



Report and Recommendation of the President to the Board of Directors

Project Number: 44429-013
May 2016

Proposed Loan India: Climate Adaptation in Vennar Subbasin in Cauvery Delta Project

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Asian Development Bank

CURRENCY EQUIVALENTS

(as of 22 April 2016)

Currency unit – Indian rupee (Re/Rs)

Re1.00 = \$0.01504

\$1.00 = Rs66.4893

ABBREVIATIONS

ADB	–	Asian Development Bank
ha	–	hectare
LIBOR	–	London interbank offered rate
m ³ /year	–	cubic meters per year
O&M	–	operation and maintenance
PAM	–	project administration manual
PMU	–	project management unit
WRD	–	Water Resources Department

GLOSSARY

bed dam	–	a barrier set up across a channel bed to reduce the speed of the flow of water
drainage infall	–	an outlet that drains irrigation fields into drainage or irrigation canals
regulator	–	a structure across a channel through which water flow can be regulated
siphon	–	when a channel passes under a channel or natural stream
sluice	–	sliding gate to control the flow of water

NOTES

- (i) The fiscal year (FY) of the governments of India and Tamil Nadu ends on 31 March. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2016 ends on 31 March 2016.
- (ii) In this report, “\$” refers to US dollars.

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CONTENTS

	Page
PROJECT AT A GLANCE	
I. THE PROPOSAL	1
II. THE PROJECT	1
A. Rationale	1
B. Impacts and Outcome	3
C. Outputs	3
D. Investment and Financing Plans	4
E. Implementation Arrangements	5
III. DUE DILIGENCE	6
A. Technical	6
B. Economic and Financial	6
C. Governance	7
D. Poverty and Social	7
E. Safeguards	8
F. Risks and Mitigating Measures	9
IV. ASSURANCES	9
V. RECOMMENDATION	9
APPENDIXES	
1. Design and Monitoring Framework	10
2. List of Linked Documents	12

PROJECT AT A GLANCE

1. Basic Data		Project Number: 44429-013	
Project Name	Climate Adaptation in Vennar Subbasin in Cauvery Delta Project	Department /Division	SARD/SAER
Country	India	Executing Agency	Water Resources Department, Public Works Department, Government of Tamil Nadu
Borrower	Government of India		
2. Sector	Subsector(s)	ADB Financing (\$ million)	
✓ Agriculture, natural resources and rural development	Agricultural policy, institutional and capacity development		7.00
	Irrigation		93.00
	Total		100.00
3. Strategic Agenda	Subcomponents	Climate Change Information	
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive	Adaptation (\$ million)	50.00
Environmentally sustainable growth (ESG)	Disaster risk management	Climate Change impact on the Project	High
	Global and regional transboundary environmental concerns		
	Natural resources conservation		
4. Drivers of Change	Components	Gender Equity and Mainstreaming	
Governance and capacity development (GCD)	Institutional development	Some gender elements (SGE)	✓
5. Poverty Targeting		Location Impact	
Project directly targets poverty	Yes	Rural	High
Geographic targeting (TI-G)	Yes		
6. Risk Categorization:	Complex		
7. Safeguard Categorization	Environment: B Involuntary Resettlement: A Indigenous Peoples: C		
8. Financing			
Modality and Sources		Amount (\$ million)	
ADB		100.00	
Sovereign Project loan: Ordinary capital resources		100.00	
Cofinancing		0.00	
None		0.00	
Counterpart		44.00	
Government		44.00	
Total		144.00	
9. Effective Development Cooperation			
Use of country procurement systems		Yes	
Use of country public financial management systems		Yes	

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to India for the Climate Adaptation in Vennar Subbasin in Cauvery Delta Project.¹

2. The proposed project will mitigate the impacts of climate change by reducing flood risks and improving the distribution of water for irrigation in an increasingly water-stressed area. This will be achieved through investments in infrastructure and improved water management in six channels,² covering a total command area of 78,000 hectares (ha), in the Vennar system of the Cauvery delta in Tamil Nadu.³

II. THE PROJECT

A. Rationale

3. Tamil Nadu is one of the most water-stressed states in India, with a per capita availability of water resources of 900 cubic meters per year (m³/year) compared with a national average of 1,545 m³/year and a water stress threshold of 1,700 m³/year.⁴ The mean annual rainfall is 912 millimeters, of which 48% comes from the erratic northeast monsoon (October to December) and 32% from the southwest monsoon (June to September). Of the 17 major river basins in Tamil Nadu, the Cauvery Basin is the largest. The Cauvery River flows through the states of Karnataka, Kerala, Tamil Nadu, and the Karaikal enclave of the Union Territory of Puducherry. Around 54% of its catchment area lies within Tamil Nadu.

4. The Cauvery delta lies on the east coast of Tamil Nadu and is referred to as the “rice bowl of Tamil Nadu.” About 73% of the delta’s population of 4.8 million is engaged in farming and fishing, and is dependent on water resources for their livelihoods. However, the availability of water resources in the delta is unreliable and flooding is common during the erratic northeast monsoon. District Revenue Department records estimate damage caused by floods in 2004–2013 at \$70.4 million. Meanwhile, climate change projections indicate an intensification of floods as rainfall increases during the monsoon and sea levels rise. Storm rainfall is predicted to increase by 19%. In coastal areas, flooding will increase because sea levels are projected to rise from 0.29 meters (low scenario) to 0.87 meters (high scenario) by 2100, compared with a 1990 baseline.⁵ Rising temperatures will increase crop water demand and evaporative losses. By 2050, maximum temperatures will rise by 1.0°C–1.5°C, according to climate projections, and minimum temperatures will increase by a larger 2.0°C–3.0°C.⁶ The climate models demonstrate drier conditions from January to May.

5. The sharing of Cauvery waters among the states has been disputed since the 1890s, and in February 2013, the Supreme Court of India upheld the water allocation decision that the Cauvery Waters Dispute Tribunal had made in 2007. Tamil Nadu was allocated 58% of the surface water resources of the basin. Despite high levels of water stress, recurrent flooding, and

¹ The design and monitoring framework is in Appendix 1.

² These are the Valavanar drain and Vedharanyam canal, which convey flood and drainage flows, and the Pandavaiyar, Vellaiyar, Harichandranadhi, and Addapar channels, which serve as irrigation and drainage channels.

³ The Asian Development Bank (ADB) provided project preparatory technical assistance for Climate Adaptation through the Subbasin Development Investment Program (TA 8166-IND).

⁴ Government of India, Press Information Bureau 2012. *Per Capita Water Availability*. News release. 26 April. <http://pib.nic.in/newsite/erelease.aspx?relid=82676>

⁵ ADB. 2014. *Relative Sea Level Rise Scenarios for the Cauvery Delta Zone in Tamil Nadu, India*. Consultant’s report. Manila (TA 8166-IND).

⁶ ADB. 2013. *Climate Data and Future Scenarios*. Consultant’s report. Manila (TA 8166-IND).

increasing risks of climate change, the long-standing dispute prevented investments toward improving the irrigation and drainage systems in the delta beyond essential maintenance. Therefore, the irrigation and drainage systems are dilapidated and unable to effectively convey irrigation and floodwaters. This led to inequitable distribution of irrigation water, with upstream farmers benefiting, and increased flooding due to overtopping or breaching of embankments. Some of the tail-end areas no longer have access to irrigation water. Malfunctioning tail-end regulators led to seawater ingress along channels. In the lower reaches of the delta, the availability of fresh groundwater is limited as a result of variable recharge and saline aquifers. Communities along the lower coastal reaches of the delta are particularly disadvantaged since they have access to neither fresh groundwater nor fresh surface water. This negatively affects the agricultural production in the area. In 2012, because of a poor southwest monsoon, the paddy production in the Cauvery delta was only 825,500 tons—compared with an annual average of 1.6 million tons in 2009–2014. Climate change is expected to exacerbate such vulnerabilities, so the need to upgrade the infrastructure is urgent, as is better water management to meet the present and future needs.

6. At the field level, water use is generally inefficient because of high distribution and field losses, low priority given to water conservation, and highly consumptive crops. Rising temperatures and uncertainties related to future rainfall demonstrate a need for stronger water management. It is essential to support the information systems with robust monitoring networks, good data archiving, and an interface to enable better decision-making in water resource management.

7. Following the 2013 Supreme Court decision, the Water Resources Department (WRD) within the Public Works Department prepared the Cauvery Modernization Proposal, which includes the rehabilitation of most of the flood control and irrigation infrastructure, and improvements to on-farm irrigation systems in the Cauvery delta.⁷ The four main irrigation systems in the delta are Lower Coleroon Anicut, Cauvery, Vennar, and Grand Anicut. Of the four, the Vennar system is considered to be the most critical in terms of vulnerability to flooding and in need of improvements.

8. **The Vennar system.** Irrigation to the delta is supplied from the Cauvery River at the Grand Anicut, where the Cauvery River bifurcates into Cauvery and Vennar. The irrigation systems in the delta have evolved over centuries, whereby natural rivers were adapted to serve as irrigation canals and drains. The result is a complex network of natural and built canals and drains. Most of the regulatory structures in the Vennar system are more than 100 years old and some are fully dilapidated. Shoals formed in the center of the channels hinder the free flow of water, and some tail-end command areas no longer receive surface water. Existing embankments are damaged or weak. At the operational level, water distribution is not systematic and is based mainly on the judgment of WRD staff in response to requests from farmers. At the farm level, the application of irrigation water is inherently inefficient.

9. The Government of Tamil Nadu has requested Asian Development Bank (ADB) financing to upgrade the Vennar system. On-farm irrigation systems will be improved through another project to be financed by the state government and other development partners. The proposed project is consistent with ADB's country partnership strategy, 2013–2017 for India,⁸ which seeks to overcome water insecurity and help communities adapt to climate change, and

⁷ State Government of Tamil. Water Resources Department. *Tamil Nadu: Improvements and Rehabilitation of Irrigation Systems in the Cauvery Basin for Efficient Water Management*. Unpublished.

⁸ ADB. 2013. *Country Partnership Strategy: India, 2013–2017*. Manila.

to promote efficient and sustainable water management in agriculture. The proposed project is aligned with the aims of the Government of India's National Water Policy,⁹ Twelfth Five Year Plan,¹⁰ and National Water Mission.¹¹ The project is also consistent with the state government's Twelfth Five Year Plan, 2012–2017,¹² which includes improving water use efficiency by modernizing irrigation systems and bolstering service delivery. The project is aligned with ADB's strategic and sector goals as articulated in (i) ADB's Strategy 2020 and its midterm review;¹³ (ii) the Water for All policy;¹⁴ (iii) the Water Operational Plan, 2011–2020;¹⁵ and (iv) the Operational Plan for Integrated Disaster Risk Management, 2014–2020.¹⁶ They all aim to reduce the water demand–supply gap in water-scarce areas, foster integrated water resource management, improve water governance and delivery of services, improve resilience to climate change, integrate disaster risk reduction in development, and reinforce the intersection between disaster risk management and climate change adaptation.

B. Impacts and Outcome

10. The impacts will be (i) coastal districts are protected from cyclones and flooding exacerbated by climate change; and (ii) innovative and inclusive economic growth, including agricultural growth, in Tamil Nadu is accelerated. The outcome will be that climate-resilient water management in the Vennar system is improved.

C. Outputs

11. The outputs of the project are (i) flood risk management and irrigation infrastructure upgraded, and (ii) improved water and flood risk management systems established.

12. **Output 1: Flood risk management and irrigation infrastructure upgraded.** Structures will be improved according to new design guidelines that consider climate change impacts. More-resilient flood management structures will reduce the frequency and impact of flooding. The civil works involve (i) resectioning and strengthening the embankments of six main channels totaling 235 kilometers to improve their resilience and flood conveyance capacity; (ii) improving conveyance of three straight cuts between the Vedharanyam canal and the sea;¹⁷ (iii) constructing 4 new regulators, reconstructing 10 dysfunctional regulators, and repairing 13 damaged regulators; (iv) doing work (new, upgrades, and repairs) on 133 irrigation head sluices offtaking from the main channels; (v) upgrading 20 bed dams and grade walls within the main channels; (vi) upgrading 136 other minor irrigation and drainage structures; and (vii) upgrading 13 pump stations through new pumps and electrical systems and repairs to pump houses.

⁹ Government of India, Ministry of Water Resources. 2012. *National Water Policy*. Delhi.

¹⁰ Government of India, Ministry of Finance, Planning Commission. 2012. *Twelfth Five Year Plan, 2012–2017: Faster, More Inclusive and Sustainable Growth*. Delhi.

¹¹ Government of India, Ministry of Water Resources. 2009. *National Water Mission*. New Delhi.

¹² Government of Tamil Nadu, State Planning Commission. 2012. *Twelfth Five Year Plan: Tamil Nadu, 2012–2017*. Chennai.

¹³ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila; and ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific*. Manila.

¹⁴ ADB. 2003. *Water for All: The Water Policy of the Asian Development Bank*. Manila.

¹⁵ ADB. 2011. *Water Operational Plan, 2011–2020*. Manila.

¹⁶ ADB. 2014. *Operational Plan for Integrated Disaster Risk Management, 2014–2020*. Manila.

¹⁷ The straight cuts allow the floodwaters of the three channels that fall into the Vedharanyam canal to be discharged directly to the sea, instead of flowing through the Vedharanyam canal, which cannot fully drain the combined floodwaters.

13. **Output 2: Improved water and flood risk management systems established.** This output will deliver nonstructural interventions designed to (i) improve decision-making on water resources, and (ii) manage flood risks and flood events. Initiatives to be developed under (i) are: (a) greater participation by stakeholders in the planning and delivery of water services through the formation of channel stakeholder groups; (b) better assessment of water resources through the installation of additional equipment to monitor and measure rainfall, surface water, groundwater, and tide levels and flows; (c) development of a decision support system that would provide system status information and enable more accurate water allocation planning and more effective asset management; and (d) training for WRD officers on more effective management of water resources. Flood risks and flood events will be managed by (i) installing flood forecasting and warning systems, and (ii) mapping flood risks. The output also includes a feasibility study, and the detailed design of similar improvements in the remainder of the Vennar and Cauvery systems that may be financed under a subsequent project.

D. Investment and Financing Plans

14. The project is estimated to cost \$144 million (Table 1).

Table 1: Project Investment Plan
(\$ million)

Item	Amount ^a
A. Base Cost^b	
1. Flood risk management and irrigation infrastructure upgraded	126.6
2. Improved water and flood risk management systems established	4.2
Subtotal (A)	130.8
B. Contingencies^c	6.2
C. Financing Charges During Implementation^d	7.0
Total (A+B+C)	144.0

Note: Numbers may not sum because of rounding.

^a Includes taxes and duties of \$900,000 to be financed from government resources as cash contributions.

^b At end-2015 prices.

^c Physical contingencies computed at 3% for civil works and 0% for all other items. Price contingencies computed at 2% on local currency costs using Asian Development Bank (ADB) domestic cost escalation factors for FY2015–2019 as of October 2015; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

^d Includes interest and commitment charges. Interest during construction for the ADB loan has been computed at the 5-year forward London interbank offered rate (LIBOR) plus a spread of 0.5%, with an average maturity of 19 years, and an additional maturity premium of 0.2%. Commitment charges for the ADB loan are at 0.15% of the undisbursed amount.

Source: Asian Development Bank estimates.

15. The Government of India has requested a loan of \$100 million from ADB's ordinary capital resources to help finance the project. The loan will have a 25-year term, including a grace period of 5 years, 12.74% annuity repayment method, an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility, a commitment charge of 0.15% per year, and such other terms and conditions set forth in the loan and project agreements. The government has requested that repayment will follow the annuity method repayment option. Based on these loan terms and repayment method, the average loan maturity is 19 years and the maturity premium is 0.2%.

Table 2: Financing Plan

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank ^a		
Ordinary capital resources (loan)	100.0	69.4
Government of Tamil Nadu	44.0	30.6
Total	144.0	100.0

^a The loan may finance local transportation and insurance costs and bank charges.

Source: Asian Development Bank estimates.

E. Implementation Arrangements

16. The implementation arrangements are summarized in Table 3 and described in detail in the project administration manual (PAM).¹⁸

Table 3: Implementation Arrangements

Aspects	Arrangements		
Implementation period	August 2016–December 2020		
Estimated completion date	31 December 2020		
Loan closing date	30 June 2021		
Management			
(i) Oversight body	State Project Steering Committee Secretary of the Public Works Department (chair) Representatives of key stakeholder departments (Department of Finance, Revenue Department, Department of Agriculture, Department of Fisheries, Department of Highways and Minor Ports, Department of Environment and Forest), and director of the State Water Resources Management Agency (members)		
(ii) Executing agency	Government of Tamil Nadu acting through its Water Resources Department		
Procurement	NCB	9 contracts	\$111,194,000
	Shopping	Various	\$365,000
Consulting services	80:20 QCBS: project technical advisory	International: 25 person-months; National: 74 person-months	\$1,100,000
	80:20 QCBS: internal audit	National: 26 person-months	\$240,000
	80:20 QCBS: MIS development and maintenance	To be identified	\$300,000
	80:20 QCBS: topography survey (2 packages)	To be identified	\$875,000
	LCS: resettlement plan implementation	National: 50 person-months	\$42,000
	ICS: project implementation	National: 8 experts, 110 person-months	\$710,803
Retroactive financing and/or advance contracting	Advance contracting and retroactive financing of civil works, equipment, and consulting services. Retroactive financing will be considered for eligible expenditures not exceeding 20% of the loan amount incurred prior to loan effectiveness, but not earlier than 12 months before the loan agreement is signed.		

¹⁸ Project Administration Manual (accessible from the list of linked documents in Appendix 2).

Aspects	Arrangements
Disbursement	The loan proceeds will be disbursed in accordance with ADB's <i>Loan Disbursement Handbook</i> (2015, as amended from time to time) and detailed arrangements agreed between the government and ADB.

ADB = Asian Development Bank, ICS = individual consultant selection, LCS = least-cost selection, MIS = management information system, NCB = national competitive bidding, QCBS = quality- and cost-based selection.
Source: Asian Development Bank.

III. DUE DILIGENCE

A. Technical

17. Hydraulic modeling of the main channel system was a key component of technical due diligence in the project's preparation, supported by hydrological modeling of the catchments in the project area to provide runoff response to rainfall. Models were run for 25-, 50-, and 100-year return events with and without climate change. While the modeling has accuracy limitations for lack of data, it provided a sound and rational basis for evaluating the differences in floodwater levels and flood extents between the existing and proposed conditions, both with and without climate change impacts. The climate change projections indicate a range of scenarios, and common themes are higher sea levels, reduced dry-season rainfall, and increased likelihood of severe rainfall events. Designs included strengthening and raising the height of embankments to withstand a 25-year return flood, and rehabilitating principal regulators to pass a 50-year return flood. The design options comprised (i) reviewing the rationale for the proposed design, specific components, and operational modes; (ii) considering a range of technical alternatives and their technical and economic viability; (iii) maximizing the beneficiary areas and communities; (iv) minimizing adverse environmental and social impacts; and (v) optimizing timescales for project implementation.

B. Economic and Financial

18. Maintaining agricultural production at present levels by upgrading irrigation structures and rehabilitating pumping schemes to restore water supplies to the original command areas is expected to yield agricultural benefits. Repairing or reconstructing drainage sluices and infalls, siphons, and tail-end regulators will help crops in the lower end of drainage areas to avoid flood damage. A risk-modeling framework was used to estimate the project benefits since the remaining life of the irrigation and drainage structures and of the pumping schemes to be repaired or replaced is not known with certainty. The economic analysis indicates that the project is economically viable, with the risk model measuring an overall project economic internal rate of return ranging from a minimum 17.2% to a maximum 19.8%. The mean economic internal rate of return was 18.3%. The project remained economically viable to sensitivity analysis on reduced project benefits and increased investment costs.

19. A distribution and poverty analysis estimated the distribution of the benefits among various stakeholder categories: farmers, marginal farmers (with less than 1 ha of land), hired labor and/or landless, and the government and/or society. The results indicate that the bulk of the net benefits will go to the farmers (58%) and marginal farmers (42%), and a poverty impact ratio¹⁹ of 26% was estimated. The financial sustainability of the project will depend on the timely availability of operation and maintenance (O&M) funds allocated by the government to WRD. The maintenance needs are significant, but capital investments have historically been very low as a result of the water dispute. The system requires a complete overhaul, and routine

¹⁹ The proportion of net discount benefits that go to the poor.

maintenance alone is insufficient to improve the performance of the system. WRD spends about Rs1,573 million annually on the O&M of about 4.1 million ha, indicating an average expenditure of Rs384 per ha. The state government has committed to borrow to invest in capital expenditure, and it has also committed to use its own O&M resources amounting to 2% of the capital costs per annum.

C. Governance

20. Financial management and procurement capacity assessments were undertaken for WRD. WRD will be responsible for implementing the project, as well as the O&M of the infrastructure after its commissioning. The financial management assessment concludes that WRD has sufficient experience and capacity to manage the project funds. The overall pre-mitigation financial management risk is rated *moderate*, primarily due to the absence of an internal audit function, delays in completion of annual audited financial statements, and manual record keeping. Risk mitigating measures are described in detail in the PAM, including an outsourced internal audit and augmented staffing, based on which the overall financial management arrangements are considered adequate for the project. The pre-mitigation procurement risk is rated *substantial*. WRD has experience in competitive bidding processes but is accustomed to different procedures. It also has limited experience in recruiting consulting firms. The project will provide training on ADB's rules and procedures, and a procurement specialist will directly support the project management unit (PMU).

21. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government and WRD. The results of the financial management and procurement capacity assessment, and the specific policy requirements and supplementary measures are described in the PAM.

D. Poverty and Social

22. Over 40% of the inhabitants of Tamil Nadu depend on agriculture for their livelihoods. The project aims to sustain agricultural production by reducing the impact of flooding and improving the reliability of irrigation water supply. Since the majority of rural households are engaged in agriculture, the project will help reduce poverty in rural areas. In addition, around 335,000 households will benefit from fewer flood risks. Farmers consulted during project preparation indicated that uncertainty in production arising from unreliability in irrigation water has put them in the trap of noninstitutional borrowing. The census and socioeconomic surveys undertaken indicate that 53.2% of project-affected people depend on cultivation or agricultural labor. The average monthly family income of households²⁰ was reported as Rs10,831 and, among them, 30% of households reported an income lower than the updated state-specific poverty line of Rs1,677 per capita per month.²¹ Therefore, the proposed project will benefit the majority of the community in the project area. The project is classified as some gender elements, where women will benefit from (i) capacity-building programs for WRD staff, (ii) increased participation in water management through membership in channel stakeholder groups, and (iii) skills training for farmers on improved agricultural practices.

²⁰ The census survey identified 3,316 project-affected households, but only 2,511 households provided income details.

²¹ The Planning Commission of India's state-specific poverty line for 2011–2012 is Rs1,081.94 for rural Tamil Nadu. This was raised to Rs1,676.54 in October 2015.

23. The contractors will be required to implement appropriate measures regarding the health and safety of men and women who work at the construction sites. The contractors, in close coordination with the PMU, will conduct awareness programs on the prevention of sexually transmitted diseases, drug use, gender issues, and core labor standards.

E. Safeguards

24. **Involuntary resettlement.** The project will not involve any land acquisition since all works along the six channels will be within the available right-of-way. The project will have a significant impact because 3,235 households in informal settlements on the channel embankments—comprising 2,642 residences, 478 shops, and 115 cattle sheds and/or other sheds—will be displaced. In total, 12,887 persons will be affected. Therefore, the project is classified as category A in accordance with ADB's Safeguard Policy Statement (2009). A resettlement plan complying with government regulations on resettlement rehabilitation and ADB's safeguard requirements for involuntary resettlement was prepared.²² The plan was prepared in consultation with the affected people and comprehensively assesses the impacts of involuntary resettlement. It provides adequate measures to manage these impacts. The resettlement plan is based on the detailed design and therefore is considered final, unless unanticipated changes in design are encountered during project implementation. To strengthen the capacity of WRD in implementing the resettlement plan, the PMU will be assisted by a nongovernment organization and a social development consultant. An external monitoring consultant will also be engaged to monitor the implementation of the resettlement plan. WRD has secured the budget to implement the resettlement plan, including the recruitment of consultants.

25. **Indigenous people.** The due diligence found that there are no indigenous peoples, as defined by the Safeguard Policy Statement, in the project-affected areas. The project is classified as category C for the indigenous peoples safeguard.

26. **Environment.** The project is classified as category B in accordance with the Safeguard Policy Statement, and an initial environmental examination with an environmental management plan was prepared.²³ The project involves resectioning channels; rehabilitating embankments; de-silting channel beds; and constructing new or upgrading existing regulators, drainage outfalls, irrigation outfalls, and infalls. Key negative impacts associated with the project are akin to those related to construction, such as noise, dust, impacts on embankment vegetation, increased turbidity due to de-silting operations, and impacts associated with the disposal of dredged material. Mitigation measures were identified and included in the initial environmental examination and environmental management plan. The positive impacts include improved conveyance of water to downstream users and fewer flooding risks. The PMU and project implementation units will be assisted by an environment specialist who is part of the project implementation consultancy team to monitor the implementation of the environmental management plan. In addition, WRD staff will be trained on environmental monitoring and management. Stakeholders were consulted and will continue to be consulted during implementation, as described in the stakeholder communications strategy. A grievance redress mechanism to manage both social and environmental issues will be established prior to project implementation.

²² Resettlement Plan (accessible from the list of linked documents in Appendix 2).

²³ Initial Environmental Examination (accessible from the list of linked documents in Appendix 2).

F. Risks and Mitigating Measures

27. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.²⁴ Based on the overall assessment, the integrated benefits and impacts are expected to outweigh the costs.

Table 4: Summary of Risks and Mitigating Measures

Risks	Mitigating Measures
Delays in commencement of works and services due to lack of familiarity with ADB bidding procedures and lengthy government approval processes	Train WRD staff before and after loan approval. Conduct advance action for procurement and consultant recruitment. Deploy WRD staff with prior experience in implementing projects funded by development partners. Project implementation consultants will include financial management and procurement specialists to support WRD.
No internal audit system for WRD transactions	Hire independent firm of chartered accountants to undertake an internal audit.

ADB = Asian Development Bank, WRD = Water Resources Department.
Source: Asian Development Bank.

IV. ASSURANCES

28. The governments of India and Tamil Nadu, and WRD have assured ADB that implementation of the project shall conform to all applicable ADB policies, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the PAM and loan documents.

29. The governments of India and Tamil Nadu and WRD have agreed with ADB on certain covenants for the project, which are set forth in the loan and project agreements.

V. RECOMMENDATION

30. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of \$100,000,000 to India for the Climate Adaptation in Vennar Subbasin in Cauvery Delta Project, from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board.

Takehiko Nakao
President

13 May 2016

²⁴ Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

DESIGN AND MONITORING FRAMEWORK

Impacts the Project is Aligned with			
(i) Coastal districts are protected from cyclones and flooding exacerbated by climate change (Vision Tamil Nadu, 2023) ^a (ii) Innovative and inclusive economic growth, including agricultural growth, in Tamil Nadu is accelerated (Twelfth Five Year Plan, 2012–2017) ^b			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
Outcome Climate-resilient water management in the Vennar system improved	By 2021 a. 3,500 ha of land in tail-end areas have renewed access to irrigation (2015 baseline: 0) b. 10,500 ha of land protected from river flooding (2008 baseline: area inundated without project is 21,300 ha) c. The minimum average annual paddy yield for the project area (78,000 ha) is sustained at 2,800 kg/ha	a. WRD records b. District collectors' reports c. Agriculture Department annual statistics report	Floods exceed design limit
Outputs 1. Flood risk management and irrigation infrastructure upgraded 2. Improved water and flood risk management systems established	By 2020 1a. 200 km of climate-resilient embankment rehabilitated to withstand a 25-year return flood (2015 baseline: 50 km of embankment) 1b. 4 new regulators constructed, 10 regulators replaced, 13 upgraded, and 133 head sluices upgraded to be fully functional (2015 baseline: regulators and sluices are only partially functional) 1c. 13 irrigation pumping schemes rehabilitated (2015 baseline: pumping schemes functioning at 40% efficiency) 1d. Cumulative seawater ingress along channels decreased to 4 km (2015 baseline: cumulative seawater ingress 37 km) 2a. WRD staff use DSS to support operational decision-making (2015 baseline: no DSS is available in 2015)	1a. PMU reports, WRD database 1b–d. WRD database 2a. WRD operational records	DSS-trained staff are moved to other areas of operation

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
	<p>2b. Flood warnings issued by WRD, through district collectors, to the public at least 24 hours in advance (2015 baseline: 12 hours in advance)</p> <p>2c. Channel stakeholder groups, comprising 20% women among farmer representatives, established (2015 baseline: channel stakeholder groups do not exist)</p> <p>2d. 140 WRD staff, comprising 10% women, trained in improved water resource management</p> <p>2e. Feasibility study and detailed design for the remainder of the Vennar and Cauvery systems (2015 baseline: 0)</p>	<p>2b. District collectors' reports</p> <p>2c–d. WRD records</p> <p>2e. Project progress reports</p>	

Key Activities with Milestones

1. Flood risk management and irrigation infrastructure upgraded

- 1.1 Implement resettlement plan (July 2016–June 2018)
- 1.2 Procure civil works (June 2015–October 2016)
- 1.3 Mobilize project implementation consultants (December 2015–April 2016)
- 1.4 Implement and complete civil works by April 2020

2. Improved water and flood risk management systems established

- 2.1 Mobilize technical advisory consultants by July 2017
- 2.2 Procure DSS and flood warning equipment by February 2018
- 2.3 Install DSS equipment and make it functional by October 2018
- 2.4 Prepare follow-on project by October 2018

Project Management Activities

PMU fully established by June 2016

Inputs

ADB: \$100 million (loan)

Government of Tamil Nadu: \$44 million

Assumptions for Partner Financing

Not applicable

ADB = Asian Development Bank, DSS = decision support system, ha = hectare, kg = kilogram, km = kilometer, PMU = project management unit, WRD = Water Resources Department.

^a Government of Tamil Nadu. 2012. *Vision Tamil Nadu, 2023: Strategic Plan for Infrastructure Development in Tamil Nadu*. Chennai.

^b Government of Tamil Nadu, State Planning Commission. 2012. *Twelfth Five Year Plan: Tamil Nadu, 2012–2017*. Chennai.

Source: Asian Development Bank.

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/RRPs/?id=44429-013-3>

1. Loan Agreement
2. Project Agreement
3. Sector Assessment (Summary): Agriculture, Natural Resources, and Rural Development
4. Project Administration Manual
5. Contribution to the ADB Results Framework
6. Development Coordination
7. Economic and Financial Analysis
8. Country Economic Indicators
9. Summary Poverty Reduction and Social Strategy
10. Initial Environmental Examination
11. Resettlement Plan
12. Risk Assessment and Risk Management Plan

Supplementary Documents

13. Project Climate Risk and Management Assessment Report
14. Detailed Economic and Financial Analysis
15. Financial Management Assessment
16. Procurement Capacity Assessment
17. Relative Sea Level Rise Scenarios
18. Climate Data and Future Scenarios for the Cauvery Delta Zone