ASIAN INFRASTRUCTURE INVESTMENT BANK

PD000063-IND
Aug. 31, 2018

Project Document
of the Asian Infrastructure Investment Bank

Republic of India
Andhra Pradesh Rural Roads Project

Currency Equivalents

(As at April 19, 2018)

Currency Unit	–	Indian Rupee (INR)
INR66.00	=	USD1.00

Abbreviations

ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
A.P	Andhra Pradesh
BT	Bitumen or Black Top
CAAA	Controller of Aid Accounts and Audit
CAG	Comptroller and Auditor General
CC	Cement Concrete
CFMS	Comprehensive Financial Management System
DPR	Detailed Project Report
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
FY	Fiscal Year
GDP	Gross Domestic Product
GoAP	Government of Andhra Pradesh
GoI	Government of India
GRM	Grievance Redress Mechanism
IA	Implementing Agency
IFI	International Financial Institution
IRC	Indian Roads Congress
NCT	National Competitive Tendering
O&M	Operation and Maintenance
PDS	Project Delivery Strategy
PIR	Procurement Instructions for Recipients
PMC	Project Management Consultant
PMGSY	Pradhan Mantri Gram Sadak Yojana
PMU	Project Management Unit
PR&RD	Panchayat Raj and Rural Development
PRED	Panchayat Raj Engineering Department
SFD	State Finance Department
SV	Switching Value
TPPF	Tribal Population Planning Framework
TTC	Travel Time Cost
VOC	Vehicle Operating Cost

Contents

1. Project Summary Sheet

Republic of India
Andhra Pradesh Rural Roads Project

Project No.	000063
Borrower Project Implementing Entity Project Implementing Agency	Republic of India Government of Andhra Pradesh Panchayat Raj Engineering Department (PRED)
Sector Subsector	Transport Roads
Project Objectives/Brief Project Description	The objective of the project is to improve road transport connectivity in previously unserved communities by providing all-weather rural roads in all 13 districts of the state of Andhra Pradesh. The plan is to construct rural roads to provide first connectivity, construct cross drainage works and bridges to complete missing links and structures, provide approaches to educational institutions and healthcare centers, construct rural roads passing through tribal areas and upgrade earthen/gravel roads to asphalt-based roads.
Project Implementation Period (Start Date and End Date)	Start Date: Nov. 1, 2018 End Date: Oct. 30, 2023
Expected Loan Closing Date	April 30, 2024
Project cost and Financing Plan	Project Cost: USD666 million <u>Financing Plan</u> Govt. of Andhra Pradesh: USD211 million AIIB Loan: USD455 million
AIIB Loan (Size and Terms)	USD455 million. Final maturity of 30 years, including a grace period of five years, with level repayments at AIIB's standard interest rate for sovereign-backed loans.
Cofinancing	None
Environmental and Social Category	B
Project Risk (Low/Medium/High)	Medium
Conditions for Effectiveness and Disbursement	Legal opinion on the Loan Agreement and the Project Agreement
Key Covenants	Project Implementing Entity to - Carry out the project in strict compliance with AIIB's Policy on Prohibited Practices (2016). - Carry out the project in accordance with the Environmental and Social Management Framework, Tribal

	Population Planning Framework and Resettlement Policy Framework. - Appoint a Financial Management expert in its Project Management Unit by Oct. 31, 2018. - Adopt a Financial Management Manual, in the form and content acceptable to AIIB, by Dec. 31, 2018. - Appoint a project management consultant firm by Dec. 31, 2018 and retain the services of the consulting firm until the end of the project. - Confirm operational readiness of project monitoring software to AIIB by Oct. 31, 2018. - Engage a consulting firm to monitor implementation of the Environmental and Social Management Plan including activities in tribal areas by March 31, 2019 and retain the services of the consulting firm until the end of the project. - Engage a consulting firm to conduct technical review and audit of the project by May 31, 2019. - Submit project progress reports to AIIB for every quarter starting January 2019 within 45 days from the end of the reporting period. - Submit project financial statement to AIIB for every quarter starting January 2019 within 45 days from the end of the reporting period. - Submit audited annual project financial statements to AIIB within nine months from the end of each fiscal year
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that the Bank is in compliance with the policies applicable to the project

President	Jin Liqun
Vice President	D.J. Pandian
Director General, Operations	Supee Teravaninthorn
Manager, Operations	Ke Fang
Project Team Leader	Hari Bhaskar, Senior Investment Operations Specialist
Project Team Members	B.K.D. Raja, Environmental and Social Consultant Giacomo Ottolini, Senior Procurement Specialist M. Boominathan, Economist Consultant Maria Kaizeler, Financial Management Specialist Somnath Basu, Senior Social Development Specialist Yige Zhang, Project Assistant Yitzhak Kamhi, Senior Transport Planning Consultant Zacharias Ziegelhöfer, Infrastructure Sector Economist

2. Strategic Context

A. Country Context

1. India is a lower-middle-income country, with a population of 1.3 billion accounting for 17 percent of the world's population.[1] India is also the world's seventh largest economy based on gross domestic product (GDP).[2] Real GDP expanded at an average annual rate of 7.3 percent between FY2003[3] and FY2012. Growth then slowed to 5.6 percent in FY2013 and 6.4 percent in FY2014 because of growing imbalances and binding supply constraints. Since 2014, however, the Indian economy has been on a gradual cyclical recovery, helped by lower commodity prices, with the GDP expanding at 7.5 percent in FY2015, 8 percent in FY2016, and 6.7 percent in FY2017. It is projected to grow by 7.1 percent in FY2018.

2. Despite India's impressive growth, around 21 percent of the country's population lives below the poverty threshold of USD1.90 per day[4] with 80 percent of the poor living in rural areas.[5] The lack of rural infrastructure is a contributor to rural poverty and constraints on growth. An estimated 35 percent of inhabited areas in India are without all-weather road access, which has been an obstacle to economic growth in those areas, preventing the rural population from integrating fully into the economy and accessing essential services, including education and healthcare.

3. Development of a rural road network, therefore, is one of the key priorities of the Government of India. A document entitled "Rural Road Development Plan: Vision 2025" released by the Ministry of Rural Development, Government of India, states that "rural roads are a key component of rural development since they provide access to economic and social goods and services, thereby generating increased agricultural income and productive employment opportunity in rural areas." To address the need for connectivity, in 2000 the Government of India established the Prime Minister's national level rural roads program (PMGSY)[6] to provide all-weather road connectivity to unserved habitations[7] in India's rural areas.

4. In June 2014, the former state of Andhra Pradesh was bifurcated into Telangana and Andhra Pradesh (A.P) states. A.P, which is situated on the southeastern coast of India, is the eighth largest state in terms of area (162,970 km^2) and the tenth most populous, with around 50 million inhabitants. With almost 70 percent of the state's population living in rural areas,[8] rural connectivity and its consequent socioeconomic development will be key to lift people out of poverty.

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[1] Department of Economic and Social Affairs, Population Division, United Nations.
[2] World Development Indicators database, World Bank, December 2017.
[3] The Government of India's Fiscal Year (FY) begins in April and ends in March. FY2015 means April 2014 to March 2015; FY2016 means April 2015 to March 2016 and so on.
[4] Poverty and Equity Data, World Bank.
[5] India's poverty profile, World Bank.
[6] The Pradhan Mantri Gram Sadak Yojana (which translates to Prime Minister's Rural Roads Scheme) was launched by the Government of India to provide nationwide all-weather rural roads connectivity to connect habitations with populations of 500 or more in the plains and populations of 250 or more in hilly, tribal and desert areas.
[7] Habitation is a cluster of population living in an area. Two to three habitations form a village.
[8] Census Organization of India.

B. Sectoral and Institutional Context

5. **The road network in India.** India's road network of over 5.4 million km[9] is the second largest in the world. The road network consists of the following categories: (i) national highways, totaling about 98,000 km; (ii) secondary roads, comprising about 900,000 km of state highways and major district roads; and (iii) rural roads, covering about 4.4 million km, linking rural communities with the highways and the major district road network. While the national highways are maintained by the National Highways Authority of India, an autonomous agency of the Government of India, all other roads in the network, from the state highways down to the rural roads, are maintained by the respective state governments.

6. **PMGSY.** The national-level PMGSY aims to provide all-weather road connectivity to unserved habitations in India's rural areas, where 70 percent of the population live. As of December 2017, at the national level some 130,000 habitations of the intended 178,000 habitations have been connected. The Government of India intends to achieve 100 percent connectivity by March 2019. In addition to the investment in rural road construction, the PMGSY also includes support for strengthening the capacity of state-level agencies to implement the program. The PMGSY obtained support from international financial institutions (IFIs) including the World Bank and the Asian Development Bank (ADB).[10] Data from the PMGSY shows that it has substantially improved the connectivity and mobility of the rural residents in the areas where the program is active. To date, it has delivered significant socioeconomic benefits, including new farm-to-market connectivity and improved access to hospitals and educational institutions, especially for poor women and children.

7. **A.P Road Network**. A.P has about 133,000 km of roads. The road network is broadly divided into three categories: (i) primary roads comprising national highways, (ii) secondary roads comprising state highways and major district roads and (iii) rural roads comprising other district roads and village roads. The road categories and lengths are shown in Table 1. The rural road network constitutes around 60 percent of the total road network. Under the PMGSY, the target was to construct around 14,564 km of rural roads, connecting about 1,309 habitations with populations above 500 people in the plains, and above 250 people in hilly and tribal areas. As of March 2018, around 90 percent of PMGSY targets had been achieved in A.P, with only a few targeted habitations remaining to be connected.

Table 1: A.P Road Network

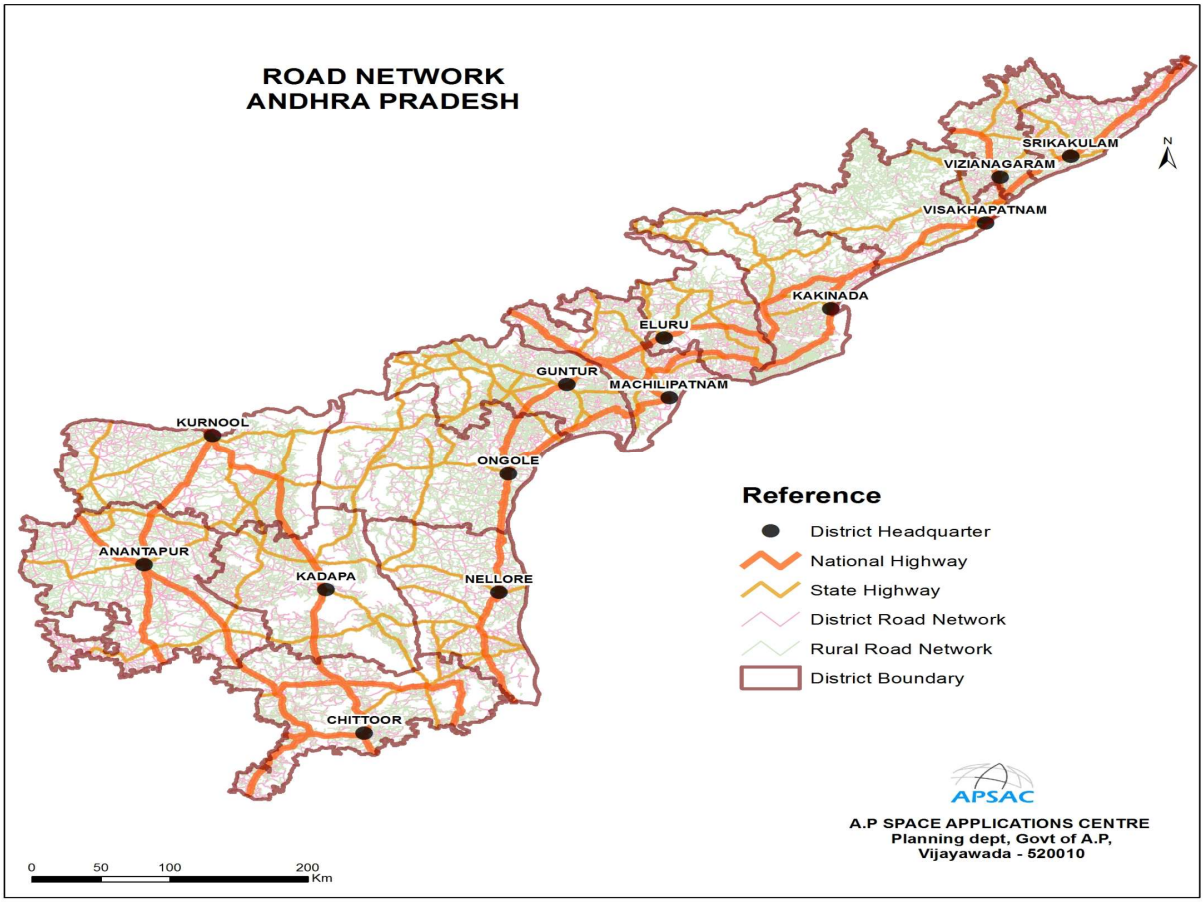
Road Category	Length (km)
National Highways (NH)	6,672
State Highways (SH)	15,406
Major District Roads (MDR)	31,950
Other District Roads (ODR)	2,401
Village Roads (VR)	76,323
Total	**132,752**

[9] Basic Road Statistics of India 2013-2014 and 2014-2015, Ministry of Road Transport and Highways, Government of India.

[10] The total support from the World Bank and ADB for PMGSY is around USD3.5 billion.

8. **A.P Rural Roads Project**. Andhra Pradesh has around 47,745 habitations. PMGSY intends to cover, in phases, only those habitations with a population of over 500 in plains and over 250 in hilly and tribal areas. To cover those habitations not under the purview of PMGSY, the Government of A.P (GoAP) had in the past launched a few projects. After the PMGSY and these state-level projects are completed, it is estimated that about 10,605 habitations, with a total population of about three million, will still be without all-weather road access. The GoAP, therefore, has decided to launch the A.P Rural Roads Project, which will connect some 3,300 habitations with a population of more than 250, and benefit around two million people. By targeting the habitations with more than 250 people, the project can provide connectivity to two million people (66 percent of unconnected population) by just targeting 3,300 habitations (31 percent of the unconnected habitations). In other words, by targeting interventions in one third of the unconnected habitations, PRED is able to reach out to two thirds of the unconnected population. The project will involve construction of new rural roads and upgradation of existing rural roads in order to provide a homogeneous road network. In a series of subsequent rural road projects to be undertaken over the coming years, the GoAP plans to achieve 100-percent connectivity. The map of the road network spanning all 13 districts of A.P is shown below.

Figure 1: Andhra Pradesh Road Network



9. The primary and secondary roads are managed by the Roads and Buildings Department while the rural roads are managed by the PRED. The PRED was established in 1967 and comes under the Panchayat Raj and Rural Development Department (PR&RD) that manages rural roads, rural water supply and other rural development activities. The PRED oversees all activities pertaining to planning, construction and maintenance of rural roads in the state and implements, on an average, projects worth USD600-800 million every year. The PRED has experience working with other IFIs such as the World Bank and is led by an Engineer-in-Chief who reports to the Principal Secretary (PR&RD) to GoAP. The Engineer-in-Chief is supported by an experienced team, as shown in the organization chart in Annex 2, including two Chief Engineers, 14 Superintending Engineers, 58 Executive Engineers and about 1,900 Deputy and Assistant Executive Engineers. The PRED has a four-tier administrative structure with its head office at Vijayawada, 13 circle offices with one circle office per district, 58 division offices and 316 subdivision offices. The PRED's set-up is well and evenly spread across A.P.

3. THE PROJECT

A. Project Objectives

10. The objective of the project is to improve road transport connectivity in previously unserved communities by providing all-weather rural roads in all 13 districts of the state of A.P.

11. The project plans to connect some 3,300 habitations of 250 people or more by constructing all-weather roads to provide first connectivity, constructing cross drainage works and bridges to complete missing links and structures, building approaches to educational institutions and healthcare centers, and constructing roads passing through tribal areas. The project will also upgrade existing earthen and gravel roads to asphalt-based roads to provide the population with a homogeneous road network.

12. **Project Beneficiaries**. The primary beneficiaries are the people living in the rural areas who are the users of the rural roads. The all-weather connectivity to be provided under the project will (i) promote new economic activities, (ii) improve transport links to get agricultural and farm goods to markets and (iii) result in better education and health outcomes as a result of improved connectivity, both inter-habitation and from habitations to the higher order roads. This is expected to bring benefits to the two million people that are living in the habitations covered under the project, particularly women and children, who will have improved access to healthcare, schools and public transportation services. Service providers, such as public transport operators, educational institutions, hospitals and traders, will also benefit from the new all-weather connectivity.

13. One of the key requirements for small habitations to grow faster is through linkages to economic and market centers. Significant travel time is required between habitations and between habitations and market centers, schools and hospitals due to absence of direct linkages. The project will better integrate the rural population, businesses and industries with the national and state economy through better transport connectivity. Improved road access will have a transformational impact on rural poverty by contributing to improved agricultural productivity, higher non-farm employment opportunities and increased rural income. It will facilitate inclusion

of rural communities in development through better access to markets, growth opportunities and services. The all-weather connectivity that will be provided by this project will result in the following benefits:

(i) Increased agricultural productivity and industrial development (agro-industries, in particular) through improved connections to markets with more favorable prices for agricultural inputs and outputs.

(ii) Reduced travel time and hence better access to schools and hospitals for the rural population, resulting in improved healthcare and increase in literacy levels. Better access roads to habitations also will result in setting up of more schools and healthcare centers around the habitations (which are considered unviable by service providers without such roads), resulting in further improvement of healthcare, literacy levels and overall quality of life.

(iii) New employment opportunities during project implementation (construction labor force) and after project completion (increased agricultural and small-scale industrial activities).

(iv) Changes in travel patterns from the existing bullock-carts to usage of motor vehicles, resulting in increased mobility and socioeconomic activities. Where motor vehicles are already used in the existing earthen tracks, increased speed of travel, along with improvement in levels of safety and passenger comfort, will result in reduced vehicle operations cost (VOC).

(v) Significant improvement in access to administrative services, law and order and welfare services (normally located at district headquarters).

B. Rationale

14. **Strategic Alignment and Country Priority**. The project aims to enhance connectivity of the rural areas of A.P, which is consistent with AIIB's transport strategy that is currently under preparation.

15. **Country Priority**. Reducing rural poverty and addressing the disparity in the provision of infrastructure is a key development priority of the Government of India and the state of A.P. India, with support from a number of multilateral development banks, has invested heavily in rural road connectivity through the PMGSY, as a core pillar in addressing these challenges. The proposed project builds directly on this national program and therefore has been identified by the GoAP as its top priority for AIIB financing. The project will extend economic development to the state as a whole by integrating isolated and poor rural populations with the rest of the state and markets. The GoAP has adopted the United Nations Sustainable Development Goals 2030 (SDG 2030)[11] and the project is expected to have a positive impact on six out of the 17 goals.

[11] On Sep. 25, 2015, countries adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years. More information at http://www.un.org/sustainabledevelopment/sustainable-development-goals/

16. **Value Addition by AIIB**. The key value additions resulting from AIIB's support are as follows:

(i) Ensuring design consistency across the project.

(ii) Enhancing safety aspects by including road safety management elements in the engineering design.

(iii) Improving sustainability of the roads by including road maintenance activities in contract procurement packages.

(iv) Ensuring implementation of international environmental and social management practices while addressing the environmental and social impacts. This enhances the quality of project outcomes and helps in capacity building of the Implementing Agency (IA).

(v) Increasing project implementation efficiency by incorporating AIIB's previous experience in similar rural road projects in India. The lessons learned from similar projects and incorporated here include (a) reduction in the number of contract packages for ease of implementation and (b) requirement of a project monitoring software to ensure timely and orderly implementation of the works and to monitor the project's progress from the headquarters of the IA and AIIB.

(vi) Ensuring financial viability of the project since public financing is the only option to finance it. While it is feasible for tolled roads (highways and expressways) with a revenue stream to attract private sector participation through public-private partnerships, rural roads that are fully owned by the public sector and have no revenue streams cannot attract such investment. Public investment, with financial support from IFIs such as AIIB, is thus needed for such projects.

17. **Value Addition to AIIB**. The key value addition to AIIB resulting from financing the project is the opportunity for the bank to incorporate lessons learned and replicate them in a similar programmatic approach to rural road projects in other states of India and in other countries in Asia. AIIB is already involved in two similar projects in India with more expected to be rolled out in other Indian states.

C. Project Description and Components

18. The roads to be constructed include approach roads to educational institutions, healthcare centers and the roads passing through tribal areas. The project will have two components, with each component having one or more subcomponents. Based on geotechnical requirements (particularly soil conditions), the GoAP has proposed to construct both cement concrete (CC) paved roads and bitumen paved roads (BT roads). Around 49 percent of roads to be constructed will be BT roads while the remaining 51 percent will be CC roads.

19. **Component 1a**. Construction of new connectivity consisting of:

(i) **BT Roads**: Construction of about 2,350 km of bitumen paved roads in locations with normal soil.

(ii) **CC Roads**: Construction of about 2,450 km of CC paved roads in locations with soft soil.

(iii) **Bridges and Structures**: Construction of bridges and hydraulic structures (culverts and drainage channels), including 18 major bridges, to increase road connectivity during the monsoon season.

20. **Component 1b**. Upgradation of existing roads including:

(i) Upgradation of about 1,500 km of existing water-bound macadam or metal roads and earthen roads into asphalt black top roads.

(ii) Construction of culverts or small bridges (where necessary) to prevent flooding and isolation of habitations during the monsoon season and to improve connectivity.

21. **Component 2**. Technical Assistance consisting of:

(i) Engagement of a Project Management Consultant firm (PMC) (and individual consultants, as needed) to assist in managing the project, including planning, implementation supervision, monitoring and reporting progress of the project to the counterpart and to AIIB.

(ii) Engagement of a consulting firm to conduct technical reviews/audits of the project, including all stakeholders, with the aim of (i) reviewing all phases of project implementation, including civil works, environmental and social, procurement, monitoring and other relevant aspects and (ii) proposing measures/actions leading to possible enhancement of project implementation and its quality and quantity control.

(iii) Engagement of a consulting firm to monitor implementation of the Environmental and Social Management Plan and other actions defined during project preparation.

(iv) A pilot project using modern technology, for example, using drones to monitor road construction during project implementation, covering a limited geographical area.

(v) Development of a digitized map of A.P's rural road network and connection to a geographic information system for real-time communication, which will be used to provide real-time updates on maintenance works in the post-contract phase.

(vi) Institutional development and capacity building of the PRED through training, workshops and study tours in overseas locations in the areas of transport planning and management, contract law and contract models, economic analysis and environmental engineering.

D. Cost and Financing

22. The total project cost is approximately USD666 million with a request from the Government of India to AIIB for financial assistance of USD455 million (68 percent of the total project cost). The indicative cost and the financing plan are as shown in Table 2.

Table 2: Cost and Financing (USD million)

Item	Cost	Financing			
		AIIB		GoAP	
		Amount	Share	Amount	Share
A. Base Cost					
Component 1a Construction of new connectivity	550	385	70%	165	30%
Component 1b Upgradation of existing roads	50	35	70%	15	30%
Component 2 Technical Assistance	7.36	7.36	100%	0	0%
Contingencies	57.5	26.5	46%	31	54%
Total Base Cost	664.86	453.86	68%	211	32%
B. Front-End Fees	1.14	1.14	100%	0	0%
Total	**666**	**455**	**68%**	**211**	**32%**

23. **Financing Terms**. Final maturity of 30 years, including a grace period of five years, with level repayments at AIIB's standard interest rate for sovereign-backed loans.

E. Implementation Arrangements

24. **Implementation Period**. The project is expected to be implemented from November 2018 to October 2023.

25. **Project Implementation Management**. The PRED is the department responsible for construction, operation and maintenance (O&M) of the rural roads in A.P and will be the IA of the project. The department is led by the Engineer-in-Chief who reports to the GoAP's Principal Secretary (PR&RD). The PRED currently manages around 78,000 km of roads in A.P's rural road network which constitutes about 60 percent of the total A.P road network.

26. The Engineer-in-Chief is assisted by two experienced Chief Engineers. Further down, the organization consists of 14 Superintending Engineers, with one responsible for each of the 13 districts and one assisting the Engineer-in-Chief directly. Below the Superintending Engineers are about 58 Executive Engineers responsible for various functions, 316 Deputy Executive Engineers and about 1,600 Assistant Executive Engineers spread at field level all over the state. In total, the PRED has about 2,000 staff on its rolls. The organization chart of the PRED is presented in Annex 2.

27. As noted earlier, the PRED implements a substantial number of rural road projects every year and has previous experience working with IFIs such as the World Bank and domestic financial institutions such as the National Bank for Agriculture and Rural Development. The PRED is currently implementing a project with World Bank assistance. The PRED has sufficient experience and professional staff to plan, manage and control the project and will enlist professional support in the form of a PMC firm to assist it in all aspects of project management until the project's closure.

28. **PMU**. A Project Management Unit (PMU) has been created within the PRED to carry out the day-to-day project implementation including monitoring project progress and reporting to the GoAP and the Bank. The Engineer-in-Chief is leading the PMU as the Project Director. The PMU is staffed with technical, procurement, financial management, economic and environmental and social personnel. The organization chart of the PMU is in Annex 2.

29. **Implementation Monitoring and Support**. Implementation monitoring will be done by the PRED through its PMU. To ensure effective monitoring of the project, various support systems are being put in place, such as project monitoring software, the PMC, a three-tier quality monitoring system, and the Results Framework. AIIB will undertake two to three implementation support visits per year to further strengthen the monitoring process. In addition, the PRED will engage an additional consulting firm to conduct technical reviews/audits to ensure project progress is in overall compliance with the plan. The PMU will send quarterly progress reports to AIIB.

30. **Project Monitoring Software**. As part of its engagement with AIIB, the PRED is in the process of developing project monitoring software to help track the project's progress during implementation and especially to support the flow of information from a large number of remote locations to PRED headquarters, the PMU and the bank. The software will monitor, among other parameters, the physical and financial progress of the project and the status of quality monitoring. As a web-based system, the software can be accessed by users from any computer, with a user name and password to be provided by the PRED. The software will also provide real-time information and updates of any road/bridge works under implementation, with photographic evidence. AIIB has been working closely with the PRED and its information technology department during the software's development.

31. **Project Management Consultant**. In response to a recommendation by the bank, the PRED is in the process of hiring the PMC firm to assist in all aspects of project management. Although the PRED has been implementing similar projects for many years and has a rich experience in design, construction, O&M of rural roads, the bank is of the opinion that involvement of a professionally managed PMC will strengthen progress monitoring and support capacity building of the PRED. The PMC's key responsibilities include review of the project's technical, physical and financial progress, review of the test results of the quality monitoring agencies, day-to-day project management activities including data entry and the operation of the project monitoring software, generation and submission of progress reports, and training and capacity building of the PRED. AIIB will work with the PRED to ensure a robust PMC selection process. The PMC will be engaged until project closure.

32. **Quality Monitoring System**. The PRED has established a quality monitoring system that is identical to that being used successfully in the PMGSY. It consists of three tiers of monitoring and control. The first tier comprises the PRED's in-house team under the supervision of the Executive Engineer. The second tier consists of State Quality Monitors (SQM) who are appointed by the PRED. Senior technical personnel appointed as Independent Quality Monitors (IQM) constitute the third tier. In addition, regular quality checks will be conducted by the PRED through its Quality Control (QC) wing.

33. **Monitoring and Evaluation**. A Results Framework has been developed for the project, including baseline data, as shown in Annex 1. The Results Framework provides the basis for project results monitoring and evaluation (M&E). The PRED will be responsible for collecting data and reporting on implementation progress for each indicator in the Results Framework. The achievements of the indicators will be evaluated by comparing the actual results against planned target values. The Results Framework, with appropriate data and associated evaluations, will be incorporated into the project's annual progress reports. The proposed results indicators are:

(i) Total length of roads constructed and upgraded.

(ii) Number of habitations that gain access to all-weather roads.

(iii) Number of people with new or improved access to all-weather roads.

34. **AIIB's Implementation Support**. The bank's support during the implementation period will include focused oversight and works supervision through a chain of technical/financial audits. AIIB will undertake two to three implementation support visits per year and will support the engagement of the technical review/audit consulting firm, which will help to perform supervision, through, among others:

(i) Technical verification of standards and specifications used.

(ii) Quantity and quality assurance control/audit of each category of works by selectively and randomly visiting sites and offices of the contractor, supervision engineers and the PRED.

(iii) Procurement and financial audit of randomly selected components for each group of works.

(iv) Verification and comparison of procurement, physical and financial progress.

35. **Maintenance and Sustainability**. The project has been evaluated as economically viable and the economic benefits are likely to increase over time. However, the sustainability of the economic benefits can only be assured with adequate maintenance of the roads. Inadequate maintenance could lead to premature failure. The project ensures adequate maintenance by including the maintenance of the constructed roads and culverts/bridges in the construction contractors' scope for a period of five years from completion of construction. The contractors will forfeit their retention payments if any faults reported by PRED are not rectified within a

certain period. The inclusion of maintenance in the construction contractor's scope improves the sustainability of the roads and ensures value for money.

36. **Procurement**. An assessment of the experience and capacity of the PRED's dedicated staff as well as applicable procurement regulations/orders was conducted during appraisal to determine the acceptability of the systems in place. Further, a Project Delivery Strategy (PDS), including a Procurement Plan and in accordance with the Procurement Instructions for Recipients (PIR) requirements, has been prepared by the PRED in consultation with the Bank and agreed upon. The PRED proposed a procurement approach in accordance with the Bank's National Competitive Tendering (NCT) method, using the latest version of the World Bank's Standard Bidding Document modified to suit the bank's provisions and tendering. The Government of India's e-procurement platform will be used. The individual contract values for the construction works range between USD4 million and USD15 million. This is within the USD20 million threshold for the use of NCT, as consistent with other IFIs. The works are scattered geographically and because of their scope are deemed unlikely to attract international competition. A review of the procedures proposed to be used confirmed that they meet the bank's Core Procurement Principles and all the requirements of the NCT method, since they provide adequate notification and competition to ensure reasonable prices, evaluation criteria are made known to all tenderers and applied fairly, the conditions of contract are fair and appropriate, and foreign firms may participate on the same conditions applicable to the national firms. The use of NCT is found acceptable based on the above criteria. A checklist verifying the procurement process followed in the project against AIIB's Core Procurement Principles and Procurement Standards is presented in Annex 5.

37. In order to negotiate the loan, the Government of India's Ministry of Finance (the borrower) requires the IA to be ready to award contracts worth at least 30 percent of the project cost. For this reason, recourse to Advance Procurement was also agreed with AIIB, as set out in the bank's PIR, Section II, para 8.2.

38. A Procurement Plan proposed by the PRED envisaged nearly 870 procurement packages for the project. AIIB, drawing on its experience and the lessons learned from its previous rural road project in India (Gujarat Rural Roads Project – Loan LN0025-IND), had advised the PRED to consolidate and reduce the number of procurement packages for more efficient and effective procurement and contract management and monitoring. Subsequently, the PRED proposed a revised procurement plan with around 63 procurement packages. With construction works spread across all 13 districts of the state, the works in each district will be consolidated into three to four packages. Such consolidation allows the packages to achieve the size required for medium-sized reputable contractors to participate in the project. It is also expected that this will enhance the level of competition. Apart from construction works, consultant services for assisting the PRED in project management will also be procured. The tentative procurement plan is presented in Annex 5.

39. AIIB encouraged the use of the Government of India's e-tendering platform as it significantly enhances the efficiency, economy and transparency of the procurement process. The e-tendering platform is also accepted by other IFIs such as the World Bank and ADB owing to its proven, secure and robust system. AIIB satisfied itself during appraisal of the platform's functionalities.

40. AIIB found that the various steps of the technical preparation phase and procurement process are well defined, and clear responsibilities exist for the approvals at various levels, depending on the estimated value of the contracts, within the GoAP and the PRED.

41. **Financial Management (FM)**. The PRED and the State Finance Department (SFD) of the GoAP will have overall accountability for maintaining the financial management system of the project and will ensure that the activities are carried out in accordance with the project's legal agreements.

42. **Funds Flow Arrangements**. The PRED, based on its requirements, receives the appropriate budgetary allocation from the GoAP to implement various road projects. Loan funds, which would be received by the GoAP from the Government of India, would then be passed on to the PRED through budgetary allocations. The PRED, as the IA, advises the accounts officers of the GoAP in the respective districts where the project is being implemented to make payments from the government treasury. AIIB will disburse loan proceeds to the Government of India account in the Reserve Bank of India. The government will make the funds available to the GoAP through its standard arrangements for development assistance to the states of India. The GoAP will make the funds available to the PRED through budgetary allocations for project expenditures comprised of the loan portion.

43. **Disbursements**. The loan will adopt both the advance and reimbursement methods for payments. The advance payments, if requested, will be based either on the expenditure forecast by the PRED for the subsequent two quarters or it will be based on an appropriate ceiling to be decided by AIIB. The GoAP will provide the loan proceeds and the counterpart funds to the PMU for project implementation, ensuring sufficient budget for payments to the contractors based on the submitted invoices. The PMU will then submit the statement of expenses to the Government of India, which will in turn submit them to AIIB. AIIB will disburse the loan proceeds to the borrower and the borrower will provide additional central assistance to the PMU through the GoAP. The GoAP will be responsible for meeting the financial responsibilities and obligations of the PMU for the project. Figure 2 depicts the funds flow while Table 3 shows the disbursement forecast.

Figure 2: Flow of Funds

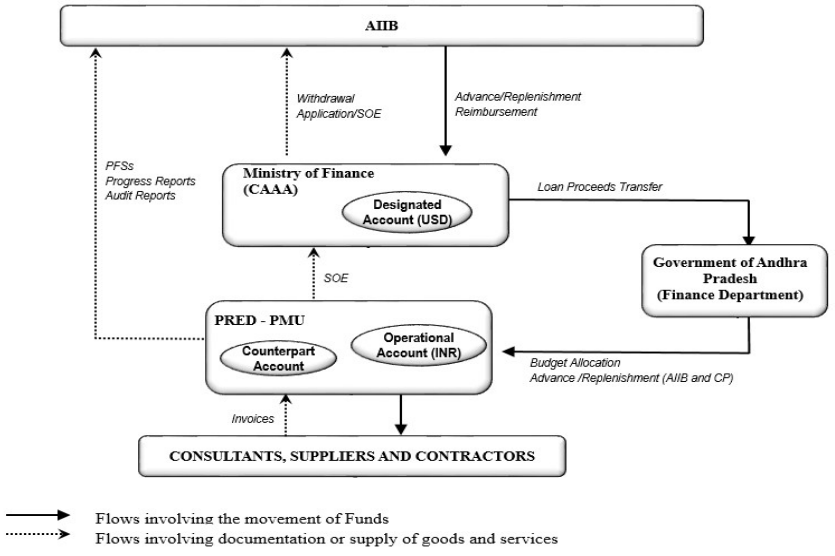


Table 3: Disbursement Forecast in USD millions

	2019				2020				2021				2022			
Period	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Disbursement	0	20	20	20	40	30	40	40	45	30	45	45	30	30	10	10
Cumulative	0	20	40	60	100	130	170	210	255	285	330	375	405	435	445	455

44. **Retroactive Financing**. All eligible expenditures under the project, incurred in compliance with AIIB's procurement policies and guidelines and in respect of which payments were made not more than 12 months prior to the date of loan agreement, up to an amount of USD91 million (20 percent of the loan amount), may be financed retroactively. The project financial statements will clearly indicate the amount claimed under retroactive financing along with the details of the expenditure incurred. Such project financial statements will be subject to audit during the annual project audit.

4. Project Assessment

A. Technical

45. **Design Appropriateness**. The project involves construction and upgradation of about 6,000 km of all-weather CC and BT rural roads and bridges/culverts, including 18 major bridges, which together will provide the necessary connectivity to about 3,300 habitations. As part of project design, the PRED studied the soil conditions at all the proposed project areas to determine whether the soil is good or soft. Project areas with good/normal soil conditions are provided with BT roads and those with soft soils, with CC roads. Also, to prevent the habitations from being cut off in the monsoon season due to inundation of roads, the PRED included provision of culverts at appropriate location, which will ensure smooth passage of traffic even during the monsoon season. Bridges have been planned for the locations with river and major channel crossings.

46. **Institutional capacity of PRED**. The AIIB team assessed the institutional capacity of the PRED to implement the project through various discussions and clarifications with the PMU and its senior management. AIIB is satisfied with the implementation capacity of the PRED for the reasons explained below:

(i) On an average, the PRED implements similar rural road projects worth around USD600-800 million every year. In this project, PRED will absorb around USD666 million over four or more years, which is well within its absorbing capacity.

(ii) The PRED has a well-crafted PDS and a realistic procurement plan, which were reviewed by AIIB. The PMU team is well experienced in procurement and implementation of similar-scale projects. With the number of contract packages

not likely to exceed 65 and a robust e-procurement platform of the Government of India to be used in the project, the PRED is well placed to manage the procurement activities of the project.

(iii) With respect to the technical capacity of the PRED to implement the project, the PRED was created a few decades ago precisely to implement such projects. The PRED manages the entire 78,000 km of A.P's rural road network. The PRED has implemented many similar projects in the past. A well-defined organization, as shown in Annex 2, exists to deliver the project. The PRED has around 2,000 staff, with the majority working in the field. Additionally, as explained in the "Implementation Arrangements" section and further elaborated in the subsequent paragraphs, the PRED has the support of the three-tier quality monitoring system, the PMC and the project monitoring software, thus making it well equipped to manage the technical aspects of the project.

47. **Three-Tier Quality Monitoring System**. Recognizing the challenges in monitoring of quality across the project during the implementation, PRED has put in place an effective and robust three-tier quality monitoring system that has been successfully followed in PMGSY. PRED's quality control wing conducts regular quality checks over and above the three-tier quality monitoring system that has been put in place. The three-tier quality monitoring system is implemented as follows:

(i) The first tier, the PRED's in-house team in each district, composed of field engineers at various levels under the supervision of the Executive Engineer, undertakes the day-to-day supervision, quality and quantity control.

(ii) The second and most comprehensive tier consists of the SQM. This function will be outsourced to a few independent firms that will conduct independent quality tests, including laboratory tests, on every road and bridge covered in this Project. The SQM detects systemic flaws, if any, in the quality control process and suggest actions to improve the process while also independently monitoring the corrective and preventive measures in coordination with the first-tier supervisors and the contractors. The SQM also performs quantity control by ensuring that the contractors deliver the work according to the approved contract bill of quantities. The SQM will provide regular reports, including status updates with photographs and laboratory test results. These reports will be updated in the project monitoring software.

(iii) Senior technical personnel in the form of IQM constitute the third tier.

48. **Project Management Consultant**. As noted earlier, the PRED is in the process of engaging a PMC to provide day-to-day capacity support in project implementation including monitoring and reporting on Project progress. AIIB is closely involved in the procurement process of PMC services and this procurement will be part of the bank's prior review. The terms of reference of the PMC services were mutually agreed between the bank and the PRED. Engagement of an experienced PMC firm enhances the implementation capacity of the PRED and helps in its capacity building.

49. **Project Monitoring Software**. As explained in the "Implementation Arrangements" section, PRED is developing a project monitoring software to monitor progress of the project in real time. AIIB, based on its past experience with the Gujarat Rural Roads (MMGSY) Project (Loan LN0025-IND), is working with the PRED to define the user needs and is closely monitoring the development of this software. Successful rolling out of this software is a critical success factor for this project as it provides the PRED management, the GoAP and AIIB with a full overview of progress on various fronts (procurement, physical and financial) at any point of time. A brief write-up of the proposed software is provided in Annex 2.

50. **Technical Design**. A Detailed Project Report (DPR) has been prepared by the PRED for every road and bridge to be constructed under the project. The DPRs include the detailed field investigations, required technical design aspects and incorporation of road safety and climate resilient aspects in the technical design. The design standards generally follow the codes of the Indian Roads Congress (IRC).[12] The DPRs on more complex engineering components (major bridges, for example) were outsourced to professional design engineering firms, with the design wing of the PRED verifying the design. The typical technical cross sections of the various types of roads and structures are shown in Annex 6. Considering that the nature of the technical works is not complex, the technical design of the project is considered robust and fit for purpose. With multiple construction contractors planned to be working in parallel in all the districts and with a PMC to monitor progress on a day-to-day basis, the proposed project schedule is considered achievable. The PMU is staffed with experts from various functions such as environmental and social management, procurement management, and design engineering to manage various aspects of the project during implementation. AIIB's prior experience in similar projects in India shows that the engineering departments in various states of India have the capacity to manage such projects.

51. **Climate Resilience Aspects in Technical Design**. The technical design of roads and other facilities is focused not only on the engineering aspects but also on the possible influence of climate change in the region and the potential for faster than anticipated deterioration of the conditions (specifically pavement) of the designed roads. Such considerations in technical design enhance the resilience of the pavements to the possible impacts of climate change. While it is difficult to predict climate change, there are several models that can assist in determining possible climate hazards and/or influences. Learning from past cases is an important factor in designing such climate protection and applying it in road design.

52. The terrain in A.P is characterized by high daytime temperatures in summer and mild night temperatures. Damages to road infrastructure have been observed in the past during the monsoon seasons due to flash floods and road blocks. With climate change, these events are likely to intensify in the future; it is therefore important to make the road infrastructure resilient to such climate change induced events. The project has taken into consideration increased rain impacts in future and has translated that into the design criteria, considering 50 years' flood data for roads and 100 years' flood data for major structures. Increased rainfall intensity of 25 percent has been considered. Consequently, appropriate hydrological calculations have been applied in the design of all components of the project.

[12] The IRC is the apex body of road sector engineers and professionals in India.

53. **Operational Sustainability**. As explained in the "Implementation Arrangements" section, the project includes maintenance of the constructed roads and culverts/bridges in the construction contractors' scope for a period of five years. This aspect ensures sustainability of the roads beyond the construction period. PMGSY projects include such maintenance by the contractors for a period of up to five years. AIIB recommended that the PRED draw from PMGSY's experience and accordingly, this will be the first state-level rural road project to incorporate such maintenance requirements in the procurement packages. The GoAP's annual budget allocation to the PRED includes the funds needed for O&M of the roads, thereby ensuring availability of funds to maintain the roads. Institutional capacity of the PRED, robust design, reasonable project schedule, inclusion of maintenance in the contractor's scope and budget provision for O&M contribute significantly toward sustainability of the roads during project implementation and beyond. The borrower's insistence that the IA be ready to procure contracts worth 30 percent of the project cost before loan negotiations/signature of legal agreements with the lenders demonstrates the borrower's commitment to complete the project in time. Also, regular project reviews planned by the GoAP with the PRED show the GoAP's commitment to the project's results. The PMC, together with the PMU, will collect data periodically to ensure that the progress in on track to meet the intended results outlined in the Results Framework in Annex 1.

B. Economic and Financial Analysis

54. **Project Costs and Benefits**. A cost-benefit analysis was carried out to assess the economic viability of the project comparing "with-" and "without-project" scenarios. The costs considered were capital investments and maintenance costs. Construction cost for the project is estimated at USD550 million.[13] Incremental maintenance costs between the without-project scenario and with-project scenario were considered. Financial costs were converted to economic costs by using a standard conversion factor. To quantify the socioeconomic benefits of the project, the consumer surplus method was applied considering savings in Vehicle Operating Costs (VOC) and Travel Time Cost (TTC).[14] [15] The detailed approach and results are presented in Annex 3.

55. **Traffic Survey and Forecast**. A survey of traffic volume was carried out by the PRED to assess the existing traffic pattern for the concerned roads.[16,17] The traffic was classified by 12 types.[18] On an average, 337 daily vehicular trips were made on the project roads. Of the

[13] Only the new connectivity roads under Component 1a were considered for the purpose of this analysis. Component 1b – Upgradation of existing roads was not considered for the purpose of analysis given its small size. Also, maintenance always renders a higher economic rate of returns (ERR).
[14] For those projects where traffic levels are likely to be sufficient for road-user cost savings to justify funding of a project (normally a minimum of about 100 daily vehicular trips), the consumer surplus method is recommended according to available guidelines (Robinson (1999)) and recent practice in India. For the MPRCP in Madhya Pradesh (2018), Bihar Rural Roads Project (2016) and Additional Finance for implementing PMGSY Roads in seven states (2018) funded by the World Bank, the consumer surplus approach was applied for carrying out the economic analysis. The savings in the VOC and TTC for each vehicle category were adapted based on the IRC guidelines (2009).
[15] Another common approach for rural roads is the "producer surplus" approach, which is used with lower traffic volume and captures other socioeconomic benefits, including agricultural productivity increase, employment generation, increased vehicle ownership, improved school attendance, etc.
[16] Data verification and quality control of the survey were carried out by the AIIB team.
[17] Panchayatraj Department of GoAP had arranged to collect the average daily traffic (ADT) during the months of January/February 2018 on all project roads.
[18] The traffic was classified by 11 vehicle types and pedestrian trips. The vehicle trips were further categorized as fast and slow-moving vehicles.

daily trips, motorized vehicles took up about 78 percent, of which 65 percent were for passenger vehicles and 13 percent for cargo vehicles. The remaining 22 percent were slow-moving non-motorized vehicles. The traffic was estimated to grow at five percent annually, which is a rather conservative growth estimation in the context of India where the average GDP growth could reach 6.5 to 7 percent. It is assumed that when villages are connected with an all-weather paved road, their trip generation and vehicle composition patterns will change to approximately those found in villages that are presently connected with paved road. Using this comparison,[19] the "generated traffic" due to the proposed road development was estimated.

56. **Economic Analysis**. The Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV) of the project were estimated based on a discounted cash-flow analysis considering the costs and benefits. The EIRR was estimated at 13.6 percent and the ENPV at USD265 million based on a six-percent discount rate. Sensitivity analysis was performed with respect to increased construction cost, increased O&M cost, decreased project benefits (by 20 percent each) and a combined worst-case scenario. The project EIRR remains above the social discount rate of six percent in all scenarios.

57. **Financial Analysis**. Rural roads, unlike expressways and highways, are not tolled and do not generate a revenue stream from user fees. Therefore, conventional financial analysis (calculating the financial internal rate of return) was not performed during project preparation. Availability of counterpart funds through budget allocation has been verified.

C. Fiduciary and Governance

58. **Procurement**. The project is classified public for procurement purposes, thus procurement falls under AIIB's Procurement Policy and Section II of its associated Interim Operational Directives on Procurement Instructions for Recipients (PIR). Based on the outcome of the assessment carried out during appraisal, the bank agrees to the procurement process following NCT as set out in para 10.4 of the Procurement Policy. The procurement of consulting firms will be conducted following Section C of the PIR using the appropriate selection methods.

59. A PDS including a detailed procurement plan has been prepared by the PRED in consultation with AIIB. During appraisal both were discussed and agreed to by the bank. The proposed procurement approach is acceptable, fit for purpose and expected to provide value for money. The PRED prepared a master set of tender documents based on the latest World Bank National Competitive Bidding version (adapted for the use of e-procurement and two-envelope system), with further adjustments made to reflect AIIB's specific requirement, e.g., Policy on Prohibited Practices. The use of a comprehensive set of tender documents with which the PRED is familiar is the foundation for sound management of the procurement process. The process follows the two-envelope system, whereby only the technical tenders considered substantially responsive and capable of performing the contract are taken forward, and their financial envelopes opened for evaluation. The lowest evaluated, substantially responsive tender will be recommended for contract award. This is a well-established method in India and the e-procurement platform is designed to support it and guarantees transparency throughout the entire process. Further, it has been agreed that the first three packages will be

[19] "Evaluation Study on Rural Roads Component of Bharat Nirman," Programme Evaluation Organization Planning Commission, Government of India, New Delhi, May 2010.

subject to AIIB's prior review. Also, the procurement packages to procure the services of the three consulting firms to be financed out of the loan proceeds (PMC, monitoring implementation of environmental and social management documentation, and technical review/audits) will be subject to the bank's prior review. The AIIB team has developed a good relationship with the PRED and is confident that a continuous exchange of communication will be maintained to anticipate and prevent any undesirable issue. The PRED intends to float the tenders for the whole project in two phases, with Phase I having started in July and Phase II planned to start in September. The PRED is considered prepared to handle the workload. A summary of the analysis is presented in Annex 5.

60. **Financial Management**. The financial management assessment focused mainly on institutional capacity and staffing, budgeting system, accounting, funds flow, internal controls, internal and external audit, reporting and monitoring, and information systems in relation to administering the proposed loan. The financial management capacity is assessed as adequate for successfully implementing the project and subsequently maintaining and operating the assets. AIIB has recommended that the PMU be staffed with financial management experts and that a Financial Management Manual, detailing the financial accounting, reporting, audit and financial management information systems for the project, be created by SFD. Both the above actions are in progress and are expected to be completed by the last quarter of 2018.

61. **Institutional Capacity and Staffing**. The PRED is the department responsible for construction, O&M of the rural roads in A.P and will be the IA of the project with the support of a PMU. Implementation monitoring will be done by the PRED through its PMU. The PMU will also be responsible for (i) requesting budgetary allocations for counterpart funds, (ii) collecting supporting documents, (iii) preparing and sending project financial statements to AIIB and (iv) preparing and sending withdrawal requests to the Ministry of Finance, the Government of India, which will sign and forward them to AIIB. The PRED is one of the project implementing units of the A.P Disaster Recovery Project being financed by the WB. Therefore, its staff is reasonably familiar with IFI requirements. The PMU will have in its structure full-time, dedicated financial management expert(s).

62. **Budgeting System**. The PRED undertakes an annual budget exercise, wherein each department prepares its budget and forwards the same to the finance department, which consolidates them and presents the overall budget to the state assembly for approval. The budget will be prepared in detail for all significant activities and provide benchmarks for budget variance analysis. A separate budget code (with appropriate classification, i.e., separate detailed head for each component) under the capital expenditure head will be created by the GoAP for the PMU under this project, to incur expenditures from the State treasury. A financial plan for the estimated expenditure provision needs to be created under this budget code.

63. **Accounting**. The PMU will maintain separate project financial statements and records by funding source for all expenditures incurred on the project. Project financial statements will follow accounting principles and practices prescribed by the government's accounting laws and regulations.

64. **Statement of Expenditures**. The statement of expenditure (SOE) procedure will be used for reimbursement of eligible expenditures or replenishment of the advance account.

Supporting documents and records for the expenditures claimed under the SOE will be maintained and made readily available for review by AIIB and for independent audit, if needed. The details of the agreed disbursement arrangements will be included in the disbursement letter which will be part of the legal agreements between AIIB and the borrower.

65. **Financial Management Information Systems and Controls**. The SFD has recently launched a new financial management information system (Comprehensive Financial Management System) which is an SAP-based application developed for processing all financial activities of the GoAP. Project expenditures and financial data will be maintained by this software. Implementation monitoring will be done by the PRED through its PMU. Physical progress details will be provided by the project monitoring software and by the PMC. Physical and financial progress details will be collated and a combined report will be generated on a quarterly basis and submitted to AIIB.

66. **Reporting and Monitoring**. Project financial statements detailing the initial and closing balance of the designated account, the source and uses of funds, planned and actual, for the quarter, year and cumulative, by component, category and activity in Indian Rupees and USD will be submitted, together with the progress report, to AIIB within 45 days of the end of each quarter.

67. **External Audit**. The detailed project financial statements will be audited in accordance with the government's audit regulations by an auditor appointed by the Comptroller and Auditor General (CAG). This arrangement is acceptable to AIIB. The audited financial statements will be submitted (in English) to the bank within nine months after the end of the fiscal year. For the project it is expected that project financial statements will be prepared and audited by CAG of India through the office of the Accountant General (Audit) of Andhra Pradesh. A copy of the audited project financial statements along with a management letter from the auditors shall be submitted to AIIB within nine months after the end of the fiscal year. The annual audit report for the project financial statements will include an audit opinion, which covers (i) whether the project financial statements present a true and fair view or are presented fairly, in all material respects, in accordance with the applicable financial reporting framework; (ii) whether loan proceeds were used only for the purposes of the project and (iii) the level of compliance with each financial covenant contained in the legal agreements for the project. For effective assistance, the PRED may engage a CAG-empaneled firm, considered acceptable by AIIB and under terms of reference agreed between the parties, to do the audit of the project and provide the required quarterly and annual reports and opinions.

68. **Anti-corruption**. AIIB is committed to preventing fraud and corruption in the projects it finances. It places the highest priority on ensuring that projects it finances are implemented in strict compliance with AIIB's Policy on Prohibited Practices (2016). Implementation will be monitored regularly by AIIB staff. The bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive or obstructive practices, and misuse of resources and theft or coercive practices relating to the project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. Detailed requirements are specified in the project tender documents and will be specified in the Loan Agreement. AIIB will monitor the work related to tender document preparation and tender/proposal evaluation under bank financing.

D. Environmental and Social

69. **Project Categorization**. Following screening in accordance with AIIB's Environmental and Social Policy (ESP), the project has been assigned Category "B." The anticipated environmental and social risks and impacts of the project are limited, temporary in nature and reversible. According to AIIB's ESP, the Environmental and Social Standard (ESS) 1: Environmental and Social Assessment and Management will be applicable. ESS 2: Involuntary Resettlement will not be applicable as land acquisition or displacement are not envisaged.[20] ESS 3: Indigenous Peoples will be applicable as the project will be implemented in areas inhabited by Scheduled Tribe[21] populations.

70. **Environmental and Social Management Framework**. As per ESS 1 (Environmental and Social Assessment and Management), the environmental and social impacts of project construction activities have been assessed, and an Environmental and Social Management Framework (ESMF) has been prepared. A generic environmental and social management plan (ESMP) has also been prepared along with the ESMF. Once locations of the road construction subprojects have been identified, subproject-specific ESMPs will be prepared as applicable.

71. **Elements of the ESMF.** The ESMF has collected environmental and social baseline data, including information on biodiversity and cultural heritage for the districts where roads will be constructed. The ESMF has provided guidance on screening of projects with respect to environmental and social risks and preparation of ESMPs that will include mitigation and monitoring measures for the identified environmental and social impacts. This includes measures to address occupational health and safety and use of cultural heritage chance find procedures. A summary of the Environmental Code of Practice has also been included in the ESMF for ready reference of the contractors/supervisors. The ESMF, the Environmental Code of Practice and a list of environmental and social activities to be conducted during the construction phase has been included in the bid documents.

72. **Social Aspects**. ESS 2 on Involuntary Resettlement does not apply as it is planned that the roads will be constructed in existing alignments that are either approach roads to habitations or link roads between two habitations and the land required is owned by the GoAP. Therefore, the project is unlikely to involve involuntary resettlement or land acquisition; however, a Resettlement Policy Framework (RPF) has been prepared to address temporary disruptions of informal commercial activities as well as the need for removal of encroachments and compensation measures for structures that may be encountered in the right of way. For example, the baseline data has indicated possibilities of encroachments such as small buildings and places of worship. The entitlement matrix regarding compensation has been developed and included in the RPF. The RPF sets out clear guidance to identify eligible persons who would be affected due to project interventions.

[20] Average length of each road work is anticipated to be between 1 and 2 km, mostly village approach roads and link roads; the construction works involves strong community involvement and most decisions are taken in formal and informal meetings of the Local Self Government (LSG) groups. Hence impacts on communities are anticipated to be addressed in the LSG meetings. The LSG groups are known as Gram Sabhas in the local language.

[21] Scheduled Tribes are one of the officially designated groups of historically disadvantaged Indigenous Peoples. The term Scheduled Tribe is recognized in the Constitution of India.

73. **Indigenous Peoples**. ESS 3 on Indigenous Peoples will apply in districts where Scheduled Tribes are living. A Tribal Population Planning Framework (TPPF) has been prepared to address special approaches to Project planning and management in these areas. The TPPF addresses special issues in the districts where Scheduled Tribes are found. Once locations of the road construction subprojects have been identified, Tribal Population Management Plans will be prepared as applicable. A Social Assessment has been undertaken as part of this process. Measures to ensure appropriate consultation of Scheduled Tribes has also been developed. The TPPF will be supported through the use of the subproject-specific Tribal Population Management Plans to provide culturally appropriate benefits based on engagement with the local Scheduled Tribes.

74. **Gender**. The ESMF has generated baseline socio economic data of project affected people, with a focus on project benefits as well as negative impacts. Special attention has been given to impacts on and opportunities for women. It has been observed that the rural areas have very strong women-based Self-Help Groups that have been engaged in the project. It has been agreed that community consultations will be conducted at the outset of construction and special attention will be given to involve women in off-carriageway maintenance works. The baseline survey has indicated that women have expressed concerns about poor road conditions affecting their health and commercial endeavors.

75. **Consultation, Disclosure and GRM**. The PMU staff currently includes an environmental specialist and a social specialist with experience in the implementation of projects funded by multilateral development banks. The draft ESMF has been discussed with stakeholders in a public consultation and the feedback of the community has been incorporated to finalize the report. An executive summary of the report has been prepared in Telugu (local language in A.P) and has been disclosed[22] on the websites of AIIB and the PRED. During the consultations on the ESMF, it was decided that the TPPF would be specifically discussed in separate consultations to be held in relevant tribal districts. The ESMF has also provided for a project-level Grievance Redress Mechanism (GRM) involving the community and stakeholders that will be implemented with the support of the PMU and its performance will be monitored by AIIB.

E. Risks and Mitigation Measures

76. Based on the assessment by AIIB, meeting with the IA, review of available documents from the IA and internal discussions and reviews, the bank has assigned a ***Medium*** risk rating to the project.

77. The possible risks and the mitigation measures are listed in Table 4. The implementation of the mitigation actions will be verified by AIIB through the reports from the PMC and during AIIB's supervision missions.

[22] The documents are available at https://www.aiib.org/en/projects/proposed/2018/andhra-pradesh-rural-roads.html, http://pred.gov.in/Downloads/Tenders/AP%20PRED%20AIIB%20ESMPF%20Final%20Report%20July%202018.pdf, http://pred.gov.in/Downloads/Tenders/AP_PRED_AIIB_TPPF_Final_Report_July_2018.pdf, http://pred.gov.in/Downloads/Tenders/AP%20PRED%20AIIB%20RPF%20Final%20Report%20July%202018.pdf and http://pred.gov.in/Downloads/Tenders/AP%20PRED%20AIIB%20ESMPF%20Executive%20Summary%20Telugu%20July%202018.pdf

Table 4: Summary of Risks and Mitigating Measures

Risk Description	Current Assessment	Mitigation
Procurement Transparency of procurement process	Medium	Procurement will be done using the Government of India's electronic platform, which has been widely used across IFI-financed projects in India. The use of this electronic platform greatly enhances transparency. AIIB will undertake procurement reviews during implementation, as a part of implementation support missions.
Procurement Delays in tendering, contract finalization and award of contract packages	Low	A realistic Procurement Plan has been prepared by the PRED (as a part of the PDS), which has been reviewed by AIIB. Procurement progress will be monitored regularly by the bank.
Project Implementation Technology – Quality of construction of CC roads	Medium	The IA has significant previous experience in construction of CC roads. The design aspects in the DPR have been reviewed and validated by the design wing of the PRED. The three-tier quality monitoring system for the project will be used to monitor specific parameters of CC road quality during construction. PMC technical specialists will also monitor the quality of construction.
Project Implementation: Delays and Quality Monitoring.	Medium	The IA has been implementing projects of similar nature worth USD600-800 million every year, which demonstrates its capacity. The IA will engage a PMC to assist in planning, implementation and monitoring the progress. The IA will also develop a project monitoring software with the bank's inputs with which progress can be monitored from the headquarters of the IA and AIIB. This will help detect any potential delays very early. A robust, three-tier quality and quantity monitoring system, which has been effective in similar rural road projects across the country, will be used in the project.

Risk Description	Current Assess-ment	Mitigation
Environmental and Social Implementation of ESMF by the local contractors	Medium	The IA has an environmental specialist and a social specialist in the PMU who are experienced in managing IFI-financed projects. The PMC's environmental and social specialists will monitor implementation of the ESMF by the contractors. AIIB's Environmental and Social Specialists will review implementation progress during the implementation support missions.
Financial Management Adequate staffing of PMU Detailing financial management procedures	Medium	The GoAP/PRED has committed to staff the PMU with financial management expert(s) by October 2018. A financial management manual, detailing the financial accounting, reporting, audit and financial management information systems for the project, is under preparation (draft seen by AIIB) by the state finance department. This manual will be ready by December 2018.

Annex 1: Results Framework and Monitoring
INDIA: Andhra Pradesh Rural Roads Project

	Project Objective: The objective of the project is to improve road transport connectivity in previously unserved communities by providing all-weather rural roads in all 13 districts of the state of Andhra Pradesh.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline 2018	Cumulative Target Values				Monitoring Frequency	Data Source/ Methodology	Data Collection by	Description (indicator definition, etc.)
				2019	2020	2021	2022/23				
Length of roads constructed / upgraded	X	Km	0	500	2,300	4,600	6,000	Semi Annual	Progress Reports	PRED	Around 6,000 km to be constructed / upgraded
Habitations with new /upgraded connectivity	X	No.	0	300	1,200	2,300	3,300	Semi Annual	Progress Reports	PRED	3,300 habitations will be provided with connectivity under the project
No. of people with direct access to all-weather rural roads	X	People '000	0	200	700	1,300	2,000	Semi Annual	Progress Reports	PRED	Two million people to benefit from the project

	Intermediate Results Indicators										
Indicator Name	Core	Unit of Meas-ure	Base-line 2018	Cumulative Target Values				Monitoring Frequency	Data Source/ Methodol-ogy	Data Collection by	Description (indica-tor definition, etc.)
				2019	2020	2021	2022/23				
Length of BT roads constructed	X	Km	0	270	1,000	1,800	2,350	Semi Annual	Progress Reports	PRED	Around 2,350 km of BT roads to be con-structed
Length of CC roads con-structed	X	Km	0	230	800	1,800	2,450	Semi Annual	Progress Reports	PRED	Around 2,450 km of CC roads to be con-structed
Length of roads upgraded to BT roads	X	Km	0	0	500	1,000	1,500	Semi Annual	Progress Reports	PRED	Around 1,500 km of earthen and metal roads to be upgraded
No. of bridges to be con-structed	X	Nos.	0	0	0	6	18	Semi Annual	Progress Reports	PRED	Around 18 major bridges to be constructed

Annex 2: Detailed Project Description

A. Andhra Pradesh Roads Sector

1. The former state of Andhra Pradesh was bifurcated into Telangana and Andhra Pradesh (A.P) states in June 2014. A.P, on the southeastern coast of India, is the eighth largest state in terms of area (162,970 km^2) and the tenth most populous, with a population of around 50 million. With almost 70 percent of the state's population living in rural areas, rural connectivity and its consequent socioeconomic development will be key to lift people out of poverty.

2. **The road network in India**. India has a road network of over 5.4 million km that constitutes the second largest road network in the world. The road network consists of the following categories: (i) national highways, totaling about 98,000 km; (ii) secondary roads, comprising about 900,000 km of state highways and major district roads; and (iii) rural roads, covering about 4.4 million km linking rural communities with the highways and the major district road network. While the national highways are maintained by the National Highways Authority of India, an autonomous agency of the Government of India, all other roads in the network, from the state highways down to the rural roads, are maintained by the respective state governments.

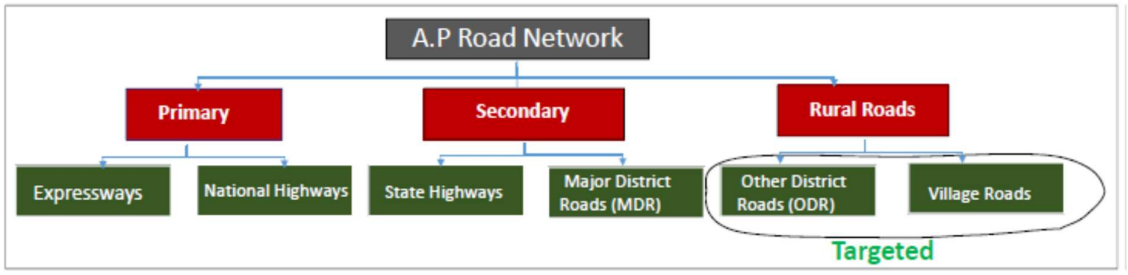
3. **PMGSY**. The national level PMGSY aims to provide all-weather road connectivity to unserved habitations in India's rural areas where 70 percent of the population live. As of December 2017, at the national level some 130,000 habitations of the intended 178,000 habitations have been connected. The government intends to achieve 100-percent completion by March 2019. In addition to the investment in rural road construction, the PMGSY also includes support for strengthening the capacity of state-level agencies to implement the program. The PMGSY obtained support from international financial institutions (IFIs) including the World Bank and ADB. Data from the PMGSY to date shows that it has substantially improved the connectivity and mobility of the rural residents in the areas where the program is active. To date, it has delivered significant socioeconomic benefits including new farm-to-market connectivity and improved access to hospitals and educational institutions, especially to poor women and children.

4. **A.P Road Network**. A.P has about 133,000 km of roads. The road network is broadly divided into three categories as (i) primary roads comprising national highways (ii) secondary roads comprising state highways and major district roads and (iii) rural roads comprising other district roads and village roads. The road categories and lengths are shown in Table 5. The rural road network constitutes around 60 percent of the total road network. Under the PMGSY, the target was to construct around 14,564 km of rural roads, connecting about 1,309 habitations with populations above 500 people in the plains, and above 250 people in hilly and tribal areas. As of March 2018, around 90 percent of PMGSY targets had been achieved in A.P, with only a few targeted habitations remaining to be connected.

Table 5: A.P Road Network

Road Category	Length (km)
National Highways (NH)	6,672
State Highways (SH)	15,406
Major District Roads (MDR)	31,950
Other District Roads (ODR)	2,401
Village Roads (VR)	76,323
Total	**132,752**

5. **A.P Rural Roads Project**. The PMGSY, however, does not provide coverage for all the rural habitations in A.P. Out of the 47,745 habitations in A.P, around 10,605 habitations will remain unconnected after the completion of PMGSY program and other state level programs that are ongoing. The Government of A.P (GoAP), therefore, has decided to launch the A.P Rural Roads Project as a supplement to the PMGSY to connect those habitations not covered under PMGSY. The proposed AIIB financing would connect some 3,300 habitations with a population of more than 250 people, benefitting around two million people. In a series of rural road projects that will follow the currently proposed A.P Rural Roads Project, the GoAP plans to achieve 100-percent connectivity in the coming years.

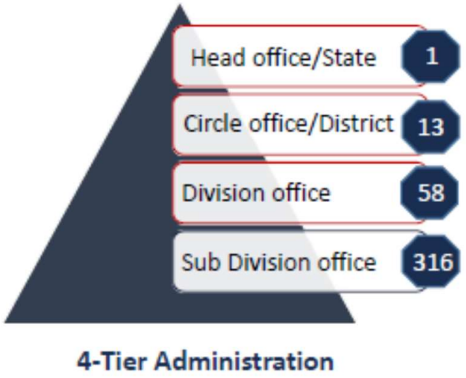


B. Institutional Structure

6. The GoAP's Panchayat Raj Engineering Department (PRED) is the department responsible for construction, O&M of the rural networks in A.P. While the primary and secondary roads are managed by the Roads and Buildings department, the rural roads are managed by the PRED. The PRED was established in 1967 and comes under PR&RD that manages rural roads, rural water supply and other rural development activities. The PRED oversees all activities pertaining to planning, construction and maintenance of rural roads in the state and implements, on an average, projects worth USD600-800 million every year.

7. The PRED functions under a four-tier administration as shown in Figure 3. The set-up is well spread throughout the state at the district and sub-district levels with an aim to cater to every habitation in the state. The headquarters of the PRED is now based in Vijayawada which is about 20 km away from Amaravati, the proposed state capital. The Engineer-in-Chief who heads the PRED is based at headquarters. The Superintending Engineers (one per district) are responsible for 13 circle offices with each circle office responsible for a district. Further down and within the districts, there are 58 divisional offices and about 316 sub-divisional offices.

Figure 3: Administrative Structure of PRED



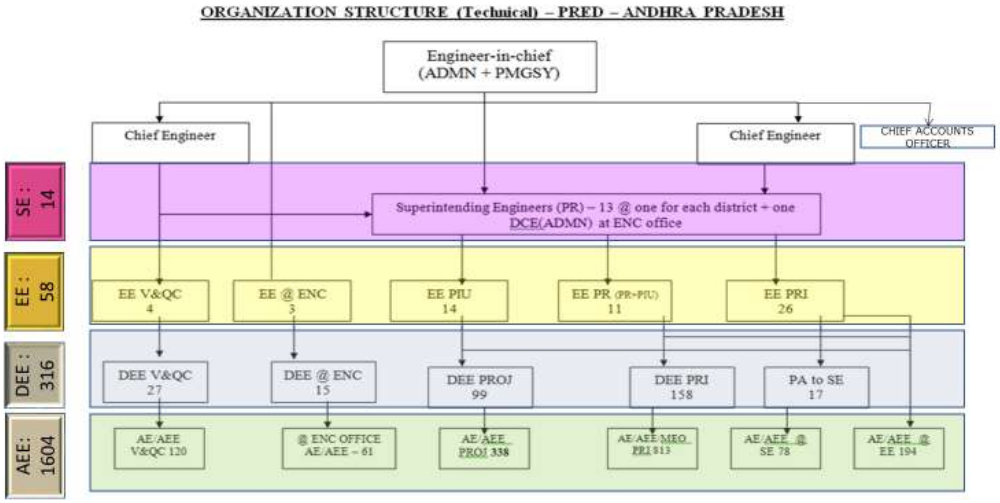
8. The PRED currently employs around 2,000 staff. The Engineer-in-Chief with more than 35 years of work experience heads the department. He is assisted by two Chief Engineers each with about 30 years of work experience. Further down are the Superintending Engineers, Executive Engineers, Deputy Executive Engineers and Assistant Executive Engineers. Table 6 provides a snapshot of the staff strength of the PRED. The organization chart of the PRED is shown in Figure 4. The PRED has sufficient experience and the professional staff to plan, manage and control the project. The department implements rural road projects worth USD600-800 million every year and has previous experience working with IFIs and domestic financial institutions. The PRED is currently implementing a project with World Bank assistance. The PRED will enlist professional support in the form of a Project Management Consultant (PMC) firm to assist it in all aspects of project management until the project's closure.

Table 6: Staff Strength, PRED

Position	**Average Experience (years)**	**Number of Positions**
Engineer-in-Chief	35	1
Chief Engineers	30	2
Superintending Engineers	25-30	14
Executive Engineers	25	58
Deputy Executive Engineers	20-21	316
Assistant Executive Engineers	15	1,604
Total		**1,995**

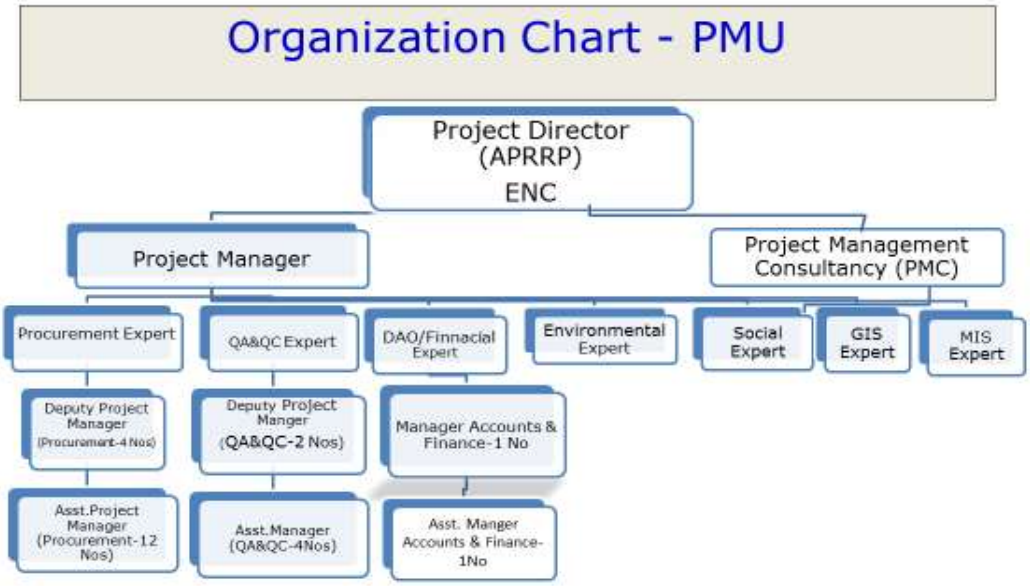
9. **PMU**. A Project Management Unit (PMU) has been created within the PRED to carry out the day-to-day project implementation including monitoring project's progress and reporting progress to the GoAP and to AIIB. The Engineer-in-Chief is leading the PMU as the Project Director. The PMU is staffed with technical, procurement, financial management, economic analyst and environmental and social personnel. The organization chart of the PMU is shown in Figure 5.

Figure 4: PRED Organization Chart



Notes: SE = Superintending Engineer, EE = Executive Engineer, DEE = Deputy Executive Engineer, AEE = Assistant Executive Engineer.

Figure 5: PMU Organization Chart



C. Project Description and Components

10. The roads to be constructed include approach roads to educational institutions, healthcare centers and the roads passing through the tribal areas. The project will have two components with each component having one or more sub-components. Based on technical requirements (particularly the soil conditions), the GoAP has proposed to construct both cement concrete paved roads and bitumen paved roads (BT roads). It is estimated that around 49 percent of the roads to be constructed will be BT roads while the remaining 51 percent of the roads will be CC roads.

11. **Component 1a**. Construction of new connectivity consisting of:

(i) **BT Roads**: Construction of about 2,350 km of bitumen paved roads in the locations with normal soil;

(ii) **CC Roads**: Construction of about 2,450 km of CC paved roads, in the locations with soft soil; and

(iii) **Bridges and Structures**: Construction of bridges and hydraulic structures (culverts and drainage channels), including 18 major bridges, to increase connectivity of the roads during the monsoon season

12. **Component 1b**. Upgradation of existing roads including:

(i) Upgradation of about 1,500 km of existing water-bound macadam or metal roads and earthen roads into asphalt-based black top roads.

(ii) Construction of culverts or small bridges (where necessary) in order to prevent flooding and isolation of the habitations during the monsoon season and to improve connectivity.

13. **Component 2**. Technical Assistance consisting of:

(i) Engagement of a Project Management Consultant firm (PMC) (and individual consultants, as needed) to assist in managing the project, including planning, implementation supervision, monitoring and reporting progress of the project to the counterpart and to the Bank;

(ii) Engagement of a consulting firm to conduct technical reviews/audits of the project, including of all stakeholders with the aim to review all phases of the project implementation, including civil works, environmental and social, procurement, monitoring and other relevant aspects and propose measures/actions leading to possible enhancement of the project implementation and its quality and quantity control;

(iii) Engagement of a consulting firm to monitor implementation of Environmental and Social Management Plan and other actions defined during the project preparation;

(iv) A pilot project using modern technology; for example, using drones to monitor construction of roads during the project implementation, covering a limited geographical area;

(v) Development of a digitized map of A.P's rural road network and connection to a geographic information system for real-time communication, which will be used to provide real-time updates on maintenance works in the post-contract phase; and

(vi) Institutional development and capacity building of the PRED through trainings, workshops and study tours in overseas locations in the areas of transport planning and management, contract law and contract models, economic analysis and environmental engineering

14. **Connectivity of Habitations across Andhra Pradesh.** Andhra Pradesh has 47,745 habitations in total for which connectivity is provided by both the PRED (for village roads and other district roads, collectively called rural roads) and Roads and Buildings department that take care of the other higher order roads (major district roads, state highways and national highways). Out of these 47,745 habitations, about 10,605 habitations remain unconnected as shown in Table 7. Table 8 shows the status of connectivity of habitations categorized by the population range. The proposed project plans to connect 3,300 of the unconnected habitations while the connectivity of the remaining habitations will be progressively taken up by the GoAP.

Table 7: Status of Connectivity of Habitations in A.P

Status of Connectivity	Number of Habitations
Connected by Roads and Buildings	19,343
Connected by PRED	17,797
Unconnected	10,605
Total Habitations	**47,745**

Table 8: Connectivity of Habitations by Population Range

Population	Total Number of Habitations	Unconnected Habitations
Above 1,000	9,533	464
500 to 1,000	8,400	1,319
250 to 500	9,533	2,499
100 to 250	4,588	4,314
Below 100	15,691	2,009
Total	**47,745**	**10,605**

E. Selection Criteria

15. The PRED's selection criteria of roads to be included in the project is based on providing maximum impact through minimum intervention. This is the reason for having selected the habitations with a population of 250 and above for the project. About 3 million people are living in the 10,605 unconnected habitations. By targeting the habitations with 250+ population, the PRED is able to provide connectivity to 2 million people (66 percent of unconnected population) by just targeting 3,300 habitations (31 percent of the unconnected habitations). In other words, by targeting interventions in one third of the unconnected habitations, the PRED is able to reach out to two thirds of the unconnected population.

F. Maintenance

16. The project brings huge socioeconomic benefits to the poorest population of A.P while at the same time being economically viable. However, the sustainability of the economic benefits can only be assured with adequate maintenance of the roads. Inadequate maintenance could lead to premature failure. The project ensures adequate maintenance by including the maintenance of the constructed roads and culverts/bridges in the construction contractors' scope for a period of 5 years from completion of construction. The contractors will forfeit their retention payments if any faults reported by the PRED are not rectified within a certain period of time. The inclusion of maintenance in the construction contractor's scope improves the sustainability of the roads.

17. The GoAP has issued "Andhra Pradesh Rural Maintenance Policy 2017" that was prepared with the support of International Labor Organization. This policy has components on rural roads maintenance which will be used as a guideline for maintaining the roads to be constructed / upgraded under the project. The main objectives of the policy are:

(i) Safeguarding rural asset base

(ii) Adequate, timely and sound maintenance of the rural roads to provide safe, convenient and efficient access to rural roads users

(iii) Providing need-based requirement of funds for maintenance of rural roads

(iv) Efficient maintenance by using appropriate technology

(v) Judicious and optimal usage of resources (including funds) for the maintenance and repair with due prioritization and

(vi) Capacity building and organizational development of manpower and agencies engaged in rural roads maintenance

F. Project Monitoring Software

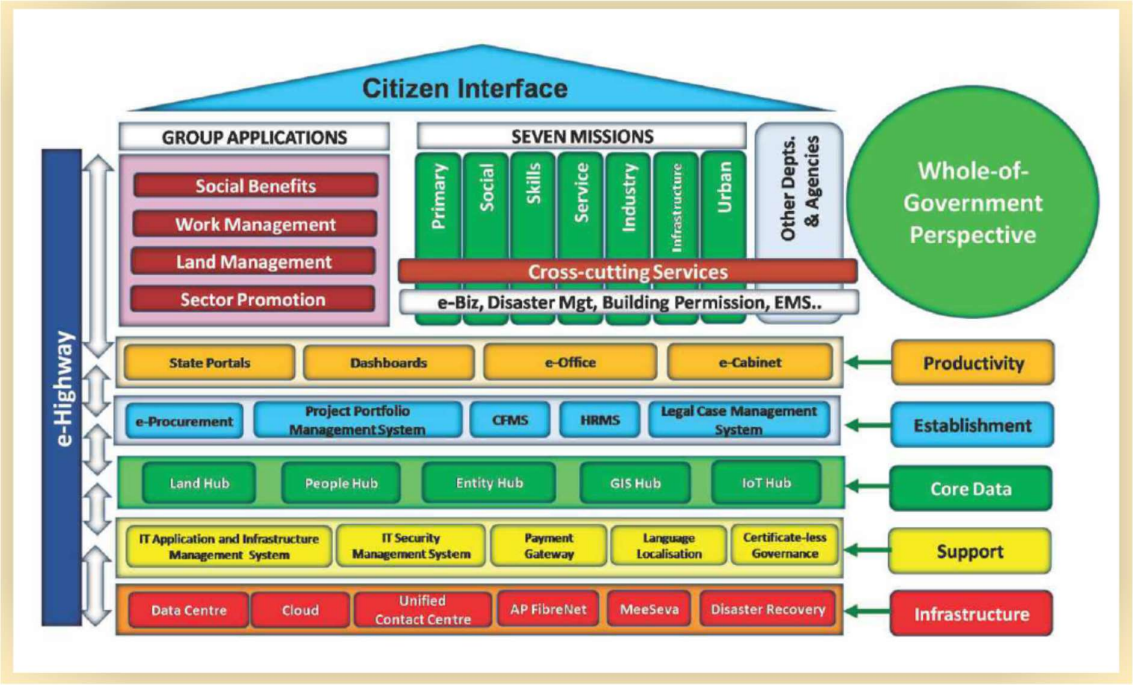
18. The project is spread over a vast geographic area with almost interventions in 3,000 roads which necessitates continuous and efficient monitoring of the progress of the project. With this objective in mind, the PRED is currently developing a project monitoring software to monitor progress of various aspects of the project, i.e., procurement, physical and financial progress. As a web-based system, the software can be accessed by users from any computer, with a user name and password to be provided by the PRED. This will be particularly helpful to monitor the progress from remote locations such as the Bank's headquarters, the PRED's headquarters and so on. The Bank, based on its past experience with Gujarat Rural Roads (MMGSY) Project (LN0025-IND), is helping the PRED define the user needs to the software development company. The software is expected to be operational in October 2018.

19. The software will provide the users with real-time information on project's progress including:

(i) Current status of the project including approval information;
(ii) Actual physical and financial progress of every contract package;
(iii) Planned progress vs actual progress;
(iv) Photographic evidence of the works at the site which then can be used to verify the progress percentage reported;
(v) Details of quality checks done by the three-tier quality monitoring mechanism; and
(vi) Generation of various graphical reports, as requested by the users.

20. The software will be a part of e-Pragati, the statewide enterprise architecture developed in A.P for e-governance. e-Pragati is a framework that provides integrated service to citizens and is a massive e-Governance program covering 33 departments and 315 agencies across the state and about 745 services have been identified so far. These services are bundled into 72 Projects, which are in turn grouped into 14 packages for ease of Procurement and implementation. The Works Management module under the Performance Management package of e-Pragati will be used to track progress of various projects including the proposed rural road project. E-Pragati will act as the backbone software platform for the state with customizations for various users (like the PRED) to manage their respective projects. The e-Pragati team of A.P works with the PRED to identify the needs of the project and to customize the software accordingly. Since the software team is present in the state, full-fledged support is available even after the software is rolled out until the project closure. e-Pragati was formed by the GoAP with the aim of having a common platform for all services in the state with customizations as needed. e-Pragati's CEO is a senior officer of the GoAP and the software development is outsourced to professional software development companies.

Figure 6: e-Pragati Framework



Annex 3: Economic and Financial Analysis

A. Introduction

1. The GoAP plans to provide one single-link all-weather connectivity roads to the remaining unconnected villages, with a population of more than 250 inhabitants, as identified in the 'Core Network' prepared under PMGSY. Under the project, it is proposed to construct about 4,800 km of BT and CC roads and upgrade about 1,500 km of existing gravel / earthen roads to asphalt-based black top roads. All the works under this program are targeted to be completed in 2022/23.

2. Most of the habitations, which will be connected by the project, are populated by the poorer sections of society. Hence, the proposed roads are likely to generate economic activity and improve the livelihood of poorer rural populations. Most of the new roads will close missing links that are short in length (2.0 km length on an average).

Table 9: Project Scope and Population Served

No. of roads	2,422
Average road length (km/road)[2]	1.97
Total length km	4,781
Total length of Bitumen Road km	2,326
Total length of Concrete Road km	2,455
No. of habitations connected (including component 1b)	3,917
Average population coverage - 2018 (No. / Road)	994
Total Population covered (2018)	2,257,036

B. Approach and Methodology

3. The economic analysis follows a consumer surplus approach in line with the practice of similar rural roads connectivity projects carried out in India during the last 3-4 years.[23] Available guidelines (World Bank: Investment Project Financing Economic Analysis Guidance Note, April 2013; Indian Roads Congress (IRC): Manual on Economic Evaluation of Highway Projects in India, SP 30; and Rural Roads Manual, SP 20) are also considered. For roads with sufficiently high levels of traffic (a minimum of about 100 daily vehicular trips), the consumer surplus method is recommended based on available guidelines and recent practice.[24] [25] According to a traffic survey carried out for this Project, 337 vehicular trips by motorized and non-

[23] Except for PMGSY for which the 'producer surplus' approach was applied considering the low traffic volume (mostly less than 100 vehicle trips in a day). In this approach, all socio-economic benefits attributable to the road connectivity are estimated separately, including agriculture productivity increase, employment generation, increased vehicle ownership, and improved school attendance.

[24] In the rural road connectivity projects including MPRCP in Madhya Pradesh (2018), Bihar Rural Roads Project (2016) and Additional Finance for implementing PMGSY Roads in seven states (2018) funded by the World Bank, have considered the consumer surplus approach for economic analysis.

[25] Dr. Richard Robinson (1999) A new approach to quantifying economic and social benefits for low-volume roads in developing countries, Impact Assessment and Project Appraisal, http://dx.doi.org/10.3152/147154699781767891 Published online: 20 Feb 2012; Notes on the Economic Evaluation of Transport Projects, Transport Note No. TRN-21, THE WORLD BANK, WASHINGTON, DC, January 2005

motorized vehicles are currently observed daily on the roads, which are planned to be improved to paved roads. A 20-year analysis period (four-year implementation period from 2019 to 2022 and 16-year lifetime of the created assets from 2023) is considered for analysis.

C. Benefits Estimation

4. For the present analysis, (i) savings in Vehicle Operating Costs (VOC) and (ii) Travel Time Cost (TTC) were considered and quantified to reflect the socioeconomic benefits of the Project. The benefits were estimated taking into account the observed and generated traffic and inflation-adjusted VOC and TTC per km based on the IRC guidelines.

5. **Traffic analysis and forecast**. A traffic survey was carried out for all Project roads in the frame of the DPR preparation to assess the existing traffic pattern. On average, 337 daily vehicular trips were made on the project roads.[26] Of these trips, 65 percent were passenger motorized vehicles, 13 percent were goods motorized vehicles and 22 percent were slow moving nonmotorized vehicles.

6. Based on typical traffic patterns and trends from other rural road projects in India, traffic growth was assumed at an annualized rate of 5 percent. Once, villages receive an all-weather paved road, it is assumed that the traffic volume and composition will change to approximately reflect the traffic volume and pattern of similar already connected villages ("generated traffic").

7. **Economic benefits**. The VOC and TTC per km were estimated based on IRC guidelines (2009)[27] with a suitable update to 2018, as indicated in Tables 10 and 11. Using these unit rates and the projected traffic, total VOC and TTC were estimated for both 'without project scenario' (gravel road) and 'with project scenario' (paved road). The difference between these two scenarios was considered as traffic related benefit. For the purpose of evaluation of the economic benefit, existing traffic and generated traffic were treated separately. For generated traffic, 50 percent of the VOC and TTC for the improved situation were treated as project benefit as practice in other cost benefit analysis for rural roads in India

Table 10: Estimate of Vehicle Travel Time Cost (INR / Vehicle Km) – 2018

Vehicle Type	Value of Travel Time - Paved Road		Value of VOC - Paved Road	
	INR/Vehicle Km (2009)	INR/Vehicle Km (2018)	INR/Vehicle Km (2009)	INR/Vehicle Km (2018)
M/C	0.98	1.59	1.06	1.72
Car	3.54	5.73	2.93	4.74
Tractor	0.29	0.47	10.52	17.03
Bus	7.98	12.92	8.16	13.21
Truck	0.47	0.76	11.4	18.46

Note: Estimated based on the data available from IRC, SP 30, 2009.
Using the average inflation rate, the unit rates of 2009 were updated to 2018.

[26] The PRED had arranged to collect the average daily traffic (ADT) during the months of January/February 2018 on all project roads.
[27] IRC, 2009, '*Manual on Economic Evaluation of Highway Projects in India (Second Revision), (IRC SP 30-2009*)'

Table11: Unit Rates for Calculating VOC and Travel Time for Rural Roads (2018 Price)

Vehicle Type	Value of Time: INR/ vehicle Km		Vehicle Operating Cost: INR / vehicle Km	
	Gravel	Paved	Gravel	Paved
M/C	2.9	1.59	3.1	1.72
Car	7.6	5.73	8.0	4.74
Tractor	0.6	0.47	19.9	17.03
Bus	21.5	12.92	16.1	13.21
Truck	1.0	0.76	21.7	18.46

Note: Estimated using the estimated travel time cost/vehicle km in the previous table and the ratio of cost data among different roads categories available in IRC, SP 30, 2009; For road roughness, the average values of 10 IRI for gravel road and 4 IRI for paved roads are considered, based on the practice followed in other rural road projects analysis.

D. Construction and Maintenance Costs

8. The investment cost for the project is estimated at USD550 million (Table 12) based on the finalized technical design documents (Detailed Project Reports, DPRs).[28] Maintenance costs for gravel roads (without project scenario)[29] and paved roads (with project scenario) were estimated based on the finalized technical design documents and the National Rural Roads Development Agency (NRRDA) guidelines.[30] A standard conversion factor (SCF) of 0.85, as practice in other rural road projects in India, was assumed to convert the financial costs to economic costs.[31]

9. Based on the cost estimates of the DPRs and the practice followed by the PRED for road maintenance, INR0.1 million/km (USD1,515/km) was used for annual maintenance for both flexible and concrete pavements. 49 percent of the road network with flexible pavement is assumed to require periodical maintenance of INR 1.0 million/km (USD15,152/km) and 51 percent of total roads with concrete pavement does not require periodical maintenance and also with significantly less routine maintenance requirements.[32] Thus, the weighted average of INR0.49 million/km (USD7,371/km) was assumed for periodical maintenance for the total road network, to be carried out once in five years. Calculations of arriving the weighted average maintenance cost for bitumen and concrete roads under the "with project" scenario and further the incremental maintenance cost (the difference between the maintenance cost under "with project" and "without project scenarios) are given in Tables 13 and 14.

[28] Cost for Component 1a New Connectivity Roads is considered.
[29] Under the present scenario, regular maintenance to the gravel roads are undertaken once in two to three years and no periodical maintenance, due to the insufficient budget availability. However, all the bitumen roads are considered with annual and periodical maintenance, as per the maintenance policy.
[30] Unit rates for maintenance are based on the inputs from PRD, GOAP and National Rural Roads Development Agency (NRRDA), Government of India.
[31] Conversion factor of 0.85 was used to account the market distortions to financial cost by removing taxes, subsidies and other distortions.
[32] Stated proportions concern the road network under the project.

Table 12: Project Cost

District	Total Road Length (km)	Project Cost				Project Cost / Km		Economic Cost / Km	
		Civil Cost INR Million	GST 12% INR Million	Total INR Million	USD Million	INR Million	USD Million	INR Million	USD Million
Anantapuram	819.00	4,513.6	541.6	5,055.20	76.59	6.17	0.09	5.25	0.08
Chittoor	1,029.00	5,990.9	718.9	6,709.8	101.66	6.52	0.10	5.54	0.08
East Godavari	239.00	1,848.9	221.9	2,070.8	31.38	8.66	0.13	7.36	0.11
Guntur	166.00	1,522.7	182.7	1,705.4	25.84	10.27	0.16	8.73	0.13
Krishna	124.00	1,196.4	143.6	1,339.9	20.30	10.81	0.16	9.19	0.14
Kurnool	321.00	2,682.8	321.9	3,004.7	45.53	9.36	0.14	7.96	0.12
Prakasam	405.00	2,392.7	287.1	2,679.9	40.60	6.62	0.10	5.62	0.09
SPSR Nellore	404.00	2,864.0	343.7	3,207.7	48.60	7.94	0.12	6.75	0.10
Srikakulam	490.00	3,262.8	391.5	3,654.4	55.37	7.46	0.11	6.34	0.10
Visakhapatnam	198.00	1,359.5	163.1	1,522.7	23.07	7.69	0.12	6.54	0.10
Vizianagaram	296.00	2,238.7	268.6	2,507.3	37.99	8.47	0.13	7.20	0.11
West Godavari	130.00	1,087.6	130.5	1,218.1	18.46	9.37	0.14	7.96	0.12
YSR Kadapa	160.00	1,450.1	174.0	1,624.2	24.61	10.15	0.15	8.63	0.13
Total	**4,781.0**	**32,410.7**	**3,889.3**	**36,300.0**	**550.00**	**7.59**	**0.12**	**6.45**	**0.10**

Notes: (a) USD = 66 Indian Rupee (INR); (b) Cost of new connectivity (Component 1A) is based on the DPRs by PRD, GOAP in 2018; (c) Economic cost excludes GST, financial charges and contingency; (d) conversion factor of 0.85 was used to convert the financial cost to economic cost to account the market distortions to financial cost by removing taxes, subsidies, grant components and so on; (e) Only Component 1A of constructing new connectivity (~4,800 km) is considered for analysis and (f) GST = goods and services tax.

Table 13: Road Maintenance Cost

Type of Road	Annual Maintenance Cost – INR / year/km	Annual +Periodical cost – INR / year/km	Composition
Paved Road	100,000	300,000	49%
Concrete Road	100,000	100,000	51%
Total	**100,000**	**197,302**	**100%**

Source: Panchayat Raj Engineering Department, Govt. of Andhra Pradesh.

Table 14: Incremental O&M INR/Km/Year

Details	Annual Maint. Cost – INR / year/km	Annual maintenance + Annualized periodical maintenance cost – INR / year/km
Weighted average maintenance cost for Bitumen (48%) & concrete Road (52%) (With project scenario)	100,000	197,3020
Gravel Road (Without project scenario)	20,000	20,000
Incremental O&M	80,000	177,302

Source: Panchayat Raj Engineering Department, Govt. of Andhra Pradesh.

E. Results

10. The Economic Internal Rate of Return (EIRR) and the Net Present Value (NPV) were estimated for the new connectivity roads financed under this Project. A social discount rate of 6 percent was applied. The EIRR under the base case was estimated at 13.6 percent exceeding the social discount rate by more than double, which illustrates the strong economic net benefit of the Project. The NPV was estimated at USD265 million. Table 15 reports the results of the economic analysis and sensitivity scenarios. Table 16 shows the detailed discounted cash-flow analysis.

11. Sensitivity analysis was carried out with respect to an increase in construction cost, increase in O&M and decrease of the project benefits (by 20 percent each) and a combined worst case scenario. Switching Values (SV) were simulated to demonstrate the sensitivity of the economic viability of the project to the above factors. The sensitivity analysis shows that the EIRR remains above the social discount rate under all scenarios. The Switching Values were estimated at 74 percent for cost overrun in construction cost, 329 percent for cost overrun in O&M cost and 38 percent for a decrease in project benefits.

Table 15: Results of Cost Benefit Analysis and Sensitivity Analysis

Sl. No.	Sensitivity Scenario	EIRR	ENPV in USD Million	SV
1	Base Case	13.6%	265	
2	20% increase in Construction Cost	10.8%	194	74%
3	20% increase in O&M Cost	13.2%	249	329%
4	20% decrease in Project Benefit	9.8%	125	38%
5	Combined effect (Worst Scenario)	7.0%	37	

Table 16: Discounted Cash Flow Analysis

Rs Million

Year	Construction Costs	Maintenance Costs	Savings Vehicle Operating Costs	Savings Passenger Time Costs	Total Benefits	Net Benefits	Scenario 2: Cost over-run in construction cost by 20%	Scenario 3: O&M Cost Increase by 20%	Scenario 4: Benefits Reduction by 20%	Scenario 5: Combined Effect (Worst Case Scenario)
2018	-	-	-	-	-	-	-	-	-	-
2019	6,788	-	-	-	-	-6,788	-8,146	-6,788	-6,788	-8,146
2020	6,788	85	572	363	936	-5,938	-7,295	-5,955	-6,125	-7,499
2021	6,788	170	1,145	726	1871	-5,087	-6,445	-5,121	-5,461	-6,853
2022	6,788	255	1,717	1,090	2807	-4,237	-5,594	-4,288	-4,798	-6,207
2023	-	340	2,289.44	1,452.84	3742	3,402	3,402	3,334	2,653	2,585
2024	-	340	2,403.91	1,525.48	3929	3,589	3,589	3,521	2,803	2,735
2025	-	340	2,524.10	1,601.75	4126	3785	3,785	3,717	2,960	2,892
2026	-	340	2,650.31	1,681.84	4332	3992	3,992	3,924	3,125	3,057
2027	-	755	2,782.82	1,765.93	4549	3794	3,794	3,643	2,884	2,734
2028	-	755	2,921.97	1,854.23	4776	4022	4,022	3,871	3,066	2,916
2029	-	755	3,068.06	1,946.94	5015	4260	4,260	4,110	3,257	3,107
2030	-	755	3,221.47	2,044.29	5266	4511	4,511	4,360	3,458	3,307
2031	-	755	3,382.54	2,146.50	5529	4775	4,775	4,624	3,669	3,518
2032	-	755	3,551.67	2,253.83	5805	5051	5,051	4,900	3,890	3,739
2033	-	755	3,729.25	2,366.52	6096	5341	5,341	5,190	4,122	3,971
2034	-	755	3,915.71	2,484.85	6401	5646	5,646	5,495	4,366	4,215
2035	-	755	4,111.50	2,609.09	6721	5966	5,966	5,815	4,622	4,471
2036	-	755	4,317.07	2,739.54	7057	6302	6,302	6,151	4,891	4,740
2037	-	755	4,532.93	2,876.52	7409	6655	6,655	6,504	5,173	5,022
2038	-	755	4,759.57	3,020.35	7780	7025	7,025	6,875	5,469	5,319
Total	**27,152**	**10,927**	**57,596.47**	**36,549.76**	**94,146**	**56,067**	**50,637**	**53,882**	**37,238**	**29,622**
NPV @6%	**23,521**	**5,324**	**28,349.37**	**17,990.03**	**46,339**	**17,494**	**12,789**	**16,429**	**8,226**	**2,457**
					NPV (6%)	17,494	12,789	16,429	8,226	2,457
					IRR	13.57%	10.84%	13.17%	9.82%	7.01%
					SV		74.4%	328.6%	37.8%	

Annex 4: Sovereign Credit Fact Sheet

A. Recent Economic Development

India is a lower-middle-income country, with a population of 1.31 billion. Indian real GDP expanded at an average annual rate of 7.3 percent between FY2003 and FY2012. However, growth had slowed to 5.6 percent and 6.4 percent in FY2012/13 and FY2013/14 because of growing imbalances, binding supply constraints, and subdued sentiment. Since 2014, the Indian economy has been on a gradual cyclical recovery, helped by lower commodity prices bringing about an improvement in the current account. The Indian economy is also supported by structural reforms, such as a new bankruptcy code and the implementation of the pan-India goods and services tax (GST). A range of supply-side measures (including release of surplus grain buffer stocks), an appropriate monetary stance and lower oil price have also contributed to the decline in inflation, from an average of about 9.8 percent during 2011-2013 to 4.9 percent in FY2015/16. Nevertheless, the demonetization initiative[33] resulted in a slower growth in FY2016/17. The Rupee also weakened with global capital outflow from emerging market assets.

B. Economic Indicators

Selected Macroeconomic Economic indicators (2013/14-2017/18)

Economic Indicators	2013/14	2014/15	2015/16	2016/17*	2017/18*
National income and prices (change %)					
Real GDP Growth	6.4	7.4	8.2	7.1	6.7
Inflation (change %, average)	9.4	5.8	4.9	4.5	3.6
Central government operations (% of GDP)					
General government overall balance	-7.6	-7.3	-7.0	-6.8	-6.6
External debt (% of GDP, EOP)	23.9	23.3	23.4	22.9	22.7
Nominal gross public debt (% of GDP)		68.3	69.8	69.6	68.8
Money and credit					
Broad money (% annual change, EOP)	13.4	10.9	10.5	12.0	13.4
Direct investment in India (net, % of GDP)	-1.2	-1.5	-1.7	-1.7	-1.7
Gross reserves (months imports)	6.7	8.5	8.6	8.1	7.9
Current account balance (% of GDP)	-1.7	-1.3	-1.1	-0.7	-2.0
Exchange rate (Rupee/$, end period)	61.0	62.6	66.6	68.4	

* Denotes projected figures. Source: IMF Country Report No. 17/54, February 2017, WEO April. 2018.

[33] Demonetization initiative: On Nov. 8, 2016, India's government announced withdrawal of the legal tender of rupees 500 and rupees1000 notes, which accounted for 86 percent of the value of currency in circulation, and introduced new rupees 500 and rupees 2000 notes.

C. Economic Outlook and Risks

Looking ahead, India's growth is projected to slow to 7.1 percent in FY2016/17 before rebounding to 7.4 percent in FY2018/19. This is due to the temporary disruptions, particularly in private consumption, caused by cash shortages accompanying the demonetization. The current account deficit is expected to widen to about two percent of GDP over the medium term on the back of stronger domestic demand and possible increase in commodity prices. External risks include financial market volatility and slower growth in China, EU and US. Internally, India faces some risk arising from potential deterioration of corporate and public bank balance sheets, and setbacks in the reform process including implementation of GST on the domestic side. India's public debt remains sustainable given manageable interest rate costs and robust growth outlook. Assuming gradual fiscal consolidation and implementation of GST, the public debt-to-GDP ratio is forecast to decline gradually to around 61 percent of GDP in the medium term from the current level of almost 70 percent. Negative growth shocks represent one of the major risks to the debt outlook. India's external debt, currently at 23.5 percent of GDP, remains sustainable.[34]

[34] International Monetary Fund (IMF), 2017. Country Report No. 17/54–2017 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for India, February 2017.

Annex 5: Core Procurement Principles Checklist and Procurement Plan

Core Procurement Principles and Procurement Standards – Checklist

CRITERIA	REVIEW
1. **Economy** - the procurement process demonstrates that the total price outcome of the of contracts for goods works and services, including economic life and cycle costs does not have a negative impact on the Project	This is an established principle in the PRED's practices. The procurement approach has been well thought through; aiming to attract strike a balance to attract wide competition of competent contractors capable to carry out the works and the maintenance obligations. **Criterion met**
2. **Efficiency –** Procurement implementation arrangements are proportional to the required outcome with regard to implementation capacity and time constraints, and are effective.	The agreed implementation arrangements have been discussed at length. The PRED and the Bank agreed the amalgamation of contracts/works per packages, based on the geographical distribution per circle, the scope of works, the estimate cost, the procurement approach and method (NCT) are deemed appropriate to ensure an efficient contracting and (more importantly) implementation. the PRED also had to comply with achieving at least 30 percent of contract to be ready to be awarded prior signing of the Loan. On this basis the agreed implementation arrangements are considered efficient. **Criterion met**
3. **Effectiveness** – the procurement process facilitates the achievement of the ultimate objectives of the Project taking into account the recipient's socioeconomic and other development objectives	The PDS and its implementation steps and processes to be carried out serve well the project's aim and objective and have been crafted with the purpose of facilitating achievement of the ambitious project's goals. High number of Contracts, mid-range cost estimate distributed across AP aiming at substantially increase connectivity required a fine balanced strategy to ensure effective implementation. **Criterion met**
4. **Fairness; good governance** – the procurement process is open, fair, non-discriminatory and provides equitable opportunity and treatment for tenderers and consultants in their submission of tenders and proposals. It also provides for clear rights and obligations as between Recipients on the one	The PRED by law and internal decision-making process is well defined and the level of responsibilities clearly identified mostly determined by the estimated cost of the contract and the applicable government order (GO) provisions to day-to-day embrace the principles of fairness and good governance. The PRED has a remarkable track record and successfully manages high number of contract with a quick turnover. For the implementation of

CRITERIA	REVIEW
hand and suppliers, contractors, and consultants on the other. The procurement process is aligned with principles of good governance.	the project, the use of SBDs based on the WB latest version, including the standard form of contracts clearly define respective roles and responsibilities. **Criterion met**
5. Value for Money (''VfM'') – the procurement process enables the Recipient to obtain optimal benefits with the resources utilized. This may include not only the initial costs but also costs over the economic life of the procure items, the quality of the output, fitness-for-purpose, timeliness, and the achievement of other socioeconomic and environmental development objectives of the recipient, Price alone may not necessarily represent VfM;	The PRED is used to operate under the applicable GO that embraces in full the principle of value for money. To achieve this a very well-oiled mechanism is in place to streamline the technical requirements, continuous review and update of the applicable Common Schedule of Rates (CSR) published by the GoAP have create an extremely efficient and competitive market place. To guarantee sustainability the contract will include a period of maintenance beyond the defects notification period (established practice in AP) by the contractor so that they will have to ensure that quality and not only low prices are duly considered during tender preparation, evaluation and contract implementation. **Criterion met**
6. Fit-for-Purpose (Ffp)– to realize VfM, the procurement process ensures that the procurement methods and procedures applied by the Recipient for the Project, and the nature and extent of Bank oversight are fit for purpose ("FfP"). The procurement modalities appropriately reflect the strategic needs and circumstances of the situation. Standardized approaches maybe used for low value low-risk or low complexity procurement. Where procurement complexity, risk and impact are high, a customized approach with transaction-specific documentation and method may be the most efficient and effective approach.	Albeit not explicitly spelled out GO provisions applicable to the PRED procurement aim at achieving FfP by a strong upstream technical preparation based on widely publicly available standards and the use of e-procurement platform at Government of India level. During the preparation of the PDS a well-crafted procurement approach has been agreed considered: the relatively low technical complexity; the degree of geographical distribution (13 circles across the AP); the average estimated cost; and the need to ensure reliable and competent contact are attracted given the required engagement for maintenance period. On this basis the proposed procurement approach NCT using Standard Bid Documents (SBDs) coupled with the Government of India e-procurement platform and adequate project implementation supervision by the PRED and PMC is considered to be FfP. **Criterion met**
7. Transparency - AIIB is committed to achieving a high level of transparency under each project. Transparency during the procurement process is a key	All procurement opportunities will receive adequate level of publicity and access to information. A General Procurement Notice (GPN) has been published on UNDB and on AIIB's website as well as on the PRED's. The use of the Government of India e-procurement platform

CRITERIA	REVIEW
element in establishing a good procurement outcome. To this end, sufficient and relevant information is required to be made available in an open manner to interested parties and for appropriate scrutiny.	for all the specific notices is coupled with publication on newspaper. On this basis it is deemed that the information on project's procurement opportunities will be adequately publicized. The Selection for the PMC has attracted 16 Consulting firms, including foreign participants. **Criterion met**
PROCUREMENT STANDARDS 5.3	**REVIEW**
(a) Planning - Strategic Procurement Planning	The PRED is required to plan one year ahead for their budget purposes, and the due diligence has demonstrated that from the preparation of technical documentation through to tendering process and implementation a good degree of discipline in planning ahead is achieved.
(b) Transparency - Transparent and unless other approaches are adequately justified, international competitive processes	**See above**
(c) Optimized balance between price and quality to generate desired development results on a sustainable basis	The PRED has a strong technical competence in-house and widely available standards to determine rates. The good quality of technical documentation and clear transparent and unambiguous pricing mechanism, have nurtured a market place that delivers quality contracts, on time and on budget in most cases.
(d) Credible recourse and impartial and equitable dispute resolution: integrity throughout the procurement process including during contract management and closure	The form of contract used for the project is the standard for the World Bank and it does include provisions to ensure an equitable resolution of any disputes and AIIB's Policy on Prohibited Practices apply in full to the project.
(e) Quality assurance, compliance checks, audits inspections and as appropriate third-party verification	The PRED will apply the well-known three-tier quality control (applicable to most Indian public sector projects) coupled by PMC support during implementation, moreover it has been agreed to include a third party technical audit on a portion of the executed contracts.
(f) Credible mechanism to address complaints of bidders and providers of goods works and consulting services	Procurement Complaints are rare in A.P – however, the SBDs provide for a clear mechanism to lodge a complaint throughout the procurement process and a mechanism to handle that. Moreover, AIIB will monitor such events should occur as provided for by the bank's Procurement Policy.

Procurement Plan (Tentative)

Description		Estimated contract value	Number of Works	Contract type	Procurement method	Tender Invitation	Contract Award	Contract Completion
Batch I - District	**Batch I - Packages**							
Srikakulam	1/APRRP/PRED/SKLM/ROADS/001	11.63	49	Works	NCT	Jul-18	Sep-18	Feb-21
	2/APRRP/PRED/SKLM/ROADS/002	15.74	85	Works	NCT	Jul-18	Sep-18	Feb-21
Vizinagaram	6/APRRP/PRED/VZM/ROADS/002	11.76	37	Works	NCT	Jul-18	Sep-18	Feb-21
Visakhapatnam	11/APRRP/PRED/VSP/ROAD/003	5.10	21	Works	NCT	Jul-18	Sep-18	Feb-21
East Godavari	13/APRRP/PRED/EG/ROAD/002	12.49	57	Works	NCT	Jul-18	Sep-18	Feb-21
West Godavari	15/APRRP/PRED/WG/ROAD/001	11.48	34	Works	NCT	Jul-18	Sep-18	Feb-21
	16/APRRP/PRED/WG/ROAD/002	4.49	22	Works	NCT	Jul-18	Sep-18	Feb-21
Krishna	18/APRRP/PRED/KRSN/ROAD/001	15.08	39	Works	NCT	Jul-18	Sep-18	Feb-21
	19/APRRP/PRED/KRSN/ROAD/002	5.21	19	Works	NCT	Jul-18	Sep-18	Feb-21
Guntur	20/APRRP/PRED/GNT/ROAD/001	11.94	30	Works	NCT	Jul-18	Sep-18	Feb-21
	21/APRRP/PRED/GNT/ROAD/002	13.90	41	Works	NCT	Jul-18	Sep-18	Feb-21
Prakasam	22/APRRP/PRED/PKM/ROAD/001	7.59	33	Works	NCT	Jul-18	Sep-18	Feb-21
	23/APRRP/PRED/PKM/ROAD/002	8.00	43	Works	NCT	Jul-18	Sep-18	Feb-21
Nellore	26/APRRP/PRED/NLR/ROAD/001	13.96	57	Works	NCT	Jul-18	Sep-18	Feb-21
	27/APRRP/PRED/NLR/ROAD/002	16.46	74	Works	NCT	Jul-18	Sep-18	Feb-21
Chittoor	29/APRRP/PRED/CTR/ROAD/001	12.63	100	Works	NCT	Jul-18	Sep-18	Feb-21
	32/APRRP/PRED/CTR/ROAD/004	15.13	87	Works	NCT	Jul-18	Sep-18	Feb-21
	33/APRRP/PRED/CTR/ROAD/005	6.63	36	Works	NCT	Jul-18	Sep-18	Feb-21
	36/APRRP/PRED/CTR/ROAD/008	17.43	93	Works	NCT	Jul-18	Sep-18	Feb-21
Kadapa	38/APRRP/PRED/KDP/ROAD/002	6.94	44	Works	NCT	Jul-18	Sep-18	Feb-21
Kurnool	40/APRRP/PRED/KRNL/ROAD/001	5.99	26	Works	NCT	Jul-18	Sep-18	Feb-21
	43/APRRP/PRED/KRNL/ROAD/004	9.80	27	Works	NCT	Jul-18	Sep-18	Feb-21
Ananthapuram	47/APRRP/PRED/ATP/ROAD/003	10.51	35	Works	NCT	Jul-18	Sep-18	Feb-21
	49/APRRP/PRED/ATP/ROAD/005	15.40	44	Works	NCT	Jul-18	Sep-18	Feb-21
	50/APRRP/PRED/ATP/ROAD/006	11.33	41	Works	NCT	Jul-18	Sep-18	Feb-21
Batch II - District	**Batch II - Packages**							
Srikakulam	3/APRRP/PRED/SKLM/ROADS/003	16.38	94	Works	NCT	Oct-18	Dec-18	May-22
	4/APRRP/PRED/SKLM/ROADS/004	11.67	87	Works	NCT	Oct-18	Dec-18	May-22
Vizinagaram	5/APRRP/PRED/VZM/ROADS/001	13.76	59	Works	NCT	Oct-18	Dec-18	May-22
	7/APRRP/PRED/VZM/ROADS/003	10.10	59	Works	NCT	Oct-18	Dec-18	May-22
	8/APRRP/PRED/VZM/BRIDGE/001	2.32	1	Works	NCT	Oct-18	Dec-18	May-22
Visakhapatnam	9/APRRP/PRED/VSP/ROAD/001	8.77	25	Works	NCT	Oct-18	Dec-18	May-22
	10/APRRP/PRED/VSP/ROAD/002	9.20	27	Works	NCT	Oct-18	Dec-18	May-22
East Godavari	12/APRRP/PRED/EG/ROAD/001	13.10	5	Works	NCT	Oct-18	Dec-18	May-22
	14/APRRP/PRED/EG/BRIDGE/001	5.86	2	Works	NCT	Oct-18	Dec-18	May-22
West Godavari	17/APRRP/PRED/WG/BRIDGE/001	2.54	1	Works	NCT	Oct-18	Dec-18	May-22
Prakasam	24/APRRP/PRED/PKM/ROAD/003	11.21	64	Works	NCT	Oct-18	Dec-18	May-22
	25/APRRP/PRED/PKM/ROAD/004	13.75	63	Works	NCT	Oct-18	Dec-18	May-22
Nellore	28/APRRP/PRED/NLR/ROAD/003	18.21	65	Works	NCT	Oct-18	Dec-18	May-22
Chittoor	30/APRRP/PRED/CTR/ROAD/002	15.28	76	Works	NCT	Oct-18	Dec-18	May-22
	31/APRRP/PRED/CTR/ROAD/003	10.37	64	Works	NCT	Oct-18	Dec-18	May-22
	34/APRRP/PRED/CTR/ROAD/006	17.23	78	Works	NCT	Oct-18	Dec-18	May-22
	35/APRRP/PRED/CTR/ROAD/007	6.99	51	Works	NCT	Oct-18	Dec-18	May-22
Kadapa	37/APRRP/PRED/KDP/ROAD/001	12.41	99	Works	NCT	Oct-18	Dec-18	May-22
	39/APRRP/PRED/KDP/BRIDGE/001	5.23	1	Works	NCT	Oct-18	Dec-18	May-22
Kurnool	41/APRRP/PRED/KRNL/ROAD/002	11.02	52	Works	NCT	Oct-18	Dec-18	May-22
	42/APRRP/PRED/KRNL/ROAD/003	11.32	31	Works	NCT	Oct-18	Dec-18	May-22
	44/APRRP/PRED/KRNL/BRIDGE/001	7.36	3	Works	NCT	Oct-18	Dec-18	May-22
Ananthapuram	45/APRRP/PRED/ATP/ROAD/001	16.65	106	Works	NCT	Oct-18	Dec-18	May-22
	46/APRRP/PRED/ATP/ROAD/002	10.92	52	Works	NCT	Oct-18	Dec-18	May-22
	48/APRRP/PRED/ATP/ROAD/004	11.88	56	Works	NCT	Oct-18	Dec-18	May-22
Batch III Districts	**Batch III Packages**							
All	13 Packages - Upgrading works	49.46	505	Works	NCT	To be decided		
PMC/Supervision	Supervision, Management	2.00		Consultancy	Open	Jun-18	Sep-18	May-22
Technical Audit	Technical Audit	2.00		Consultancy	Open	May-19	Jul-19	Jun-20
Total:		**603.61**						

Annex 6: Typical Cross Sectional Drawings of Roads and Bridges

Typical Cross Sections		
S. No	**Description**	**Plate No.**
1	Typical Cross Section of BT Road Construction	1
2	Typical Cross Section of CC Road Construction	2
3	Typical Cross Section of Upgradation to BT Roads	3
4	Details of Pipe Culverts	4
5	Details of Slab Culverts	5
6	General Arrangement of Bridge	6

Plate 1: Typical Cross Section of BT Road Construction

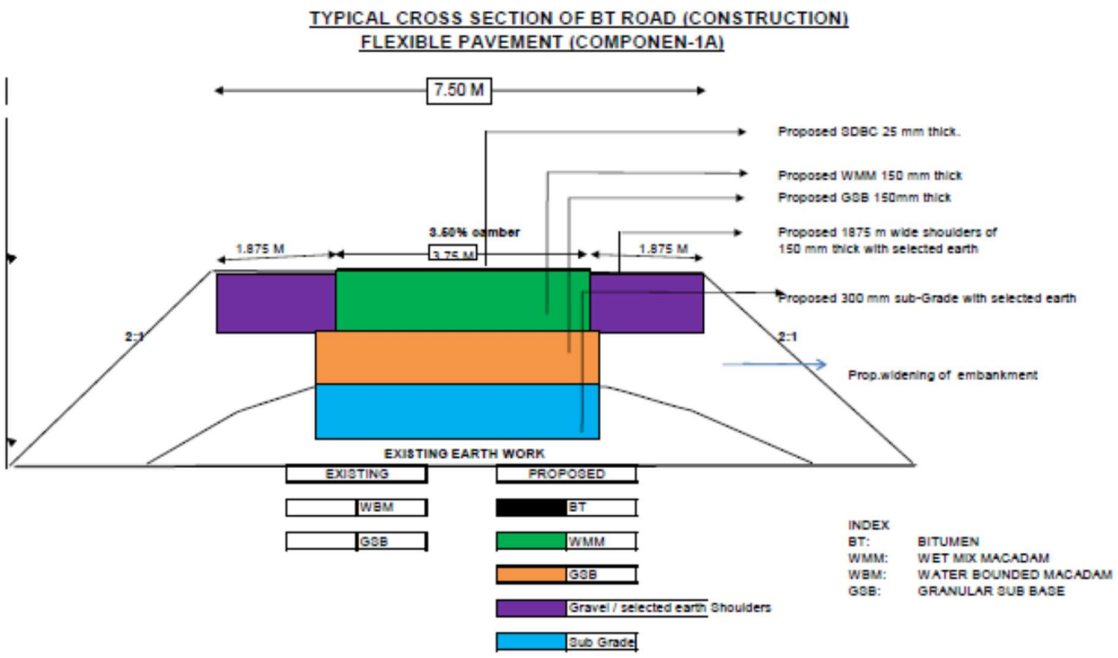


Plate 2: Typical Cross Section of CC Road Construction

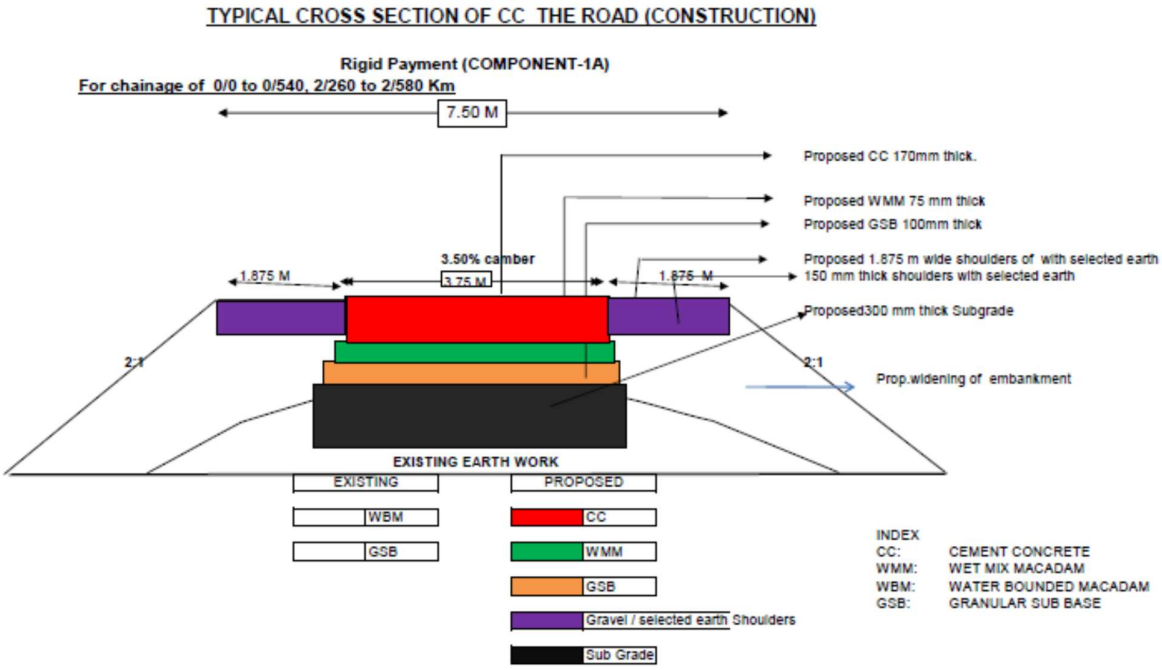


Plate 3: Typical Cross Section of Upgradation to BT Roads

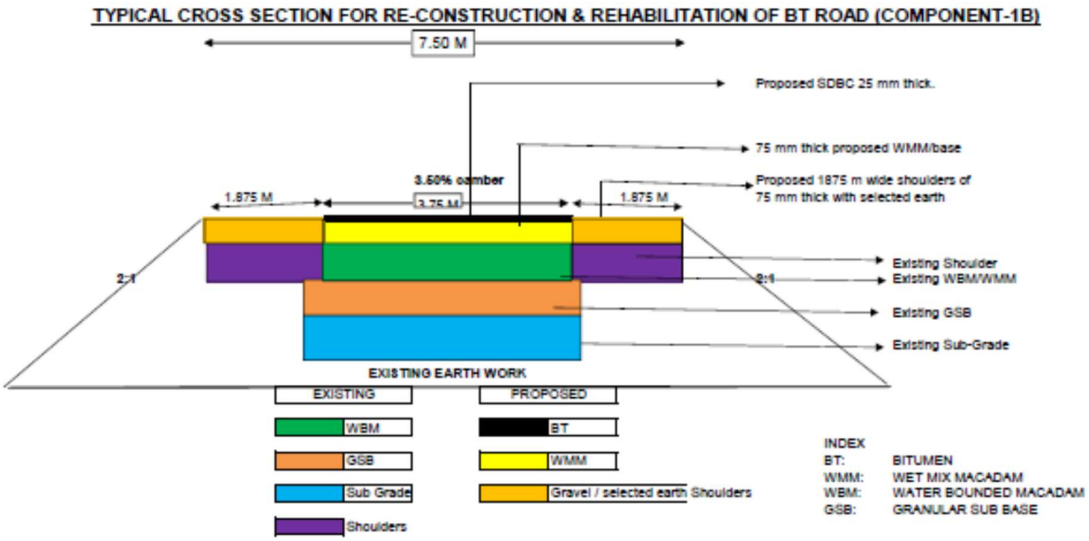
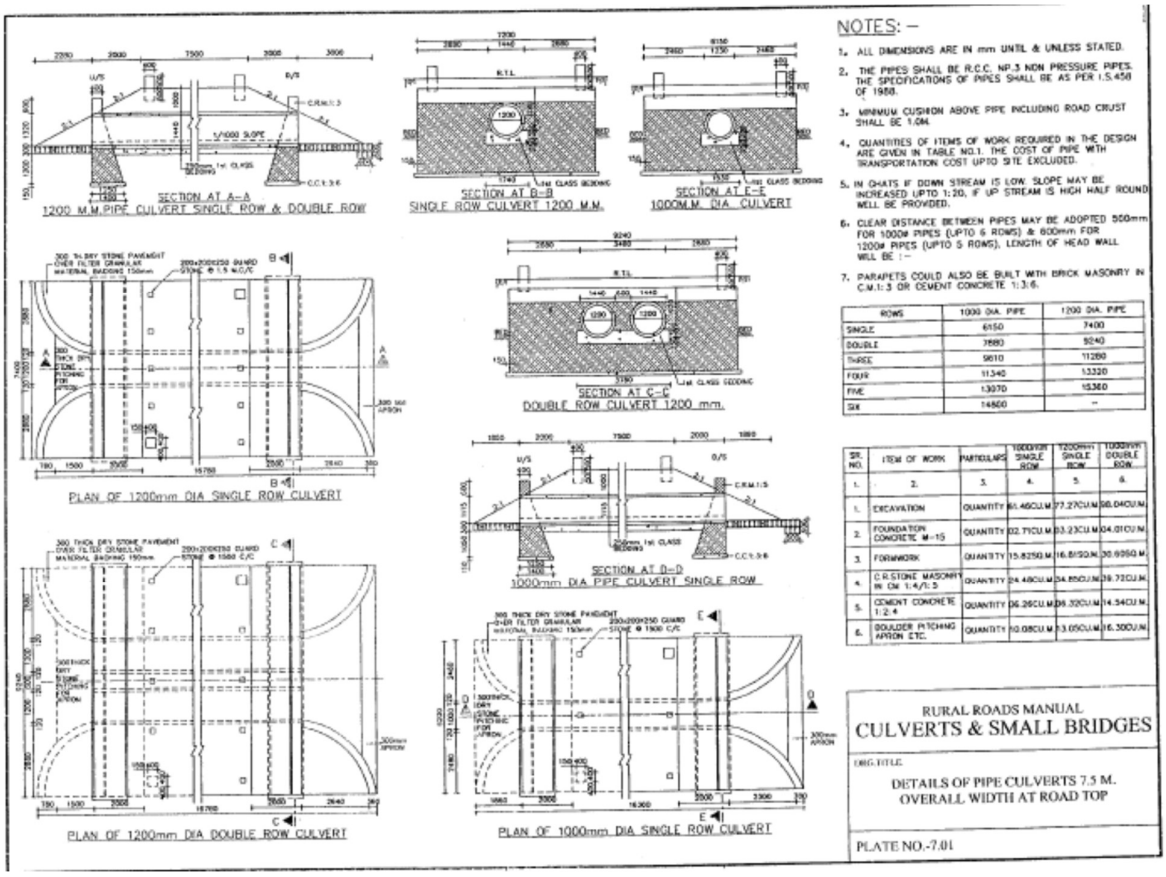


Plate 4: Details of Pipe Culverts



NOTES: –

1. ALL DIMENSIONS ARE IN mm UNTIL & UNLESS STATED.
2. THE PIPES SHALL BE R.C.C. NP.3 NON PRESSURE PIPES. THE SPECIFICATIONS OF PIPES SHALL BE AS PER I.S.458 OF 1988.
3. MINIMUM CUSHION ABOVE PIPE INCLUDING ROAD CRUST SHALL BE 1.0M.
4. QUANTITIES OF ITEMS OF WORK REQUIRED IN THE DESIGN ARE GIVEN IN TABLE NO.1. THE COST OF PIPE WITH TRANSPORTATION COST UPTO SITE EXCLUDED.
5. IN GHATS IF DOWN STREAM IS LOW SLOPE MAY BE INCREASED UPTO 1:20, IF UP STREAM IS HIGH HALF ROUND WELL BE PROVIDED.
6. CLEAR DISTANCE BETWEEN PIPES MAY BE ADOPTED 500mm FOR 1000ø PIPES (UPTO 6 ROWS) & 600mm FOR 1200ø PIPES (UPTO 5 ROWS). LENGTH OF HEAD WALL WILL BE : –
7. PARAPETS COULD ALSO BE BUILT WITH BRICK MASONRY IN C.M.1: 3 OR CEMENT CONCRETE 1:3:6.

ROWS	1000 DIA. PIPE	1200 DIA. PIPE
SINGLE	6150	7400
DOUBLE	7880	9240
THREE	9810	11280
FOUR	11340	13320
FIVE	13070	15360
SIX	14800	--

SR. NO.	ITEM OF WORK	PARTICULARS	1000MM SINGLE ROW	1200MM SINGLE ROW	1000MM DOUBLE ROW
1.	2.	3.	4.	5.	6.
1.	EXCAVATION	QUANTITY	61.46CU.M.	77.27CU.M.	98.04CU.M.
2.	FOUNDATION CONCRETE M-15	QUANTITY	02.71CU.M.	03.23CU.M.	04.01CU.M.
3.	FORMWORK	QUANTITY	15.82SQ.M.	16.81SQ.M.	20.93SQ.M.
4.	C.R.STONE MASONRY IN CM 1:4/1:3	QUANTITY	24.48CU.M.	24.85CU.M.	29.72CU.M.
5.	CEMENT CONCRETE 1:2:4	QUANTITY	06.26CU.M.	06.32CU.M.	14.54CU.M.
6.	BOULDER PITCHING APRON ETC.	QUANTITY	10.08CU.M.	13.05CU.M.	16.30CU.M.

RURAL ROADS MANUAL

CULVERTS & SMALL BRIDGES

DRG.TITLE

DETAILS OF PIPE CULVERTS 7.5 M. OVERALL WIDTH AT ROAD TOP

PLATE NO.-7.01

Plate 5: Details of Slab Culverts

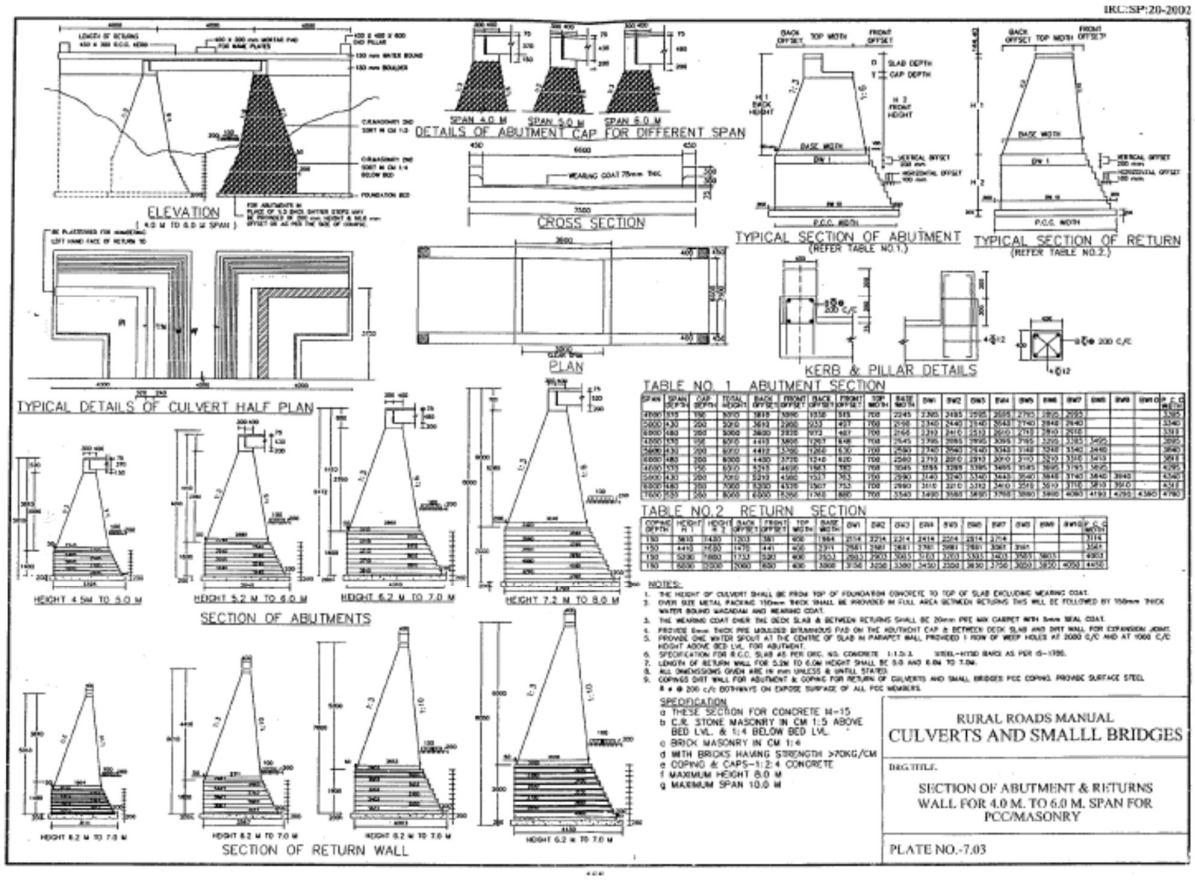


Plate 6: General Arrangement of Bridge