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Report No: PAD2150

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF

US$235 MILLION

TO THE

REPUBLIC OF INDIA

FOR

BIHAR RURAL ROADS PROJECT

NOVEMBER 29, 2016

Transport and ICT Global Practice
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective November 17, 2016**)**

Currency Unit = Indian Rupees (INR)

INR 67.81 = US$ 1

FISCAL YEAR
April 1 - March 31

Regional Vice President:	Annette Dixon
Country Director:	Junaid Kamal Ahmad
Senior Global Practice Director:	Pierre Guislain
Practice Manager:	Karla Gonzalez Carvajal
Task Team Leader(s):	Ashok Kumar

ABBREVIATIONS AND ACRONYMS

ACEO	Additional Chief Executive Officer
AMP	Asset Management Plan
AMS	Asset Management System
APW	Advanced Planning Wing
BRRDA	Bihar Rural Roads Development Agency
BRRP	Bihar Rural Roads Project
CQS	Selection Based on Consultants' Qualifications
CRRI	Central Road Research Institute
DPR	Detailed Project Report
ECoPs	Environmental Code of Practices
EIRR	Economic Internal Rate of Return
EMF	Environment Management Framework
EO	Environment Officer
FM	Financial Management
GIS	Geographic Information System
GoB	Government of Bihar
GoI	Government of India
GTSNY	Grameen Tola Sampark Nischaya Yojana
IAP	Integrated Action Plan
IBRD	International Bank for Reconstruction and Development
ICT	Information and Communication Technology
IDA	International Development Association
IRC	Indian Roads Congress
IT	Information Technology
IUFR	Interim Unaudited Financial Report
M&E	Monitoring and Evaluation
MDRs	Major District Roads
MIS	Management Information System
MMGSY	Mukhya Mantri Gram Sampark Yojana
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MoRD	Ministry of Rural Development
NHs	National Highways
NQM	National Quality Monitor
NRRDA	National Rural Roads Development Agency
OMMAS	Online Management, Monitoring, and Accounting System
PDO	Project Development Objective
PFS	Project Financial Statements
PIU	Project Implementation Unit

PMC	Project Management Consultant
PMGSY	Pradhan Mantri Gram Sadak Yojana
PMGSY RR	PMGSY Rural Roads
PRI	Panchayati Raj Institution
PSC	Project Steering Committee
PWD	Public Works Department
RCD	Road Construction Department
RoW	Right-of-Way
RSMP	Road Sector Modernization Plan
RWD	Rural Works Department
SCs	Scheduled Castes
SDGs	Sustainable Development Goals
SHs	State Highways
SMF	Social Management Framework
SQMs	State Quality Monitors
STA	State Technical Agency
STs	Scheduled Tribes
TA	Technical Assistance
ToR	Terms of Reference
VF	Vulnerability Framework
VOC	Vehicle Operating Cost

BASIC INFORMATION

Is this a regionally tagged project?	Country (ies)	Lending Instrument
No		Investment Project Financing

[ ] Situations of Urgent Need or Assistance/or Capacity Constraints

[ ] Financial Intermediaries

[ ] Series of Projects

Approval Date	Closing Date	Environmental Assessment Category
19-Dec-2016	31-Dec-2022	B - Partial Assessment

Bank/IFC Collaboration
No

Proposed Development Objective(s)

The PDO is to improve rural road connectivity in project districts, and enhance management of rural roads in Bihar.

Components

Component Name	Cost (USD Million)
Rural Roads Improvement	320.00
Asset Management and Institutional Effectiveness	15.00

Organizations

Borrower : Republic of India

Implementing Agency : Rural Works Department, Bihar

[✓]	[ ] IBRD	[✓] IDA Credit	[ ] IDA Grant	[ ] Trust	[ ]

Counterpart Funding		[ ] Crisis Response Window [ ] Regional Projects Window	[ ] Crisis Response Window [ ] Regional Projects Window	Funds	Parallel Financing

Total Project Cost:	Total Financing:	Financing Gap:
335.00	335.00	0.00
	Of Which Bank Financing (IBRD/IDA):	
	235.00	

Financing (in USD Million)

Financing Source	Amount
Borrower	100.00
International Development Association (IDA)	235.00
Total	**335.00**

Expected Disbursements (in USD Million)

Fiscal Year	2017	2018	2019	2020	2021	2022	2023
Annual	0.00	25.00	40.00	60.00	60.00	35.00	15.00
Cumulative	0.00	25.00	65.00	125.00	185.00	220.00	235.00

INSTITUTIONAL DATA

Practice Area (Lead)

Transport & ICT

Contributing Practice Areas

Climate Change

Gender
Jobs
Social, Urban, Rural and Resilience Global Practice

Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

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

[Section I.A, para. 1 & 2, of the Sch. to the PA] Bihar to vest the overall responsibility for Project implementation in RWD, acting through BRRDA, and to that end, maintain throughout implementation: (a) a high level project steering committee; (b) the good-standing and operation of BRRDA; (c) one or more project implementation units in each project district; (d) a road sector modernization group; and (e) a road safety management group.

Sections and Description

[Section I.A., para. 3, of the Sch. to the PA] BRRDA to select/engage within 8 months after effectiveness the services of a project management consulting firm (or group of experts) to assist RWD and BRRDA with Project implementation.

Sections and Description
[Section I.B., para. 1, of the Sch. to the PA] BRRDA to implement the Project in accordance with the FM Manual.

Sections and Description
[Section I.B., para. 2, of the Sch. to the PA] BRRDA to prepare and furnish to the Association: (a) an Asset Management Plan, within six (6) months after effectiveness; (b) a Human Resources Professional Development Strategy, within one (1) year after the effectiveness; and (c) a Rural Roads Safety Action Plan within six (6) month after effectiveness.

Sections and Description
[Section I.D., para. 1 & 2, of the Sch. to the PA] Bihar/BRRDA to carry out the Project in accordance with the EMF, the ECoPs, the SMF, the VF and the environmental management plans, resettlement action plans and/or vulnerable communities' development plans required thereunder. To this end Bihar/BRRDA shall refrain from inviting bids or undertaking any construction works in respect to rural roads and/or any construction work for road safety interventions until and unless: (i) the proposed activities have been screened in accordance with the EMF, ECoPs, SMF and VF; (ii) all necessary environmental documentation required by the EMF, resettlement action plans required by the SMF, and vulnerable community development plans required by the VF, as well as all compensations measures thereunder, have been agreed, prepare and documented; and (iii) the foregoing documents have been publicly disclosed by Bihar/BRRDA in local language(s) at the relevant Project sites.

Sections and Description
[Section I.D., para. 3, of the Sch. to the PA] Bihar/BRRDA to ensure that prior to commencement of any civil works: (a) all necessary governmental permits and clearances for such civil works shall have been obtained from the competent governmental authority/ies; (b) pre-construction conditions stage conditions imposed have been complied with/fulfilled; (c) all resettlement measures set forth in the applicable resettlement action plans have been fully executed, including the full payment of compensation prior to displacement and/or the provision of relocation assistance to all Displaced Persons; and (d) all development actions provided for in the vulnerable communities development plans, required prior to the commencement of such civil works, have been undertaken.

Sections and Description
[Section I.D., para. 4, of the Sch. to the PA] Bihar/BRRDA to ensure that each contracts for civil works under the Project includes the obligation of the relevant contractor to comply with the relevant safeguard documents applicable to the civil works commissioned/awarded under said contract.

Sections and Description
[Section I.D., para, 5, of the Sch. to the PA] Bihar to ensure that the following Project expenditures are financed exclusively out of the Bihar's own resources, namely: (i) all land acquisition required for the purpose of the Project; (b) any compensation, resettlement and rehabilitation assistance or payments to Displaced Persons; and (c) tree cutting, forest land diversion costs, and/or other expenditures associated with the obtaining of any regulatory clearances and/or utilities relocation.

Sections and Description
[Section I.D., para. 6, of the Sch. to the PA] Bihar/BRRDA to ensure that the ToRs for all consultants' services under Component 1.2 and 2 of the Project incorporate the requirements of the Association's safeguard policies.

Sections and Description
[Section I.D., para 7, of the Sch. to the PA] BRRDA to: (a) maintain throughout Project implementation, a social and environmental nodal officers under ToRs acceptable to the association; and (b) engage a consultant for the carrying out of an independent assessment of: (i) BRRDA's, the PIUs' and contractors' compliance with the safeguard documents; (ii) the social and environmental impact of Project activities; and (iii) the results of mitigation or benefit-enhancement measures applied.

Sections and Description
[Section I.E. of the Sch. to the PA] Bihar to maintain and operate throughout Project implementation, a district-level grievance redress mechanism, subject to guidelines and procedures agreed with the Association.

Sections and Description
[Section I.F. of the Sch. to the PA] As part of the Road Sector Modernization Plan, Bihar to: (a) maintain an adequate level of maintenance funding as per the current Bihar's Rural roads Maintenance Policy, and increase such allocation proportionately to the annual growth of its Rural Roads network; (b) allocate at least eighty percent (80%) of such maintenance funds as per priorities established under the annual maintenance plans; (c) introduce, within a year after effectiveness, performance-based maintenance contracts covering at least twenty percent (20%) of the rural roads network, allocating the necessary resources, and thereafter progressively expanding such coverage; and (d) use climate resilient and environmentally optimized designs for at least twenty percent (20%) of the rural roads covered under the Project.

Conditions

Type	Description
Disbursement	None

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Ashok Kumar	Team Leader(ADM Responsible)	Highways Engineer	GTI06

Sangeeta Patel	Procurement Specialist(ADM Responsible)	Procurement	GGO06
Puneet Kapoor	Financial Management Specialist	Financial Management	GGO24
Aruna Aysha Das	Team Member	Administrative Support	SACIN
Deepak Man Singh Shrestha	Team Member	Engineering Designs	GTI06
Neha Pravash Kumar Mishra	Safeguards Specialist	Environmental Management	GEN06
Reenu Aneja	Team Member	Implementation Arrangements	GTI06
Ross S. Pavis	Team Member	Monitoring & Evaluation	GTISO
Sangeeta Kumari	Safeguards Specialist	Social Development	GSU06
Victor Dato	Team Member	Institutional Development	GTI02

Extended Team

Name	Title	Organization	Location
Arun Kumar	Consultant, Pavement Design		Melbourne,Australia
Asif Faiz	Consultant, Low-Volume Road Engineering		Washington,
D.P. Gupta	Consultant, Road Sector Modernization		New Delhi,India
Graham Johnson-Jones	Consultant, Low-Volume Roads		Philippines,
Kamlesh Kumar	Consultant, Road Sector Modernization		New Delhi,India
Muthuthevar Boominathan	Consultant, Economic Analysis		Chennai,India
Rashi Grover Kashyap	Consultant, Monitoring & Evaluation		New Delhi,India
Sujit Das	Consultant, Engineering Designs		New Delhi,India
Vaideeswaran Sankaran	Consultant, Climate Change		Chennai,India
Vinod Kumar Gautam	Consultant, Environmental Management		New Delhi,India

INDIA
BIHAR RURAL ROADS PROJECT

TABLE OF CONTENTS

I. STRATEGIC CONTEXT

A. Country Context

1. India is the seventh-largest country by area, fourth largest economy, and second most populous country in the world. Its 1.2 billion people live in 29 states and seven union territories. India's economy has seen a steady growth of about 7 percent per annum during the last decade, and consequently India is now a low-middle income country. However, the gains are uneven across the regions. Some of the states still have high concentration of poverty and low incomes.

2. Bihar is one of the faster growing low income states of India with 34 percent of its population living below the poverty line compared to a national average of 22 percent. Its per capita income of INR 13,482 is one-third of the national average (INR 42,647).[1] About 90 percent of its 104 million population is rural (as opposed to 69 percent of the country's population). Notwithstanding recent improvements, it ranks lowest in terms of key socio-economic parameters[2]-the Human Development Index is 0.367 in comparison to the national average of 0.467. The state faces several challenges including low human capacity and livelihood opportunities, low productivity in agriculture, a low level of industrialization, deeply entrenched poverty, and vulnerability to frequent floods.

3. Bihar has a significant agricultural base and is endowed with vast natural resources and suitable agro-climatic conditions. Agriculture and allied activities employ approximately 80 percent of Bihar's total labor force, however, contributing only 19 percent to the state gross domestic product. The state has vast potential for growth in agriculture and agro-based industries, tourism, and handicrafts and cottage industries but the potential is underutilized due to inadequate road infrastructure and market linkages. The labor force participation rate in the state is 45 percent compared to a national rate of 56 percent, within which the female labor force participation rate is only 9 percent (compared to a national average of 31 percent).[3] Bihar is also vulnerable to climate related risk due to recurring floods of increasing frequency and intensity. About 76 percent of the population in north Bihar is subject to the recurring threat of flood devastation.

4. The state government is addressing these challenges with a prudent development strategy that aims to exploit the state's potential for growth in the hitherto underachieving sectors on account of inadequate road infrastructure and market linkages. It has taken initiatives toward increased investment in the infrastructure (particularly in strengthening the road transport network) and social sectors, and through a focus on good governance. These initiatives have triggered confidence in Bihar's economy and have resulted in the state economy growing at about 6.7 percent per year during the period 2005-12,[4] making it one of the faster growing states in India.

[1] Real per capita gross state domestic product at 2005 prices. Source: World Bank India State Briefs - Bihar.
[2] The 2011 Census recorded male literacy at 71.2 percent and female literacy at 51.5 percent, the lowest in India.
[3 & 4] Data pertains to 2012. Source: World Bank India State Briefs – Bihar

5. The state government has made "road connectivity to each habitation" among its top seven priorities[5]. In addition, it has established a mobility goal of bringing all parts of the state within five hours of travel time from the state capital, Patna.

B. Sectoral and Institutional Context

6. ***Bihar road network:*** Excluding 4,594 km of National Highways (NH), Bihar has a road network of 142,610 km, of which 14,887 km (about 10 percent) is under the Road Construction Department (RCD) and classified as State Highways (SHs) and Major District Roads (MDRs), while 127,723 km (about 90 percent) is under the Rural Works Department (RWD) and classified as rural roads.

7. ***Bihar has constructed about 60,000 km of rural roads in the last decade but still has a big task ahead:*** Table 1 shows the status of road connectivity in the state. As part of the state government's priority of 'road connectivity for each habitation,[6] Bihar has already provided road access to 51 percent of its habitations, leaving a balance of 49 percent. About 60 percent of the existing rural road network is unpaved and is in poor condition. The network has been developed mainly through improvements of existing tracks in bits and pieces[7] and has several deficiencies such as missing linkages, dilapidated bridges or absence of bridges, inadequate geometry, poor drainage, weak pavements, and missing road safety measures. The network has also suffered severe damage due to floods, lack of maintenance, inadequate quality of initial construction, and overloading in some parts of the state. Inefficient sector management has not helped the situation.

Table 1: Current Status of Road Connectivity in Bihar

Scheme	Connected Habitations	Unconnected Habitations	Total No./Eligible Habitations	Length Constructed (km)	Cumulative Expenditure (US$ Millions)	Length Yet to be Constructed (km)	Future Investment (US$ Millions)
PMGSY*	19,336	15,835	35,171	39,938	3,362	16,505	1,463
MMGSY**	3,821	28,378	32,199	4,719	938	33,189	4,432
GTSNY***	0.00	13,786	13,786	0	0	12,500	1,656
Others****	11,630	1,809	13,439	15,667	1,554	1,881	17
Total	**34,787**	**59,808**	**94,595#**	**60,324**	**5,855**	**64,075**	**7,568**

Note: *PMGSY: Pradhan Mantri Gram Sadak Yojana- Government of India (GOI) funded program to provide all-weather road access to all habitations with above 500 population in the country. **MMGSY: Mukhya Mantri Gram Sampark Yojana-Government of Bihar (GoB) funded program to provide road connectivity to habitations having population of 250-499, are not covered under PMGSY. ***GTSNY: Grameen Tola Sampark Nischaya Yojana- to connect habitations below 250 population. ****Others: These include habitations mostly connected under other state schemes and programs. # 27,782 habitations were connected before the finalization of the core network taking the total number of habitations to 122,377.

8. ***The underdeveloped rural road network is constraining the growth of rural areas:*** While rural roads generate multiple benefits to the rural economy in both the commercial and social spheres, a large part of rural Bihar is deprived of these benefits due to the poor quality and limited coverage of the rural road network.

[5]The other six priorities include rural electrification, clean drinking water, toilets in every home, youth empowerment and skill development, access to higher education, and women empowerment.
[6] A habitation is a group of houses; a village may have many habitations. The population is generally less than 1,000.
[7] With little attention to long-term systematic planning except for the PMGSY and MMGSY programs.

Weaknesses in basic road infrastructure are slowing down the progress on poverty reduction, agricultural growth, and integration of rural areas with the state and national economies (Box-1[8]).

Box-I: Typical Benefits of Rural Roads in India

Government expenditure on roads has been found to have the largest impact on poverty reduction (163 persons lifted out of poverty with INR1 million investment) as well as a significant impact on productivity growth. Road investments have seen improved agriculture productivity, increased off-farm employment opportunities, and higher wages. Other impacts observed are doubling of farmers' incomes; reduction in freight charges by more than 60 percent; increase in literacy rate by 8 percent; increase in land prices by 80 percent; about 12 percent higher prices for agricultural produce; and timely help during medical emergencies, particularly for pregnant women.

9. ***GoB has established three key priorities for its rural roads program:*** (i) to provide all-weather road connectivity to the remaining 49 percent unserved rural habitations; (ii) to preserve the existing road assets and upgrade them to acceptable standards; and (iii) to improve institutional effectiveness of RWD.

Priority One: All-Weather Road Access to the Remaining 49 percent Habitations

10. ***PMGSY (The Prime Minister's Rural Roads Program):*** In 2000, the Ministry of Rural Development (MoRD), GoI launched a flagship program, PMGSY, to provide all-weather road access to all habitations with above 500 population in the country, to systematically address the issue of road access as part of its poverty reduction strategy. After a slow start, RWD has constructed 39,938 km of rural roads under PMGSY. Through that process, the systems and procedures of PMSGY have been institutionalized into RWD. The World Bank is engaged with PMGSY, since its inception, through active dialogues, technical assistance (TA), and a series of lending operations and has contributed to many good practice examples. Currently, the World Bank is supporting PMGSY Rural Roads (PMGSY RR) Project (US$1400 million) involving construction and upgrading of about 25,000 km rural roads in eight participating states including Bihar and capacity building for improved planning processes, effective delivery and maintenance of rural roads infrastructure.

11. ***MMGSY[9] - the focus of this operation:*** GoB launched MMGSY in 2013 to provide road connectivity to 32,199 habitations with 250-499 population which are not covered under PMGSY. MMGSY involves construction and improvement of 37,908 km roads including standalone bridges with an estimated expenditure of US$5 billion. Thus far, 4,719 km of rural roads connecting 3,821 habitations have been constructed under MMGSY, involving an expenditure of US$504 million. MMGSY has comprehensive guidelines similar to PMGSY with regard to project selection, engineering designs, management of social and environment issues, procurement, financial management (FM), quality assurance, monitoring, and governance structure. GoB has planned to seek external funding support to complement its own resources for MMGSY.

Priority Two: Preserving Existing Road Assets and Upgrading Them to Acceptable Standards

12. RWD has US$8 billion worth of rural road assets and these will undergo losses of about US$400 million annually in asset value and an equal amount in higher operating costs, if they are not maintained. In addition, it

[8] Based on various impact assessment studies conducted under PMGSY and World Bank supported rural roads projects including Andhra Pradesh Economic Restructuring Project.

[9] Chief Minister Rural Connectivity Program (Mukhya Mantri Gram Sampark Yojana)

will also affect the poverty reduction and growth process.[10] RWD has adopted a maintenance policy that has seen introduction of performance based maintenance contracts on about 4,600 km of roads and the maintenance funding has increased from US$30 million in FY06 to US$170 million in FY16. The maintenance contracts are now to be scaled up to cover the remaining network. In addition, the 14th Finance Commission has provided grants to local bodies for 11 activities including maintenance of rural roads. The priority is to assist the local governments to effectively use these grants.

13. The World Bank has supported RWD to prepare an Asset Management Plan (AMP) to introduce a new Road Asset Management Approach by moving away from a construction focus to deliver consumer based priorities such as a satisfactory level of riding quality and safety, at least cost over the long run. It will establish a sound and reliable asset data-base system, performance measurement, asset valuation, and implementation of long-term financing plans. RWD needs considerable additional technical support to implement and institutionalize AMP.

Priority Three: Improved Institutional Effectiveness

14. ***RWD needs to improve both the pace and quality of delivery of its road programs*** by improving the quality of engineering designs and asset management, value for money, procurement performance, and by minimizing time and cost overruns. RWD needs substantial enhancement in its traditional way of doing business, to improve its performance and cope with the current demands of both construction and maintenance. RWD's original institutional structure and business procedures are primarily suited for small works and have not kept pace with the current demands, latest developments and innovations happening in the rural road sector.

15. ***RWD has adopted a Road Sector Modernization Plan (RSMP):*** RWD is already in the process of improving its engineering design, procurement procedures, quality assurance and road maintenance practices, as well as related staff capacities under the PMGSY RR Project. RWD has adopted an RSMP to make this process more structured, enhanced, and a regular practice. RWD needs the World Bank's knowledge support to implement RSMP (to be provided under Component 2 of the project). In addition to AMP described above, some key elements of RSMP adopted by RWD are summarized below (additional details in Annex-1):

(a) ***Strengthening of the Road Sector Policy Framework:*** RWD has initiated the process of establishing a comprehensive rural road vision and strategy to address the key sector issues and achieve the goal of road access to all.

(b) ***Building human resources capacity and a knowledge base in both the public and private sector:*** RWD has highly qualified staff but they have limited exposure to the latest developments and best practices in the sector. In addition, the capacity of the local construction industry[11] needs strengthening, especially in the areas of construction management practices and adoption of modern technologies.

(c) ***Streamlining and modernizing of key business processes:*** RWD is currently using the Online Management, Monitoring, and Accounting System (OMMAS), an effective business management tool, for PMGSY and plans to extend its use to MMGSY and other rural road programs. RWD is also planning to streamline, standardize and computerize its main business procedures, approval processes, and

[10] Which is a long process and requires the roads to be in usable condition throughout the process.
[11] Including the consulting sector.

databases using the latest information technology (IT) tools for project life cycle management to improve efficiency, transparency, and overall sector governance.

(d) Climate resilient and cost-effective engineering designs: The unit cost of rural road construction in Bihar is relatively high due to long haulage of road aggregates, extra requirement for flood protection works, and design procedures that ignore the use of local materials. The World Bank has supported RWD with the development of environmentally optimized road designs using local materials and industrial by-products as an alternative to rock aggregates, resulting in more than 25 percent savings in construction costs. This includes the use of extensive deposits of alluvial sand that accumulate on large tracts of arable land after floods. RWD also needs to undertake a climate vulnerability assessment of the existing rural road network, with a focus on floods, and incorporate suitable remedial measures in its road design, construction and maintenance programs.

(e) ***Focus on rural road safety:*** Road safety has become a critical issue on rural roads in Bihar due to a high percentage of pedestrians, cyclists, and two or three wheelers that share the same roadway with larger motorized vehicles. The problem is further compounded by geometric deficiencies such as sharp curves, poorly designed junctions, narrow roadways, missing protection structures on high embankments, and negligible awareness about road safety in rural areas. The Transport Department of Bihar has adopted a Road Safety Action Plan, which was prepared for SHs and MDRs, and RWD will prepare a similar plan for rural roads.

(f) ***Rural transport services also need improvement:*** There is a need for more efficient and reliable transport services in rural areas to derive the full benefits from improved road connectivity, specifically for women and the poorer population, who may not own a vehicle and are thus largely dependent on public transport, which is currently under-developed.

(g) ***Employment opportunities:*** While road programs offer good opportunities for job creation both direct and indirect, poor and marginalized groups (including unemployed youth, boys and girls alike) are unable to access these jobs due to lack of adequate skills. Meanwhile, the road programs suffer from non-availability of technical staff and skilled workers. Suitable training and capacity building programs are required to harness these opportunities to complement concurrent national and state government programs.[12]

16. ***Analytical underpinnings for the operation.*** There is a substantial analytical underpinning to the rural roads sector in Bihar especially through the World Bank's long-engagement in PMGSY, the Bihar Development Policy Loan (DPL), and the World Bank supported studies.[13] The World Bank has recently undertaken a detailed assessment to further enhance the systems and procedures of PMGSY. Results and findings from all these engagements and studies have been incorporated in the project design.

[12]Supported by state and national government through the Ministry of Labor & Employment, Ministry of Skill Development & Entrepreneurship and MoRD.

[13]These include the road construction industry study, road safety action plan, road sector vision, process improvement studies for design and contract management, road asset database for RCD under the U.K. Department for International Development Trust Fund support, and the Human Resources Professional Development Strategy, in addition to a detailed assessment of PMGSY, AMP, and environmentally optimized road designs for rural roads.

C. Higher Level Objectives to which the Project Contributes

17. The project is fully aligned with the World Bank Group's goal of reducing poverty and promoting shared prosperity, and with India's Country Partnership Strategy 2013-2017 priority of supporting low-income states and its three themes: integration, transformation, and inclusion. The project will better integrate the rural population, businesses and industries in Bihar's remote and poorer districts with the national and state economy through better transport connectivity, as well as through improved integration with the strategic transport corridors passing through Bihar. Improved road access will have a transformational impact on rural poverty through its effect on improved agricultural productivity, higher non-farm employment opportunities and increased rural wages. It will facilitate better inclusion of the poorer and marginalized communities in the growth process through better access to markets, jobs, growth opportunities, and services. The project will also support GoI's development priorities[14] which emphasize the development of rural roads to facilitate inclusive growth, economic development, and access to markets. In addition, it will also support GoI's current priority of doubling farmers' incomes.

18. The project will also support GoB in achieving the Sustainable Development Goals (SDGs)[15]: Rural roads are proven poverty reducers (Goal 1: Ending Poverty); enable flow of agriculture inputs and farm produce (Goal 2: Food Security and Sustainable Agriculture); allow quicker access to health care and education facilities, specifically for women/girls (Goal 3: Health and well-being, and Goal 4: Inclusive, Equitable and Quality Education); facilitate mobility of labor and increase employment opportunities (Goal 8: sustainable and inclusive economic growth and employment); and connect remote and inaccessible areas with economic opportunities (Goal 10: Reduce Inequality).

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

19. The PDO is to improve rural road connectivity in project districts, and enhance management of rural roads in Bihar.

B. Project Beneficiaries

20. The project is expected to provide all-weather road access to economic opportunities and social services to a population of about 1.2 million[16], mostly representing the poorer and vulnerable sections of the society (30 percent are below the poverty-line, and about 48 percent are females). The maintenance program supported under the project will further benefit about 30 million people in the state by way of maintaining a good quality road network and improved access to rural transport and other social services. About 2,500 RWD staff, 1,000 contractors, and 600 classified consultants would benefit under the capacity building program, in addition to development of many small contractors under the maintenance program.

[14] Twelfth Five-Year Plan (2012-17).
[15] As demonstrated in various impact assessment studies of PMGSY, rural roads are closely related to the achievements of many of SDGs.
[16] Based on the data from the state core rural roads network.

Box-2: Jobs and Gender

The project will generate direct employment of about 20 million person days for local labourers through rural road construction and maintenance program. As part of its gender empowerment, the project will create employment opportunities for youth through suitable training programs for laboratory and field investigations, engineering designs, and other similar tasks, in addition to skill enhancement for construction workers, development of small and micro-enterprise contractors for maintenance works, and pilots to encourage women self-help groups to operate rural transport services.

C. PDO-Level Results Indicators

21. The achievement of the project development objective (PDO) will be monitored by the following PDO level Indicators: (a) Increased road connectivity to habitations; (b) Roads in good and fair condition as a share of total classified roads [core]; (c) Improved effectivness of project expenditure–project roads designed using cost-effective measures; and (d) Improved asset management–number of districts that have developed and are using an asset management system.

III. PROJECT DESCRIPTION

A. Project Components

22. The project combines both investment and knowledge support: (i) investment will improve about 2,500 km of rural roads that will help to enhance the quality of delivery of MMGSY by introducing cost-effective designs, road safety engineering measures, improved quality of existing infrastructure, and better contract management practices to avoid time and cost-over-runs; and (ii) knowledge support will gradually transform RWD into a modern and high performing road agency capable of building and maintaining its road assets based on a sound technical and financial footing, while keeping its knowledge base updated with the latest developments and innovations in the sector.

Box-3: Some Innovative Aspects of the Project (see Annex-1 for details)

Climate resilience and green growth: (i) conducting a detailed climate vulnerability assessment of the rural road network with a focus on floods, the major climate-induced event facing the state; (ii) introducing climate resilient and environmentally optimized road and bridge designs using alternative materials such as local sand deposits accumulated due to floods, fly-ash, and waste plastics instead of rock aggregates, bringing both environmental and economic benefits, and improved drainage measures in flood prone areas; (iii) tree plantation along the rural roads, and use of bio-engineering measures for erosion control that provides for green cover and also serve as carbon sinks; (iv) use of Environmental Codes of Practice (ECoP) that include special provisions for designing roads in flood prone areas and environmental benefits during construction operations; and (v) improved asset management using lifecycle approach and avoiding pre-mature failure of both the roads and the vehicles-leading to big savings in consumption of fuel and scarce natural resources.

E-tools for lifecycle monitoring for rural road projects including e-payments, use of mobile based applications for citizen feedback and road inspections, and computerizing key business processes of RWD.

Efficient delivery of road maintenance: Using innovative maintenance contracting approaches and developing small and micro-enterprise contractors.

Road Sector Modernization Plan to gradually transform RWD into a modern, high performing, and outcome focused road agency using best practices for strategic planning, project delivery, asset management, sector governance, and building its capacity and knowledge base.

Improved capacity and knowedge base of RWD, and construction and consulting industry including gender-based skill enhancement.

Safe rural roads through improved road safety management and infrastructure enhancements including retrofitting road safety measures in existing network and implementation of Rural Road Safety Action Plan.

23. The project has two components:

24. ***Component 1–Rural Roads Improvement:***

(a) ***Civil works for rural roads***: Constructing and/or improving/upgrading approximately 2,500 km of state rural roads core network and standalone bridges, in project districts under MMGSY, including demonstration of new technologies to promote cost effective, modern, climate resilient, and environment friendly road construction.

(b) ***Design, implementation and management support***: (i) preparing cost-effective climate-resilient engineering designs and related surveys and investigations; (ii) carrying out engineering supervision of civil works; (iii) providing/hiring management services for the Project; (iv) implementing independent monitoring of quality of design and works, and contract compliance; (v) carrying out independent monitoring/assessments of safeguards compliance and the achievement of Project outcomes.

(c) ***Pilots on innovative bridge construction and retrofitting road safety and climate resilient measures****:* (i) construction and improvement of bridges using innovative designs and climate resilient measures; and (ii) retrofitting road safety engineering measures and climate resilient measures on small parts of state rural roads core network.

25. ***Component 2: Asset Management and Institutional Effectiveness:*** This component will support implementation of RSMP[17] to build on and carry forward the ongoing initiatives in the following areas.

(a) ***Asset Management****:* (i) Implementing RWD's Asset Management Plan by setting up a simple asset management system and preparing prioritized plans for capitals works and maintenance, and revision of the state rural road core network using remote sensing imageries; (ii) supporting implementation of

[17] RSMP is a mechanism to capture the opportunities for modernizing RWD on a regular basis. It is a dynamic plan to be updated on a regular basis and its implementation will continue even after the closure of the project. The activities to be completed within the project duration are shown in the results framework.

innovative maintenance contracts for at least twenty percent (20%) of the state rural roads core network to establish an effective road maintenance delivery system (the contracts are to be funded by GoB from its maintenance funds for rural roads); and (iii) establishing and implementing a climate resilience action plan for rural roads, including network level climate vulnerability assessment of roads and bridges and introduction of climate-resilient, cost-effective, and environmentally optimized road designs using local and waste materials.

(b) ***Institutional Effectiveness:*** (i) Implementing RWD's Human Resources Professional Development Strategy to acquaint RWD's staff with the latest industry practices, providing training to contractors and their staff, and piloting projects for creating employment opportunities for the youth; (ii) providing infrastructure and equipment support to RWD's laboratories, offices and training facilities, survey and investigation teams; (iii) carrying out studies to improve institutional effectiveness of RWD, as well as RWD's contractors and consultants; (iv) streamlining and computerizing RWD key business processes; (v) modernizing policies, engineering practices and business procedures within RWD through, *inter alia*, the development of a long term rural roads vision and strategy and technical guidelines and manual; and (vi) carrying out studies for the improvement of rural transport services and designing incentives for private sector and women self-help groups involvement in such services.

(c) ***Road Safety Management:*** Updating/improving Bihar's Rural Road Safety Action Plan and support its implementation through the preparation of schemes for retrofitting road safety measures in the existing rural roads network, including capacity building of RWD staff and other related agencies, awareness programs for local governments, communities and work zone safety, and road safety audits of priority rural roads.

B. Project Cost and Financing

26. *Lending instrument.* The proposed lending instrument for this project is Investment Project Financing.

27. The total cost of the project is US$335 million out of which IDA will finance US$235 million and GoB will provide the counterpart funding of US$100 million. Table 2 below summarizes the Project Costs and Financing.

Table 2: Project Cost and Financing

Project Components	Project Cost (US $ Million)	IBRD or IDA Financing (US $ Million)	Trust Funds	Counterpart Funding (US $ Million)
(a) Rural Roads Improvement	320	224	0	96
(b) Asset management and Institutional Effectiveness	15	11	0	4
Total Costs				
Total Project Costs	335			
Total Financing Required	335	235	-	100

C. Lessons Learned and Reflected in the Project Design

28. The project is designed to offer a holistic package of solutions to effectively deliver a rural road program and sustainably manage the existing rural road network at the sub-national level by reflecting the lessons as well as good practices drawn from the long engagement of the World Bank in PMGSY, and the other specific Bank operations in the state.

29. ***Road sector reforms require active engagement of policy makers and road agency staff.*** GoB has set-up a High Level Project Steering Committee to oversee the implementation of the project including RSMP and a Working Group to implement RSMP. RSMP has been prepared through active consultations and discussions at various levels in GoB and RWD to reflect its priorities.

30. ***Establishing separate systems for the World Bank projects supporting a government program should be avoided where possible.*** The project largely uses the same systems and procedures that are already in place and functioning under PMGSY and MMGSY.

31. ***The World Bank technical assistance can be very effective in introducing system-wide improvements in a road agency:*** While the World Bank will support only a small part of MMGSY, TA under the project will focus on the entire rural road sector toward modernizing the existing systems and procedures of RWD and enhancing the capacity and skill base to implement them.

32. ***Low-income states generally have limited capacities and skill base both in private and public sectors:*** A Human Resources Professional Development Strategy will be implemented to improve staff capacities including for the contracting industry. The construction program has been carefully planned, taking into account the available capacities, and civil works contracts will be closely monitored.

33. ***The small size and dispersed nature of the rural road improvement works pose many implementation challenges to the World Bank's implementation support:*** The World Bank will rely on a better system of independent verification, performance audits, and improved monitoring and oversight mechanisms to target particular areas of concern and create opportunities for performance enhancements.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

34. The project will be implemented by RWD through its technical agency Bihar Rural Roads Development Agency (BRRDA). BRRDA has deputed a Project Director who will work under the guidance of a Chief Engineer and Additional Chief Executive Officer (ACEO), BRRDA, and a Project Steering Committee (PSC), headed by the Secretary, RWD. BRRDA has established designated units for engineering designs, procurement, contract management, social, environmental, grievance redressal, financial management, and institutional development including road safety. All procurement will be undertaken by BRRDA. GoB has established a Road Sector Modernization Working Group to implement RSMP (Component 2) and a multi-disciplinary Working Group to oversee implementation of the road safety sub-component by their designated staff.

35. Arrangements at project districts: RWD field Project Implementation Units (PIUs) under the guidance and oversight of Superintending Engineers will be responsible for implementation of all project activities in their respective districts, as well as for mobilizing the support of and coordination with local administration, local communities, and departments such as forest, revenue, rural development, and other departments. Funds for project activities will be provided by the head office in project specific bank accounts.

36. BRRDA will engage: (a) technical examiners to review the quality of engineering designs and implementation of civil works including seeking community feed-back; (b) contract staff to complement in-house capacities; (c) a Project Management Consultant (PMC) to support the project and undertake bi-annual performance audits to identify any implementation issues and recommend remedial measures; (d) consultants for independent safeguard monitoring; and (e) academic and research institutions to support on the introduction of new technologies, environmentally optimized designs, and training activities.

37. Citizen Engagement: The state core network, engineering designs and maintenance plans have been (and will be) finalized based on active consultations with local communities. Citizen information boards are to be provided on all project roads and citizens' feedback is to be sought during inspections by technical examiners. Reports of the technical examiners shall be made public. To complement personal and panchayat oriented feedback mechanism, a mobile application[18] is already operational in BRRDA to receive citizen feedback on rural roads in addition to written communications.

Box-4: Meri Sadak-Citizen Feedback System

"Meri Sadak" is a mobile application under PMGSY to enable users to give their feedback (with photographs); make the system more transparent and accountable; users to monitor the redressal of their feedback through this app; and allow BRRDA to respond to the users.

B. Results Monitoring and Evaluation

38. BRRDA is already using a custom-designed Management Information System (MIS) for MMGSY which will be the basis for results monitoring. The project will also support expanding the use of OMMAS to the entire rural road sector in Bihar to produce customized performance reporting at the state and district levels, incorporating improved information on road quality monitoring, outcome monitoring, and citizen feedback, and gender disaggregated reports of community participation in planning, design, quality monitoring, training and other project activities. BRRDA will also prepare quarterly progress reports containing the progress on both the project components.

39. PMGSY RR is developing an outcome monitoring methodology for PMGSY that will also be used for MMGSY. This methodology includes poverty and other socioeconomic assessments, road users' perception surveys, and rural travel characteristics including benefits of rural roads to women and girls.

[18] Meri Sadak – "My road" introduced under PMGSY

C. Sustainability

40. GoB is demonstrating strong commitment to MMGSY since its inception. The RSMP, which has been carefully customized to address the priorities of GoB and integrated with the on-going reforms under PMGSY, is already under implementation[19]. There is good momentum and support for the reforms from various levels in GoB and RWD. GoB is already showing strong commitment towards its rural road maintenance policy and has agreed to maintain adequate level of maintenance funding as per the policy. The asset management system to be developed under the project will further ensure effective use of these funds through annual maintenance plans[20].

41. Technical and environmental sustainability of the project will be achieved through use of the 'environmentally optimized and climate resilient road designs'.

42. Operational sustainability of the project will be ensured through the preparation of good quality engineering designs and contract management, reinforced by independent quality audits and an in-built provision in the construction contracts for maintenance for five years. Implementation of AMP and innovative maintenance contracts will support preservation of the road network.

D. Role of Partners

43. No partner is involved in this project, Asian Development Bank is involved with SHs and MDRs that are under RCD, a different department than RWD.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

44. The overall implementation risk of achieving the PDO is rated substantial, along with the technical design of the project and institutional capacity for implementation and sustainability. The climate resilient engineering designs and other innovative activities under RSMP are relatively new to RWD. RWD also requires significant augmentation to its implementation capacity and knowledge base to effectively cope with the big demands of MMGSY and PMGSY and to deliver on the prescribed standards set under these programs. In addition, it has to focus on maintenance of the existing rural road network. The construction industry in Bihar is relatively less developed. There are implementation delays, and quality issues both in the designs and built infrastructure.

45. The project will use many international and local experts as well as academic and research organizations to support implementation of RSMP and climate resilient and environmentally optimized road designs. Project design lays special focus on enhancing the capacity and knowledge base of RWD through implementation of the Human Resources Professional Development Strategy, use of improved design and construction management tools, and use of private sector engineering capacities to augment RWD capacities. The civil works construction program has been designed considering the capacity of local construction industry. Project designs also include

[19] Through support under PMGSY RR
[20] Refer to legal covenants section in the PAD datasheet for details.

a PMC and independent quality monitoring of engineering designs and quality of construction. In addition, the project design incorporates significant implementation support from a core team of experts from the World Bank, complemented by international experts to support implementation of RSMP.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

46. **Economic Analysis:** The project will provide last mile road connectivity to smaller habitations which depend on earth or brick paved tracks not suitable for motorized traffic. During the monsoons, these tracks become practically unusable.

47. The economic analysis was undertaken on a typical road section of 2.64 km, representative of about 1,000 km of project roads having similarity in terrain and land use and passing through an agricultural area. The average daily traffic level has been 240 vehicles consisting of 35 percent passenger, 23 percent goods, and 42 percent slow moving non-motorized vehicles along with about 100 pedestrians. Key assumptions include annual growth rate of traffic of seven percent; cost of construction of US$0.1 million per km (economic cost US$0.09 million per km); 18 months' construction period; incremental maintenance cost of US$1,194 and US$17,910 for routine and periodic maintenance per km respectively for gravel road, and US$1,119 and US$14,925/km for paved road; and 5 years and 6-year periodic maintenance cycle, respectively, for 'without' project and 'with' project scenarios. The primary benefits considered for the economic analysis include: (a) reduction in vehicle operating costs (VOCs) and travel time savings for vehicle users and (b) reduction in carbon emissions from vehicles using the improved roads[21].

48. Based on estimates of economic costs and benefits over a period of 20 years, including 4 years of implementation, the economic internal rate of return (EIRR) of the project was calculated for the BRRP network. The project has an EIRR of 15.1 percent, which is higher than the World Bank recommended social discount rate (SDR) of 6 percent. EIRR remained higher than the SDR even after sensitivity analysis was carried out to assess selected downward risk scenarios[22].

49. **Fiscal Analysis:** Fiscal analysis indicates that counterpart fund requirements for the project during project implementation will be about 2.25 percent of GoB's fiscal allocation for RWD. To maintain project sustainability, the Government would need to allocate about INR405 million annually for operation and maintenance, on an average, over the period 2022 to 2036, or about 0.54 percent of GoB's current annual rural development budget. GoB has confirmed that such levels of support would be maintained.

50. **Carbon Emission Reduction Benefits Estimates:** Using the working model developed for the economic analysis, carbon emission reduction estimates have been derived for the 2,500 km, by considering improved fuel consumption quantity[23], carbon emission rate (0.0023 ton/ litre)[24], carbon cost (US$ 38 per ton in 2022)[25] and the

[21] Based on Evaluation Study by Planning Commission, 2010, unit rates suggested by Indian Roads Congress (IRC) for motorized vehicles and World Bank Study for Andhra Pradesh (2000). Existing traffic based on primary survey (2016).
[22] In case capital and O&M costs are both increased by 20 percent and benefits are concurrently decreased by 20 percent.
[23] Reduced fuel consumption estimated by assuming that travel speed will increase by 20 percent.
[24] GHG Analysis Road Improvement, Guidance Note, World Bank Group, February 2016.
[25] Estimated based on' CCGCE Guidance note on Social Value of Carbon in project appraisal, July 14, 2014, World Bank'.

traffic under 'without' and 'with' project scenarios. Though the number of vehicles on the road would necessarily increase, the project is estimated to result in a marginal decrease in carbon/GHG emissions, mainly due to the considerably reduced carbon emission rates. The carbon/GHG savings, however, would have little or only marginal impact on the overall economic analysis of the project.

B. Technical

51. Project roads will be selected from the state's core rural roads network according to the prioritized lists established under MMGSY after considering the land availability, as required under MMGSY. Roads less than 1.5 km are generally not included under the project. Most of the project roads will be improved to single lane roads using the existing alignments currently in the form of either earth tracks or brick pavements, by providing adequate geometry, pavement, drainage, bridges, and road safety engineering measures, including special treatment in built-up areas. The rural roads will generally have a carriageway of 3 m and total formation width of 5-7 m depending on the site conditions.

52. All roads and bridges will be designed to all-weather standards prescribed by the Indian Roads Congress (IRC) for rural roads and already being used in PMGSY and MMGSY. However, it will not be practical to comply with those uniformly due to the variability in the existing right-of-way and works already undertaken. Typical examples are built-up village areas[26] and road sections having water channels or tree plantations and other structures on their side. In such situations, the design will be suitably customized by making optimal use of the available right-of-way to serve the basic purpose of providing accessibility, carefully avoiding demolition of houses and other structures, cutting of old trees, and minimizing additional land requirements. Suitable passing places will be provided in such situations ensuring smooth flow of traffic in narrow sections. In flood-affected areas, the roads will be designed as submersible roads, depending upon the site conditions, to avoid obstructions by the road embankments to the floods, in consultations with the local communities. Unit costs for the project are relatively high as compared to other Indian states due to the lack of availability of rock aggregates resulting in long haulage, high embankments and other measures to mitigate flood damages, and a relatively large number of culverts and bridges.

53. *Environmentally optimized and climate* resilient *road designs and new technologies:* The World Bank has supported BRRDA to develop environmentally optimized and climate resilient designs aiming to utilize local materials such as sand, marginal material, local soils, fly ash, brick kiln wastes, and other similar material, and climate resilient designs for roads and bridges to minimize damage due to adverse climatic events and extreme weather conditions. Similarly, pre-cast segments for culverts and bridges will be used (based on international experiences), to maintain quality, and save both time and cost of construction. BRRDA has made a beginning by using improved road designs, which has already resulted in savings of about 25 percent in the cost of construction. The project will also conduct network level climate vulnerability assessments to identify the road sections and assets (bridges and culverts) that need adequate mitigation measures to protect against extreme climate events.

26 While MMGSY roads are required to connect the habitation boundary, in some cases improvement of internal village roads would be required to provide access to schools and Panchayat Headquarters. In such cases, the improvement works will be designed within the available right of way carefully avoiding demolition of houses and other structures.

54. *Rural road safety*: All the rural roads have provisions for road safety engineering measures such as improved lane markings, protection structures, and road signs as prescribed by IRC. BRRDA will also undertake simple rural road safety audits during the design and construction stage as well as consultations with the local communities to identify the needs for any road safety enhancements. Due to land constraints, it may not be feasible to meet the prescribed geometric standards - in such cases suitable information boards and other engineering measures will be used.

55. *Innovative maintenance contracts*: The project will support area-based and other simple maintenance contracts for a five-year duration combining both periodic and routine maintenance. The project will pay special attention to develop small maintenance contractors to undertake routine maintenance operations by working as sub-contractors.

C. Financial Management

56. BRRDA will provide assurance over the use of project funds while RWD will exercise budgetary oversight. The entity's governance authorities are its Governing Body and Executive Committee. Project FM responsibilities will be carried out at the head office of BRRDA vested in the ACEO-cum-Financial Controller and the designated PIUs under the Executive Engineer supported by the Divisional Accountant. The World Bank capacity assessment indicates that FM arrangements in BRRDA can provide reasonable assurance over the use of Project funds. The guiding principle is that project FM systems will be predicated on BRRDA's own systems, supplemented by Bank's reporting and audit arrangements. This is expected to strengthen BRRDA's institutional capacity for FM.

57. The World Bank and counterpart funding will be provided in the state budget for which a separate head of account has been approved and steps initiated to make budget provision. GoB/ RWD will ensure that adequate funds are available to the project. For the project, BRRDA will use a banking mechanism based on authorization limits to PIUs. Separate project books of account will be maintained and the project will be subject to internal audit under terms of reference (ToR) agreed with the World Bank. Project expenditure will be reported through periodic interim unaudited financial reports (IUFRs) drawn from the books, which will form the basis for reimbursement. External audit will be conducted by a private audit firm/s under ToR agreed with the World Bank. BRRDA's audited annual financial statements are available for FY16. Details are provided in Annex-2.

58. Control deficiencies noted by BRRDA's external auditors include inadequate reconciliation between progress reports and accounts, non-reconciliation of bank balances, non-maintenance of certain books and records or weaknesses in related controls. These procedures have been specified in the FM Manual and their compliance will be reviewed by project auditors/ Bank. Besides, BRRDA will establish a system of periodic compilation of project receipts and expenditure for financial reporting to the World Bank. The project will support strengthening FM capacity in BRRDA including automating accounting, enhancing quality of entity financial statements, further strengthening finance manuals, implementing computerized contract management and building FM capacity in staff of RWD/BRRDA.

D. Procurement

59. All procurement under the project will be undertaken by the procurement unit of BRRDA, which is familiar with the World Bank procurement procedures through implementation of the PMGSY RR Project. The

procurement capacity assessment carried out by the World Bank staff concluded that the staff in BRRDA and RWD has limited capacity for procurement under the Bank projects and requires capacity building. Accordingly, BRRDA has set-up a procurement unit with four full time staff to handle all procurement matters as a prime responsibility. The World Bank team has provided training and support to BRRDA officials (both in procurement and contract management) who will be involved in project procurement. The project will also support use of the existing procurement and contract management manual of PMGSY RR Project and corresponding training program over the life of the project. The manual includes all procurement processes, decision making, and safe upkeep and management of records. MMGSY has a comprehensive system for handling complaints.

60. One of the issues is low competition in some districts that will be mitigated through contractors' outreach programs, packaging of works to suit local conditions, invitation of bids in smaller lots, and avoiding bunching of bid invitations under different programs. The World Bank implementation support will involve close monitoring of the Procurement Plan and procurement performance, prior and post reviews, and strengthening of the complaint management process. The project also includes a construction industry study to build the capacity of the local construction industry.

61. Procurement Plan and functional arrangements: For all contracts to be financed by the Credit, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame will be reflected in the Procurement Plan to be agreed between the Borrower and the World Bank project team. The Procurement Plan for procurement to be taken up during the first eighteen months of project implementation has been prepared and accepted by the World Bank. All procurement will be done through an e-portal using the model bidding document acceptable to the World Bank.

E. Social (including Safeguards)

62. Enhanced mobility of the inhabitants due to all weather connectivity to the habitation through the rural roads constructed under the project is expected to trigger huge positive benefits in terms of better access to jobs and markets, health and education facilities and farm and non-farm based produce. At the same time, construction of these rural roads may require additional land or cause minor impacts on structures at few locations. The design approach adopted for the project strives to minimize such impacts. No physical displacement or loss of livelihood is expected. To comply with OP 4.12, a Social Management Framework (SMF) including a Resettlement Policy Framework has been prepared to guide and manage the land transfer and impact on assets under the project. A Vulnerability Framework (VF) has also been prepared to ensure participation of vulnerable people including Scheduled Castes, Scheduled Tribes to meet the requirements of OP 4.10 on Indigenous people.

63. **Social Impact Statements** are to be prepared for each batch of project roads, there is no need for any land take and thus no resultant impact on private and community assets for 1,051 km of Batch I roads.[27]

[27] Engineering designs for these roads have been prepared in full compliance with the agreed safeguard procedures including consultations and disclosure requirements.

64. **Stakeholder participation[28]:** SMF provides for stakeholders' participation through a transect walk and consultation during the detailed project report (DPR) stage. Draft SMF and VF was discussed with stakeholders in August 2016 at Buxar, Motihari and Purnea followed by state level stakeholder consultations on September 30, 2016. The final SMF and VF have already been disclosed on the World Bank's Infoshop (on October 24, 2016) as well as on BRRDA website along with executive summaries in Hindi and English. A newspaper notification was also issued in this regard. The hardcopies of the same shall also be made available to the District Collector and respective PIUs through official communication.

65. **Grievance redressal mechanism:** The project grievance redressal mechanism (GRM) is in line with the provisions of the Bihar Grievance Redressal Act. Any person or group who has any grievance can directly contact the Executive Engineer of the respective division. If the complaint is not resolved locally, it will be addressed according to the procedures of the Bihar Grievance Redressal Act 2015. (See Annex 2 for details).

66. **Gender actions:** Under the project, gender actions are envisaged at project as well as community levels. The project will ensure participation of both men and women from the communities including increased participation of women in transect walks and consultation at planning and design stages at the project road level. The VF awards priority to women over men to overcome the cultural isolation and marginalization which are characteristic of rural India and Bihar. This framework has adopted an engendered road map to ensure that women's issues are continuously considered throughout the project cycle starting with the planning phase. Opportunities in the project for skilling and employment opportunities for youth including females are also proposed under TA Component for capacity building.

F. Environment (including Safeguards)

67. ***Environmental issues.*** Project activities, particularly those under Component 1, if not properly planned, managed and mitigated, could have some adverse environmental impacts. Deficiencies in planning and design of sub-projects could affect the natural drainage pattern leading to impairment or worsening of the local/regional drainage. Other likely impacts on account of the proposed project interventions include: (a) felling of some limited number of roadside trees; (b) adverse impacts on religious properties, sensitive receptors and water resources, including from silt flow during execution of works; (c) soil erosion; (d) construction phase impacts, including those related to camp site operation, dust generation, and pollution from plants/machinery/vehicles and from improper disposal of debris/ other construction wastes; (e) inappropriate management of materials (such as aggregates, sand, water, and earth), their sources and access routes; (f) safety concerns during construction for both road-users and road-side residents, due to increased traffic speeds during operation; and (g) the potential for poorly planned or managed development induced by the improved roads. No sensitive ecological features/sites such as natural habitat and protected areas would be affected by the project. Most of the impacts are expected to be site specific, temporary in nature and can be mitigated with good design and appropriate construction management practices. Accordingly, the Bank's OP 4.01 on Environmental Assessment and OP 4.11 on Physical Cultural Resources have been triggered, and the project is designated as Category B.

68. The project proposes to introduce/mainstream environmental sustainability through appropriate strategies and mechanisms that would be built into the institutional systems. Towards this end, the proposed

[28] EMF and ECoPs also include the same level of stakeholder's participation, and have also been discussed with the stakeholders' and disclosed along with SMF and VF.

interventions will also include demonstration of new technologies to promote cost effective, climate resilient, and environment friendly road construction pilots.

69. ***Management of environmental issues and risks.*** The environment management process and tools for the project have been designed keeping in mind the varied scope of work as defined above. Accordingly, to effectively plan, design and integrate environmental dimensions into the over-all project cycle, an Environment Management Framework (EMF) has been prepared. As the proposed project works are dispersed over a large geographic area consisting of several small works, a framework approach guiding the selection, planning, design, construction, and monitoring requirements is more effective as a management tool.

70. The EMF has been prepared to guide the sub-project preparation and implementation process. It covers aspects such as the screening methodology; environmental codes of practices (ECoPs); and institutional and implementation arrangements (including for monitoring and reporting) to facilitate compliance with the requirements specified in the World Bank's operational policies and those required under GoI/ state government norms. The EMF has been informed by: (a) results of a diagnostic review; (b) experience from the on-going World Bank-funded PMGSY RR Project in Bihar; and (c) experiences from similar rural road projects being implemented elsewhere in the country. The requirements set forth in the EMF and more specifically ECoPs will be appropriately integrated and cross-referenced in DPRs, contract conditions and bills of quantities. A comprehensive assessment report on environmental performance will be prepared by the Project Authority at mid-term and end-term.

G. Other Safeguard Policies

71. No other safeguard policies are triggered for the project.

H. World Bank Grievance Redress

72. 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.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY : India
Bihar Rural Roads Project

Project Development Objectives

The PDO is to improve rural road connectivity in project districts, and enhance management of rural roads in Bihar.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Name: Increased road connectivity to habitations		Number	60280.00	62000.00	End of project (EOP)	MIS (Refer to Para 37)	BRRDA
Description: Defined as a habitation connected by a road constructed to all-weather standards, including bridges and necessary cross drainage works but allowing for submergence of some of its sections during floods. Habitation is considered connected when it is formally opened to traffic by RWD.							
Name: Roads in good and fair condition as a share of total classified roads	✓	Percentage	40.00	50.00	EOP	MIS	BRRDA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Description: Percentage of the total classified road network in the project area that is in good and fair condition depending on the road surface and the level of roughness. Classified roads are the roads that have been included in the roads legislation as public roads. Please note that this indicator requires supplemental information Supplemental Value: Total classified network in the project area (KM) The Supplemental value is the total classified network in the project area. Classified roads are the roads that have been included in the roads legislation as public roads.							
Name: Improved effectiveness of project expenditure - Project roads designed using cost-effective measures.		Percentage	0.00	50.00	EOP	MIS	BRRDA
Description: These measures are defined in the recently introduced IRC guidelines such as IRC 72, 62 (issued in 2015) and other guidelines based on the research work done under PMGSY and including climate resilient and environmentally optimized road designs. (Details are provided in the appraisal summary and Annex 1).							
Name: Improved asset management - number of districts that have developed and are using asset management system		Number	0.00	10.00	EOP	MIS	BRRDA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Description: The asset management system is to be developed under the project to prepare prioritized plans for capital and maintenance works. The plans are to be prepared using a rational criterion for investment decisions and an asset management database that is at most two years old.							

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Name: Roads constructed, Rural	✓	Kilometers	0.00	2500.00	EOP	MIS	BRRDA
Description: Kilometers of rural roads constructed under the project. Rural roads are roads functionally classified in various countries below Trunk or Primary, Secondary or Link roads, or sometimes Tertiary roads. Such roads are often described as rural access, feeder, market, agricultural, irrigation, forestry or community roads. Typically, rural roads connect small urban centers/towns/settlements of less than 2,000 to 5,000 inhabitants to each other or to higher classes of road, market towns and urban centers.							
Name: Improved quality of built Infrastructure - Project roads delivered with satisfactory quality certified through independent quality reviews		Percentage	0.00	85.00	EOP	Independent Quality Monitoring Reports	BRRDA
Description: The design and construction standards are prescribed under MMGSY guidelines and relevant IRC documents. The quality monitoring for designs and construction standards will be undertaken by independent technical examiners/SQMs. While all the roads have to meet the prescribed quality standards, there might be some poorly performing contracts due to reasons such as remote location and low capacity of the contractors, in such cases, contract remedies will be applied.							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Name: Length of roads subject to planned maintenance contracting		Kilometers	4600.00	10000.00	EOP	MIS	BRRDA
Description: Number of km of rural roads which are under either performance based maintenance contracts or other innovative maintenance contracts.							
Name: Effective Citizen Feedback Mechanism		Percentage	0.00	85.00	EOP	MIS	BRRDA
Description: Percentage of feedback from citizens on project roads received on mobile app (“Meri Sadak”) and through other means (e-mail, post, etc.) responded to within 30 days.							
Name: Road Safety improvement scheme related audits undertaken on priority roads		Kilometers	0.00	2000.00	EOP	Quarterly progress reports	BRRDA
Description: Number of km of project roads on which road safety audits have been undertaken							
Name: GIS based road and bridge inventory and condition database (including videography) established in project districts		Percentage	0.00	50.00	EOP	MIS	BRRDA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Description: Percentage of project districts in which a GIS based road and bridge inventory and condition database (including videography) established							
Name: Network level climate vulnerability assessment undertaken with special focus on floods		Kilometers	0.00	2000.00	EOP	MIS	BRRDA
Description: Network level vulnerability assessment undertaken on specified km of road network, with special focus on floods as part of Component 2.							
Name: RWD staff received at least six (6) weeks of professional training during the entire project duration.		Number	0.00	400.00	EOP	Progress reports	BRRDA
Description: The professional training is to be provided in specified subject defined under the Human Resources Professional Development Strategy.							
Name: Gender-based capacity enhancement		Number	0.00	30.00	EOP	Progress reports	BRRDA
Description: Number of training workshops for youth on laboratory and field investigations, engineering designs, and other similar tasks, and gender-based skill enhancement for construction workers and small contractors.							
Name: Direct project beneficiaries	✓	Number	0.00	1200000.00		MIS	BRRDA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Female beneficiaries	✓	Percentage	0.00	48.00		MIS	BRRDA

Description: Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value: Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage.

Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR6	End Target
Increased road connectivity to habitations	60280.00	62000.00	62000.00
Roads in good and fair condition as a share of total classified roads	40.00	50.00	50.00
Improved effectiveness of project expenditure - Project roads designed using cost-effective measures.	0.00	50.00	50.00
Improved asset management - number of districts that have developed and are using asset management system	0.00	10.00	10.00

Intermediate Results Indicators

Indicator Name	Baseline	YR6	End Target
Roads constructed, Rural	0.00	2500.00	2500.00
Improved quality of built Infrastructure - Project roads delivered with satisfactory quality certified through independent quality reviews	0.00	85.00	85.00
Length of roads subject to planned maintenance contracting	4600.00	10000.00	10000.00
Effective Citizen Feedback Mechanism	0.00	85.00	85.00
Road Safety improvement scheme related audits undertaken on priority	0.00	2000.00	2000.00

Indicator Name	Baseline	YR6	End Target
roads			
GIS based road and bridge inventory and condition database (including videography) established in project districts	0.00	50.00	50.00
Network level climate vulnerability assessment undertaken with special focus on floods	0.00	2000.00	2000.00
RWD staff received at least six (6) weeks of professional training during the entire project duration.	0.00	400.00	400.00
Gender-based capacity enhancement	0.00	30.00	30.00
Direct project beneficiaries	0.00	1200000.00	1200000.00
Female beneficiaries	0.00	48.00	48.00

ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: India
Bihar Rural Roads Project

1. The project is designed to provide a holistic package of solutions to leverage the entire rural road sector in Bihar by complementing the traditional World Bank funding for MMGSY with its knowledge support to enhance management of the rural roads in Bihar. While the project will fund only 10 percent of MMGSY, it will leverage the project benefits to improve the entire MMGSY by enhancing its systems and procedures as well as improving their compliance. The project will use the same systems and procedures and the same implementation arrangements as for MMGSY with minor variations. Thus, the enhancements introduced through project roads will be easily absorbed and percolated in entire MMGSY. While MMGSY is an ongoing program mostly based on the sound principles of PMGSY, there are a number of areas where the project will support enhancements. These areas are (a) improved planning processes for project selection; (b) use of climate resilient and cost-effective engineering designs incorporating road safety and social and environment issues; (c) improved procurement and contract management processes to avoid time and cost-overruns; (d) improved quality assurance to ensure longer-life roads and avoid their premature deterioration; (e) improved means of verification and oversight mechanisms; (f) citizen participation, and (g) improved monitoring and management tools. In addition, the project will also support effective asset management, enhancing the capacity of RWD and the construction industry, and transforming the entire road agency into a modern rural road agency through implementation of a Road Sector Modernization Plan. Use of cost-effective designs could result in savings of about 25 percent in the unit cost of rural roads and the improved asset management would minimize about US$ 400 million of potential losses in road asset value annually, and saving an equal amount in VOC. The project will deliver the above through the following PDO and two components.

2. The PDO is to improve rural road connectivity in project districts, and enhance management of rural roads in Bihar.

Project Components

3. The project comprises two components: (i) Rural Roads Improvement and (ii) Asset Management and Institutional Effectiveness.

Component 1 – Rural Roads Improvement

4. This component will support construction and improvement of the state core network to improve road connectivity of target habitations under MMGSY (having 250-499 population in year 2012) in project districts. It consists of three sub-components: (a) civil works for rural roads; (b) design, implementation and management support; and (c) pilots on innovative bridge construction, retrofitting road safety and climate resilient measures in existing rural road network.

5. *Sub-component 1(a): Civil works for about 2,500 km of rural roads including standalone bridges*. This sub-component will also include demonstration of new technologies to promote cost-effective, modern, climate resilient, and environment friendly road construction.

6. *Selection of roads for construction and improvement*. RWD has prepared a state core network that shows locations of all habitations and the road links and bridges required to be constructed to connect them with the nearby market centers (to access facilities for marketing, health, education, and social welfare) either directly or through other roads. The network has been finalized through detailed community and stakeholder consultations. BRRDA has prepared a prioritized list of roads considering the population of the habitation. The MMGSY program for construction and upgrading of rural roads is ongoing in 27 Non-IAP districts out of 38 districts in the state. This project will cover the rural roads in 10 of the 27 Non-IAP districts – Araria, Banka, East Champaran, Gopalganj, Katihar, Patna, Purnea, Vaishali, Buxar and Saran. Other districts might be added if required during project implementation. The project roads and bridges are being / will be selected from the prioritized list of these districts. Roads of 1.5 km or more length are generally proposed to be included under the project. BRRDA is in the process of awarding the contracts for 403 roads totaling 1,051 km under Batch one, and preparing the designs for 391 roads totaling 584 km under Batch two.

7. *Engineering designs.* Most of the project roads will be constructed or upgraded to single-lane roads using the existing alignments currently in the form of either earth tracks or brick pavements, by providing adequate geometry, pavement, drainage, cross-drainage, and road safety measures, including special treatment in the built-up areas. The roads will generally have a carriageway width of 3 m with shoulders on both sides of minimum 1 m each. The roadway width will be 5-7 m depending on the site conditions. Following the directive of National Rural Roads Development Agency (NRRDA) for PMGSY works, GoB has decided to use double surface dressing as the basic paving option for all roads under MMGSY program and this practice will also be adopted for this project.

8. Survey, investigations and designs are being carried out following the standards and guidelines of the IRC and MoRD, GoI for rural roads in India and already included in the PMGSY and MMGSY programs. However, it will not be practical to comply with those uniformly because of variability in the existing road land width. Typical examples are built-up village areas and road sections having water channels or tree plantations and other structures on their side. In such situations, the design will be suitably customized by making optimal use of the available road land width to serve the basic purpose of providing accessibility, carefully avoiding demolition of houses and other structures, cutting of old trees, and minimizing additional land requirements. Suitable passing places will be provided in such situations ensuring smooth flow of traffic in narrow sections. Minor impacts on existing structures will be mitigated as part of the civil works. These modifications will suffice to meet the needs of most of the project roads as they carry low volumes of traffic with high percentage of medium and small vehicles and two-wheelers. In flood-affected areas, depending on the site conditions, the roads will be designed as submersible roads (using a variety of causeway/ford designs) to avoid obstructions to natural floodwater channels caused by road embankments.

9. *Road safety.* All roads will have provisions for road safety engineering measures such as improved lane markings, protection structures, and road signs as prescribed by the IRC. In addition, BRRDA will undertake simple road safety audits during the design and construction stage as well as consultations with the local communities to identify the needs for any road safety enhancements. Due to land constraints, it may not be feasible to meet the prescribed geometric standards. In such cases, suitable information boards and other engineering measures will be used.

10. *Costs*. Cost of road construction in Bihar is relatively high compared to other Indian states (unit cost is US$150,000 compared to US$100,000 in other states) due to long haulage of about 300 km or so involved in transporting rock aggregate and gravel materials from outside the state because of closure of mining / quarrying activities in the state. The project, thus, proposes to introduce cost-effective technologies and use of local (including marginal and waste) materials in road construction as described in paragraphs 11 and 12 below.

11. *Environmentally optimized and climate resilient road designs and new technologies.* The World Bank has supported BRRDA in developing guidelines for environmentally optimized designs using local materials such as sand, marginal materials, local soils, fly ash, brick kiln wastes, and other similar materials; industrial by-products (in place of crushed rock); and low-cost bitumen seals for surfacing. The implementation of climate resilient designs for roads and bridges will likely minimize damage due to adverse climatic events and extreme weather conditions. These designs will reduce the cost of construction by about 25 percent (or even higher) compared to the use of conventional designs. In addition, the designs will use large sand deposits accumulated due to frequent floods and occupying large agricultural areas. GoB has decided to use these designs on a minimum of 20 percent of the roads in MMGSY and thus under this project also. Pre-cast culverts and bridges will be used based on international experiences, to save both time and cost of construction and provide quality assured products. The project will support tree plantation along the rural roads, use of bio-engineering measures for erosion control that provide for green cover and also serve as carbon sinks. BRRDA has made a beginning in using improved road designs which has already resulted in reduction of about INR3 million in cost of construction per kilometer.

12. *Use of new / non-conventional technology.* Following the directive of NRRDA for PMGSY works, BRRDA has decided to introduce the following new / non-conventional technology in a substantial length of MMGSY program and thus under this project also: (a) cell filled concrete pavement, (b) use of cold mix technology using bitumen emulsion, and (c) use of waste plastic in bituminous wearing course. In addition, RWD will also use innovative bridge designs including pre-cast bridges to save on both the time and cost of construction. It is also intended to introduce appropriate maintenance technologies such as a mobile road repair vehicle (equipped with tools, equipment and materials) developed by RCD and tractor drawn graders for blading unpaved roads.

13. *Sub-component 1(b): Design, implementation and management support.* This sub-component will support preparation of engineering designs and related surveys and investigations, engineering supervision of the civil works, project management services, independent monitoring of quality of designs and works and of contract compliance, independent safeguards monitoring, and outcome monitoring (including stakeholders' perception surveys and project impact surveys). It will also support preparation of cost-effective and climate-resilient engineering designs.

14. *Sub-component 1(c): Pilots on innovative bridge construction, retrofitting road safety and climate resilience measures* in existing rural road network. This sub-component will support pilot projects on innovative design and construction of bridges such as pre-cast beams and to demonstrate retrofitting road safety engineering measures and climate resilience measures on a small part of the existing state rural road core network (identified under 2 a(iii) and 2(c)).

Component 2 – Asset Management and Institutional Effectiveness.

15. RWD has prepared RSMP to gradually transform itself into a modern road agency using best practice examples of sector policies, project delivery, and asset management, and improve its institutional effectiveness. RSMP has been prepared with active consultations at various levels in RWD and incorporating various studies supported by the World Bank. RSMP has been introduced as a dynamic mechanism to further the modernization process on a regular basis to capture latest developments in the sector and adopt those in RWD on a regular basis and even after the project closure. This component will support implementation of RSMP through the following three subcomponents:

Sub-component 2 (a) Asset management:

i) *Implementation of AMP*: RWD has prepared an AMP with the World Bank support to help it shift from a traditional construction focus to a modern asset management approach to deliver the required level of service of the road network. AMP will determine the long-term funding requirements to deliver the agreed level of service, and will identify the areas where RWD business processes needs to change to ensure effective implementation of AMP. This sub-component will support implementation of actions suggested under AMP to achieve its objectives. This will include putting in place a simple AMS and preparing prioritized plans for capital works and maintenance (to be used for RWD's budget allocation) including a road inventory and condition data-base based on Geographic Information System (GIS), strip plans showing RoW availability, and videography of road network; revision of the core network using remote sensing imageries with a view to include the missing habitations and missing links; and improving network efficiency.

ii) *Effective delivery of road maintenance:* As part of its maintenance policy, RWD has started to implement maintenance contracts containing initial periodic renewal followed by five-year maintenance. This sub-component will support further enhancements in these contracts and expand those to about 20 percent of the core network roads to establish an effective maintenance delivery system for the existing road network of 127,723 km. This will include introducing various innovative approaches for maintenance delivery such as area-based maintenance contracts and maintenance contracts focusing on routine maintenance. This will also include retrofitting road safety and addressing climate vulnerability and other deficiencies in the existing network through maintenance programs. The sub-component will only fund the required TA; actual maintenance works will be funded by RWD from its own maintenance funds.

iii) *Climate resilient and environmentally optimized road network and innovative technologies:* The World Bank has supported RWD to develop climate resilient and environmentally optimized road designs using local materials to replace rock aggregates. The guidelines also include low-cost bitumen surfacing. Further, a large part of the rural road network is vulnerable to damages due to frequent floods. This sub-component will support establishment and implementation of a climate resilience action plan for rural roads including network level climate vulnerability assessment of rural roads and bridges specifically in flood affected areas and development of suitable mitigation plans; introduction of improved designs of roads and bridges to withstand flood related damages, and low-cost and innovative design of bridges including drainage improvement and erosion controls; introduction of cost-effective and environment friendly road designs using local materials such as big deposits of river sand and industrial by-products;

related research studies; and collaboration with international agencies having significant expertise in this area.

Sub-component 2 (b) Institutional Effectiveness:

iv) *Institutional and human resource development:* This sub-component will support implementation of the existing Human Resources Professional Development Strategy to acquaint RWD staff at various levels with latest industry practices and to enhance their knowledge base in identified priority areas listed in the strategy by providing about two weeks of professional training to each staff. This will also include suitable training programs for contractors' staff and consultants participating in the project. It will also implement pilot projects for creating employment opportunities for youth (boys and girls) through training in areas such as laboratory investigations, quality assurance, surveying, and similar areas and skill enhancement programs for contractors' workforce (possibility of linking with skill enhancement programs). This sub-component will also include (a) infrastructure and equipment support for RWD's laboratories, offices, training facilities, and surveys and investigation teams; (b) development of training material and IT based training products; (c) studies related to improving institutional effectiveness of RWD, contractors, and consultants; and (d) capacity building of the local construction industry including skill enhancement of contractors' staff.

v) *Streamlining and computerization of RWD's key business processes, transparency, monitoring, and citizen participation*: This sub-component will support RWD with streamlining and computerizing its key business processes and moving towards a paperless office. Currently, RWD is using OMMAS which has capabilities to monitor the projects during the entire project cycle, including e-payments and citizen monitoring. In addition, it will also support streamlining and computerizing RWD systems for project preparation, approvals (DPR submission and approval), contract management, automation of the e-procurement system and monitoring including used of modern project and contract management tools, expansion and implementation of a citizen participation and feed-back framework already in place under PMGSY, and integration of GIS and AMS with OMMAS.

vi) *Modernization of policies, engineering practices, and business procedures:* This sub-component will support system-wide enhancement in RWD through (a) development of a long-term rural roads vision and strategy to address the key sector issues and meet the future demands of rural road construction and maintenance; (b) technical guidelines and manuals including for preparation of engineering designs, management of social and environmental issues, construction operations, and quality monitoring; (c) procurement and contract management manual; (d) public financial management; and (e) revision of other RWD guidelines, manuals and operational directives.

vii) *Improvement of Rural Transport Services*: This sub-component will support studies to assess the current status of rural transport services in Bihar, and the extent to which they meet the current demands particularly for the poorer population and women (generally not owning motorized vehicles), and suggest measures to make the services more effective through their better management, incentive schemes for the private sector and women self-help groups on a pilot basis, and identify viable routes for such services.

Sub-component 2 (c): Rural Road Safety Management:

viii) The Transport Department of Bihar has adopted a Road Safety Action Plan for SHs and MDRs which was prepared with support from the World Bank in 2014 using a safe systems approach. This sub-component will support preparation of similar safety action plan for rural roads and implementation of the key activities under it including the following: (a) training of RWD engineers in road safety with a particular focus on undertaking quick road safety assessments to identify road safety related issues during design and construction; (b) designing suitable road safety measures in consultation with local communities; (c) retrofitting road safety in the existing network to address road safety related issues in normal construction and maintenance programs of RWD; (c) undertaking road safety audits of priority roads; (d) creating awareness programs for road safety for local communities and students; (e) creating awareness programs for contractor's staff for safety during construction; (f) development of a road safety module in AMS; (g) pilots on IT-based applications for collecting data on road crashes and awareness programs for drivers training; (h) training and capacity building of local police and transport departments about road safety management on rural roads.

Government of Bihar
Rural Works Department (RWD) and Bihar Rural Roads Development Agency (BRRDA)
Road Sector Modernization Plan

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
1.	**Policy and Planning Framework**			
(a)	Advance Planning Wing (APW) functioning and coordinating with other road departments	• APW exists in RWD • Some system of project-related data exists • Strategy to strengthen APW is being drafted along with identification of its roles and functions	• Strengthen the wing • Define the function of the wing and fix role and responsibilities • Establish library • Establish world-class road data center for the rural road sector in the state including Asset Inventory System with geo-tagging and videography of the network; satellite imagery through remote sensing and road condition database linking to GIS	• APW strengthened • Library established and functioning • Road data center established and functioning; reports generated for the department and public relations and citizen information.
(b)	Document on long-term policy, vision and strategy for rural roads in the state and implementation of the vision	• Objectives laid down and projections for universal connectivity undertaken • Principles for prioritization of new connectivity and upgradation of existing roads/tracks established • Strategies for asset management of rural roads have been drafted	• Formulate a well thought out policy, vision (2030) and strategy document for development, maintenance and management of the rural roads network (including coverage of last mile connectivity) in the state and its integration with secondary and	• The policy, vision and strategy document formulated and released by the state government • High level group constituted to steer implementation of the vision • Vision being implemented

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
		• The Vision 2030 for Rural Roads Sector in Bihar is being drafted	primary roads. (utilize current initiatives of RWD and BRRDA) • Strategy to adopt master plan approach for prioritization to develop roads to maximize integration and benefits • Adoption of asset depreciation and asset valuation principles to improve FM and accountability, timely actions • Improving delivery system through proper monitoring and evaluation framework	
(c)	Availability of financial resources to meet the development and maintenance goals	• Road funding has been enhanced considerably in the last 5 years • Vision document to recommend possible actions for FM and bridging resource gap	• State Government set up a senior management level task force to identify potential sources of generating additional funds for rural roads and bridge financing gap • Dedicated funds for capital as well as maintenance works • Identify potential ways to reduce requirement of funds for the network which could include reduction in per unit cost for which life cycle cost analysis could be undertaken to achieve value for money for investments.	• Financial allocations are in tune with the requirements set out in the Vision document for both development and maintenance

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Plan for optimal utilization of maintenance funds earmarking to routine maintenance, periodic maintenance and rehabilitation.	
(d)	Preparation of 5-year and Annual Plans and programs	• System of preparing Annual Plan exists • Work closely with APW and BRRDA to develop system for preparation of five year plans	• Evolve and establish system of preparing five year plans for rural roads • Annual Plans should be prepared as part of the 5-year Plans	• System of preparing 5-year and annual plan functional
(e)	Promoting participation of local communities in rural road programs	• Block level and district level rural roads plans are prepared involving local communities, Panchayati Raj Institutions (PRIs) and local area Members of Legislative Assemblies (MLAs), Members of Parliament (MPs).	• Evolve a comprehensive Community Participation Framework	• Community Participation Framework evolved and implemented
2.	**Engineering Practices and Business Procedures**			
2.1	***Efficient delivery of Detailed Project Reports (DPRs)***			
(a)	Preparation of sound and error free DPRs with focus on soil, material surveys, geological/hydraulic investigations, resource efficiency strategies and environmental and social safeguards	• IRC codes, manuals, standards available for rural roads • Manual for preparation of DPRs and ECoPs (for social and environment safeguards) available • Work of preparing DPRs outsourced to consultants • Field PIUs associate with consultants to prepare the DPRs	• IRC needs to continue review of their codes in the light of best international practices • Design Directorate may be strengthened to supervise the work of consultants • Evaluate performance and ensure accountability of DPR consultants	• Design Directorate strengthened and Project Management Unit supports the Design Directorate • Manuals on environmentally optimized designs of roads and bridges prepared and implemented • Modern software for design of roads and bridges procured and being utilized.

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Design Directorate should have core competencies in and specialist Cells for - Pavement design - Bridge design - Safety and traffic engineering including geometric design - Maintenance and Asset Management - Environment and Social safeguards • Manuals on environmentally optimized designs of roads and bridges • Procure modern software for design of roads and bridges • Template and manual for preparation of good quality DPRs • May utilize services of outside domain experts such as experienced SQMs/NQMs so as to serve as Advisers to BRRDA	• Reduction in incidence of time and cost over runs
(b)	Scrutiny of DPRs to ensure quality	• State Technical Agencies (STAs) are engaged for scrutiny of PMGSY DPRs • BRRDA has identified experienced resource persons/SQM (retired engineers) for scrutiny of DPRs	• Enhancing departmental capacity for preparation, review and scrutiny of DPRs • Apart from STAs, establish a pool of experienced SQMs for scrutiny of DPRs	• System of preparing and scrutiny of DPRs strengthened.

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Scrutiny of all DPRs entrusted to STAs or SQMs • Process of certification of Design Consultants and encouraging culture of peer review among themselves • Dedicated Training courses for preparation and scrutiny of DPRs to all engineers	
2.2	***Resource Efficiency Strategies***			
(c)	State related research and development activities identified with the support of Central Road Research Institute (CRRI) and STAs	• State seized of concerns relating to availability of road aggregates; recently took up study of locally available marginal materials in two districts (Bhagalpur and Darbhanga) under the guidance of CRRI and NRRDA • Resource Efficiency Strategy is under preparation	• A dedicated center for research and development activities for the rural road sector needs to be set up • Identify the academic and research institutions in the country to seek support in undertaking studies to achieve resource efficiencies in delivery of the rural road projects. • Prepare a state specific resource efficiency strategy framework for rural roads in Bihar • Long-term mapping of local materials and aggregate sources against future needs	• A well thought out Resource Efficiency Strategy Framework for rural roads at the state level has been prepared and operationalized • Use of locally available marginal materials and sand from dredging of rivers • Average cost of construction reduced significantly, without compromise on quality • A dedicated centre for research and development set up

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Continuous research in new materials, technologies, processes, and techniques	
2.3	***Ascertaining Land Availability and Transfer***			
(d)	Optimum width of RoW to reduce adverse impact on local communities	• PIUs seized of the concern to ensure land availability due to poor access to information on land ownership • System of Transect Walk exists to identify locations with land availability constraints • Community awareness guidelines drafted • Delays due to manpower constraints with revenue department to support RWD in ascertaining land availability	• Environment and social safeguards cell of the Design Directorate to interact with the community to factor in the land requirement • Modification in the design and alignment to reduce the requirement of land • Set up land cell with experts for land survey and transfer process • Review community awareness guidelines	• System of transect walk strengthened • Land transfer minimized • Concerns of community are addressed • Community awareness guidelines reviewed and implemented • Capacity of BRRDA enhanced with a fully functional Land Cell.
2.4	***Tree Plantation***			
(e)	Plantation of trees along rural roads	• IRC guidelines available • For PMGSY, funds from Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) can be leveraged.	• Plantation of trees to take place on all rural roads • Modifying the scope of work of Design Consultant to include identification of location for tree plantation along the roads • Making arrangement to handover identified sites to independent NGOs/ firms/ individuals for tree	• Plantation undertaken through local communities

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			plantation, keeping it outside the contractual scope of work	
2.5	***Procurement of Civil Works, Consultancy Services and Equipment***			
(f)	Time bound and transparent procurement of works, services and goods	• Standard Bidding Documents of PMGSY and MMGSY road projects available • System of e-procurement functioning to enhance transparency and competition • Interaction with prospective bidders and addressing their concerns • Procurement Manual for works, services and goods drafted	• Preparation of Procurement Manual for standardizing procedures and guidance • Review the existing bidding documents to reflect national and international best practices • Strengthening of local construction industry and consultants through regular training and capacity building • Healthy growth of small contractors for maintenance operations • Preparation of bidding document for innovative Engineering, Procurement and Construction (EPC) contract and area based maintenance contracts	• Reduction in time for bid evaluation and issue of Letter of Award • Bid evaluation process provides for mechanism to handle procurement related grievances • Six monthly interactive workshops between road departments, contractors, and consultants to address issues of mutual concern.
2.6	***Project and Contract Management during Construction***			
(g)	Projects completed within stipulated cost and time and works conform to quality standards and specifications	• System in place. Field PIUs supervise the works • Three-tier Quality Control for PMGSY RR well- functioning, where: - PIU – is first tier	• Preparation of Construction and Contract Management manual to standardize procedures and guiding contractor, departments and public at large	• Works executed are of high quality for both materials and workmanship • Regular management meetings held between PIU and

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
		- SQMs appointed by BRRDA function as second tier - NQMs appointed by NRRDA function as third tier • For MMGSY rural roads, PIUs and SQMs are responsible as first and second tier • Quality Assurance Handbook and Specifications for Rural Roads of the NRRDA, MoRD, GoI are adopted • Fine tuning of existing Manual on contract management and finalizing its delivery mechanism	• Review capacity of PIUs to deliver the mandate and strengthen where necessary • Senior level engineers perform oversight role through well laid-down inspection guidelines	contractors to resolve bottlenecks, if any • Reduction in incidence of time and cost over runs
3.	**Asset Preservation**			
(a)	• Assets created in the form of rural roads are preserved and protected from premature deterioration • Good serviceable road throughout its design life • Road free from encroachment	• Asset Management Framework drafted • Performance based maintenance projects undertaken • Model contract document for performance based maintenance of rural roads drafted • Draft Asset Management Plan for Bihar Rural Roads is under preparation	• Develop a Rural Road AMP for the state based on review of current efforts and initiatives • Formulate of Asset Management Strategy and promote culture of preparing five year and annual maintenance plans for the rural road network • Review the Asset Management Framework for further refinement based on national and international practices	• AMP finalized and instructions issued for implementation • Funds required for implementation of AMP are adequate and released to PIUs well in time • Mechanism for routine maintenance put in place and tie-up with contractors ensured • Maintenance management systems based on inventory and condition survey developed and

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Review performance of contractors for routine maintenance works in performance based maintenance contracts and promote competition among contractors • Formulate implementable strategy for ensuring regular and timely routine maintenance of entire rural road network of the state • Asset Information System and reliable methods for regularly updating the data • Strengthen availability of physical infrastructure (such as mobile maintenance units and equipment) in the field for timely maintenance of rural roads • Establish road health clinics at district headquarters • Bundle of roads for surface renewal contracts • Undertake Road User Satisfaction Surveys for obtaining community feedback • Support PRIs in routine maintenance of internal village	functioning on a regular and sustained basis • Road user satisfaction surveys are conducted on rural road network on a sampling basis and results put in public domain • PRIs supported in routine maintenance of internal village roads and non-core roads built under schemes such as MGNREGS

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			roads and non-core roads built under schemes such as MGNREGS	
4.	**Institutional and Human Resource Development**			
4.1	***Training and Skill Development***			
(a)	Adequate development and building of capacity of staff of RWD, BRRDA and consultants, contractors for efficient delivery of rural road programs and projects	• Training of staff taking place as part of PMGSY and MMGSY initiatives • Draft strategy for capacity building of RWD and BRRDA has been prepared	• A comprehensive and state specific policy and strategy framework for capacity building of all stakeholders of rural roads – road agencies, contractors, consultants, PRIs and even quality improvement of STAs needs to be formulated. • Establish a Research-cum-Training Centre for rural roads at the state level (strengthening State Laboratory in Patna to full-fledged training center) • Forge collaboration with national/international agencies • A full time nodal officer at SE level to coordinate the activities relating to training of engineers at all levels • Institutionalizing Training & capacity building • Training in all gamut's and subjects including material testing, construction	• Human Resource Professional Development Strategy formulated and approved by the state government. • Arrangements put in place to implement the strategy • Mechanism to monitor results of initiatives undertaken for training and skill development of engineers of road agencies, consultants and contractors. • A state level Road Research and Training Centre established and functioning. • Construction industry encouraged to run construction academy for workers and equipment operators

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			management and execution of designs along with others. • Training should include both theoretical classroom training as well as practical field training • Accreditation of Domain experts in the state • Mechanism for ensuring proper career progression of Department Engineers at all levels to enhance performance and motivation	
4.2	***Leveraging IT and Information and Communication Technology (ICT) enabled Services***			
(b)	Harness potential of IT and ICT to enhance efficiency in delivery of projects	• Computerization activities undertaken and being enhanced • GIS based technology being mainstreamed • OMMAS being up-scaled to include total process flow for MMGSY along with PMGSY	• Develop techno-IT expertise in-house • Revamping of Department Website • Paperless office and computerization	• Information Strategy Plan prepared • Use of web-site being promoted
4.3	***Governance and Transparency***			
(c)	Right to Information Act systems in place • Both on demand and *suo moto* disclosure • Designated officers in place	• Information provided to citizen on demand • System in place, officers are in position (sometimes as additional charge)	• Law to recognize road user and stakeholders rights, including a transparent Community Participation Framework	
(d)	Transparency in procurement process – dissemination of data relating to procurement time, extent	• System in place	• Develop database of contractors, consultants and their capacity	• Database developed • Information disseminated

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
	of bid response, contract performance, etc.	• Procurement now through e-system	• Database for tendered rates for Bill of Quantities (BOQ) items • Develop benchmark indicators for efficiency of procurement • Dissemination of information	• Unsuccessful bidders informed at the qualification stage as well as after evaluation of financial bids
(e)	Strengthening preventive vigilance – keep a vigilance unit in place	• System exists	• The vigilance unit may utilize the existing labs for independent verification of complaints on quality	• Vigilance unit functioning independently • Testing labs strengthened
(f)	Be responsive to pressures from public	• System of complaints redressal exists	• Enhance efficiency in responding to community, contractors and elected representatives	• Response time reduced and timely action ensured.
5.	**Road Safety Management**			
(a)	Rural roads are built to provide safe movement to road users (motorized vehicles, non-motorized traffic, pedestrians, and cyclists)	• Safety standards defined in various IRC codes provide guidelines for integrating road safety in design and preparation of DPRs • Road Safety Manual drafted by BRRDA to alert the field PIUs and consultants. • Community participation guidelines provide for raising awareness on safety precautions • Road safety measures are built into the engineering designs	• Build capacity of RWD and BRRDA in managing road safety challenges in rural roads • Undertake road safety audits to identify road safety engineering measures on existing network and formulate a time-bound action plan to remove the deficiencies • Integrating road safety measures in road engineering designs • Introduce system of DPRs to be subjected to Road Safety Audit	• RWD and BRRDA strengthened to manage challenges in safety on rural roads • Length of existing roads where safety engineering measures identified through safety audit and safety measures implemented • Number of accidents attributable to engineering factors monitored • Number of accidents reduced over time

S. No.	Key Output	Current Status	Further Actions Proposed	Performance Indictor
(1)	(2)	(3)	(4)	(5)
			• Introduce system of recording data of road accidents on rural road network • Regular maintenance of safety devices • Awareness programs for local government on road safety and ensuring their participation in preparation of engineering designs on safety measures • Spreading awareness among drivers, schools and other road users through regular road safety campaigns • Maintenance of service level to enhance safety • Preparation of Road Safety Action Plan for rural roads	

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY: India
Bihar Rural Roads Project

Project Institutional and Implementation Arrangements

1. The Project will be implemented by RWD through its technical agency BRRDA, which is a registered society under RWD established to implement PMGSY, MMGSY and other state funded schemes. While BRRDA is responsible for overall planning, procurement, coordination, and monitoring, RWD is responsible for major policy decisions as well as implementation of the project activities through its structure at the Head-Quarters, regions, and districts. RWD is headed by a Secretary who is supported by an Engineer-in-Chief, four Chief Engineers and other staff at various levels including PIUs in the districts.

2. *Overall implementation arrangements*: BRRDA has appointed a Project Director (PD), supported by an Assistant Project Director and designated teams (each having a nodal person) for training and consulting services; project planning, selection and engineering design; quality management; environmental and social management; procurement and contract management; RSMP and asset management; grievance redressal, and financial management. This team is also responsible to implement MMGSY in addition to this Project. PD will work under the guidance of a Chief Engineer, the Additional Chief Executive Officer, BRRDA, and the Secretary, RWD.

3. *PSC*: RWD has established a PSC for overall project monitoring and guidance, inter-agency coordination, and high level policy decisions related to the project. PSC is headed by the Secretary, RWD and includes the Engineer-in-Chief and the four Chief Engineers of RWD. PSC will meet at least once in two months.

4. *PMC:* BRRDA will engage a PMC (consisting of a small team of experts) with a special focus on implementation of Component 2 and performance audits on a semi-annual basis. This audit will involve detailed review of the overall implementation of a small sample of project roads to identify the areas in which further enhancements are required including compliance of the contract conditions on the ground. PMC will also undertake discussions with contractors, RWD field staff, and user communities while making its assessment. The findings of the audit will be jointly discussed by the World Bank, RWD, and BRRDA during implementation support missions.

5. *Arrangements at Project Districts:* A total of 33 RWD field PIUs under the guidance and oversight of 9 Superintending Engineers will be responsible for implementation of all project activities in their respective districts, as well as for mobilizing the support of and coordination with local administration, local communities, and departments such as forest, revenue, rural development, and other departments. All field engineers of RWD have been equipped with tablets/personal computers for implementation, monitoring and updating on real-time basis. The districts and regional laboratories of RWD will also be involved in undertaking surveys and laboratory investigations for the preparation of engineering designs and quality assurance of the project roads.

6. *Component 1 Rural Road improvement*: BRRDA is engaging local consulting firms for carrying out surveys, investigations, environment and social screening, and designs and preparation of detailed project reports for the rural roads and bridges under Component 1. The consulting firms are carrying out their assignments under

the supervision of the field Divisions of RWD. Independent technical examiners are also field-verifying and reviewing the engineering designs of roads and bridges. BRRDA will also engage contract staff to compliment the in-house capacities at both Headquarters and field level; consultants for independent safeguard monitoring; and academic and research institutions to support the introduction of new technologies, environmentally optimized designs, and training activities.

7. *Quality monitoring of project roads:* The quality of the project roads will be monitored through the existing three tier quality assurance system of MMGSY: First Tier – PIUs directly responsible for quality control of the works, materials and workmanship; Second Tier - Periodic inspections of works and random tests of the quality of works by the Superintending Engineers (SEs); and Third Tier - Independent SQMs to undertake quality monitoring and submit their report to BRRDA. The scope of SQMs will be enhanced to include overall compliance to contract conditions, physical and financial progress, compliance to safeguard procedures, and consultations with local communities to collect their feedback about the quality of the work and any modification required in the engineering design. All SQMs have at least 10 years of experience in construction of roads and are required to upload their inspection reports including typical photos on BRRDA's website.

8. *Safeguard compliance and other contract related issues*[29]: All engineering designs will be prepared as per the provisions of SMF, VF, EMF, and ECoPs. BRRDA will ensure all pre-construction activities including necessary governmental permissions and clearances and resettlement measures before the commencement of civil works. The model bidding document contains the contract conditions for safeguard compliance which are to be complied by the civil works contractors.

9. *Component 2 Asset Management and Institutional Effectiveness:* RWD has constituted a Road Sector Modernization Group (RSMG), headed by the Secretary RWD, to direct and guide implementation of Component 2. It has also constituted sub-groups for each of the areas: (a) policy and planning framework, (b) engineering practices and business procedures, (c) asset management and maintenance, (d) institutional and human resource development, and (e) road safety management. RWD has already constituted the Road Safety Management Sub-Group under the chairmanship of Secretary, RWD with representatives from police, transport, education, and health departments. A Nodal Officer with five designated officers of BRRDA will be responsible to implement Component 2, under the direction and guidance of the RSMG and Sub-Groups through various officers of RWD and BRRDA. The maintenance contracts under the sub-component 2(b) will also be implemented by the field PIUs of RWD.

Financial Management

10. Project FM arrangements have been documented in the entity's Financial Management Manual which has been approved by the competent authority, reviewed by the World Bank and considered acceptable. A separate budget head has been approved and steps have been taken to make provision for meeting project expenditure. During implementation, GoB/RWD will ensure adequate and timely availability of project funds. BRRDA will ensure appointment of project internal and external auditors and adequate FM staffing in PIUs and their capacity building; and will implement an accounting application, and a system for periodic compilation of project receipts and expenditure from the books.

11. *FM Institutional arrangements:* Project FM functional responsibilities will be carried out at the head office and designated PIUs. FM responsibility will be vested in the ACEO-cum-Financial Controller of BRRDA who will

[29] Refer to legal covenants section in the PAD datasheet for details.

be supported by a Project Team and dedicated contractual staff comprising of a Finance Manager, Assistant Finance Manager, Assistant Accounts Managers and Accountants. At the PIUs, RWD's Executive Engineers will be responsible for the FM function, supported by Divisional Accountants (government officials) and Assistant Accounts Manager and IT Manager as contractual staff. BRRDA will ensure that there are no vacant finance/accounts positions in the designated project PIUs.

12. *Planning and budgeting:* GoB will ensure provision of adequate budget for the project on the basis of annual work plan and budget request by RWD/BRRDA.

13. *Flow of Funds:* Project funds flow arrangements will be as follows.

- From GoI to GoB: The World Bank funds will be disbursed to GoI who will pass on these funds to the Consolidated Fund of GoB, in accordance with its standard arrangements.
- From GoB to BRRDA: RWD will draw the project funds from the designated treasury and deposit these to the Personal Ledger Account of BRRDA from where the funds will be transferred to a central project specific bank account in BRRDA. GoB will ensure that project funds are released to BRRDA on time.
- From BRRDA head office to PIUs: Each PIU will have a dedicated project bank account, operated under dual signatories of Executive Engineer and Divisional Accountant. BRRDA head office will provide authorization limits based on requirements and the bank will transfer the funds to the PIU accounts[30].

14. *Accounting:* BRRDA follows the double entry system of accounting on cash basis and separate project books will be maintained in accordance with a chart of accounts included in the manual. Accounting centers will be the head office and designated PIUs. BRRDA is working with the MoRD to adapt OMMAS for all non-PMGSY schemes[31] for real time accounting and to eliminate the manual process of consolidation. This will strengthen the accounting function of the entity and this activity is proposed to be supported under the project.

15. *Internal controls including internal audit:* The ACEO-cum-Financial Controller will issue authorization to PIUs to utilize project funds based on periodic requisitions limited to actual work done, and the banker will honor payments raised by the PIU only in favor of the contractors up to the authorized limit. Recording of transactions will be done at the PIU by the Cashier and Divisional Accountant. Reconciliation of project bank accounts will be done at least quarterly by the head office and respective PIUs. BRRDA follows the Public Works Department (PWD) Code for the contracts it handles and will also ensure that each PIU maintains a contractor register, guarantees are adequate and updated and payments to contractors and vendors under the project will be made electronically. There is an opportunity to implement a computerized system for contract management.

16. *Internal Audit:* BRRDA has instituted a system of internal audit through a panel of private firms under defined ToR. The internal auditors report to the ACEO every quarter who seeks explanations and follows up on actions undertaken to resolve the issues. There is opportunity to strengthen this function by preparing a manual for internal audit and instituting an audit committee. BRRDA's internal audit system will be extended to cover project transactions and the World Bank will review the internal audit findings. An extended ToR has been included in the FM Manual.

30 The authorization limits are conveyed through office orders and include details of the signatories, the names of the payees and the amount that can be drawn.

31 Alternatively, if this does not work out, BRRDA may consider implementing a higher version of TALLY, an off the shelf application

17. *Financial reporting:* BRRDA will prepare IUFRs based on its books of account, at least quarterly, and submit these to the World Bank within 45 days from the close of the quarter. The format and contents of the IUFRs are included in the FM Manual and the World Bank's Disbursement Letter. BRRDA will prepare separate annual project financial statements (PFS) according to the FM Manual.

18. *External audit:* External audit of the PFS will be conducted by a firm of chartered accountants, acceptable to the World Bank, on agreed ToR and included in the FM Manual. BRRDA will share the annual audited report within December 31 from end of financial year, starting with the year in which the first disbursement is made. The World Bank will also review the entity audit report for any major audit qualifications or accountability issues. The audit reports mentioned in Table 2.1 will be monitored through the World Bank's systems.

Table 2.1: Audit Reports Monitoring

Audit Report	Audited by	Due Date
Annual Project Financial Statements	Private audit firm acceptable to the World Bank	December 31

19. Disclosure: Under the Access to Information Policy of the World Bank, the annual project audit report and the financial statements will be disclosed on the Bank's and BRRDA's website.

Disbursements

20. BRRDA will seek reimbursement of eligible project expenditure from World Bank through IUFRs to be submitted to the Controller of Aid Accounts and Audit. The project will be pre-funded by GoB and no advance or direct payment method is envisaged. Eligible/in-eligible expenses have been detailed in the FM Manual. GoB will use its own resources to fund the cost of any land acquisition, compensation, resettlement and rehabilitation costs, and the costs of tree cutting.

Table 2.2: Disbursement

Category	Amount of Credit Allocated (US$)	Percentage of Eligible Expenditures to Be Financed (Inclusive of Taxes)
Goods, works, non-consulting services, consultants' services, Training and Workshops, and operating costs for the Project	235,000,000	70%

21. *Retroactive Financing:* Expenditures incurred on or after January 1, 2016 up to the day prior to date of legal agreement, subject to USD 47 million, can be claimed as retroactive expenditure, subject to compliance with the World Bank's procurement guidelines. BRRDA will submit a separate stand-alone IUFR certifying the actual expenditure incurred on the project during this period, and this IUFR will be subject to audit by the project auditors.

Procurement

22. Procurement of goods, non-consulting services and works will follow the 'Guidelines: Procurement of Good, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by the World Bank Borrowers' of 2011, updated July 2014. Similarly, consultants will be selected and employed according to the 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by the World Bank Borrowers' of 2011, updated in July 2014.

23. *Procurement arrangements:* All Procurement under the project will be done by BRRDA. Bids will be invited

by BRRDA and the contract award will be approved by an evaluating committee chaired by the officials designated according to the value of contract.

24. *Procurement planning:* For each contract to be financed by the Credit, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame will be reflected in the procurement plan to be agreed between the borrower and the World Bank project team. The procurement plan will be updated annually (or at any other time as required) and will reflect changes, if any, to prior review thresholds as well as changes in thresholds for procurement methods. All procurement would be carried out in accordance with the Procurement Plan.

Environmental and Social (including safeguards)

25. **Environment safeguards**: For environment management, the staffing arrangements in the project would be as follows:

A. At the headquarters of RWD, an Environment Management Cell will be created to handle all matters pertaining to environmental management in road projects, including all activities related to project planning and preparation, supervision, monitoring, evaluation, reporting, documentation, training and over-all co-ordination with concerned agencies on environment management. The staffing of this cell will be as follows:

(i) A Nodal Environment Officer (Executive Engineer/Assistant Engineer level) who will deal with matters pertaining to integration of environmental aspects into project design/contract documents; integrating environmental aspects in the modernization plan and other institutional studies/plans/works; co-ordination with various departments/agencies of GoB and other units involved in project implementation and will be responsible for over-all monitoring and supervision of environmental activities in the project. The Nodal EO will also deal with matters pertaining to supervision and monitoring of environmental aspects related to construction management during project implementation and assist the Project Director in supervision, reporting documentation and data management.

(ii) An independent expert hired from the market will guide, support and assist the activities of the environmental cell of the RWD.

(iii) Data and Documentation Assistant: The Environment Management Cell officials will be supported by a data and documentation Assistant.

B. At the division level, an Assistant Engineer from RWD will be designated as the EO, whose main responsibilities will include regular supervision, monitoring and co-ordination of environmental aspects related to pre-construction, construction and operation stages of the project. The EO shall also be responsible for data collation and selected verification at the field level.

26. *Capacity building for environmental management:* Strengthening staff capacity by deputing dedicated officials and providing them adequate orientation/exposure/training is necessary. The staff in the field divisions will also need orientation and sensitization as there is a strong linkage between engineering, environment and social dimensions of road planning, execution and operation. The project will support activities that will contribute towards improving RWD's exposure and overall capacity in managing environment issues. A training plan has been prepared (and included in the EMF) incorporating the project needs as well as the short and longer term capacity building needs of RWD. The plan consists of various training modules tailored to the needs of various target groups. The training will cover basic principles; implementation techniques; monitoring and reporting requirements; regulatory requirements and; other relevant environmental management methods and

tools.

27. **Social safeguards:** The project has triggered OP 4.12 on Involuntary Resettlement and OP 4.10 on Indigenous Peoples. To comply with the country and state legislations and meet the requirement of the World Bank's operational policies, a SMF including a Resettlement Policy Framework and VF have been prepared by BRRDA. Provision is made to screen and avoid any land take through design modifications. If the required land width is not available, then the land shall be taken either on lease/on acquisition/on donation according to the provisions laid down in state/national rules/policies/acts. However, need for land take and impact on assets is anticipated to be minimal. No physical displacement or loss of livelihood is anticipated. Any losses shall be compensated/mitigated according to the Resettlement Policy Framework in the SMF. The VF addresses vulnerability resulting from social identity, notably gender, Scheduled Castes (SCs) and Scheduled Tribes (STs). The goal of the VF is to support compliance with OP 4.10 and ensure participation of STs and SCs population given that some of the proposed project districts such as Purnia and Katihar have pockets of ST population. Where Scheduled Tribes represent over 10 percent of a participating village, the VF will require holding a free prior and informed consultation with STs to seek their broad support for the project as required by OP 4.10.

28. Overall RWD through BRRDA shall be responsible for ensuring implementation of SMF and VF prepared for the project. Implementation monitoring and reporting arrangements have been detailed in SMF. BRRDA shall appoint one fulltime Social Nodal Officer at BRRDA and designate one Assistant Engineer as social officer at District PIU level for coordination and monitoring purposes. Provision of a third party safeguard review consultant has also been made. Executive Engineer of the respective PIU shall be responsible for ensuring that all the affected persons are identified, and entitlements are delivered according to the SMF and VF. District PIUs are facing great difficulty in ascertaining the land availability status at the time of preparation of DPR due to limited availability of land survey and measurement staff with revenue department. A land cell shall be established in BRRDA to manage land related matters and support PIUs as required. For this, land cell experts with Land survey and measurement skills from the open market shall be engaged by BRRDA early on to inform the DPR preparation for future batches of roads and also confirm the status of land availability during construction phase.

29. **Social Impact Statement:** The DPRs for the first batch of 1,051 km of roads have been prepared and bids have been called for. According to the Social Impact Statement for this 1,051 km, there is no need for any land take and thus, no resultant impact on private and community assets. The DPRs have utilized the checklists and formats provided in the SMF to assess the need for land acquisition and adverse impact on assets. The DPRs are currently being verified by SQMs. The statement shall be updated based on 'on the ground' enquiries and shall serve as a decision-making tool for awarding the contracts. Minor impacts on structures and need for land take may be identified during construction or preconstruction surveys and will be mitigated according to SMF. It was agreed that a Social Impact Statement shall be prepared for all the future batches of DPRs for bidding. The same shall be verified and updated by the PIUs prior to the date of commencement of contracts. This is to ensure that the entire land take process is completed and entitlements are disbursed before initiating any civil works.

30. *Impacts identified during construction:* Minor impacts on structures and need for land take may be identified once the contactor starts preparing the site for construction. The contractor shall intimate such cases to the PIU and a joint inspection shall be carried out by PIU representative, contractor, Gram Panchayat representative and likely affected persons to assess the extent of impacts. In case of minor impacts on structures, it shall be restored through the provisions in the contract. Other impacts shall be mitigated according to the agreed SMF.

31. *Budget:* RWD has a budget head for disbursement of compensation against land acquisition. The cost of land acquisition, if any, shall be made from this budget head from the state Government funds. For any impact identified during the construction phase, the entitlements shall be assessed by the PIUs and funded through the project account.

32. **Grievance redressal mechanism:** Grievances in MMGSY will be handled at the PIU level at the initial stage. Any person or group who has any grievance can directly contact the Executive Engineer of the respective division. On receipt of the complaint, the Executive Engineer will direct it to the nodal officer of environment and social who will try to address the complaint locally with the help of the local community. The nodal officer can also seek the help of the Public Grievance Redressal Officer. If the complaint is not resolved locally, it will be addressed according to the procedures of the Bihar Grievance Redressal Act 2015. (See section H).

33. RWD has a full-fledged Grievance Redressal Cell. The existing mechanism is to address the grievances received through a toll free number, 18003456179. People can directly register their grievances in writing to the Grievance Redressal Cell/Vigilance Officer or directly present their written grievances to the Chief Minister at Janta Darbar.

Monitoring and Evaluation

34. *Quarterly progress report and monitoring indicators:* In addition to MIS, the progress on various project components will be monitored through quarterly progress reports to be prepared by RWD and submitted to the World Bank. During project implementation, use of OMMAS will be extended to entire MMGSY and other programs to serve as an effective management and monitoring tool for the project.

35. *Stakeholders perception and project impact surveys:* Two rounds of road user satisfaction surveys will be carried out, the first after six months of the start of project implementation and the second just before project completion, to assess the perception of road users on the quality of road infrastructure and the level of modernization and effectiveness of RWD. Project impact surveys (cost benefit survey) will also be undertaken to identify the social and economic benefits of the improved roads, as well as other impacts of the project.

36. *Results monitoring and evaluation:* Project results will be monitored using the results framework detailed in Section VII.

Role of Partners (if applicable)

Not applicable

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY : India
Bihar Rural Roads Project

Strategy and Approach for Implementation Support

1. The World Bank's implementation support will focus on: (a) effective delivery of project roads; (b) institutional capacity and project design; and (c) knowledge support to implement RSMP. This will also involve (a) continual policy dialogue with GoB on road sector modernization; (b) field-based reviews of project activities including consultation with project beneficiaries; and (c) consistent review of fiduciary and safeguard procedures and oversight mechanisms within RWD.

2. ***Effective delivery of project roads:*** The project roads involve large number of small-size contracts in widely dispersed locations. The World Bank implementation support will thus aim to enhance the inbuilt oversight and monitoring mechanisms under MMGSY and use them to facilitate effective delivery of project roads. This will also benefit the overall implementation of MMGSY and minimize the implementation capacity risk. The main elements of these oversight systems are as follows:

(i) OMMAS or the current MIS and quarterly progress reports will form the basis of all reporting under the project including the physical and financial progress as well as citizen feedback.
(ii) The quality of engineering designs and construction quality, and compliance to contract conditions will be monitored by independent technical examiners/SQMs.
(iii) PMC will report on the shortfalls in project performance and compliance. It will also identify the actions to address performance shortfalls, and the non-compliance where the World Bank may have to exercise remedies.

3. The World Bank will consider using the above information during its implementation support missions to highlight the implementation issues and possible areas for further enhancements.

4. ***Mitigation of risks related to implementation capacity:*** The Bank will play a very active role in building capacity and knowledge base of RWD through implementation of Human Resources Professional Development Strategy, developing good quality training material, facilitating linkages with local and international training institutions, using e-learning and modern project management tools, and sharing the training material available from various sources. The World Bank will also support RWD to use private sector capacities to complement its in-house capacity.

5. ***Risks Related to Innovative project design:*** The World Bank will share with RWD the best practice examples on the key areas under RSMP based on the Bank's long experience under PMGSY, asset management, innovative maintenance contracts, road safety, environmentally optimized road designs, rural transport services, computerization of RWD, and citizen engagement including women participation. The World Bank team will provide proactive assistance to RWD to define the scope of various consultancy services, procure and implement

those, and review various outputs and facilitate their use. This will also include the knowledge available within various Global Solutions Groups, communities of practices, and the Global Road Safety Facility of the World Bank.

6. ***Location of Staff Expertise.*** Team leadership, safeguards, financial management, and procurement contributions will be provided by the World Bank's country office-based staff. Technical expertise will be provided by a multi-disciplinary team consisting of local and international World Bank staff and specialist consultants.

7. ***The technical support team*** will include experts on rural roads, climate resilient and environmentally optimized designs, pavement design, contract management, bridge engineering, road safety, asset management, innovative maintenance contracts, gender, IT applications, and community engagement.

8. ***Methodology:*** The implementation support will be provided through bi-annual implementation support missions as well as technical visits, regular discussions with the project team and GoB to facilitate project implementation, special thematic assessments, discussions with local communities, training workshops, and resolving any project implementation issues by closely working with RWD in between the six-monthly missions.

9. ***Fiduciary Support:*** FM support will cover, in addition to the operational status and capability of FM systems, timeliness of release of funds to the project, quality of financial reports, reconciliation of financial data, capacity building of FM staff, review of audit reports and follow up on implementation of recommendations, and ensuring that the agreed auditing, reporting, and disbursement arrangements are adhered to. Procurement support will cover effective implementation of the project Procurement Plan and compliance to the World Bank procurement procedures, capacity building of RWD on procurement and contract management, advice on various procurement and contract related issues including selecting the appropriate procurement procedures, and undertaking prior and post reviews.

10. ***Safeguards Support*** *will consist of* effective implementation of safeguard procedures through mainstreaming them during planning, design and construction of project roads, with a focus on capacity building of RWD, consultants, and contractors through suitable training programs. This will also include finding of practical solutions in consultation with RWD to any social or environmental issues that emerge during implementation, sharing of good practice examples, suggesting possible enhancements in social and environmental management in MMGSY, and mobilizing community support for MMGSY.

11. The Implementation Support Plan (ISP) given in the Table below indicate the focus areas and skills required to provide implementation support during the initial and subsequent periods of the project. It will be reviewed regularly and updated as and when required during the implementation. Table 3.1 shows the skill mix required.

Implementation Support Plan and Resource Requirements

Time	Focus	Skills Needed	Resource Estimate (Staff Weeks, SW)	Partner Role
First twelve months	Regular coordination with BRRDA/RWD and internal World Bank	Task Team Leader/project management	10	NA

	team			
	Review of designs and civil works	Rural Road Engineer	8	NA
		Bridge Specialist	2	NA
		Contract Management Expert	3	NA
		Road Safety Expert	2	NA
	Climate resilient and Cost-effective designs	Technical Specialist for Climate Resilient and Environmentally Optimized Designs	3	NA
	Road sector reforms	Road sector strategy, institutional development, asset management, rural transport, and others	20	NA
	Environmental safeguards	Environmental Specialist	3	NA
	Social safeguards	Social Development Specialist	3	NA
	Financial Management	FM Specialist	3	NA
	Procurement	Procurement Specialist	3	NA
12-72 months	Regular coordination with RWD staff and internal World Bank team	Task Team Leader	8 per year	NA
	Review of designs and civil works	Rural Road Engineer	6 per year	NA
		Bridge Specialist	3 per year	NA
		Road Safety Expert	2 per year	NA
		Contract Management Expert	3 per year	NA
	Review of procurement documents	Procurement Specialist	2 per year	NA
	Climate resilient and Cost-effective designs	Technical Specialist for Climate Resilient and	2 per year	NA

	Environmentally Optimized Designs		
Road sector reforms	Asset management, road sector strategy, institutional development initiatives	10 per year	NA
Environmental safeguards	Environmental Specialist	3 per year	NA
Social safeguards	Social Development Specialist	2 per year	NA
Review of FM arrangements	FM Specialist	2 per year	NA

Table 3.1 Skill Mix Required

Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task management country-based	50	18	Field-based
Institutional development specialist	70	15	Field-based
Rural Roads Engineer	38	12	Field-based
Technical Specialist for Climate Resilient and Environmentally Optimized Designs	33	12	International trip
Road Safety specialist	12	8	International trip
Procurement specialist	15	12	Field-based
Financial Management specialist	15	12	Field-based
Environment specialist	18	12	Field-based
Social Development specialist	15	12	Field-based
Bridge Specialist	17	12	Field-based
Contract Management Expert	18	12	Field-based

Partners

Name	Institution/Country	Role
NA		

Annex- 4: Streamlining Climate-resilient, low-carbon road development

Country: India
Bihar Rural Roads Project

Climate resilient road infrastructure – A priority

1. According to the Bihar State Action Plan on Climate Change 2015, there is high probability of an increase in climate change-related natural disasters, particularly North Bihar, which is highly flood-prone. Out of Bihar's total geographical area of 94,160 sq. km, about 73 percent (68,800 sq. km) is vulnerable to floods with annual flooding accounting for about 30-40 percent of the flood damages in India. Out of its 38 districts, 28 districts get flooded (of which 15 districts are worst affected) causing huge loss of property, lives, farmland and infrastructure. Recognizing the absence of state-level climate models and/or vulnerability studies, as well low community awareness, it is imperative to be climate-resilient and move to a low-carbon development path. In line with the State Action Plan that focuses on "Building Resilience Through Development", addressing climate change has been the overarching consideration at various levels in this project:

(i) ***Strategic Planning***: at the planning stage, the project would undertake vulnerability assessment of rural roads and bridges specifically in flood affected areas and help prepare suitable area-specific mitigation measures using locally applicable vulnerability assessment tools such as flood maps and meteorological data.

(ii) ***Design***: To reckon with possibility of flooding, road design modifications could include raising the road bed (in specific situations), submersible road structures in areas prone to flooding (such as hard concrete causeways and vented fords for stream crossings), providing additional length of both lined and natural side drains, increasing the capacity and spacing of cross drains and culverts to respond to the increase in storm intensity and frequency (as reflected in shorter storm return periods), and applying soil bioengineering technology for erosion control and strengthening cut slopes and embankments. Other design innovations could include alternate pavement structures such as concrete geocells, Otta seals and paving blocks using locally available riverine sand deposits and industrial waste materials.

(iii) ***Construction***: Climate-induced flood events bring large sand deposits, which can be gainfully used in road construction under this project. The environmentally optimized road designs using local materials and industrial by-products instead of rock aggregates are a win-win. They bring both environmental (disposal of large sand deposits) and economic gains (reduces the unit cost of road construction, which is relatively high due to long haulage in Bihar). RWD is also adopting new innovative construction technologies under PMGSY.

(iv) ***Maintenance & Rehabilitation***: improved maintenance techniques and rehabilitation measures through higher frequency of cleaning drains and using soil bio-engineering methods for the control of erosion and sedimentation. Retrofitting climate-resilient road maintenance in asset management plans to withstand flood related damages will be done. This will lead to a shift in the use of state's funding towards climate-resilient road development, as suitable remedial measures will be an integral part of maintenance programs.

(v) ***Institutional Capacity***: The project will provide substantial support to the institutional strengthening, training and capacity building of key stakeholders including field staff, contractors, consultants and community on climate resilience to improve the overall performance effectiveness to achieve intended outcomes.

Climate opportunities – contributing towards a low carbon path

2. These practices will result in low-carbon rural road development as well: (i) significant extension of road service life due to enhanced resilience; (ii) optimized life cycle costs and minimizing losses in asset value due to premature failure; (iii) reduction in aggregate and asphalt quantities by utilising local sources and minimising the import of rock aggregates leading to resource efficiency gains; (iv) reducing energy intensity of road construction and promoting sustainable growth of infrastructure; and (v) reduction in unit cost of construction due to the optimization of pavement layers and materials. In all, as can be seen from the above, the project has integrated climate resilience and low carbon development considerations in its entirety.