent Technical Audit Consultancy will be responsible for independent verification of the DLIs and to perform an annual integrated performance audit covering, *inter alia*, engineering designs, management of social and environmental issues, and quality assurance. Construction Supervision Consultants (CSC) will provide regular supervision of the works contracts. Consultants/non-governmental organizations will aid MoRTH in the implementation of the Resettlement Action Plans. Reputed educational/research institutions contracted under the project will undertake systematic monitoring and evaluation of the pilot works. The Road User Satisfaction Survey consultant will carry out baseline, mid-term, and end-stage user satisfaction surveys. Consultants procured under the project will carry out the studies under Components B and C. Details of the implementation arrangements and the Implementation Support Plan are provided in Annex 1.

B. Results Monitoring and Evaluation Arrangements

44. **Results Framework.** The Results Framework lists the indicators to monitor project outputs and outcomes. Data will be disaggregated by gender wherever feasible. MoRTH and the Bank will jointly assess the achievement of the PDO at least twice a year as part of the Bank's implementation support missions. MoRTH will prepare quarterly progress reports describing the progress of activities under the project and the result indicators, the status of legal covenants, compliance with the environmental and social safeguards, implementation of gender actions, disbursements and DLIs, results of satisfaction surveys, and citizen



engagement, and share with the Bank. In addition to the quarterly reports, MoRTH will also prepare and share with the Bank a mid-term report and the Borrower's Implementation Completion Report.

45. **Monitoring of Green Highway Corridor Improvement and Maintenance contracts** will be done primarily by the Supervision consultants and PIUs responsible for each sub-project road. The relevant information will be collated by PMC for further monitoring by the EAP Cell. The performance of the pilots will be monitored and studied by the research organizations/consultants/academia procured for the purpose.

46. **Third-Party Performance Monitoring and Auditing** will be done by the TAC, which will report to the Head of the EAP Cell and recommend measures to be taken to improve performance. The TAC's report will also be reviewed by the Project Steering Committee.

C. Sustainability

47. **Sustainability of project initiatives is sought to be achieved through mainstreaming them in MoRTH.** The project will: (i) design and construct large pilots involving green technologies; (ii) partner with academia, research organizations, and the Standards and Research wing of MoRTH to review, monitor and evaluate the performance of the pilots; (iii) provide inputs for updating the codes and manuals through partnering with the IRC; (iv) develop, adopt and implement policies and guidelines for mainstreaming green solutions; and (v) partner with training centres including IAHE to provide training and capacity building of relevant stakeholders. This systematic approach, along with the project DLIs which provide incentives for achieving results, would help mainstream green technologies in the highway sector. MoRTH has already shown over the years its to follow through with pilots in ways that mainstream their use. For example, experience of past Bank-funded projects implemented by MoRTH also shows that good practices introduced (such as EPC-lumpsum and Hybrid-annuity contracts, longer-duration maintenance contracts, asset management systems and practices, road safety infrastructure and systems, codes and specifications) have been systematically mainstreamed in the highway sector.

48. **Sustainability of investments in civil works is being secured through combined construction and maintenance contracts** that: (i) promote optimization of capital and operating interventions over the contract life cycle; (ii) offer incentives for adequate maintenance; and (iii) commit the government to meet the expenditures necessary for maintenance. In addition, independent third-party audits will be used as an additional layer to monitor the quality of construction. The project highways will also be tolled by MoRTH.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis (if applicable)

Technical

49. MoRTH has commissioned consultants for the preparation of designs for 783 km of NH using its own funds. The existing project highways are of single or intermediate or non-standard two-lane configuration



(pavement width up to 7 m) with Annual Average Daily Traffic levels ranging from 4,000 to 7,000 PCUs. Several sections of these highways have poor geometrics, distressed pavements, inadequate capacity, narrow and/or weak cross-drainage structures, steep gradients, formation levels below the High Flood Levels, poor riding quality and black spots prone to accidents.

50. The proposed works will consist of widening to two/four-lane configuration with paved shoulders and include strengthening of existing pavement, construction of new pavement, widening, rehabilitation of existing structures, new structures, widening / reconstruction of structures, drainage facilities, bus lay-byes and truck lay-byes, bypasses, improvement of junctions, road safety engineering measures and improvement of the geometry of the alignment of the highway. The designs will conform to the relevant codes of the Indian Roads Congress and incorporate the requirements specified in the Manual of Specifications and Standards for Two Laning of Highways (IRC: SP: 73-2007) and Manual of Specifications and Standards for Four Laning of Highways (IRC: SP: 84-2009) and MoRTH Specifications for Road and Bridge Works. The works will include the aspects of natural resource efficiency, use of local materials and stabilization (cement, lime), use of cut material for embankment filling and pavement layers, use of waste products (fly ash), recycling (asphalt and granular pavement), use of bio-engineering solutions (for treatment of embankment slopes, landslide zones, dumping and quarry sites' reinstatement and protection works), water conservation (redevelopment/enhancement of ponds, water harvesting structures, water channelization structures to protect stream bed and store storm runoff water), borrow area development, plantation and renewable energy sources for lighting (solar).

51. The designs will incorporate road safety measures which include improvement of junctions, pedestrian facilities, crash barriers, speed calming measures, street lighting, signs and markings, improvement of geometrics of the road alignment, widening of all narrow culverts, improvement of sight distance, replacement of railings/parapets of existing bridges with crash barriers, and parapet walls. To ensure these provisions are implemented, these will be duly embedded in the contract documents. Additionally, the contract documents will stipulate road safety audit by an independent Safety Consultant, inclusion of a Qualified Safety Officer and a Safety Supervisor in the Contractor's working team, monthly reports with construction safety checklist, reporting of accidents, maintenance of insurances for the Contractor's personnel and third-party, and penalties for not attending to and repair of damaged safety features.

52. The preparation of designs and drawings is at an advanced stage. NH 158 in Rajasthan, NH 70 in Himachal Pradesh, and some sections of NH 516E in Andhra Pradesh have been designed, while designs are being prepared for the remaining project highways. The design aspects considered alternatives to reduce the consumption of natural resources, energy and bituminous products. The pavement design approach has resulted in the reduction in the volume of natural resources and bituminous material required and in construction cost savings. The designs of three project highways in Rajasthan (NH 158), Himachal Pradesh (NH 707) and Andhra Pradesh (NH 516E) were assessed using the Bank's Road Safety Screening and Analysis Tool (RSSAT) to determine the project safety impact (PSI) when the roads are opened to traffic (i.e., in 2022). Annual fatality rates on these three roads range from about 0.06/km to 0.15/km, which is categorized as moderate to substantial based on international standards. The analysis shows that the PSI will be less than 1 for all three roads when they are operational. The safety features built in the designs of these road sections



are expected to reduce overall road fatalities in project highways in Rajasthan, Himachal Pradesh and Andhra Pradesh by about 19 percent, 35 percent and 22 percent respectively compared to the existing conditions.

53. The designs adopted for the project highways indicate that across different project highways there will be savings in the requirement of aggregates in the range of 8 to 22 percent, bitumen in the range of 4 to 35 percent, borrow soil in the range of 30 to 40 percent, sand in the range of 0 to 50 percent, and water in the range of 15 to 20 percent. The following table summarises use of different technologies / materials in the design of project highways.

Sr. No.	State	NH Number	Length (km)	Stretch details	Use of (in the design of pavement and slopes)					
					Recycled asphalt	Fly ash	Lime	Cement-treated subbase/base	Bio-engineering	Cut earth
1	Himachal Pradesh	NH 70 (New NH 03)	110	Hamirpur to Mandi				Yes	Yes	Yes
2	Himachal Pradesh	NH 707	105	Poanta Sahib to Feduz	Yes		Yes	Yes	Yes	Yes
3	Andhra Pradesh	NH 516E	210	Koyyuru to Bhalluguda, and Bowdara to Vizianagaram	Yes	Yes		Yes	Yes	Yes
4	Rajasthan	NH 158	117	Ras to Mandal	Yes	Yes		Yes		Yes
5	Uttar Pradesh	NH 731K and NH 730C	241	Philibit to Madhya Pradesh Border	Being designed					

54. **Climate Change:** Project designs incorporate GHG emission reduction interventions through energy saving technologies, such as the use of low carbon cement, use of recycled asphalt mix, and stabilization using local materials. Road improvement works will help in increasing vehicle speeds enhancing fuel efficiency and removing choke points, thereby reducing the carbon footprint. The project also supports a study to map the freight volume and movement pattern on the entire NH network and identify constraints on the efficient use of trucks, designing physical and digital freight management platforms for freight consolidation and interoperability. These measures will contribute to a reduction in the GHG footprint, including carbon emissions.

55. Resilience is a key feature of the design solutions that will be adopted to address climate vulnerability and the resilience of highways. About 95 percent (100 percent of Component A and most of Component B) of the project investment will be applied to climate risk mitigation, building resilience, green highways development, research, and institutional capacity building related interventions. The measures to be integrated include flood protection, drainage systems, and geo-hazard risk (landslide) protection in the designs of bridges and highways. The project will adopt appropriate bioengineering solutions for protection from geo-hazard risks in mountainous areas affected by extreme rainfall; protection of drainage facilities and land reserves from erosion; and stabilizing cut slopes and debris disposal areas. Details of climate co-benefits,



vulnerability assessment and mitigation and adaptation measures incorporated in the project are presented in Annex 2.

56. **Economic analysis:** The project highways have been subjected to economic evaluation using the Highway Development and Management Model (HDM-4), a globally accepted analytical tool for the economic analysis of highways with investment alternatives, which simulates life cycle conditions and costs and provides economic decision criteria for multiple road design and maintenance alternatives. The main project economic benefits are savings in vehicle operating costs, travel time costs, and maintenance costs resulting from the road improvements. Project benefits also include savings due to reduction in accident costs and carbon emissions. The cost-benefit analysis indicates that the average Economic Internal Rate of Returns (EIRR) of the project highways is 27.9 percent. The summary results of economic analysis for each of the project highways are presented in the table below.

Project Highway	Base Case	
	EIRR	ENPV @ 9% Discount - Rs. Million
Ras-Beawar-Mandal (NH-158)	29.5%	13,815
Paonta Sahib - Feduz (NH-707)	34.1%	42,386
Hamirpur-Mandi (NH-70)	26.3%	26,151
Bewar-Etawah-Philibit (NH 731K and NH 730C)	39.9%	39,298
Koyyuru-Chintapalli-Araku-Vizayanagaram Section (NH-516 E)	10.0%	1,120
Combined	27.9%	1,22,770

57. A sensitivity analysis has been carried out by increasing or decreasing the critical factors (20 percent increase in cost, 20 percent reduction in benefits, one-year delay in construction, and these factors combined) affecting the cost and benefit streams. In the worst scenario, the project highways have an average EIRR of 20.9 percent. The details are presented in the table below.

Project Highways	EIRR - Base Case	EIRR - 20% increase in cost	EIRR - 20% reduction in benefits	EIRR – One-year delay	EIRR - Combined worst scenario
Ras-Beawar-Mandal (NH-158)	29.5%	25.6%	24.8%	29.4%	21.2%
Paonta Sahib - Feduz (NH-707)	34.1%	30.5%	29.7%	34.0%	21.2%
Hamirpur-Mandi (NH-70)	26.3%	23.9%	23.4%	26.0%	21.0%
Bewar-Etawah-Philibit Section	39.9%	34.4%	33.2%	39.8%	28.5%
Koyyuru-Chintapalli-Araku-Vizayanagaram Section (NH-516 E)	10.0%	8.3%	7.9%	9.2%	5.3%
Combined	27.9%	24.7%	24.0%	27.8%	20.9%



B. Fiduciary

(i) Financial Management

58. Project Financial Management arrangements will essentially be the same as in NHIIP, which have been satisfactory. MoRTH, being part of the central government has its FM arrangements vested with the Office of the Principal Chief Controller of Accounts (Pr. CCA) reporting to the Controller General of Accounts (CGA). The existing FM arrangements in MoRTH are appropriate and will be applicable to the Project; a few additional complementary reporting and auditing requirements applicable to the Project are provided in the Project Financial Management Manual.

59. **Disbursement.** Disbursement from the loan will be through Reimbursement on achievement of DLIs and on submission of IUFRs by MoRTH to CAAA after concurrence from the Bank.

60. Further details of project financial management and disbursement arrangements are provided in Annex 1.

(ii) Procurement

61. The Procurement arrangements for the project will be the same as in the ongoing NHIIP. The EAP-Cell at MoRTH, supported by PMC, will have overall responsibility for procurement and contract management, while the PIUs in the states will be responsible for project execution.

62. Procurement for the proposed project will be carried out in accordance with the World Bank Procurement Regulations for Borrowers for Goods, Works, Non-Consulting and Consulting Services, dated July 1, 2016, Revised November 2017 and August 2018 and applicable to IPF, hereinafter referred to as "Regulations." The project will also be subject to World Bank Anticorruption Guidelines, dated October 15, 2006, and revised in January 2011 and as of July 1, 2016. MoRTH will obtain Bank's prior no-objection for any variations, time extensions, and any substantial changes to the civil works, consultancy, and goods contracts.

63. **Procurement risk assessment.** The Procurement risk rating is "Moderate". The procurement assessment identified the following risks: (i) lack of familiarity of procurement staff with the latest procurement procedures in accordance with the World Bank's procurement policies; (ii) lack of comprehensive internal procurement manuals and hence, the need to improve the set of procedures to ensure fairness and transparency in procurement process; (iii) weaknesses in the procurement review function and resolution of complaints; and (iv) need to build capacity in procurement and contract management. The proposed mitigation measures include: (i) training of procurement staff; (ii) hiring of a consultant (firm) experienced in procurement under Bank financed projects to prepare documents and to strengthen procurement capacity; (iii) streamlining contract management to ensure satisfactory contract performance; (iv) adopting a clear and fair complaint handling mechanism and disseminating the results to the bidding community; and (v) improving the document filing system.



64. **Project Procurement Strategy for Development (PPSD).** MoRTH has prepared a PPSD. Extensive market analysis for different packages of procurement has informed decisions on packages to ensure adequate participation of bidders and has helped to frame the consultancy contracts. Based on the PPSD, the Procurement Plan has been prepared. The Procurement Plan sets out the selection methods for the procurement of goods, works, and non-consulting and consulting services financed under the project for the first 18 months). The Procurement Plan will be updated annually or as required and will be reviewed and approved by the World Bank. Annex 1 provides more details on procurement under the project.

C. Safeguards

(i) Environmental Safeguards

65. The proposed project will demonstrate “how to” mainstream green and resilient technologies/ techniques in the National Highway domain, thereby helping to reduce the environmental (including carbon) footprint of the sector. However, if appropriate and timely avoidance and mitigation measures are not taken, the proposed expansion of the project roads and associated rehabilitation works are likely to create adverse environmental impacts as well.

66. **Key Environmental Issues/Concerns.** Project activities, if not properly managed and mitigated, could have the following adverse environmental impacts: (i) felling of roadside trees (roughly 28,000 trees are likely to be impacted for improving and widening 783 km of project NHs); (ii) adverse impacts on water resources (water bodies/public water supply sources); (iii) impairment to or worsening of the local/regional drainage; (iv) slope failure accentuated due to improper hill cutting practices; (v) management of excavated/cut materials and debris; (vi) construction phase impacts, including those related to camp site operation, dust generation, extraction of construction materials, disposal of construction wastes and pollution from plants, machinery and vehicles; (vii) potential indirect impacts on biodiversity rich areas or ecologically important features in some cases; (viii) impact on common property resources; (ix) impact on environmentally sensitive receptors (such as schools and health facilities) located along the road corridors from increased noise and air pollution during the construction and operation stages; (x) occupational health and safety risks faced by construction workers; and (xi) the potential for poorly planned or managed development induced by the improved roads.

67. Diversion of forest land is required for widening of the road for sub-projects NH-516E, NH-158, NH-70 and NH-707. For the other sub-projects (NH-730C and NH-731K), plantation along the avenue declared as ‘protected forest’ will also be affected due to cutting of trees for the proposed expansion/upgrading of NHs. By and large, no roads have been proposed for financing in ecologically sensitive habitats such as national parks, tiger/elephant reserves and sanctuaries, except one bridge in NH-92 (Uttar Pradesh) that crosses over a protected area in River Chambal. However, the presence of wildlife habitats and/or crossings outside the protected environs has been identified in some cases. In the cases of NH-707 and NH-516E, the impact on wildlife in forest areas along/close to the road needs to be addressed through appropriate measures in the engineering design and through enabling provisions in the contract documents.



68. Additionally, uptake of fertile agricultural land is likely to arise on account of planned project interventions. Potential long-term impacts could include changes in land use patterns (from agriculture to real estate or other non-farming purposes) and changes in the occupational pattern of people residing in the sub-project's influence area. If not properly designed, improved roads could also have safety concerns for road-users and road-side residents during the operation phase, especially as design speed improvement is a key desired outcome of the project. No significant change in macro-climatic parameters (precipitation, temperature and wind) is envisaged due to the project but cutting of roadside trees, laying of paved surface and other construction activities are likely to temporarily affect the micro-climate. In view of the potential impacts on the environment, the project has been designated as Category A.

69. The following Operational Policies have been triggered by the project: Environmental Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Forests (OP/BP 4.36); and Physical Cultural Resources (OP/BP 4.11). Since the project proposes to support activities of the National Green Highways Mission of MoRTH that seeks creation of carbon sinks along the NHs through systematic and scientific avenue plantation, OP 4.09 Pest Management has also been triggered.

70. **Environmental Management.** The three main pillars of project design, namely green/resource efficiency, climate resilience and safety, will help in reducing environmental footprint (including GHG emissions) compared to other projects of similar nature. These elements have been entrenched in each stage of the project – from sub-project selection, alignment finalization, detailed design and preparation of schedules for the bidding documents. The over-all environment management strategy for the project involves: (i) preparation of an Environment Management Framework (EMF) for the over-all project; (ii) environmental screening to identify key issues including those related to biodiversity/wildlife, and consider them in the selection and design of sub-projects; and (iii) preparation of Environmental Impact Assessments (EIAs) along with preparation of corridor-specific Environment Management Plans (EMPs) for each sub-project to be financed under the project. An independent review of these documents has been conducted concurrently by the Project Management Consultants engaged by MoRTH in order to ensure compliance with the Safeguard Policies of the World Bank. The management measures are being appropriately incorporated in the engineering design and bidding documents.

71. An EMF has been prepared to guide the over-all sub-project selection, screening (including on biodiversity/wildlife issues); carrying out of EIAs, preparation of EMPs, institutional arrangements, and monitoring to facilitate compliance with the requirements specified in the Bank's Operational Policies, Govt. of India's regulations and concerned State Government norms. The framework will help in addressing environmental risks and issues in a structured and systematic manner.

72. **Biodiversity Protection.** There are two key elements in the over-all environment management approach of the project: (i) avoidance of impacts on critical/ecologically significant natural habitats through a carefully designed screening mechanism and; (ii) comprehensive assessment and appropriate design of sub-projects in cases where diversion of forest land is required and/or where wildlife habitat or corridors are involved beyond the limits of designated protected areas. Based on this approach, no road traversing through



or located along a designated protected area is included in the project except for a bridge in Uttar Pradesh that would require reconstruction over a protected habitat, which is a designated sanctuary for crocodiles in the River Chambal. This was thought through carefully before inclusion in the project as this is a major choke point/bottleneck, and currently witnesses prolonged congestion every day with a consequent impact on fuel consumption, safety of road users (the present structure is weak) and travel time. In addition to integration of avoidance and minimization measures for biodiversity management in the engineering designs, enabling provisions/clauses will be incorporated in the bidding documents. Monitoring and evaluation to assess efficacy of such management and mitigation measures will be carried out.

73. **EIAs and EMPs.** Corridor specific EIAs and EMPs have been prepared for five roads, namely, NH 707 (2 road sections), NH 158 (1 segment) and NH 516E (2 road segments) in accordance with Bank requirements. Potential environment, health and safety risks have been assessed in an integrated way in the EIAs covering direct, indirect and cumulative impacts, as relevant to the context of the sub-project and engineering design propositions therein. Preliminary results are available for the remaining four road corridors where engineering designs/DPRs are under preparation and detailed environmental assessments/surveys are underway. Based on the key findings for the nine NH segments under the proposed project, a comprehensive executive summary has been prepared and disclosed on November 14, 2019. EIAs/EMPs are under preparation for the remaining four sub-projects, which would be finalized and disclosed following procedures similar to those used for first five roads. The EMF includes the requirements for disclosure and public consultations and for Bank's clearances of the final safeguards documents and instruments. The project activities are not likely to generate significant irreversible adverse direct, indirect or cumulative impacts on environment or pose substantial risks to human population if engineering propositions (designs/enabling provisions in the bidding documents) duly incorporate requirements related to environment protection, resource efficiency, resilience and safety. The potential impacts are largely predictable and can be temporary, reversible and local in context with proper implementation of EMPs.

74. **Consultations.** Consultations with both primary and secondary stakeholders were/are being conducted on the design proposals and suggestions/views have been/will be sought on environmental and safety issues as part of the environmental assessments for individual sub-projects. Feedback on the EMF has also been obtained from both primary and secondary stakeholders. The screening results, EIA findings and feedback from officials from Forests, Wildlife, and Public Works Departments have been/are being integrated into the engineering designs/DPRs.

75. **Institutional Arrangements.** The safeguards unit of MoRTH will be strengthened to monitor the proper implementation of the innovative green and resilience solutions during construction and maintenance periods. The EAP cell, will be responsible for the preparation and implementation of the EMF, EIAs and EMPs. It will include a team comprising an Executive Engineer (EE) designated as an Environment and Social Officer (ESO) and a suitable number of technical and secretarial staff. The EE will ensure that all project activities comply with the EMF and EMPs. In each project state, an Environment/Forest Officer will coordinate the preparation/implementation of EMPs and ensure that they comply with the EMF and are implemented in accordance to provisions laid out in the contract documents. For each project road, the PIU will oversee day



to day implementation of environment, health and safety plan, including on issues pertaining to tree cutting, plantation works, utility relocation and worksite safety management.

76. The PMC will include an Environment Specialist, who will work with the EAP team. The PMC will be responsible for training, guidance, and recommendations on handling policy and implementation issues at the state and sub-project levels. The Construction Supervision Consultant/Independent Engineer's team will have Environment and Safety personnel for day-to-day supervision and monitoring. The Environmental and Safety Officer on the Contractor's team will ensure compliance with the environmental contract clauses and will report on progress or challenges to the Construction Supervisory team, as per the contract. Technical Audit Consultants would oversee the implementation of environmental management, health and safety related aspects.

77. **Monitoring and Evaluation:** The application and implementation of EMF/EMPs will be closely monitored (using parameters prescribed in the EMPs) by qualified specialists (including those on the Independent Engineer's team) who will report on a regular basis. A third-party audit/review agency will be selected by MoRTH to evaluate the level of compliance with environment, health, and safety requirements and will share its reports. A comprehensive assessment report on environmental performance will be prepared by MoRTH at mid-term and end-term.

(ii) Social Safeguards

78. The project is expected to have positive social impacts in terms of providing better connectivity in the project states. It will also provide economic opportunities, better health services, and support higher levels of education and improved road safety. Project activities will also have certain adverse impacts, mainly due to land acquisition for road widening, bypasses, realignments and curve improvements. Based on the surveys done for five roads and the preliminary estimates available for the remaining roads, a total of 242 ha of private land will be acquired. This will impact about 2,835 structures fully or partially, about 6,513 households and 15,547 project affected persons. Upgrading of roads will also be undertaken in tribal dominated areas in Andhra Pradesh. Because of these impacts, the project triggers the Bank's Involuntary Resettlement (BP/OP 4.12) and Indigenous Peoples (OP/BP 4.10) policies. The project could also result in social conflict and increase in Gender Based Violence (GBV) due to labor influx.

79. **Management of Social risk and Issues.** MoRTH has prepared a Resettlement Policy Framework (RPF) and Tribal Development Framework (TDF) which provide guidelines to screen the potential adverse impacts and likely benefits of the project, and for the preparation of the Social Impact Assessment (SIA), the Resettlement Action Plan (RAP) and the Tribal Development Plan (TDP), where applicable. The RPF will be applicable to all sub-projects and includes a gender mainstreaming strategy. The draft SIAs and RAPs for five packages related to NH-707, NH-158, NH- 516 E has been prepared and disclosed by MoRTH as well as at the World Bank's portal. The preparation of the SIAs and RAPs for the remaining sub-projects is underway. Stakeholder consultations were conducted during the preparation of these documents to solicit opinions during the design stage. In case of any impacts on the tribal population, a Tribal Development Plan (TDP) or Indigenous People Development Plan (IPDP) will also be prepared and disclosed. To address issues related to



labor influx and GBV, Labor Management Procedures (LMP) and Gender Action Plan (GAP) will be prepared. MoRTH and the PIUs will ensure implementation of LMPs by the contractors.

80. **Institutional Mechanism.** The PIUs will be responsible for RAP and TDP implementation. The RRO in the respective PIUs will be responsible for the implementation of RAP/IPDP/LMP/GAP at site and will assist the Project Director at the PIU and the SDS at the Central Level on all matters related to resettlement and rehabilitation.

81. **Monitoring and Evaluation.** The project authority will carry out monitoring and evaluation through an external agency one month after the mobilization of the RAP implementing agency at the project site. Internal monitoring will be carried out by the Social Officer of Project Implementation Unit (PIU), with assistance from R&R officer and the RAP IA, whereas external monitoring and evaluation will be carried out by the third party engaged for the purpose.

82. **Sexual Exploitation and Abuse (SEA) and Gender Based Violence (GBV).** The GBV risk assessment tool was applied to assess the gender-based violence risks for the project. The overall gender-based violence risk rating for the project was 13.75 on a scale of 25, which was assessed to be “Moderate”.

83. **Labor Influx and Labor Management Plan / Procedures.** Labor influx risks are “medium” in the context of this project and can be managed through the Environmental and Social Management Plans (ESMP) and adequate monitoring. This will be complimented by an effective GRM. A Labor Management Plan will also be prepared to address any potential labor related risks. It is expected that most contractors will be local and will engage laborers from local communities. However, it is envisaged that non-local laborers, especially skilled workers, such as equipment operators, foremen, and technicians will be engaged from other locations. SEA risks may also increase as local laborers gain spare cash, especially younger men. In most cases, the project’s labor-influx risks are assessed as “low”, however, a few areas pose “moderate” (child labor, sexual exploitation and abuse, inadequate waste disposal, and wastewater discharges) to “high” risk (injuries to workers or passersby from construction activities). Moreover, some of the works will be carried out in less populated areas, which may create potential power imbalances. Women are generally engaged as unskilled laborers at construction sites; as these jobs are physically demanding, usually young to middle-aged women work in these sites. Women could face sexual harassment and exploitation in these worksites.

84. **The project will take measures to address labor influx, sexual exploitation and abuse, and occupational health and safety issues.** These include: specialized training for Government officials involved in project implementation on sexual exploitation and abuse; contract provisions barring unlawful engagement of child labour; inclusion of occupational health and safety (OHS) and SEA in contract documents; engagement of NGOs for sensitization (e.g. organizing trainings) and follow-up; engagement of a third-party for helping the SPIUs in monitoring and managing occupational health and safety, labor-influx, SEA and child labor engagement; use of local government area-level women’s development forum for reporting on SEA related grievances and organizing the inclusion of these grievances in the GRM and the (ePMS) and Inclusion of risk mitigation measures for labor-influx and gender-based violence .



(iii) Grievance Redress Mechanisms

85. **Grievance Redress Mechanism (GRM) and Beneficiary Feedback Mechanism:** The project will set up a project specific Grievance Redress and Feedback Mechanism for concerns or complaints when people feel unfairly treated or are negatively affected by any of the project interventions. The mechanism will, *inter-alia*: (i) provide information on project implementation; (ii) facilitate communication between the project and the affected people; (iii) provide a forum for resolving grievances and disputes at the lowest level before they become unmanageable; and (iv) allow communities to express views on negative impacts from construction, on contract workers, work quality, and malpractices. The mechanism to address complaints is envisaged to be at multiple levels (site, state, national).

86. There will be a grievance redressal committee (GRC) for each PIU, comprising of six members, headed by a retired Revenue Officer / Social Welfare Officer. Other members of the GRC will include the concerned Project Director, a retired PWD Officer (not below the rank of Executive Engineer), RRO, representative of PAPs and Sarpanch (Elected Head of Village) of the concerned village. Grievances of affected persons in writing will be brought to the GRC for redress by the RAP/TDP implementation agency. PAPs will be made fully aware of the GRM for effective, inexpensive and amicable settlement of claims for compensation and assistance through meetings with PAPs, public meetings and distributing leaflets containing the salient features and procedures of the GRM. The RAP/ TDP implementing agency will document all cases brought to GRC and maintain records of the proceedings of the GRC meetings. The GRC will normally meet once in a month but may meet more frequently, if the situation so demands. A period of 45 days will be available for redressing the grievances of PAPs. The affected persons will have the option of taking recourse to the court of law, at their own expense, if they wish to dispute the GRC decision.

87. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

V. KEY RISKS

88. The technical design of the Project is rated Substantial because the project involves introduction of pilots on resource efficient, green and climate resilient infrastructure improvement and related interventions, which may not always result in envisaged positive outcomes. This risk is mitigated by preparation of designs



by engaging reputed consulting firms for each of the Project roads. The institutional capacity for implementation and sustainability is rated Substantial because the project will be implemented through several PIUs of varying capacities and the need to mainstream the green technologies. This risk is mitigated by strengthening the capacity of the PIUs with PMC and through appropriate DLIs for mainstreaming the concepts. The fiduciary risks are rated substantial because of the nature and quantum of works envisaged in the project. These risks are mitigated through robust financial management and disbursement arrangements. The environmental and social risks are rated substantial due to the risks associated with upgrading of highways in mountainous, geo-hazard prone and flood-prone areas, and traversing through some dense settlement sections. These risks are mitigated through preparation of safeguard documents by engaging reputed consultants and through institutional arrangements. The overall risk for the project is rated as Substantial because of the above reasons and the project design and implementation arrangements are designed to mitigate it.



VI. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: India

Green National Highways Corridor Project

Project Development Objectives(s)

The Project Development Objective is to demonstrate safe and green National Highway corridors in selected States and enhance the institutional capacity of the Ministry of Road Transport and Highways in mainstreaming safety and green technologies.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Demonstrate green National Highway corridors in selected states				
Natural resource efficiency gains in construction of project highways (Text)		Usage not systematic	Natural resource efficiency aspects incorporated in design and construction of 250 km of project highways	Natural resource efficiency aspects incorporated in design and construction of 783 km of project highways
Reduced carbon emissions in construction of project highways (Percentage)		0.00	15.00	25.00
Reduced Vehicle Operating Costs on project highways (Text)		Trucks VOC is Rs. 20 per km		Trucks VOC is less than Rs. 20 per km
Demonstrate safe National Highway corridors in selected states				
Reduction of fatalities on project highways (Text)		2019 baseline data - to be collected		No increase in fatalities
Enhance the institutional capacity of MoRTH in mainstreaming safety and green technologies				
Safety and green highway technologies applied on 2,500 km of non-project highways (Kilometers)	DLI 10	0.00		2,500.00
Green National Highways Policy and Guidelines	DLI 5	Policy to be developed		Policy developed and implemented



Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
developed and implemented (Text)				
National Highways Climate Adaptation Policy and guidelines developed and implemented (Text)	DLI 4	Policy to be developed		Policy developed and implemented

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Component A: Green Highway Corridor Improvement and Maintenance				
Length of project National Highways developed incorporating green technologies (Kilometers)	DLI 1	0.00	250.00	783.00
Climate resilience aspects incorporated in construction of project highways (Kilometers)		0.00	250.00	783.00
Length of project highways constructed incorporating bio-engineering solutions (Kilometers)	DLI 3	0.00		150.00
Roads constructed (CRI, Kilometers)		0.00	250.00	783.00
Roads constructed - rural (CRI, Kilometers)		0.00	0.00	0.00
Roads constructed - non-rural (CRI, Kilometers)		0.00		783.00
Beneficiaries of job-focused interventions (CRI, Number)		0.00		1,000.00
Beneficiaries of job-focused interventions - Female (CRI, Number)		0.00		500.00
Grievances filed through project GRM are properly tracked and receive satisfactory responses (Percentage)		0.00		90.00



Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Increase in road user satisfaction (on a scale of 0 to 5) (Text)		Baseline data not yet available		Increase in road user satisfaction
Component B: Institutional Capacity Enhancement				
Development and implementation of guidelines and model documents for mainstreaming safety and green technologies (Text)		Template ToRs for design, supervision, bid documents for incorporating safety, resilience and green technologies not available		Template ToRs for design and supervision of construction, bidding documents and project management process of the EPC contracts incorporating safety, resilience, and green technologies developed and implemented
Development and implementation of policy for reducing emissions from transport services (Text)	DLI 6	None		Policy to reduce vehicular emissions developed and implemented.
Development of physical and digital freight management systems' models (Text)	DLI 7	No models in place		Appropriate models designed and platforms developed
Percentage of women engaged as staff in Highway Safety Work force (Percentage)		0.00		30.00
Component C: Road Safety				
Strengthening safety enforcement and emergency response along the project highways (Text)	DLI 11	None		Highway safety enforcement and emergency response facilities (Traffic Aid Posts) established at fourteen locations on the project highways.
Improved road safety data analytics (Text)	DLI 8	The Integrated Road Accident Database Management System is being developed		Roll out of the Integrated Road Accident Database Management System in 5 states
Enhanced capacity and support to National Road Safety Board (Text)	DLI 12	The National Transport Safety Board is to be formed		Support provided to the National Transport Safety Board
National Highway Safety System implemented (Text)	DLI 9	National Highway Safety System is being designed		National Highway Safety System implemented in 1,200 km of highways



Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Natural resource efficiency gains in construction of project highways	This indicator attempts to capture the extent of savings in use of scarce natural materials in construction and maintenance of highways by incorporating appropriate pavement designs	Mid-term and End of project	Design Consultants, Supervision Consultant reports, R&D	Design reports/Supervision Consultant's Reports, R&D Reports	MoRTH, project consultants
Reduced carbon emissions in construction of project highways	This indicator seeks to measure the extent to which GHG emissions are reduced in construction of project highways	Mid-term and End-of-Project	Design Consultants, Supervision Consultants, R&D	Consultant's reports	MoRTH, project consultants
Reduced Vehicle Operating Costs on project highways	This indicator seeks to measure reduction in vehicle operating costs of trucks in project highways	Mid-term and End of project.	Design consultants, Supervision consultants	Consultant reports	MoRTH, project consultants
Reduction of fatalities on project highways	This indicator seeks to measure the effectiveness of road safety interventions on project roads	Annual	DPR Reports and Police records	consultants' reports	MoRTH, project consultants
Safety and green highway technologies applied on 2,500 km of non-project highways	This indicator measures mainstreaming of green technologies in design and construction of highways	Annual	MoRTH	Policy documents, consultant's reports	MoRTH



Green National Highways Policy and Guidelines developed and implemented	This indicator measures capacity enhancement in mainstreaming of green technologies through policy development and implementation.	Mid-term, end-of-project	Government order	PMC, TAC report	MoRTH, TAC
National Highways Climate Adaptation Policy and guidelines developed and implemented	This indicator measures capacity enhancement in mainstreaming of climate resilience through policy development and implementation.	Mid-term, end-of-project	MoRTH	MoRTH/Government order, PMC and TAC reports	MoRTH, TAC

Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Length of project National Highways developed incorporating green technologies	This indicator seeks to measure the length of National Highways constructed incorporating green technologies and demonstrating resource efficiency, climate resilience, and safety aspects	Mid-term, End-of-Project	Supervision consultants	Consultant reports	MoRTH, project consultants
Climate resilience aspects incorporated in construction of project highways	This indicator seeks to measure the length of project highways constructed incorporating	Mid-term and End of project	Design Consultants, Supervision Consultants	Consultants' reports	MoRTH, project consultants



	climate resilience aspects				
Length of project highways constructed incorporating bio-engineering solutions	Bio-engineering solutions applied in the project highways	Mid-term, End-of-Project	Supervision consultants	Progress reports	MoRTH, project consultants
Roads constructed		Mid-term and End-of-Project	Supervision consultants	Progress reports	MoRTH, project consultants
Roads constructed - rural		Mid-term, End-of-Project	Supervision consultants	Progress reports	MoRTH, project consultants
Roads constructed - non-rural		Mid-term, End-of-Project	Consultants	Monthly progress reports	MoRTH, project consultants
Beneficiaries of job-focused interventions		Mid-term, End-of-Project	Supervision consultants	consultants report	MoRTH, project consultants
Beneficiaries of job-focused interventions - Female		Mid-term, End-of-Project	Supervision Consultants. This indicator measures the number of female beneficiaries reached by interventions that are	consultants reports	MoRTH, project consultants



			supported by the Project.		
Grievances filed through project GRM are properly tracked and receive satisfactory responses	The indicator measures the percentage of grievances satisfactorily dealt that are lodged with the Grievance Redressal Management system strengthened under the project	Annual	Supervision Consultant Reports, MoRTH	Extraction of Data from GRM systems	Supervision Consultants, MoRTH
Increase in road user satisfaction (on a scale of 0 to 5)	This indicator seeks to measure the increase/decrease in level of satisfaction of the road users during and after completion of construction of project highways.	At the start of the project, at the mid-term, and at the close of the project	Report of the Road User Satisfaction study consultants	Road User Satisfaction surveys	Consultants, MoRTH
Development and implementation of guidelines and model documents for mainstreaming safety and green technologies	This indicator seeks to measure the mainstreaming of safety and green technologies through development and implementation of model documents and guidelines	Six-monthly	Consultant reports/quarterly monitoring reports	Consultant reports/quarterly monitoring reports	MoRTH
Development and implementation of policy for reducing emissions from transport services	This indicator seeks to measure whether policy to reduce vehicular emission have been developed and implemented, which would in turn help in promoting	six-monthly	Consultant reports/quarterly monitoring reports	Consultant reports/quarterly monitoring reports	MoRTH



	green highways by reducing vehicular emissions.				
Development of physical and digital freight management systems' models	This indicator seeks to improve freight flows through development of suitable models	yearly	PMC and consultant's reports	PMC and consultant's reports	MoRTH, PMC
Percentage of women engaged as staff in Highway Safety Work force	The indicator seeks to measure percentage of women employed in the Highway safety work force in implementation of National Highway Safety System and Traffic Aid posts in the Project.	Six-monthly	Supervision consultants, MoRTH and NHSS consultants	Consultants reports	MoRTH, project consultants
Strengthening safety enforcement and emergency response along the project highways	This indicator seeks to measure the extent to which highway safety and emergency response facilities have been established, thus reducing fatalities and road crash incidences.	Annual	Consultant reports/quarterly monitoring reports	Consultant reports/quarterly monitoring reports	MoRTH
Improved road safety data analytics	This indicator seeks to systematically analyse road accident data and support decision making	Annual	MoRTH	Consultancy reports	MoRTH
Enhanced capacity and support to National Road Safety Board	This indicator seeks to enhance the operational effectiveness of the National Transport Safety Board	Annual	MoRTH	MoRTH	MoRTH
National Highway Safety System implemented	This indicator seeks implementation of road	Annual	MoRTH, project	Consultant's reports	MoRTH



	safety enforcement on highways		consultants		
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Disbursement Linked Indicators Matrix

DLI 1	Project National Highways constructed incorporating green technologies			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Percentage	200.00	40.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
Year 1	10.00		20.00	
Year 2	30.00		60.00	
Year 3	30.00		60.00	
Year 4	20.00		40.00	
Year 5	10.00		20.00	
DLI 2	Updated design and contract documents for construction and maintenance of highways developed and mainstreamed			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Outcome	No	Text	25.00	5.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	Contract documents for implementation of safety			



	and green technologies in design and construction of highways not available			
Year 1	Contract documents for implementation of safety and green technologies in design and construction of highways developed, approved and mainstreamed			25.00
Year 2				0.00
Year 3				0.00
Year 4				0.00
Year 5				0.00
DLI 3	Project National Highways constructed incorporating bio-engineering solutions			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Kilometers	50.00	10.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
Year 1			0.00	
Year 2	30.00		10.00	
Year 3	30.00		10.00	
Year 4	60.00		20.00	



Year 5	30.00		10.00	
DLI 4	National Highways Climate Adaptation Policy and guidelines developed and implemented			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	No	Text	40.00	8.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	Climate Adaptation Policy and guidelines not available			
Year 1			0.00	
Year 2	Climate Adaptation Policy and guidelines developed and implemented		40.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	
DLI 5	Green National Highways Policy and Guidelines developed and implemented			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	No	Text	40.00	8.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	Green National Highways Policy and Guidelines not available			



Year 1			0.00	
Year 2	Green National Highways Policy and Guidelines developed and implemented		40.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	
DLI 6	Policy for reducing vehicular emissions developed and implemented			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	No	Text	20.00	4.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	Policy for reducing vehicular emissions not available			
Year 1			0.00	
Year 2	Policy for reducing vehicular emissions developed and implemented		20.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	



DLI 7		Physical and digital freight management systems and models developed and adopted		
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	No	Text	15.00	3.00
Period	Value	Allocated Amount (USD)		Formula
Baseline	Physical and digital freight management systems and models not available			
Year 1	Physical and digital freight management systems and models developed and adopted	15.00		
Year 2		0.00		
Year 3		0.00		
Year 4		0.00		
Year 5		0.00		
DLI 8		Highway safety monitoring and data analytics improved		
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Text	15.00	3.00
Period	Value	Allocated Amount (USD)		Formula
Baseline	No accident database management system in place			
Year 1		0.00		



Year 2	Integrated Road Accident Database Management System is implemented in 5 states		15.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	
DLI 9	National Highway Safety System implemented			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Text	15.00	3.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	National Highway Safety System is being designed			
Year 1			0.00	
Year 2	National Highways Safety System implemented in 1,200 km of highways		15.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	



DLI 10				
Mainstream safety and green technologies in the development of highways				
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Outcome	Yes	Kilometers	50.00	10.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
Year 1	500.00		15.00	
Year 2	2,000.00		35.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	
DLI 11				
Enforcement of safety and emergency response along the project highways improved				
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Number	14.75	2.95
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
Year 1			0.00	
Year 2	2.00		2.75	
Year 3	4.00		4.00	



Year 4	4.00		4.00	
Year 5	4.00		4.00	
DLI 12	National Road Safety Board capacity enhanced			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	No	Text	2.40	0.48
Period	Value		Allocated Amount (USD)	Formula
Baseline	The National Transport Safety Board is to be formed			
Year 1			0.00	
Year 2	National Road Safety Board adopts its first-year action plan		2.40	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	
DLI 13	Training imparted in road safety			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Number	1.60	0.32
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			



Year 1		0.00
Year 2	100.00	0.70
Year 3	100.00	0.30
Year 4	100.00	0.30
Year 5	100.00	0.30

DLI 14	An integrated ERP system implemented in MoRTH and its two implementing agencies			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Process	No	Text	10.00	2.00
Period	Value		Allocated Amount (USD)	Formula
Baseline	ERP solution is being developed			
Year 1			0.00	
Year 2	ERP solution is implemented in MoRTH and its two implementing agencies		10.00	
Year 3			0.00	
Year 4			0.00	
Year 5			0.00	

**Verification Protocol Table: Disbursement Linked Indicators**

DLI 1	Project National Highways constructed incorporating green technologies
Description	This DLI will be met when 783 kilometers of project National Highways are designed and constructed incorporating green technologies that will ensure efficient use of natural resources, climate resilient designs and road safety features. The upgraded works should also include compliance with the relevant social and environmental safeguards instruments adopted by the project.
Data source/ Agency	Progress reports prepared by the Supervision Consultants, project reports prepared by the PMC, and the audit reports prepared by the TAC
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$20 million upon achievement of initial 10 percent of physical progress of works, and thereafter US\$20 million in tranches upon achievement of an additional 10 percent physical progress of works up to a maximum of US\$200 million. The physical progress of works is defined as the sum of the payments made under the works contracts for the work done (excluding advances and claims) divided by the greater of (a) Rs. 4700 crore, and (b) the sum of the contract prices (the lumpsum contract price as mentioned in the contract agreements) of all the works contracts in Component A. A comprehensive review will be carried out by the TAC. The review covers engineering designs prepared by the contractor and approved by the Supervision Consultant and its physical construction at site. The review also includes quality assurance, compliance with and implementation of Environmental and Social Management Plans, and implementation of traffic safety measures. The TAC will verify and submit reports in June and December of every year, to certify that the DLIs have been fully or partially achieved and on call basis also if ever needed in case of exceptional achievement.
DLI 2	Updated design and contract documents for construction and maintenance of highways developed and mainstreamed
Description	This DLI will be met when improved Terms of Reference incorporating safety, resilience and green technologies for design of highways, supervision of construction, and bidding documents and project management process of the EPC contracts are prepared and mainstreamed by the MoRTH based on a study identifying gaps and documenting good practices in the design, implementation and maintenance stages of highways.
Data source/ Agency	Consultant's report and Model procurement / contract documents of MoRTH



Verification Entity	Technical Audit Consultant (TAC)
Procedure	The TAC reviews the model Terms of Reference for design of highways, supervision of construction, and bidding documents approved and issued by MoRTH for implementation in National Highway works and confirms inclusion of safety, resilience and green technologies. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 3	Project National Highways constructed incorporating bio-engineering solutions
Description	This DLI will be met when 150 kilometers of project National Highways are designed and constructed incorporating bio-engineering solutions. The upgraded works should also include compliance with the relevant social and environmental safeguards instruments adopted by the project.
Data source/ Agency	Progress reports prepared by the Supervision Consultants, project reports prepared by the PMC, and the audit reports prepared by the TAC
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$10 million upon execution of 30 km up to a maximum of US\$50 million. A comprehensive review will be carried out by the TAC. The review covers designs prepared by the contractor and approved by the Supervision Consultant and its physical construction at site. The review also includes quality assurance, compliance with and implementation of Environmental and Social Management Plans, and implementation of traffic safety measures. The TAC will verify and submit reports in June and December of every year, to certify that the DLIs have been fully or partially achieved and on call basis also if ever needed in case of exceptional achievement.
DLI 4	National Highways Climate Adaptation Policy and guidelines developed and implemented
Description	This DLI will be met when disaster risk and impact assessment of 5,000 km of the NH network is carried out, and a Climate Adaptation Policy and guidelines are developed and implemented by the MoRTH in construction and maintenance of National Highways.
Data source/ Agency	Consultant’s report on disaster risk and impact assessment, Government Notification/Order issued by MoRTH on Climate Adaptation Policy and guidelines
Verification Entity	Technical Audit Consultant (TAC)



Procedure	The TAC reviews the Government Notification / order issued by MoRTH on Climate Adaptation Policy and guidelines and confirms the applicability of the policy and guidelines for implementation in the National Highways. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 5	Green National Highways Policy and Guidelines developed and implemented
Description	This DLI will be met when Green National Highways Policy and guidelines have been developed and implemented.
Data source/ Agency	Consultant’s or R&D organization’s reports, Government Notification/Order issued by MoRTH on Green National Highways Policy and guidelines
Verification Entity	Technical Audit Consultant (TAC)
Procedure	The TAC reviews the Government Notification / order issued by MoRTH on Green National Highways Policy and guidelines and confirms the applicability of the policy and guidelines for implementation in the National Highways. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 6	Policy for reducing vehicular emissions developed and implemented
Description	This DLI will be met when policy, regulations and systems for reducing vehicular emissions are developed and implemented based on a study mapping the freight volume and movement pattern on the National Highway network.
Data source/ Agency	Consultant’s report on freight movement on the National Highway network, Government Notification/Order issued by MoRTH on policy for reducing vehicular emissions
Verification Entity	Technical Audit Consultant (TAC)
Procedure	The TAC reviews the Government Notification / order issued by MoRTH on policy for reducing vehicular emissions and confirms the applicability of the policy for implementation in the National Highways. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 7	Physical and digital freight management systems and models developed and adopted
Description	This DLI will be met when physical and digital freight management systems for freight flow management based on a study mapping the freight volume and movement pattern on the National Highway network. are developed and models



	established.
Data source/ Agency	Consultant’s reports
Verification Entity	Technical Audit Consultant (TAC)
Procedure	The TAC reviews the consultant’s report and prepares an assessment report. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 8	Highway safety monitoring and data analytics improved
Description	This DLI will be met when the roll out of the Integrated Road Accident Database Management System is implemented in 5 states.
Data source/ Agency	Consultant’s reports, PMC reports
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$5 million upon roll out of the Integrated Road Accident Database Management System in one state, plus US\$2.5 million for roll out of the Integrated Road Accident Database Management System in every additional state thereafter, up to a maximum amount of US\$15 million. The TAC reviews the consultant’s report and PMC’s reports and prepares an assessment report. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 9	National Highway Safety System implemented
Description	This DLI will be met when the National Highway Safety System which is being currently developed is implemented on 1,200 km of National Highways.
Data source/ Agency	Supervision consultant reports, PMC’s reports and MoRTH
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$6 million upon implementation of the National Highway Safety System in 200 km of National Highways, plus US\$4.5 million for implementation of the National Highway Safety System in every additional 500 km thereafter, up to a maximum amount of US\$15 million.



	The TAC reviews the consultant’s reports and PMC’s reports and prepares an assessment report. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 10	Mainstream safety and green technologies in the development of highways
Description	This DLI will be met when the MoRTH or its implementing agencies (NHAI, NHIDCL) have signed contracts for upgrading / construction of 2,500 km of non-project highways incorporating safety and green technologies.
Data source/ Agency	Government Notification / Order / Contract Agreements
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$15 million upon the signing of contracts covering at least 500 km, plus US\$8.75 million for contracting of every additional 500 km thereafter, up to a maximum amount of US\$50 million. The TAC reviews the new contracts signed by the MoRTH or its implementing agencies (NHAI, NHIDCL) for upgrading / construction of non-project highways and confirms incorporation of safety and green technologies like the project highways.
DLI 11	Enforcement of safety and emergency response along the project highways improved
Description	This DLI will be met when measures for highway safety and emergency response facilities equipped with patrol vehicles, advanced life-saving ambulances, cranes, tow trucks, communication system, and surveillance and other enforcement equipment to deter speeding, drink driving, and other risky user behaviors have been established at 14 critical locations on the 783 km of project highways to improve safety.
Data source/ Agency	Consultant’s reports, PMC reports
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$1.75 million for the first location, US\$1 million for every additional location thereafter, up to a maximum amount of US\$14.75 million. The TAC reviews the supervision consultant’s report and PMC’s reports and prepares an assessment report. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.



DLI 12	National Road Safety Board capacity enhanced
Description	This DLI will be met when support is provided to the proposed National Road Safety Board in its initial startup phase, through expert support as part of an interim secretariat and the National Road Safety Board adopts its first-year action plan related to (a) monitoring and evaluation, (b) drafting of rules for the MVAA, and (c) data analysis and recommendations.
Data source/ Agency	Consultant's contracts and PMC's reports
Verification Entity	Technical Audit Consultant (TAC)
Procedure	The TAC reviews the consultant's contracts and PMC's reports and prepares an assessment report. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.
DLI 13	Training imparted in road safety
Description	This DLI will be met when training has been imparted to 400 officials of MoRTH, implementing agencies of MoRTH, and the NRSB in road safety management, crash investigation, safety audit, and monitoring and evaluation.
Data source/ Agency	PMC's reports and MoRTH
Verification Entity	Technical Audit Consultant (TAC)
Procedure	US\$0.7 million upon training of 100 officials, plus US\$0.3 million for imparting training to every additional 100 officials thereafter, up to a maximum amount of US\$1.6 million. The TAC reviews the PMC's and MoRTH's reports and prepares an assessment report.
DLI 14	An integrated ERP system implemented in MoRTH and its two implementing agencies
Description	This DLI will be met when an integrated ERP solution is implemented in MoRTH, NHAI and NHIDCL. The ERP in the MoRTH and its associated agencies is being implemented in various phases which includes Business Blueprinting, Implementation phase Wave 1 to Wave 3, Stabilization phase followed by operation acceptance and third-party verification and thereafter Operations and Maintenance (O&M) Phase. The above milestones are detailed in the design, implementation and O&M contract signed between MoRTH and the System Integrator for ERP implementation.
Data source/ Agency	PMC's reports, operational acceptance certificates, MoRTH



Verification Entity	Technical Audit Consultant (TAC)
Procedure	<p>US\$2.5 million upon completion, acceptance and go-live of Wave 2 of the implementation phase. US\$2.5 million upon completion, acceptance and go-live of Wave 3 of the implementation phase. US\$2.5 million upon completion of operational acceptance, third party verification and completion of stabilization phase of the ERP and shifting to O&M phase. US\$2.5 million upon completion of 1 year of O&M phase.</p> <p>The TAC reviews the PMC's reports and prepares an assessment report. The validation will be based on successfully completed user acceptance testing and the operational acceptance certificates signed by MoRTH / NHIDCL / NHAI, as the case may be. In case this DLI is met later than the target date, the disbursement linked to the indicator will still be made when the DLI is met.</p>



ANNEX 1: Implementation Arrangements and Support Plan

1. Implementation arrangement for the project will be the same as for NHIP, except for the involvement of state PWDs in project execution.
2. MoRTH will implement the project, through its Externally Aided Projects (EAP) Cell. The EAP Cell will have the overall responsibility for all aspects of the project including financial management, procurement, contract monitoring, environment & social safeguards, road safety and institutional strengthening. MoRTH will have PIUs in each of the states which will be responsible for execution of the civil works. Project activities will be implemented in collaboration with the respective partner agencies, e.g., regional offices of the MoRTH in each of the states (for civil works), Road Safety Cell of MoRTH and National Road Safety Board once established (for road safety activities), Indian Road Congress (for developing standards and other sector guidance material), and the Indian Academy of Highway Engineers (for Training).
3. **Project Management.** The EAP Cell will be the custodian of the project and each of the deliverables as well as initiatives from the project will eventually have to be managed by the functional divisions of the MoRTH and the respective partner agencies. MoRTH will engage a Project Management Consultant (PMC, a consulting firm), with adequate number of staffs covering the areas of environment management, social safeguards, engineering, contract management, financial management, and road safety. The PMC will provide direct assistance in project-level planning and implementation.
4. **Audit and verification of DLIs.** An independent Technical Audit Consultancy will be responsible for independent verification of DLIs and to perform an annual integrated performance audit covering engineering designs, management of social and environmental issues, and quality assurance.
5. **Supervision and monitoring.** Construction Supervision Consultants (CSC) will provide regular supervision of works contracts under Components A and C (sub-components C1 and C3). Consultants/non-governmental organizations will aid MoRTH in the implementation of the RAPs. Reputed educational/research institutions contracted under the project will undertake systematic monitoring and evaluation, and documentation of the results of the pilot works undertaken in Component A of the project. The Road User Satisfaction Survey consultant will carry out baseline, midterm, and end stage user satisfaction surveys. Consultants will also be procured under the project to carry out the studies in Components B and C of the Project.
6. **Day-to-Day Contract Management.** In case of civil works, bulk of the responsibility for day-to-day contract management will be vested with the PIUs, which will be established for each sub-project road, with devolution of certain financial, technical and contractual powers within pre-specified thresholds for faster decision-making; decisions beyond those thresholds will be made by the Ministry's Regional Offices and the EAP Cell, as per existing rules and regulations. The PIU will be headed by an Executive Engineer, who will be the client's representative at the field level. These PIUs will be directly responsible for



expediting preparatory activities and making available encumbrance-free land for construction through coordination with the state-level agencies responsible for forestry, environmental clearances, land acquisition, resettlement, and public utilities. The PIUs will also guide and oversee the Contractor, Consultants/NGOs implementing the RAPs, and the CSC or Engineer to ensure compliance with contractual agreements and safeguard requirements. Each PIU will have designated staff to coordinate technical aspects, as well as environmental and social safeguards.

7. **Project Oversight.** A Project Steering Committee comprising of the Secretaries of the PWDs of all project states, will be constituted with Secretary, MoRTH as the chair, to periodically review, resolve emerging issues, and provide necessary guidance to the EAP Cell.

8. **Mainstreaming green technologies.** The EAP cell will work in close collaboration with different wings of the MoRTH (the Standards and Research wing, Road Safety Cell, National Road Safety Board, Indian Roads Congress, and the Indian Academy of Highway Engineers) and the state Public Works Departments, foster monitoring and evaluation in association with academia and other research organizations, and partner with consulting and contractor associations to systematically mainstream green technologies in the highway sector.

Financial Management and Disbursements

Financial Management

9. The Project Financial Management arrangements will primarily be the same as those in the ongoing NHIP, which are functioning satisfactorily. MoRTH will be responsible for overall project FM arrangements through the EAP Cell, Regional Offices (RO) of MoRTH and Regional Pay and Accounts Offices (RPAO) under the Principal Chief Controller of Accounts (Pr. CCA). The FM assessment indicates that there are appropriate FM systems in the RPAOs and ROs to account for and report on the project expenditure and to meet the Bank's fiduciary requirements complemented by certain reporting requirements with respect to the preparation of Interim Unaudited Financial Reports and internal audit. Actual execution of the contracts under the project will be overseen by the PIUs set up by the ROs at the state level. Oversight and payment approval functions will vest with the ROs and payment and accounting functions will be handled by the RPAOs under the existing country systems. Based on the FM Assessment, the overall FM risk is assessed as Substantial. Key features of the project FM arrangements are presented hereunder.

10. **Budgeting and Counterpart Funding.** Project funds (Bank share and counterpart funds) will be provided for under separate budget heads and will be reflected in the Demand for Grants of MoRTH, in accordance with the GoI budget system. The project budget will be based on the Annual Plan prepared by each RO for the concerned state and consolidated by CCA-MoRTH. After the budget is approved by the Parliament, the budget allocation will be made by MoF to MoRTH and conveyed down the line to the relevant ROs. PFMS software used by RPAOs provides control of actual expenditure against budgeted expenditure by budget head and by state.



11. **Payments to Contractors, including verification and approval of payments.** The New Direct Payment Procedure (DPP) will be applicable for payments to contractors and consultants. All payments in respect of contracts will be made through electronic transfers directly to the contractors by the concerned RPAO, based on bills verified by the PIUs and approved by the RO. The works executed by contractors will be verified by the Executive Engineer with the support of supervision consultants and other engineering staff. The verified bills will also be reviewed by the Financial Management Consultant based at the PIUs. Payments for the contractors/consultants working for EAP Cell will be made using the extant system of MoRTH after the bills are verified by the EAP Cell and reviewed by IFD.
12. **Accounting.** Accounting in MoRTH follows the system prescribed for ministries under the Union Government. The accounting responsibility vests with the CCA reporting to the Integrated Financial Advisor under the CGA. Detailed instructions and procedures for accounting and payments are documented in the Civil Accounts Manual (CAM). The chart of accounts is mapped to the budget heads. The accounting centers are the RPAOs that use PFMS software for accounting and reporting. The detailed works/ contract wise information is recorded in manual Job Control Registers maintained by the RO and the RPAO. The accounting arrangement described above will be applicable to the Project transactions. Computerization of the manual Job Control Register presents an opportunity to strengthen reporting and overall contract-wise financial progress monitoring. This aspect is expected to be covered under the ongoing ERP implementation in MoRTH.
13. The EAP Cell will be responsible for preparing the annual Project Financial Statement (PFS) in Bank agreed formats. The PFS will include annual and year to date sources and uses of project funds, project expenditures and reconciliation of disbursement claims with total application of funds. The procedures for preparing PFS and reconciliation of disbursements and claims are described in detail in the FM Manual.
14. **Internal Controls including Internal Audit.** MoRTH will follow the internal controls prescribed in the CAM, the General Financial Rules, 2017 of the GoI and its internal circulars, including the delegation of powers. The technical, administrative, and financial sanction of each estimate for the works included in the project will be accorded by MoRTH and conveyed through a sanction letter.
15. The Project Internal Audit would be undertaken by an internal audit firm appointed by MoRTH. The half yearly project internal audit will be undertaken as per the terms of reference and criteria agreed with the Bank and will cover financial management, contract management and procurement aspects.
16. **Financial Reporting.** MoRTH will submit quarterly Interim Unaudited Financial Reports (IUFR) to the Bank within 45 days from the end of each quarter for reporting project expenditures, and which will also be the basis for disbursement by the Bank. The IUFR will detail the project funds received through the budget and component/ sub-component-wise actual expenditures for the quarter, year to date; cumulative to date; physical/ financial progress of project components; and details of the contracts funded under the project; reconciliation between expenditure reported under IUFR with expenditure booked under budget heads in PFMS. The ROs would compile works/ contract-wise expenditures through the manual Job registers. The EAP Cell may face the challenge of compiling the data from several ROs and



submit the information to the Bank in the IUF. This risk is mitigated by the fact that the ROs already have a system of monthly reporting of the physical and financial progress of the contracts and this report with necessary amendments would provide the information feeding into the IUF. The formats of the IUFs are included in the FM Manual.

17. **External Auditing.** The audit arrangements under CAG are accepted by the Bank as part of country systems approach. For the project, CAG will audit the annual PFS under the terms of reference agreed for World Bank funded projects. The audited PFS will be submitted to the Bank within nine months from the close of the financial year. As in the case of NHIP, CAG will issue a consolidated audit report for the program. In addition, the project would ensure timely submission of PFS to the auditors providing sufficient time for audit and compilation. The following audit reports will be monitored in the Bank’s System.

Audit reports to be monitored

Agency	Audit Report	Auditor	Due Date
MoRTH-EAP Cell	Annual Audit Report on the Project Financial Statements	Comptroller and Auditor General of India	Nine months from the close of the financial year

18. **Project FM Staffing:** MoRTH has assigned a senior MoRTH official of the rank of SE as FM Coordinator to the EAP Cell who would be adequately supported by in house/ contractual staff which will include a Chartered Accountant appointed through PMC. The broad responsibilities of the FM Coordinator would include consolidating and submitting the quarterly IUFs and the annual PFS; submitting claims to CAAA, and reconciling claims with disbursements; receiving annual project audit reports of the C&AG and forwarding them to the Bank and addressing resolution of the audit observations. At regional level, the regional offices of MoRTH, headed by Superintending Engineer will have overall responsibility of FM functions. Qualified/semi-qualified Chartered Accountants will also be appointed through PMC at each of the PIUs. The RPAO will be responsible for accounting and treasury functions. The ROs will coordinate internal and external audits. Project FM staff will be supported by the FM manual and undergo training to gain understanding of Bank’s Financial Management and Disbursement arrangements, as needed.

19. **Ineligible expenditure:** The following expenditures are treated as ineligible expenditures for financing from the Bank under this project:

- a. All land acquisition/ purchases required for the purpose of the project
- b. Any compensation, resettlement and rehabilitation payment to affected person in accordance with the provision of the RAPs, CPTDs and TPDP
- c. Any compensatory afforestation payments
- d. Retention money/security deposit retained (till the time it is not released)
- e. Expenditure incurred after the project closing date
- f. Expenditure not in line with the project description in the Legal Agreement
- g. Procurement not in line with agreed procurement procedures
- h. Expenses disallowed by auditors and not resolved adequately, and expenses found ineligible during Bank review



20. **Disbursement Arrangements:** Reimbursement will be the primary method of disbursement under the project. EAP Cell will submit withdrawal applications supported by IUFR to CAAA for onward submission to the Bank for reimbursement of expenditures. Disbursement will be made against satisfactory achievement of DLIs and verified as per the agreed verification protocol supported by EEPs incurred under the project. The basic principles governing the DLI-based component are as follows:

- a. Project will submit reports (at least annually) showing the status of achievement of DLIs. This will be verified, where appropriate, by an Independent Verification Agency (IVA) to be appointed by the project as per ToR agreed with the World Bank.
- b. On validation of DLIs achieved, the project will seek reimbursement from the World Bank of an amount equivalent to the DLI value achieved. The World Bank, subject to EEPs being adequate to cover the value of DLI(s) achieved, will disburse the full amount. Where the reported EEP is less than the aggregate DLI value achieved by the project, disbursement by the World Bank will be limited to the value of the reported EEP. The balance DLI value will be reimbursed when adequate EEP is reported subsequently. Reported EEP will be considered cumulatively.
- c. If the project does not achieve the DLI target(s) for a particular year, the same will be rolled over till the DLI is achieved. It is clarified, that in the case of non-scalable DLIs (as provided for in the DLI Verification Protocol), the Bank will only disburse against the full achievement of the DLI target for that particular year.
- d. In case the audited EEP is less than the reported EEP, the difference would be adjusted against disbursement of subsequent DLI.
- e. In the case of partial achievement of any specific scalable DLI, the Bank may, at its discretion, reallocate an amount not exceeding [thirty percent] [30 percent] of the proceeds of the Loan to any other DLI. In no case shall the amount allocated against any DLI be increased by more than [thirty percent] [30%] through any reallocation, including the reallocation mentioned herein.

21. IBRD funds will be disbursed against eligible expenditures under the following categories subject to the allocated amount and the disbursement percentage as indicated in the table below.

Expenditure against disbursement categories

Disbursement Category	Amount of the Loan Allocated (expressed in US\$)	Percent of expenditures to be Financed (inclusive of taxes)
(1) Works under the Eligible Expenditure Program (EEP) under the Project	429,000,000	50%
(2) Goods, consulting services, non-consulting services, and Training under the Eligible Expenditure Program (EEP) under the Project	69,750,000	80%
(3) Front-end Fee	1,250,000	
(4) Premia for Interest Rate Cap and Interest Rate Collar	0	
Total Amount	500,000,000	



22. **Implementation Support:** The project will require a high degree of implementation support which will be provided through six-monthly (or lesser periodicity as required) missions, review of IUFR and audited financial statements and internal audit reports. Status of implementation of agreed FM arrangements will be reviewed by the Bank.

Procurement

23. **Procurement for the project will be carried out in accordance with the World Bank “Regulations.”** The project will also be subject to World Bank Anticorruption Guidelines, dated October 15, 2006, and revised in January 2011 and July 2016.

24. **A PPSD has been developed for the project.** Extensive market analysis has been carried out for different procurement packages. Based on the findings, decisions on packages and lots were finalized for civil works to ensure adequate participation of bidders. Consultancy contracts have been framed based on market research and packaging in terms of the scope of services and duration. The project will utilize the Government e-Marketplace (GeM) for goods and non-consulting services procurement below the NCP threshold. Based on the risks and market analysis, the Procurement Plan has been prepared to set out the selection methods to be used during project implementation for the procurement of goods, works, and non-consulting and consulting services financed by the loan, as shown in Table A5.1. Table A5.2 lists procurement and contract approaches that were not selected.

Table A5.1: Selection methods to be used for procurement during project implementation

Departments	Category	Description	Selection method
PMU	Works	Including supply and installation works	RFB-International/National; RFQ-National
	Goods	Vehicles, IT system, computers and accessories, software and related items, etc.	RFB-International/National, RFQ- National including Government e-Marketplace; a few may be DS
	Consultancy	Project Management Consultants, Authority Engineers, IVA/TAC internal audit, , etc. and research activities, capacity-building activities	QCBS, LCS, FBS, QBS, CQS, a few may be DS

Note: CQS = Selection based on Consultant’s Qualifications; DS = Direct Selection; FBS = Selection under a Fixed Budget; LCS = Least-Cost Selection; QCBS = Quality- and Cost-Based Selection; RFB = Request for Bids; RFQ = Request for Quotations.

Table A5.2: Procurement and contract approaches

Attribute	Selected arrangement
Best and Final Offer	No
Negotiations	No

25. **The project will implement Systematic Tracking of Exchanges in Procurement (STEP), a planning and tracking system, for procurement activities.** Details of the procurement activities that have been prepared, including the Procurement Plan, have been entered in the STEP system. Initial training on operation of the STEP system has been provided to procurement staff of the IAs.



26. **MoRTH will use the NIC e-procurement system for all procurements under International Competitive Bidding and National Competitive Bidding.** The NIC e-procurement system has been assessed and accepted by the Bank for use for procurement under World Bank-funded projects. Based on the packages already identified, most of the procurement is likely to use the NCB method. Requirements for e-procurement will be indicated in Procurement Plan.
27. **A procurement capacity assessment conducted for the MoRTH established that the procurement risk for this operation is Moderate.** The assessment reviewed the MoRTH's organizational structure and current operating environment for implementing the types of procurement transactions expected by the project. Issues/risks concerning the procurement function include: (i) lack of familiarity of staff with latest procurement procedures in accordance with the World Bank's procurement policies; (ii) lack of comprehensive internal procurement manuals, and the need to improve the set of procedures to ensure fairness and transparency in procurement process; (iii) strengthening the procurement review function and resolution of complaints; and (iv) need for building capacity of the staff in procurement and contract management.
28. **A Procurement Plan has been agreed between the MoRTH and the Bank.** For each contract to be financed by the loan, the different procurement methods or consultant selection methods to be used, the need for pre-qualification, estimated costs, prior review requirements, and time frame are reflected in the Procurement Plan, which will be uploaded in STEP.
29. **All contracts not covered under prior review by the Bank will be subject to post review.** Post Procurement Reviews may be conducted either by a consultant hired by the Bank or by Bank staff.
30. **Two missions are envisaged** year, at an interval of six months.
31. **Contract management.** MoRTH will follow contract management practices in accordance with the provisions of the contract agreement and Annex-XI (Contract Management) of the Regulations. MoRTH staff responsible for contract management may additionally undertake the certificate program in contract management available online at www.procurementlearning.org.
32. **Procurement training may be provided to key staff by the Indian Institute of Management, Lucknow, or the Administrative Staff College of India, Hyderabad.** The project may also take advantage of the free Massive Open Online Course on public procurement (www.procurementlearning.org) offered by the World Bank, as well as the paid Professional Diploma in Public Procurement delivered through the Charter of Public Procurement Studies.
33. **The procurement risk assessment for the proposed project identified significant procurement-related risks and the corresponding mitigation measures** (Table A5.3). The overall residual procurement risk rating for the project is Moderate. The residual risk rating for procurement will be reviewed and updated periodically by the World Bank.



Table A5.3: Procurement Risks and Mitigation Measures

Risk factor	Initial risk	Mitigation measure	Completion date	Residual risk
lack of familiarity of MoRTH staff with the latest procurement procedures in accordance with the World Bank's procurement policies and inefficiencies resulting in delays in procurement and contract management processes	Moderate	<ul style="list-style-type: none"> • Use of skilled procurement staff for handling procurement activities including hiring of consultant (firm) with experience of procurement in Bank financed projects • Monitoring through the Procurement Plan and quarterly reports • Use of e-Procurement and contract management tools • Participation in training and workshops • Improving document filing system 	Year 1	Moderate
Non-compliance with agreed procurement arrangements	Moderate	<ul style="list-style-type: none"> • Training and handholding provided by the World Bank • Prior and post reviews by the World Bank • Internal and external audits 	Year 1	Moderate
External interference in the procurement process	Moderate	<ul style="list-style-type: none"> • Disclosure of procurement-related information • Appropriate handling of complaints by adopting clear and fair complaint mechanism 	Year 1	Moderate
Overall risk	Moderate			Moderate

34. **Procurement methods to be used for activities financed by the loan are shown in Table A5.4.** The thresholds indicated in Table A5.4 will apply to the initial 18 months of implementation and may be modified during project implementation based on procurement performance.

Table A5.4: Procurement Methods and Thresholds

Procurement approaches and methods	Threshold (US\$ equivalent)
Open international (Goods, IT, and Non-consulting services)	≥ 10 million
Open national (Goods, IT, and Non-consulting services)	Up to 10 million
National request for quotation (Goods/Works)	Up to 100,000
Open international (Works)	≥ 40 million
Open national (Works)	Up to 40 million
Direct selection	<ul style="list-style-type: none"> • No threshold • For Goods/Works/Non-consulting services: According to paragraphs 6.8–6.10 of the Regulations • For Consultants: According to paragraphs 7.13–7.15 of the Regulations
Shortlist of national consultants	Up to 800,000

35. **The Bank will carry out a prior review for contracts above the threshold indicated below:**



- i. Works including Supply and Installation of Plant and Equipment: All contracts more than US\$15 million equivalent.
- ii. Goods and IT System: All contracts more than US\$4 million equivalent.
- iii. Non-consulting services: All contracts more than US\$4 million equivalent.
- iv. Consultants: All contracts (a) more than or equal to US\$2 million equivalent for firms; and (b) more than or equal to US\$400,000 equivalent for individuals.
- v. In addition to the above, and irrespective of the contract value, the following procurement activities are subject to the Bank's prior review:
 - Procurement processes involving contract negotiations, as described in Section VI, paragraphs 6.34–36, of the Regulations.
 - Competitive dialogue.
 - Sustainable procurement.
 - Selection of probity assurance providers, as described in Section III, paragraph 3.3 of the Regulations.
 - Best and final offer.

36. **With respect to national procurement procedure conditions**, national competition for the procurement of goods, works, and non-consulting services per established thresholds will be conducted in accordance with paragraphs 5.3–5.5 of Section V of the Regulations, the provisions contained in the loan agreement, and the following provisions:

- i. Only the model bidding documents agreed with the World Bank (and as amended from time to time) shall be used for bidding.
- ii. Invitations to bid shall be advertised on a widely used website or electronic portal with free open access at least 30 days prior to the deadline for the submission of bids, unless otherwise agreed in the approved Procurement Plan.
- iii. No special preferences will be accorded to any bidder either for price or for other terms and conditions when competing with foreign bidders, state-owned enterprises, small-scale enterprises, or enterprises from any given state.
- iv. Except with the prior concurrence of the World Bank, there shall be no negotiation of price with the bidders, even with the lowest evaluated bidder.
- v. The GeM set up by the Ministry of Commerce, GoI, will be acceptable for procurement under the RFQ method.
- vi. At the Borrower's request, the World Bank may agree to the Borrower's use, in whole or in part, of its electronic procurement system, provided that the Bank is satisfied with the adequacy of such systems.
- vii. Procurement will be open to eligible firms from any country. This eligibility shall be as defined under Section III of the Regulations. Accordingly, no bidder or potential bidder shall be declared ineligible for contracts financed by the World Bank for reasons other than those provided in Section III of the Regulations.
- viii. The Request for Bids/Request for Proposals document shall require that Bidders/Proposers submitting Bids/Proposals include a signed acceptance in the bid, to be incorporated in any resulting contracts, confirming application of, and compliance with, World Bank Anti-Corruption Guidelines, including without limitation the Bank's right to sanction and the Bank's inspection and audit rights.
- ix. The Borrower shall use an effective complaints mechanism for handling procurement-



- related complaints in a timely manner.
- x. Procurement Documents will include provisions, as agreed with the World Bank, intended to adequately mitigate against environmental, social (including sexual exploitation and abuse and gender-based violence), health, and safety (“ESHS”) risks and impacts.
37. **Use of GeM will be allowed in lieu of RFQ as per the following details:**
- i. Up to INR 50,000 in catalog mode (viz. any available item could be selected by the IA without further competition), provided selected Item/Supplier meets the requisite quality, specification, and delivery period.
 - ii. Up to INR 3 million from the Supplier having lowest price among at least three Suppliers meeting the requisite quality, specification, and delivery period. The tools for online bidding and online reverse auction available on GeM *may be* used by the Purchaser.
 - iii. Up to INR equivalent of US\$100,000 from the Supplier having the lowest price and meeting the requisite quality, specification, and delivery period after *mandatorily* obtaining bids from at least three Suppliers, using online bidding or reverse auction tool provided on GeM.
 - iv. While making use of the GeM portal, the Borrower shall make use of Special Terms and Conditions meant for World Bank–financed projects.
38. The documents that will be disclosed on the project/state websites include: (i) a Procurement Plan and updates; (ii) an invitation for bids for goods and works for all contracts; (iii) request for expression of interest for selection/hiring of consulting services; (iv) contract awards of goods and works procured under international and national procedures; (v) a list of contracts/purchase orders placed under shopping procedures on a quarterly basis; (vi) a list of contracts under direct contracting on a quarterly basis; (vii) a monthly financial and physical progress report of all contracts; and (viii) a report of actions taken on complaints received on a quarterly basis.
39. The following details will be sent to the Bank for publishing on the United Nations Development Business and the World Bank external websites: (i) an invitation for bids for procurement of goods and works using open international procedures; (ii) contract award details of all procurement of goods and works using open international procedures; and (iii) a list of contracts/purchase orders placed following direct contracting procedures on a quarterly basis.
40. Further, MoRTH will also publish on their websites any information required under the provisions of “*suo moto*” disclosure as specified by the Right to Information Act.

Implementation Support Plan:

41. Most of the Bank team members will be based in the India country office, including the Task Team Leader, technical, procurement, financial management, and safeguards specialists, which would facilitate timely, efficient, and effective implementation support to the client. Detailed inputs from the Bank team are outlined below:
- (a) Transport Sector Specialist, together with the Procurement Specialist and Lawyer, will provide inputs to finalize all aspects of the bidding documents. The technical specialist will also provide



specific implementation support to facilitate smooth implementation of the EPC contracts throughout the project life. The technical specialist will also collaborate with the safety expert in providing implementation support for the road safety component (particularly engineering aspects) as well as work-zone safety aspects during construction.

- (b) **Institutional Strengthening Inputs.** The institutional specialist will provide implementation support in finalizing the institutional strengthening component, aid MoRTH in completing the procurement process for this component, and review (along with the EAP Cell) the quality of various studies/outputs prepared by the consultants. The specialist would also provide specific implementation support in ensuring the adoption/rolling out of various institutional study recommendations.
- (c) **Road safety inputs.** The road safety specialist in collaboration with the institutional specialist and the technical/sector specialist would provide implementation support to the MoRTH in developing a road safety program under the project and its subsequent implementation. Specific implementation support will be also provided for monitoring preparation and implementation of civil works to ensure that road safety was properly addressed and work-zone safety is fully incorporated in contract management.
- (d) **Fiduciary.** The Bank’s financial management and procurement specialists will help MoRTH identify capacity building needs to strengthen its procurement and financial management capacity and to improve procurement management efficiency including identification of red flags (for fraud and corruption). Both specialists will also provide timely support in procurement processing and compliance with financial management requirement, including the timely submission of audit statements and financial reports. Besides regular supervision, thematic supervisions will be carried out by the specialists as required.
- (e) **Safeguards.** The Bank’s social and environmental specialists will provide implementation support in review of various safeguards documentation and ensuring compliance with the Bank’s operational policies and procedures on social and environmental safeguards. The specialists will visit project sites during implementation support missions and follow up to help improve safeguards implementation. Besides regular supervision, thematic supervisions will be also carried out by the specialists as required.

42. The implementation support is summarized below.

Time	Focus	Skills Needed	Resource Estimate
First twelve months	Green Highway Corridor Improvement and Maintenance Component	Technical/Transport Sector Specialist	8 SW
	Institutional Capacity Enhancement Component	Road Sector Specialist	4 SW
		Institutional Development Specialist	4 SW
	Road Safety Component	Road Safety Specialist	6SW



Time	Focus	Skills Needed	Resource Estimate
	Fiduciary and Safeguards, Preparation of contracts	Procurement specialist Environment Specialist Social Development Specialist FM Specialist Lawyer	8 SW 6 SW 6 SW 3 SW 2 SW
	Team leadership	Task Team Leader	8 SW
12-60 months	Green Highway Corridor Improvement and Maintenance Component	Technical Specialist	8 SW/ year
	Institutional Capacity Enhancement and Road safety Components	Road Sector Specialist Institutional Development Specialist Road Safety Specialist	5 SW / year 4 SW / year 4 SW/ year
	Fiduciary and Safeguards	Procurement specialist Environment Specialist Social Development Specialist FM Specialist	3 SW/ year 6 SW/ year 6 SW / year 3 SW / year
	Task leadership	TTL	8 SW / Year



ANNEX 2: Project Climate Co-benefits

Part A: Climate Co-Benefits

1. The project presents several opportunities to generate climate co-benefits, both for adaptation and mitigation and has a strategy for reducing greenhouse gas (GHG) emissions. The project’s main objectives are mainstreaming the green technologies in construction and maintenance of National Highways and supporting capacity enhancement of MoRTH in its pursuit to conserve natural resources and improve climate vulnerability of National Highways network and reduce GHG from the transport sector. The project activities include construction 783 km of highways incorporating green technologies, development of policies, guidelines and model documents, training, and mainstreaming the resource efficiency, climate resilience, green and safety aspects in the design, construction and maintenance of highways.

2. Table 1 below sets out the climate vulnerability context, list the project’s intent and statement of purpose for addressing climate vulnerability and outlines an explicit link with the project activities. Table 2 gives Component/Sub-Component-wise key activities that would have direct and/or indirect climate co-benefits are given below in the table.

Table 1: Climate Vulnerability Context, Project’s Intent for addressing it and Link to Project Activities

<p>Climate vulnerability context</p>	<p>The project would cover existing National Highways in the states of Rajasthan, Himachal Pradesh, Uttar Pradesh and Andhra Pradesh.</p> <p>Andhra Pradesh</p> <ul style="list-style-type: none"> • The growth of cities and large-scale migration of rural population to urban areas has increased the population and population density. The urban population is disproportionate to the available infrastructural facilities. Higher population and rising income levels have increased the vehicular population multi-fold (almost 200 percent in the last 10 years). • Because of the high vehicle population in urban areas, road congestion has become a major problem, resulting in poor fuel economy. Although an incentive program is in place (e.g. tax exemption for battery/compressed natural gas/solar power-driven vehicles) penetration of low carbon fuel vehicles is negligible. • Andhra Pradesh holds tremendous potential in natural gas availability. However, in comparison to the potential, mobilization of CNG in transportation sector is not adequate. Lack of organized efforts to promote fuel efficiency improvement and eco-driving habits for ‘vehicles in use’ among drivers or owners of the vehicles (private or governmental)³. • Andhra Pradesh, situated in Southern India, is exposed to cyclones, storm surges, floods and droughts. A moderate to severe intensity cyclone can be expected to make landfall every two to three years. The coastal region suffers repeated cyclones and floods. • The Project Highway in Andhra Pradesh is in the coastal districts. Some parts of the highway is in rolling terrain and the remaining is in mountainous terrain. The project highway has (i) steep gradients, (ii) sections below the High Flood Level, (iii) poor pavement and cross-
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³ Source: State Action Plan for Climate Change for Andhra Pradesh, 2012.



drainage structures, (iv) narrow structures, (v) no longitudinal drains, (vi) locations requiring new culverts/bridges, (vii) hill and valley slopes and embankments requiring protection works etc.

- To address the above challenges, the design includes (i) correction of the deficiencies in the horizontal and vertical geometry in the alignment of the existing road, (ii) construction of the entire highway above the High Flood Level, (iii) construction of slope protection works, sub-surface drains, longitudinal drains, energy dissipation structures, and (iv) construction of new bridges and culverts, reconstruction of structurally-deficient bridges and culverts, and repair and widening of existing bridges and culverts. The project highway design also includes solar lighting in inhabited stretches, water harvesting structures, plantation, bio-engineering solutions for protection of hill and valley slopes, borrow areas, dumping sites etc.

Himachal Pradesh

- It is estimated that transport sector emissions in Himachal Pradesh were of the order of 0.667 million tonnes of CO2 equivalent. Road transport being the dominant mode of transport in the state emitted 99.99 percent of the total CO2 equivalent emissions from the transport sector. Transport sector emissions formed about 11 percent of total CO2 equivalent emissions (2007-08-09).
- A Master Plan for Transport is proposed to be prepared for Himachal Pradesh, focusing on long term transport plans to facilitate the growth of medium and small towns in ways that ensure efficient and convenient public transport in tourist seasons⁴.
- Himachal Pradesh, situated in the western Himalayas, is a mountainous state with elevation ranging from about 350 meters to 6,000 meters. Earthquakes, landslides, extreme precipitation and flooding are some of the common risks. The existing transport infrastructure is thus often blocked by landslides and washed out stretches of highways causing interruptions. Extreme precipitation also may cause the capacities of drainage structures as well as bridges to be exceeded and increase the risk of damage to valley slopes.
- The Project Highway (Paonta Sahib - Feduz)'s climate vulnerability is also due to (i) two major landslide zones along the highway, one is about 2 km-long and the other is about 5 km-long (ii) steep gradients - the existing highway in a length of 34 km is steeper than 6 percent, in 18 km is steeper than 7 percent and in 17 km is steeper than 8 percent (with a maximum gradient of about 18 percent), (iii) there are neither longitudinal drains on the hillside nor the subsurface drains and the sections of highway with sunshade have been heavily damaged, (iv) the condition of the existing pavement and cross-drainage structures is very poor and unsuited to heavier traffic, e.g. 9 of the 13 minor bridges have inadequate width and poor structural condition, (v) culverts are required at 54 new locations where cross-drainage is inadequate, also a number of existing culverts are in poor condition, etc.
- The Project Highway (Hamirpur - Mandi)'s climate vulnerability is also due to (i) major landslide zone along the highway, about 2.8 km-long (ii) steep gradients - the existing highway in a length of 12.7 km is steeper than 6 percent, in 10.9 km is steeper than 7 percent, and in 0.4 km is steeper than 8 percent (with a maximum gradient of about 18 percent), (iii) there are neither longitudinal drains on the hillside nor the subsurface drains and the sections of highway with sunshade have been heavily damaged, (iv) the condition of the existing pavement and cross-drainage structures is very poor and unsuited to heavier traffic, e.g. 6 minor bridges have inadequate width and poor structural condition, (v) culverts are required at 10 new locations where cross-drainage is inadequate, also a number of existing culverts are in poor condition, etc.

⁴ Source: State Strategy & Action Plan on Climate Change, Himachal Pradesh, 2012.



- To addresses the above challenges, the design of above project highways includes (i) correction of the deficiencies in the horizontal and vertical geometry in the alignment of the existing road, (ii) construction of slope protection works, sub-surface drains, longitudinal drains, energy dissipation structures, and (iii) construction of new bridges and culverts, reconstruction of structurally-deficient bridges and culverts, and repair and widening of existing bridges and culverts. The project highway design also includes solar lighting in inhabited stretches, water harvesting structures, plantation, bio-engineering solutions for protection of hill and valley slopes, borrow areas, dumping sites etc.

Rajasthan

- Due to rapid economic growth, increase in tourism activities, and developmental growth in the state, there is an increased demand for transportation services. The total number of vehicles registered in the state increased about six times from 1,051,343 in 1990 to 6,993,548 in 2009. These vehicles mainly consume non-renewable fossil fuels, and are a major contributor of greenhouse gases, particularly CO₂ emission. In India, the transport sector emits an estimated 258.10 Tg of CO₂, of which 94.5 percent was contributed by road transport (2003–2004). Among all the states and Union Territories, Rajasthan contributes 15.17 Tg which is 6.22 percent of India’s emissions from the road sector. Growing private vehicles and lack of good public transport have led to increased emissions from the sector. The state has already initiated efforts like the Rail Metro system in Jaipur and the city buses in major towns.
- Promoting sustainable transportation has been identified as one of the key priorities under the state action plan for climate change. This is envisaged to be undertaken through preparation of Comprehensive Mobility Plans (CMPs) for all major cities (population > 1 lakh) in Rajasthan, and by increasing the modal share of public/non-motorized transportation⁵.
- The State of Rajasthan is situated in the western part of India, faces severe water scarcity, has poor rainfall, and is classified as arid/semi-arid region. The state has the maximum probability of occurrence of drought in India, with recurring droughts in 3–4 years in a cycle of 5 years. Higher summer temperatures and prolonged periods of heat waves pose the potential to increase damages to road pavements and affect the structural integrity of bridges and drainage structures. On the other hand, Rajasthan is the second state where maximum number of cold waves has occurred. Such temperature variations contribute to pavement distress and is the most common problem in the performance of bituminous asphalt roads.
- Although Rajasthan State is characterized for the most parts a desert or arid region, yet intense rainstorms are not uncommon. Many places in Rajasthan have witnessed flash floods due to heavy rainfall events. Floods in July 1981 in Jaipur, Tonk, Nagaur and in 2006 over Barmer are few examples. Due to heavy rain downpour, flooding in rivers have been observed over the state. Such extreme events may cause the capacities of drainage structures as well as bridges to be exceeded and increase the risk of damage to embankment earthworks.
- The Project Highway’s climate vulnerability is also due to (i) steep gradients in 4 locations in a length of about 1.2 km, (ii) a total length of about 11 km in 13 locations is below the Highest Flood Level, (iii) the condition of the existing pavement and cross-drainage structures is very poor and unsuited to heavier traffic, e.g. 9 of the 14 minor bridges have inadequate width and poor structural condition and there is only a causeway at one location and the road is often overtopped by flood water at this location.
- To addresses the above challenges, the project highway design includes (i) correction of the deficiencies in the horizontal and vertical geometry in the alignment of the existing road, (ii)

⁵ Source: Rajasthan State Action Plan on Climate Change, Government of Rajasthan.



	<p>construction of entire highway above the High Flood Level, and (iii) construction of new bridges and culverts, reconstruction of structurally-deficient bridges and culverts, and repair and widening of existing bridges and culverts. The project highway design also includes solar lighting in habituated stretches, drains, re-development of ponds which are adjacent to the highway, water harvesting structures, plantation, use of VG 40 grade of Bitumen which performs better in areas expecting extreme temperatures, concrete pavement, bio-engineering solutions for protection of embankments etc.</p> <p>Uttar Pradesh</p> <ul style="list-style-type: none"> • The roads length per ten thousand population in the state is 99 km (against the national level of 136.9 km). In terms of road length, the state occupies the 15th position among the major 19 states. The state's highways account for about 9.6 percent of the total National Highways network in India. The railways network in Uttar Pradesh is the largest in the country spanning over 8,890 km. The intra-state rail network is well-developed, connecting the towns and the district headquarters of the state. • About 68 percent of GHG emissions from Uttar Pradesh come from the energy category. This category includes emissions due to fossil fuels and biomass burning within power plants, manufacturing industries, transport sector and residential sector. The transport sector accounted for about 7 percent of total CO2 emissions in U.P. (2005)⁶. • Uttar Pradesh, situated in Northern India, is exposed to floods and storm surges. The Project Highway in Uttar Pradesh is in plain terrain. The project highway has (i) missing links, (ii) sections of highway below the High Flood Level, (iii) poor pavement and cross-drainage structures, (iv) narrow structures, (v) no longitudinal drains, (vi) locations requiring new culverts/bridges etc. • To address the above challenges, the design of above project highways includes (i) construction of missing links, (ii) construction of entire highway above the High Flood Level, (iii) longitudinal drains, and (iv) construction of new bridges and culverts, reconstruction of structurally-deficient bridges and culverts, and repair and widening of existing bridges and culverts. The project highway design also includes solar lighting in habituated stretches, water harvesting structures, plantation, bio-engineering solutions etc.
<p>Statement of purpose or intent</p>	<p>The project aims to ensure that the highway network in India is resilient to the impacts of disasters and climate change induced extreme events and construction and maintenance of highways are carried out by applying green technologies incorporating the principles of natural resource efficiency and bio-engineering solutions. The project activities lead to this systematically. Through the activities of Component A, the project will demonstrate inclusion of climate resilience aspects and green technologies in the design and construction of project highways. The climate resilient designs for the project highways will include appropriate drainage structures, highway embankments, hill slope protection works and bio-engineering solutions. Through the activities in Component B, the project will undertake the disaster risk assessment of the National Highway network and prepare a Climate Adaptation Policy and a Green Highway Policy, which will be applicable for the entire highway network. Also, through the activities in Component B, the project will provide inputs to update the key standards and manuals as the current IRC codes and guidelines do not adequately incorporate climate resilience aspects in planning, design and construction of highways. This will lead to mainstreaming climate resilience in the highway network in India.</p>

⁶ Source: State Action Plan on Climate Change, Uttar Pradesh, 2014.



Link to project activities	Adaptation and mitigation approaches have been mainstreamed in the project design for increasing resilience against climate risks. The project will address adaptation aspects by including pilots demonstrating resource efficiency, climate resilience, green and safety aspects. In addition, the project will support capacity enhancement of MoRTH in its pursuit to conserve natural resources and improve climate vulnerability of National Highways network and reduce greenhouse gas (GHG) emissions from the transport sector. The MoRTH and its implementing agencies, state PWDs, professional societies, and the academia will benefit from the construction pilots and research outcomes to adopt natural resource-efficient, climate-resilient, and green technologies. The project will also help disseminate global and domestic best practices and knowledge in application of resource efficiency and climate resilient strategies on the project pilots and more widely in the NH network.
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Table 2: Component-wise Adaptation and Mitigation Climate Co-Benefits

Activities	Adaptation Actions	Mitigation Actions
Component A: Green Highway Corridor Improvement and Maintenance (Total Cost: US\$1,001 million, including IBRD US\$423.95 million)		
Upgradation and maintenance for 5 years of about 783 km of selected existing National Highways in the states of Rajasthan, Himachal Pradesh, Uttar Pradesh and Andhra Pradesh incorporating green technologies and demonstrating resource efficiency, climate resilience, and safety aspects	<ul style="list-style-type: none"> The activities listed will ensure that the road designs confirm to the relevant codes of the Indian Roads Congress and include appropriate adaptation aspects to climate-induced weather events, such as use of bio-engineering solutions (for treatment of embankment slopes, landslide zones, dumping and quarry sites' reinstatement and protection works), water conservation (redevelopment/enhancement of ponds, water harvesting structures, water channelization structures to protect stream bed and store storm runoff water, energy dissipation techniques), provision of sub-surface drainage, and borrow area development. The project will (a) build new or reconstruct 10 major bridges, 86 minor bridges, 3 Rail over Bridges, 1,742 culverts and 11 under/overpasses; (b) widen 2 major bridges, 23 minor bridges, and 246 culverts; and (c) rehabilitate/repair 3 major 	<ul style="list-style-type: none"> Tree plantation and renewable energy sources for lighting (solar). Natural resource efficiency through use of local materials and stabilization (cement, lime), use of cut material for embankment filling and pavement layers, use of waste products (fly ash), recycling (asphalt and granular pavement) with resulting lowered GHG emissions. Design of project highways and cross-drainage facilities to collect runoff and store in water harvesting structures, use of cut and fill methods, gentle alignments etc. The proposed road upgradations would provide missing linkages, shorten distances traveled, enable movement of heavy vehicles in all weather conditions, add to vehicle speed and carrying capacity, reduce travel times, vehicle operating costs and traffic



Activities	Adaptation Actions	Mitigation Actions
	bridges, 12 minor bridges and 1 Rail over Bridge. <ul style="list-style-type: none"> Flexible pavements will be constructed using VG 40 grade of Bitumen which performs better in areas expecting extreme temperatures reducing the requirement of maintenance which in turn reduces the usage of material. 	congestion, reducing GHG emissions. <ul style="list-style-type: none"> Develop loading-unloading areas, helping improve connectivity to local markets, have truck parking zones, reduce high percentage of empty truck movements. These would help reduce the logistics costs and GHG emissions.
Component B: Institutional Capacity Enhancement (Total Cost: US\$34.5 million, including IBRD US\$27.6 million)		
Sub Component B1: Development of a Climate Adaptation Policy and guidelines and mainstreaming climate resilience in National Highways design and construction processes		
<ol style="list-style-type: none"> Disaster risk and impact assessment of about 5,000 km of the NH network Preparation of a Climate Adaptation Policy Updating key standards and manuals 	<ul style="list-style-type: none"> Preparation of a climate adaptation policy and mainstreaming climate resilience in project design and implementation. 	<ul style="list-style-type: none"> the project will undertake the disaster risk assessment of the National Highway network and prepare a Climate Adaptation Policy, which will be applicable for the entire highway network. Also, the project will provide inputs to update the key standards and manuals as the current IRC codes and guidelines do not adequately incorporate climate resilience aspects in planning, design and construction of highways. This will lead to mainstreaming climate resilience in the highway network in India.
Sub-Component B2: Development of policy, regulation and systems to reduce emissions from transport services		
<ol style="list-style-type: none"> Study to map the freight volume and movement pattern on the entire NH network and identify constraints for efficient use of trucks Designing physical and digital freight management platforms for freight consolidation and interoperability 		<ul style="list-style-type: none"> Three-fourths of transport-related emissions are from transport services. The study that will be undertaken through this sub-component will provide necessary data, analysis, and recommend solutions for efficient movement of trucks in the



Activities	Adaptation Actions	Mitigation Actions
3. Recommending complementary innovative logistics solutions as well as transport operators' and regulators' coordination mechanism		entire NH network for adoption by the government. This is expected to lead to fuel efficiency.
Sub Component B3: Research and Development and mainstreaming resource efficiency and green solutions in National Highways design and construction processes		
1. Systematic monitoring and evaluation, and documentation of results of pilot works	<ul style="list-style-type: none"> Proposed activities will lead to research and evaluation of resiliency measures to inform updated highway design standards. 	<ul style="list-style-type: none"> Through this sub-component, the project will undertake systematic monitoring and evaluation of resource efficiency and green solutions engaging in research and development. This will lead to inputs to update the design and construction standards and manuals and mainstream them in the highway network.
Sub Component B4: Development of guidelines and model documents for mainstreaming green and safe highways		
<ol style="list-style-type: none"> Identifying gaps and documenting good practices in the design, implementation and maintenance stages for mainstreaming green and safe highways Preparation of documents for design and supervision of construction, bidding documents and project management process of the EPC contracts 	<ul style="list-style-type: none"> Proposed activities will lead to inclusion of climate resiliency measures in future highway planning. 	<ul style="list-style-type: none"> One-fourth of transport-related emissions are from construction and maintenance of highways. The project will address this through natural resource efficient pavements and green technologies in road construction. Through this sub-component, the project will undertake preparation of documents such as the template Terms of Reference for design and supervision of construction, bidding documents and mainstream them in the highway network.
Sub Component B5: Mainstreaming green and safe highways initiatives in the development of highways		
1. Supporting MoRTH in mainstreaming green and safe initiatives by replicating these in about 2,500 km of non-project highways in NH network	<ul style="list-style-type: none"> Proposed activities will lead to replication of resiliency measures in 2,500 km of non-project highways. 	



Activities	Adaptation Actions	Mitigation Actions
Sub Component B6: Implementing ERP solution in MoRTH and its implementing agencies		
1. Implementation of ERP in MoRTH and its implementing agencies, which are currently ongoing under the National Highways Interconnectivity Improvement Project, upon its closure		
Component C: Road Safety (Total Cost: US\$59 million, including IBRD US\$47.2 million)		
Sub Component C1. Support to the Integrated Road Accident Database Management System and the National Highway Safety System		
1. Development and implementation of <ul style="list-style-type: none"> • Integrated Road Accident Database Management System for recording and analysis of road accidents • National Highway Safety System for road safety enforcement 2. Updating codes and manuals		
Sub Component C2. Support to operationalization of the National Road Safety Board		
1. Operationalization of the National Road Safety Board, and support its activities: <ul style="list-style-type: none"> • Monitoring and evaluation • Drafting of rules for the MVAA • Data analysis and recommendations 		
Sub-Component C3. Strengthening highway patrol and emergency response along the project corridors		
1. Establishment of combined enforcement and emergency response outposts at critical locations to improve enforcement and post-crash care		Landslides, flooding, narrow structures etc. are causes for road accidents. The emergency response outposts will be engaged in providing warning to the road users and rescuing victims of accidents. The project will provide/install adequate warning signs of landslide locations and flood-prone areas.
Sub-Component C4. Capacity building & training		
1. Training and capacity building of the officials of MoRTH,		



Activities	Adaptation Actions	Mitigation Actions
implementing agencies of MoRTH, and the NRSB in road safety management, crash investigation, safety audit, and monitoring and evaluation		

Part B: Green House Gas Estimation

Based on current and future traffic forecasts, emission reductions due to the project are estimated as follows:

Gross emission during the economic lifetime (CO2 in Tonne) during 2020-2043 (Without Project or No project case) = 11,42,113

Gross emission during the economic lifetime (CO2 in Tonne) during 2020-2043 (With Project case) = 8,93,421

Net Emission during the economic lifetime (CO2 in Tonne) during 2024-2043 = (-) 248,692

Annual average net emission during the economic lifetime (CO2 in Tonne/year) during 2024-2043 = (-) 12,435