



Completion Report

Project Number: 38411-023
Loan Numbers: 2444 and 8240
August 2017

India: Orissa Integrated Irrigated Agriculture and Water Management Investment Program – Project 1

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Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit		–	Indian rupees (₹)
		At Appraisal (1 August 2009)	At Project Completion (14 February 2017)
₹1.00	=	\$0.0235	\$0.0150
\$1.00	=	₹42.49	₹66.763

ABBREVIATIONS

ADB	–	Asian Development Bank
CAD	–	command area development
CCA	–	Certified Command Area
CO	–	Community Organizer
DMF	–	design and monitoring framework
DOA	–	Department of Agriculture
DOWR	–	Department of Water Resources
EE	–	Executive Engineer
EIC	–	Engineer-in-Chief
EIRR	–	Economic internal rate of return
ERM	–	Extension, Renovation, and Modernization
GAP	–	gender action plan
GIS	–	Geographical Information System
ha	–	hectares
IEE	–	initial environmental examinations
IPM	–	Integrated Pest Management
ISPMC	–	Institutional Strengthening and Project Management Consultant
IWRM	–	Integrated Water Resources Management
MCI	–	Mahanadi Chitropala Island
MMF	–	multitranchise financing facility
MIS	–	management information system
MLI	–	Minor Lift Irrigation
NGO	–	non-governmental organization
NIA	–	Net Irrigated Area
OFID	–	OPEC Fund for International Development
OIIAWMIP	–	Orissa Integrated Irrigated Agriculture and Water Management Investment Program
OPEC	–	Organization of Petroleum Exporting Countries
O&M	–	operation and maintenance
PIM	–	Participatory Irrigation Management
PMU	–	project management unit
PMS	–	Project Management System
PP	–	Pani Panchayat (WUA at minor canal command level)
PSC	–	Project Steering Committee
QC	–	quality control
RBO	–	River Basin Organization
RRP	–	report and recommendation of the President
SIO	–	Sub-Project Implementation Office
SRI	–	System of Rice Intensification

SST	–	Support Services Team
TA	–	Technical Assistance
WALMI	–	Water and Land Management Institute
WUA	–	Water User Association

NOTES

- (i) The fiscal year (FY) of the Government of India ends on 31 March. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2017 ends on 31 March 2017.
- (ii) In this report, “\$” refers to US dollars.

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BASIC DATA

A. Loan Identification

1.	Country	India
2.	Loan Numbers	2444 (ADB) and 8240 (OFID)
3.	Project Title	Orissa Integrated Irrigated Agriculture and Water Management Investment Program– Project 1
4.	Borrower	Government of India
5.	Executing Agency	Department of Water Resources
6.	Amount of Loan	\$16.5 million (ADB), \$30 million (OFID)
7.	Project Completion Report Number	1641

B. Loan Data

1.	Appraisal	ADB Loan	OFID Loan
	– Date Started	5 December 2007	NA
	– Date Completed	21 December 2011	
2.	Loan Negotiations		
	– Date Started	7 August 2008	NA
	– Date Completed	8 August 2008	
3.	Date of Board Approval	26 September 2008	8 October 2008
4.	Date of Loan Agreement	25 February 2009	12 March 2009
5.	Date of Loan Effectiveness		
	– In Loan Agreement	26 May 2009	10 June 2009
	– Actual	4 June 2009	29 May 2009
	– Number of Extensions	NA	NA
6.	Closing Date		
	– In Loan Agreement	30 September 2013	31 October 2013
	– Actual	14 February 2017	
	– Number of Extensions	2	3
7.	Terms of Loan		
	– Interest Rate	LIBOR +0.60%	1.75%
	– Maturity (number of years)	25	20
	– Grace Period (number of years)	7	5

8. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
7 December 2009	2 February 2016	6 years, 2 months
Effective Date	Original Closing Date	Time Interval
4 June 2009	30 September 2013	4 years, 4 months

b. Amount (\$)

Category	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
01A Works – Major & Medium Schemes (Main and Distibutary Canals)	4,300,000	3,900,000	-	3,900,000	3,536,152	363,848
01B Works – Major & Medium Schemes (Minor Canals)	-	-	-	-	-	-
01C Works – Command Area Development	600,000	2,095,000	-	2,095,000	2,566,765	(471,765)
01D Works – Minor Lift Schemes	-	-	-	-	-	-
01E Works – O&M Support	100,000	75,000	-	75,000	74,349	651
01F Works – Other	600,000	1,080,000	-	1,080,000	1,079,791	209
02A Vehicles & Equipment-Minor Lift Equipment	-	-	-	-	-	-
02B Vehicles & Equipment – Vehicles	100,000	-	-	-	-	-
02C Vehicles & Equipment – Equipment & Materials	1,100,000	100,000	-	100,000	100,990	(990)
03A Specialist Services – NGO Special Mobilization	700,000	755,000	-	755,000	792,335	(37,335)
03B Specialist Services – TA Consultant	3,100,000	4,050,000	-	4,050,000	4,049,279	721
03C Specialist Services – Minor Lift Implementation	600,000	870,000	-	870,000	609,033	260,967

03D	Specialist Services – Resettlement Plan Implementation	100,000	50,000	-	50,000	30,920	19,080
03E	Specialist Services – Studies	300,000	-	-	-	-	-
04	Survey & Investigation	500,000	945,000	-	945,000	916,199	28,801
05	Training	1,200,000	500,000	-	500,000	449,976	50,024
06	Incremental operational costs	900,000	2,080,000	-	2,080,000	2,294,210	(214,210)
07	Unallocated	2,300,000	-	-	-	-	-
Total		16,500,000	16,500,000	-	16,500,000	16,500,000	0

C. Project Data

1. Project Cost (\$)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	66.40	62.13
Total	66.40	62.13

2. Financing Plan (\$ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	14.70	18.23
ADB Financed	16.50	16.50
OFID	30.00	24.55
Beneficiaries	1.80	1.29
Subtotal	63.00	60.57
IDC Costs		
Borrower Financed	3.40	1.56
ADB Financed	0.00	0.00
Other External Financing	0.00	0.00
Beneficiaries	0.00	0.00
Subtotal	3.40	1.56
Total	66.40	62.13

ADB = Asian Development Bank, IDC = interest during construction.

3. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate	Actual
A. Irrigated Agriculture Management Systems		
1. Planning and WUA Development	0.9	1.47
2. Irrigation and Associated Infrastructure	40.9	45.50
3. Agriculture and Livelihoods Support	0.6	0.06
4. Sustainable O&M	0.2	0.31
Subtotal	42.6	47.34
B. Institutional Development		
1. Institutional Strengthening	6.6	6.0
2. Project Management	4.3	7.23
Subtotal	10.9	13.23
C. Contingencies		
Price and Physical Contingencies	9.5	0.00
D. Financing Charges	3.4	1.56
Total	66.4	62.13

4. Project Schedule

Item	Appraisal Estimate	Actual
Social Mobilization of PPs and Micro-planning	January 2010	December 2009
Civil Works (Main structures except MCI)	January 2010	June 2009
Civil Works (minor structures including design except MCI)	January 2011	April 2010
Resettlement Plan Implementation (MCI)	January 2010	September 2009
Civil Works (MCI including design)	July 2010	April 2014
Command Area Development and Conjunctive Use	January 2010	June 2009
Agriculture and Allied Sector Support, and Livelihood Enhancement	January 2010	December 2009
O&M Support	January 2011	April 2013
Minor Lift Schemes	January 2010	September 2009
Project Management	April 2009	June 2009
Mobilization of ISPM Consultants	April 2009	August 2009
DOWR Strengthening	April 2009	August 2009
Training	April 2009	August 2009

DOWR = Department of Water Resources, MCI = Mahanadi Chitropala island irrigation, O&M = operation and maintenance, PP = pani panchayat

5. Project Performance Report Ratings

Implementation Period	Rating	
	Development Objectives	Implementation Progress
From 30 September 2008 to 31 December 2010	Satisfactory	Satisfactory
From 1 January 2011 to 31 March 2011		Potential Problem
From 1 April 2011 to 30 June 2012		On Track
From 1 July 2012 to 31 December 2012		Potential Problem
From 1 January 2013 to 31 December 2013		Potential Problem
From 1 January 2014 to 31 December 2015		On Track

D. Data on ADB Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Special Loan Administration Mission	9 to 13 Feb 2009	2	8	g, h
Special Loan Administration Mission	10 to 11 Jun 2009	1	1	g
Inception Mission	29 Oct to 7 Nov 2009	4	21	g, h, i, c
Special Loan Administration Mission	25 Jan to 01 Feb 2010	2	14	g, i
Special Loan Administration Mission	24 to 27 Apr 2010	2	3	h, i
Review Mission	16 to 28 June 2010	1	12	i
Special Loan Administration Mission	23 Aug to 3 Sep 2010	2	13	h, i
Special Loan Administration Mission	25 Oct to 11 Nov 2010	1	17	h
Review Mission	5 to 14 Feb 2011	3	19	g, i, j
Project-1 Review during Project-2	18 to 30 May 2011	3	21	g, h, j
Fact Finding Mission				
Review Mission	5 to 9 Sep 2011	2	8	g, h
Review Mission	30 Jan to 04 Feb 2012	6	24	h, i, f, m, a, g
Review Mission	10 to 14 Sep 2012	3	8	h, l, a
Loan Midterm Review Mission	16 to 26 Sep 2013	8	29	h, j, g, l, b, c, k, i
Review Mission	7 to 14 July 2014	2	14	h, c
Consultation (Project 2) and Special Project Administration (Project 1 and JFPR) Mission	11 to 14 Nov 2014	2	8	h, g
Consultation and Review Mission	19 to 26 Feb 2015	2	14	h, g
Review Mission	21 to 25 July 2015	1	4	h
Review Mission	24 Nov to 8 Dec 2015	3	42	h, g, f/j
Review Mission	16 to 25 May 2016	7	51	h, g, f, j, c, l, f/j
Project Completion Review Mission	17 to 29 April 2017	5	54	h/i,c,d,l,j

a = engineer, b = financial analyst, c = project analyst, d = economist, e = procurement specialist, f = environment specialist, g = programs officer, h= mission leader, i = water specialist, j=social specialist, k= gender specialist, l= project implementation officer, m = design & O&M.

Source: ADB.

I. PROJECT DESCRIPTION

1. India's rapid overall economic growth is contributing to growing urban–rural disparity amidst chronic high rural poverty. This has emerged as a major concern. Growth in agriculture and related rural non-farm sectors has been stagnant and the sector is undergoing a slow transformation to more intensive and high-value production and processing systems.

2. Odisha (formerly Orissa) is one of the poorest states in India, and despite recent acceleration of its annual economic growth rates to 7%, the disparity with the national average is widening. The Government of Odisha considers improvements in irrigated agriculture as central to reducing rural poverty. The agricultural industry employed 60% of available labor in 2008 and generated one-third of the state's domestic product. However, productivity of this sector was poor and agricultural diversification was low due to the condition of the irrigation infrastructure. Less than half of agricultural land was equipped with irrigation facilities, and of the schemes that were operating, one-third hardly received any water. Inconsistent irrigation supply was due to poor system design, inefficient operation, lack of field channels, limited accountability in system management to farmers, and insufficient maintenance.

3. The government has taken steps to improve the situation and support better agricultural productivity and sustainability. It progressively developed the policy, planning, and institutional basis for the irrigation and water resources sector in the decade prior to project design. The government also initiated comprehensive economic reforms in the early 2000s, aimed at inclusive growth with stronger public sector accountability and community and private sector participation. Within this context, the government was keen to further advance participatory irrigation management (PIM)¹ in irrigation schemes and incorporate good practices from other Asian countries and Indian states to attain higher agricultural productivity and sustainability.

4. The Orissa Integrated Irrigated Agriculture and Water Management Investment Program was designed as a multitranche financing facility (MFF) supporting the government's agricultural goals.² The investment program was approved in September 2008 for \$268.8 million, to be implemented over 8 years with four tranches.³ The impact of project 1 was to enhance economic growth and reduce poverty in the selected areas, and institutionalize effective mechanisms to put into operation PIM-based agriculture. The outcomes were (i) enhanced productivity, water use efficiency, and sustainability of irrigated agriculture in selected existing schemes and (ii) improved institutional performance of irrigation service delivery (with PIM) and integrated water resources management (IWRM).⁴ The two main outputs were (i) productive and sustainable irrigated agriculture management systems and (ii) strengthening of institutions and operationalization of project management systems. The project included development of water user associations (WUA), further refinement of the WUA legal framework, and progress toward sustainable operation and maintenance (O&M) financing and IWRM. It was proposed that program delivery and governance be upgraded to ensure sufficient WUA empowerment upfront, infrastructure quality, integration with the agriculture value chain, and sound provider–recipient relations for O&M.

¹ PIM refers to the participation of irrigation users (farmers) in the management of irrigation systems, establishing WUAs, progressively transferring O&M responsibilities to WUAs while enhancing departmental accountability.

² ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranchise Financing Facility India: Orissa Integrated Irrigated Agriculture and Water Management Investment Program*. Manila.

³ The investment program currently has only two projects and is due for closure in September 2018.

⁴ IWRM promotes water for all, access to other economic uses of water, and healthy riverine environments.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

5. During project design, the Indian government's 11th Five-Year Plan sought to address the country's rural poverty problems and looming water crisis by promoting diversification to high-value agriculture in areas with good climate and marketing conditions.⁵ At the same time, a new Asian Development Bank (ADB) country partnership strategy⁶ expanded ADB's operations in agriculture and irrigation. Through several sector studies, PIM and IWRM were identified as primary areas for ADB to support. The project was in line with India's National Water Policy (2002) and the Odisha's Water Plan of 2007 that prioritized improving the productivity and sustainability of existing underutilized irrigation infrastructure by adopting PIM. The project was also consistent with ADB's 2001 Water Policy that emphasized improving governance, building capacity in water sector institutions, water conservation, and improving irrigation system efficiency. The MFF modality allowed for irrigation rehabilitation in batches while gradually implementing water resources reforms. At completion, however, the design is considered overly ambitious given the capacity of the Department of Water Resources (DOWR) (para. 40).

6. The investment program and project 1 were designed with a project preparatory technical assistance (PPTA).⁷ Consultants prepared (i) basin irrigated agriculture development strategy and investment plans, (ii) an investment package comprising feasible sample subproject proposals, implementation guidelines, and safeguards and other required assessments, and (iii) an institutional development strategy and actions to operationalize PIM and IWRM. The PPTA was rated *satisfactory* by ADB. The design and monitoring framework (DMF) followed an old ADB standard and lacked focus, with too many outcomes, outputs and indicators,⁸ no baselines, and no means of measurement for some indicators. For civil works, it is better to measure structures and canal lengths that have improved and are operating successfully rather than simply the total irrigated area to be improved. Project staff were unclear on their targets for results to beneficiaries and only assessed performance based on completion of contract packages; they did not verify that irrigation water was reaching the tail end. A better DMF and benefit monitoring system, with well-defined indicators, baselines and measurable targets, would have helped project staff focus on results.

B. Project Outputs

7. The DMF, including achievements against targets at project completion, is in Appendix 1.

1. Productive and sustainable irrigated agriculture management systems

8. The project was designed to rehabilitate one major (Talandanda), three medium (Gohira, Remal, Sunei), and 650 minor irrigation subprojects covering 69,600 hectares (ha) of command area. Preconstruction works for an additional major subproject Mahanadi Chitropala Island (MCI) was included in project 1 at appraisal (13,260ha).⁹

⁵ Planning Commission, Government of India. 2007. *Eleventh Five-Year Plan, 2007–2012*. New Delhi.

⁶ ADB. 2009. *Country Partnership Strategy: India, 2009–2012*. Manila.

⁷ ADB. 2007. *Technical Assistance Orissa Integrated Irrigated Agriculture and Water Management Project*. Manila.

⁸ The DMF has 2 outcomes, and 10 outputs with numerous repetitive indicators. The standard is for only 1 outcome, and generally 3 outputs with clearly defined baselines (Appendix 1).

⁹ Included WUA formation, and finalization and implementation of the resettlement plan. Civil works will be done in project 2. WUA activities deferred to project 2 (ADB review mission, February 2011).

9. **Participatory planning and water user association empowerment.** Feasibility studies and subproject implementation plans had to be prepared in consultation with and endorsed by WUAs. The WUAs had to be strengthened by holding elections and enrolling over 75% of farmers, with a participation target of 33% for women. Elections were conducted in 82 of 121 WUAs,¹⁰ with 80% of the farmers, 64% of the women, and 74% of vulnerable groups enrolled in WUAs (Appendix 2 and 3). Where elections were held, women's representation in WUA executive committees achieved the 33% participation target. This representation was also mandated in the WUA Act and Rule 2008 revision. At the subproject level, WUA women members are as follows: Remal 33%, Sunei 49%, Gohira 37%, and Taladanda 33%. Elections were stalled in the Taladanda subproject due to legal disputes. Communities in Taladanda, where executive committees were only elected in 2008, were still involved in project activities, but were observed to be considerably weaker with no input into the water management plans of the sub-project implementation offices (SIO).

10. For the major and medium subprojects, implementation plans were completed during appraisal, with WUA consultation and endorsement. Support services teams (SSTs), consisting of non-government organizations (NGO) and The Water and Land Management Institute (WALMI) consultants, worked with each WUA to prepare micro-plans detailing implementation plans for minor infrastructure, command area development (CAD), agriculture, livelihood, and O&M. Micro-plans were prepared and endorsed for all 121 WUAs, but a sample assessment¹¹ revealed that some WUAs, particularly in Taladanda, were not aware of the micro-plans, and at least four WUAs were not using them for their activities. The project envisaged two years of support for WUA strengthening and agricultural improvement post construction, but this was cut short due to delays in civil works.

11. **Irrigation and associated infrastructure development.** Civil works included repair of reservoirs, renovation of regulators, canals, and minor drainage works for major and medium subprojects, and replacement or renovation of pumps and expansion of piped distribution systems for minor lift irrigation (MLI) schemes. All intended civil works were reported completed by the government except for one construction package, T2 in Taladanda (47% completed, Section J) and some minor works in Gohira and Remal. The WUA survey found that 9 of the 32 WUAs were not satisfied with the infrastructure and/or were not receiving sufficient water. Rehabilitation design for Gohira mistakenly omitted 51 out of 121 water courses (856 ha). For Remal, the WUAs reported two subminors incomplete supplying 65 ha and 50 ha, the latter a result of a WUA dispute preventing contractor access. From a target value of 68,000 ha, the reported irrigated area achieved 64,583 ha (95%)¹² (Appendix 4). A request is outstanding for a joint revenue and agriculture department verification of the major and medium scheme irrigated areas, which would confirm that tail-end users are receiving adequate water. A total of 650 MLI schemes serving 13,333 ha were improved. These schemes were either revived from partially operating or non-functioning status to fully operational. Progress on improving these schemes was rapid, due to small land areas, simple operations, and smaller WUAs.

12. At project appraisal, discharge measurement structures, communication equipment, and software were proposed for subprojects to improve distribution efficiency and inform WUAs of their allocated flow. However, measurement structures were only installed in Sunei and Gohira subprojects and only measured at Sunei. There were technical difficulties in retrofitting

¹⁰ Elections were conducted during the project period for 62 of 121 WUAs, others were completed post project.

¹¹ The ADB PCR mission interviewed a sample of WUAs in each subproject: 5 in Gohira, 4 in Remal, 5 in Sunei, and 9 in Taladanda. The mission interviewed 9 WUAs in MLI schemes.

¹² Contribution of the project to ADB Results Framework – Land improved through irrigation, drainage, 64,583 ha.

measurement structures as the schemes were never designed to incorporate additional head losses. Painted gauges on off-take channels, and calibrated gates were provided in the other schemes, but are not used to inform operation. Communication for operation continues to be via mobile phones, and overall the accurate management of flows has not been achieved.

13. Command area development and conjunctive use. Placing of field channels and strengthening WUAs for on-farm water management were considered essential for attaining high water-use efficiency and intensification and diversification of cropping. It was originally planned to construct field channels and drains covering 40% of the area in major and medium schemes. According to the government, all command area development (CAD) works were completed in Gohira, Remal, and Sunei, but only 62% of the work was completed in Taladanda due to delays in the WUA formation and increased cost. The CAD division planned its work based on surveys from the 1980s and 1990s and determined the extent of CAD channels in consultation with WUAs. This CAD development proposal was based on a state cost norm of ₹6,000 per ha to rehabilitate channels.¹³ However, many Taladanda channels had mostly vanished; thus, the rate increased in the first year to ₹15,000 per ha for complete field channel construction. WUAs were contracted to construct the CAD channels in 39,890 ha (61%) of the major and medium subproject areas (Appendix 4). Lack of coordination between the SIO and CAD staff resulted in CAD improvements not linked to minor and subminor works. The project design also called for conjunctive use of groundwater to be promoted for dry season cropping in 7% of the major and medium subproject area. Plans for conjunctive use of groundwater were not included in the feasibility studies or detailed designs, and thus, this was not achieved.

14. Agriculture development and livelihood enhancement. Programs for agriculture and horticulture development were to be prepared in conformity with the existing district agricultural plans and as stipulated in the WUA micro-plans. During the project, WUAs were encouraged to participate in central and state government programs such as Bringing Green Revolution to Eastern India and National Food Security Mission. Through these programs, the farmers received financial, extension, and technology support. The Department of Water Resources (DOWR) also provided 748 training sessions in WUA management, agriculture- and horticulture-related activities including the system of rice intensification (SRI) and compost and soil fertility (Appendix 5). Approximately 19,800 persons participated, including 36.6% women,¹⁴ exceeding the target of 33% for women. In all, 76 meetings were held with self-help groups and villages to create awareness in WUAs with 1,672 participants, out of which 47% were female. Agricultural practices improved during the project period, with line transplantation¹⁵ and SRI taken up by farmers in Sunei, Remal, and Taladanda. Linkages were established between the seed and fertilizer suppliers and WUAs. Livelihood enhancement activities were set out in the micro-plans, including plans to link WUAs to government and private agencies to market products, create self-help groups, provide credit, and improve access to extension and technical support. The SSTs that supported the WUAs provided advice for livelihood enhancement, but implementation of livelihood plans was only done in certain communities supported by an associated grant from the Japan Fund for Poverty Reduction (JFPR).¹⁶

15. Sustainable O&M Systems. For major and medium subprojects, main and distributary (secondary) canals are to be managed by DOWR based on O&M plans. Subproject O&M manuals were prepared under the project, but have only been implemented at Sunei so far. Other subprojects are expected to implement O&M plans in 2017. This delay is due to the late

¹³ Beneficiaries contributed 10% in-kind toward the cost of CAD works in the form of land and/or labor.

¹⁴ Including 14% scheduled caste, 35% scheduled tribe, and 37% other backward castes.

¹⁵ Line transplantation is a method of planting rice paddy in straight rows to facilitate management practices.

¹⁶ ADB. 2009. *Grant to India for Capacity Building & Livelihood Enhancement of Poor Water Users*. Manila.

finalization of manuals a result of difficulty in recruiting suitable O&M experts. No scheme-wise management information systems (MIS) for O&M monitoring and planning have been implemented, which is necessary for sustainable scheme management. Minor systems' O&M were expected to be fully transferred to WUAs, but only Sunei's has formally been transferred due to delays completing the works in the other schemes.¹⁷ However, 30 out of 32 WUAs surveyed understood that they were responsible for the O&M of the minors and subminors. DOWR provides grants to WUAs at ₹100/ha in the first year on the provision of 75% membership. For the next 3 years, the grant is proportional to the percentage membership and after the fifth year proportional to the water rates collected. There are currently no audits or follow-up on the use of grant payments by WUA. For MLI subprojects, WUAs are required to mobilize resources from members for O&M. Sampled MLI WUAs had joint bank accounts and collected operation fees from members.

16. For overall macro planning, the government committed under this project to (i) maintain the policy of providing O&M funds following the Government's Finance Commission reports (FCR), (ii) maintain the full O&M cost recovery policy by revising irrigation, industrial, and other water tariffs, (iii) reduce the gap between irrigated areas recorded by DOWR and the Revenue Department through joint verification by WUAs, and (iv) establish guidelines for O&M fund allocation with clear performance-based criteria. The current O&M rate provided to irrigation operators from DOWR is in line with the 12th FCR recommendation (₹600/ha). This has been noted by the SIOs as insufficient for general maintenance, resulting in the need to acquire "critical lump funds" from DOWR to complete emergency works on infrastructure that may not have been maintained. The 13th FCR recommended a rate increase to ₹1500/ha per annum, but this has not yet been adopted by DOWR.

17. The government's collection for irrigation and industrial water tariffs only covers a portion of total O&M expenditure. The indicator to fix tariff levels for cost recovery may have been unrealistic as the government has stated that "since there is low productivity of agriculture and the per capita income of people engaged in agriculture is low, there is not much scope for increasing the rates to ensure full cost recovery".¹⁸ The irrigation water rate has remained the same since 2002. Industrial water rates were increased in 2014, but there was significant public opposition to a proposed increase in irrigation rates and the proposal was dropped. However, overall collection of water tariffs has increased from ₹298 million in 2009 to ₹1,458 million in 2015–2016.¹⁹ Digitization of the land recorded from 2012–2016 has increased the collection of land tax and assisted with collection of water user charges.

2. Institutions Strengthened and Project Management Systems Operational

18. The government's 2004 Water Plan and the revised State Water Policy of 2007 enforce the principles of PIM, IWRM, and full recovery of O&M costs from users. The investment program was designed to support the implementation of the policy and plan, and established a detailed road map for their operationalization. Project 1 was expected to strengthen DOWR and related institutions and advance the state's legal and policy framework to support the reforms.

19. **Policy, planning, and legal framework.** The State Water Policy was revised in 2012 to bring in groundwater and climate change. DOWR reported that another policy revision is

¹⁷ Ownership transfer set out in The Orissa Pani Panchayat Act, 2002.

¹⁸ Pandey, S.T.K. 2016. *Preparation of Revised Estimates for 2016–2017 and Budget Estimates for 2017–2018*. <http://www.odisha.gov.in/finance/pdf/2016/34048.pdf>

¹⁹ Odisha State Government DOWR. 2016. *Water Pricing & Cost Recovery*. Bhubaneswar. <http://www.dowrorissa.gov.in/WaterPricing/WaterPricing.pdf>

underway to incorporate principles on water reuse and efficiency. The Water Resources Board (WRB) is responsible to operationalize the State Water Policy. During project 1, it was expected that the WRB would review policy implementation annually. In practice, however, the WRB meets infrequently as it is under the chairmanship of the Chief Minister who has additional responsibilities. A state-level Water Advisory Committee was created under the chairmanship of the state's Chief Secretary to monitor policy implementation; it meets once a year. The Pani Panchayat Act²⁰ and rules were refined as envisaged, with amendments in 2008 and 2014. These are key to operationalizing PIM throughout the state. The amendments fostered stronger pani panchayat institutional continuity, better representation of head, middle, and tail reaches of the canal, and increased participation of women. Another amendment is planned to improve implementation of the provisions of the act, including election processes, representation of women and the landless, ownership of minor and subminor canals for O&M, and collection of water tariffs.

20. DOWR's institutional setup, structure, skill mix, and business processes strengthened. The road map and investment program envisioned improving irrigation service delivery by empowering WUAs. As planned, DOWR refined its vision and strategy, established a PIM–CAD Directorate to oversee project implementation, and implemented a capacity development plan for all staff. DOWR reported that it is currently preparing a revised vision, road map, and budget framework. However, sufficient qualified staff were not deployed to the directorate, and DOWR continues to struggle with recruiting and retaining suitable staff especially from non-engineering/multifunctional disciplines (e.g. agriculture, fisheries, horticulture, social development) that can support WUA strengthening. The directorate relies on consultants and NGOs for WUA strengthening and agricultural and livelihood support, and lacks sufficient and capable staff to monitor the quality of the work done by consultants and NGOs. DOWR management recognizes the need to create better linkages with other state departments to assist them in PIM. DOWR was strengthened through the project, with over 4,200 staff participating (35% women) in 132 different training programs on topics such as project management, WUA interaction, and construction management. Toward project completion, the PIM–CAD Directorate and the project management unit (PMU) had 29% female staff and 20% female support services team in the field.

21. Project 1 also aimed to strengthen DOWR in quality control (QC) systems by establishing a QC cell to undertake third-party testing and internal technical auditing. These were not put in place (para. 30). During project 1 implementation, QC was the responsibility of two institutional strengthening and project management consultant (ISPMC) engineers.²¹

22. The Water and Land Management Institute (WALMI) is an institute in Odisha mandated to build the capacity of DOWR, WUAs, and the Department of Agriculture in PIM and related action research. Project designers envisaged WALMI's strengthening to support the implementation of the investment program. During project 1, WALMI was to be reformed with higher autonomy and improved staff quality. Some efforts were made toward this end, with one WALMI director recruited from the market, but once he resigned, subsequent directors were appointed. WALMI's role in the project was limited to serving as one of several service providers for WUA strengthening in subprojects. DOWR management is currently preparing a blueprint for WALMI's restructuring and strengthening.

23. Actions toward operationalizing IWRM. The investment program planned for the state's Water Plan to expand with development plans for the four northern river basins, i.e. the project

²⁰ A pani panchayat is the local term for an irrigation water user association.

²¹ The ISPMC terms of reference called for recruitment of four QC engineers but only two were recruited.

area. The government also committed to (i) defining and establishing institutional arrangements to operationalize IWRM, (ii) establishing a pilot river basin organization for the Baitarani River basin, and (iii) strengthening the hydrological database and decision support systems. ADB provided a technical assistance (TA) grant to support the government in initiating these steps (Section H). TA consultants prepared recommendations, and ISPMC further developed the recommendations into a timebound action plan. Part of the recommendations included a scheme for marketing water rights across user groups, but civil society opposed the idea. Thus, implementation of the action plan was limited to conducting some training sessions on basin planning and modeling, and establishing and publishing the notification for the Baitarani River Basin Organization (but it has not been achieved to date). Further actions toward IWRM have been committed during project 2 implementation.

C. Project Costs

24. At appraisal, the total project cost was estimated at \$66.4 million, of which ADB was to finance \$16.5 million (25%), OPEC Fund for International Development (OFID) \$30.0 million (45%),²² the government \$18.1 million (27%), and beneficiaries \$1.8 million (3%). Actual project cost was \$62.13 million, 94% of the estimated amount. ADB financed \$16.5 million (26.5%), OFID financed \$24.55 million (39.5%), and the government provided \$19.79 million (31.8%), comprising \$18.23 million for direct project activities and \$1.56 million in interest and commitment charges during implementation. The contribution of beneficiaries, which was provided in the form of land and labor for field channel construction, was estimated at \$1.29 million (2%). As a result of the slow project start-up and the increased role of project consultants and NGOs, the allocation of project funds by expenditure category was revised in June 2012 and April 2015. There were higher than allocated expenditures for CAD work (para. 13) and civil works, a result of higher than expected inflation rates (10% compared with 4%–5%). This was partly offset by the depreciation of the Indian rupee against the US dollar and one stalled civil works package (para. 40). Costs for specialist services and project management were also higher given the extension in project implementation, and due diligence for project 2 preparation was more labor-intensive than expected. Overall, actual project cost, excluding finance charges, was \$60.57 million. Estimated and actual project cost and variances are detailed in Appendix 6.

D. Disbursements

25. The total ADB loan of \$16.5 million was fully disbursed, while OFID loan disbursement was \$24.55 million, equivalent to 82% of the loan's \$30 million. OFID loan closing is in progress and \$5.45 million will be cancelled. Appendix 6 provides a breakdown of annual disbursements by expenditure category. Under the ADB loan, the first disbursement was on 7 December 2009 and the final disbursement was on 2 February 2016. The ADB financial closing was late due to adjustments made on ineligible expenses. The loan proceeds were disbursed using reimbursement and direct payment procedures in accordance with ADB's Loan Disbursement Handbook (2007). Disbursement did not meet initial annual targets due to delays in civil works procurement, consultant recruitments, and account set-up and staffing at the PMU. Disbursement projections were revised along with the updated implementation schedule and financial progress improved towards the third year of implementation.

²² OFID cofinancing was approved on 8 October 2008 after ADB loan approval.

E. Project Schedule

26. Project 1 was declared effective on 4 June 2009. It was designed to be implemented over four years, with an expected completion date of 30 September 2013. However, implementation during the first 12 months was behind schedule due to constraints faced in consultant selection, civil works procurement, and the unfamiliarity of new staff with project implementation and ADB procedures. The project suffered persistent delays in civil works procurement, construction, consultant recruitment, and more time was needed in WUA strengthening activities (para. 35). Preparation of some bid documents was delayed due to changes in detailed design and associated design required during implementation.²³ In general, project staffing was insufficient to manage the myriad of simultaneous activities expected. The ADB loan period was extended twice: (i) from 30 September 2013 to 31 March 2015, and (ii) from 31 March 2015 to 30 September 2015. The extensions were necessary to complete strengthening of the WUAs and irrigation infrastructure works. Physical activities were completed on 30 September 2015. Details on the project schedule are in Appendix 7.

F. Implementation Arrangements

27. The Odisha DOWR was designated as the project's executing agency. By inception, the PMU was established and six subproject implementation offices were set up with consultants mobilized (two major, three medium, and two mobile MLI). A project steering committee was formed and met once, in September 2010. At the outset, DOWR lacked the personnel it had committed at appraisal. Turnover in project management also affected implementation. Over the course of the project, there were 8 special secretaries (heading the PIM–CAD Directorate) and 10 project directors (6 serving long term). Project 1 was initially designed with PMU implementing the project through the existing DOWR field structure, (i.e. civil works being implemented through the existing field offices under the control of the concerned chief engineer's civil engineers). The PMU's role to coordinate and monitor the works was difficult as chief engineers were unable to prioritize the project. The subproject execution responsibilities of the field chief engineers were consolidated with the PMU project director by government order at the end of 2010. Thus, the SIOs, executive engineers, and superintending engineers reported directly to the Project Director on project-related matters, with the chief engineers acting as advisors.

28. Several cells within the PMU were not formed as designed (i) the management information system (MIS) cell, (ii) the environmental cell, and (iii) the quality control cell. This resulted in limited project document control and poor work quality during the initial stages of implementation. Due to these issues and other constraints observed across critical areas of the project (design, construction supervision, and coordination of PIM–CAD), the institutional strengthening and project management consultant's (ISPMC) role was modified from an advisory consulting service to more intensive implementation support. This included preparation and review of initial environmental examinations, monitoring implementation of the environmental management plans, and quality control. A construction management specialist was provided by ADB in 2011 to monitor construction quality under a separate capacity development technical assistant grant.²⁴ Additional design support from an irrigation design engineer was also provided under the same grant to assist with preparation of detailed designs. ADB also supported DOWR by establishing a design cell with two international irrigation design engineers. They also provided on-the-job training for DOWR staff. DOWR also faced challenges with respect to recruiting and retaining

²³ An example of a design change during implementation is where the historical lock structures in the Taladanda canal could not be converted to canal regulators, and an alternate design was required.

²⁴ ADB. 2010. *Technical Assistance to India for Project Management Capacity Building for Water Resources Sector Executing Agencies*. Manila.

NGOs to support WUA strengthening (para. 39), and completing surveys and designs with their own staff. ADB responded to DOWR's requests to change the procurement method for both NGOs and survey firms by processing eight changes in implementation arrangement requests.

G. Conditions and Covenants

29. Out of 23 loan covenants, 15 were complied with in full and without delay or deviation. Eight covenants were partially complied with (i) a state-level project steering committee was formed but only met once (para. 29), (ii) a QC cell was not established although consultants were used (para. 30), (iii) physical and financial progress of the project and contracts were not posted on time, (iv) not all policy and institutional actions as specified in FFA, Schedule 2, Table 2 were implemented (Section B.2), (v) works contracts did not include required provisions on third-party inspection for QC, and HIV/AIDS awareness programs were not implemented, (vi) project performance and benefits monitoring reports were prepared, but an effective MIS was not established, and (vii) the government's PCR was submitted late and was incomplete. The partial compliance is mainly a result of insufficient staff capacity in DOWR. Further actions to implement the sector roadmap were committed under project 2. Appendix 8 details compliance with each loan covenant.

H. Related Technical Assistance

30. An associated technical assistance (TA) of \$0.25 million from the Multidonor Trust Fund under the Water Financing Partnership Facility was provided to support the government in initiating IWRM.²⁵ The TA was signed on 30 March 2009 and consultants were fielded on 12 January 2010. The TA was closed on 26 March 2011. Total disbursements were \$0.22 million (89% of the total TA amount). ADB engaged three individual consultants and provided 8 and 6.6 person-months of international and national inputs, respectively. As expected, the TA prepared in a consultative manner specific steps toward establishing and operationalizing IWRM. The institutional framework proposed expanding the existing Odisha Water Planning Organization's functions to include water allocation and pricing, and that a water regulator be established. However, the initiatives supported under the TA were not sustained because civil society voiced concern about water allocation and pricing possibly leading to capturing of water by economic interests and reduced allocation for basic human and environmental needs. Institutional reform of water sector is a long-term process, and continued leadership and ownership will be necessary to achieve the envisaged outcome. The TA completion report is in Appendix 9. The TA was rated *successful*.

I. Consultant Recruitment and Procurement

31. At appraisal, project 1 was proposed to finance the following consulting service packages (i) ISPMC, (ii) MLI implementation support services, (iii) four packages of NGO services for subproject social mobilization support, and MCI resettlement plan implementation support, (iv) training and action research program (through WALMI), and (v) training by various resource persons. Except for WALMI and the resource persons, which were recruited using single source selection and individual consultant selection method, respectively, the remaining consulting services packages were recruited using the quality- and cost-based selection (QCBS) method. At appraisal, it was proposed that ISPMC would provide a total of 780 person-months of consulting

²⁵ ADB. 2008. *Technical assistance to India for Institutional Development of Integrated Water Resources Management in Orissa*. Manila. (TA 7131-IND, approved on 18 September 2009).

services. By project completion 646 months had been utilized. For the MLI consultants, 288 person-months of consulting services was proposed. By project completion 477 person-months had been utilized. The MLI consultants' package was increased in August 2013 as the original terms of reference did not cover the project's 650 MLI schemes.²⁶ Procurement was carried out in accordance with ADB's Procurement Guidelines (2007, as amended from time to time). At appraisal, 11 major civil works packages were designed based on geographic location and size, and were proposed to be procured through national competitive bidding.

32. Following project readiness requirements in India, advance actions were taken to recruit consultants and procure civil works. The ISPMC and MLI consultants were mobilized in August 2009 and November 2009, respectively. Delay in recruitment was caused mainly by DOWR's limited experience in selecting a multidisciplinary team following ADB guidelines. The recruitment of NGOs was even more challenging. Two NGOs withdrew from their contracts during implementation and one NGO package failed during the first round of selection as no NGO met the qualification criteria. Selection methods were changed throughout implementation to assist with recruitment (para 31). Details on consultant inputs are in Appendix 10.

33. At inception, seven civil works packages were expected to be awarded, but only one contract was signed. Procurement progress also suffered considerable delays due to (i) limited bidder response, (ii) low quality of design and cost estimate, (iii) inadequate procurement staff, and (iv) slow evaluation process by SIO and PMU and approval process by authorities. National-level contractors were not interested in bidding due to the nature and scope of the works.²⁷ Some packages were broken down into two or three smaller packages to attract more bidders and enable lower class contractors to qualify. Over time, bidding documents were progressively improved through more practical packaging and eligibility criteria, and technical specifications. ISPMC provided critical support to procurement and the PMU undertook analysis of prices using market rates instead of the schedule of rates and clarified deviation with the bidders. At project completion, a total of 22 civil works packages were awarded and all contracts were completed, except for one in Taladanda (para 40). On average, the bidding process for a civil works package took 300 days. Details on civil works contracts are in Appendix 11.

J. Performance of Consultants, Contractors, and Suppliers

34. With the delays in PMU formation and the lack of adequate staff, ISPMC took on much greater responsibility in implementation than expected. A contract variation in November 2010 adjusted the terms of reference of the ISPMC consultants (para. 30). This helped with performance and construction work quality. MLI implementation consultants were effective in supporting the rehabilitation of 650 MLI schemes. The performance of consultants is rated *satisfactory*.

35. NGOs were responsible for WUA strengthening and PIM activities under the project. NGO performance was mixed. Two of the five NGOs pre-terminated their contracts. They had limited experience in PIM concepts and some had their own social mobilization methodology, which was different from the project's micro-planning concept. The divergent views on the best approach caused difficulty in implementation. DOWR experienced difficulties replacing the NGOs. Also, one of the NGOs working in Taladanda did not complete its scope of work with good quality, resulting in complaints from the WUAs surveyed. In general, NGOs were essential in bridging the gap

²⁶ The MLI consultant package originally covered only 400 MLI feasibility studies and 200 MLI implementation.

²⁷ Works were small, remote, scattered, and some packages were located in areas subject to political instability.

between the SIOs and the WUAs, but given the challenges with their recruitment and management, the performance of NGOs is rated *less than satisfactory*.

36. In the early stages of implementation, the civil works progressed slowly and the quality was poor. Civil work contractors proved to have low capacity for programming work for timely implementation and lacked quality control procedures. The slow progress was also partly attributed to field conditions deviating from bid documents. By midterm review, construction quality and progress had improved with greater support from ISPMC. One major contract, Taladanda T2, was not completed in the project period due to a persistently underperforming contractor. The contract was terminated, with a final notice given on 5 November 2014 with only 47% of the works completed. The contractor is contesting its termination in a court of law; therefore, DOWR could not retender the package to date and the works remain incomplete. Out of the remaining 21 civil works packages, only one package in Gohira was completed on schedule, while 10 packages exceeded proposed completion dates by over a year. Performance of the civil works contractors is rated *less than satisfactory*.

K. Performance of the Borrower and the Executing Agency

37. As the borrower, the Government of India had limited direct involvement in project implementation. DOWR, as executing agency, was responsible for implementation. The Government of India's Department of Economic Affairs nevertheless undertook periodic monitoring of project activities, including contract awards and disbursement and resolution of issues through tripartite portfolio review meetings with ADB and DOWR. The borrower's performance is considered *satisfactory*.

38. The performance of DOWR was mixed. Frequent changes of project leadership and insufficient staff in the PMU and SIOs adversely affected project implementation. Some PMU cells were not formed or adequately staffed, reducing DOWR's ability to monitor infrastructure quality and NGOs. During implementation, a review of DOWR's financial management systems noted several ways it needed to be strengthened; however, DOWR did not initiate actions until project 2. The PMU, with the support of the ISPMC, were able to provide guidance to the project and largely complete civil works within budget. DOWR also successfully established the PIM-CAD directorate and actively engaged with the WUAs. Safeguard requirements were followed and loan covenants were mostly complied with. The performance of DOWR is rated *satisfactory*.

L. Performance of the Asian Development Bank and the Cofinancier

39. During project implementation, ADB fielded an inception mission, 11 review missions, 1 midterm review mission, 7 special loan administration missions, and 1 project completion review mission. On average, there were three missions a year. ADB assigned staff with in-depth technical expertise in water resources management and strong country experience, which ensured effective project supervision. Three project officers were responsible for project implementation from the beginning until loan closure. Four project analysts were assigned to the project. Overall, there was sufficient continuity in staffing and effectiveness in resolving issues and guiding the PMU on all implementation matters. ADB responded to the implementation delay in 2010 by fielding more frequent missions. DOWR expressed no concerns with respect to ADB and was appreciative of the support received. ADB's performance is rated *satisfactory*. OFID funds were important to support the civil works and equipment expenditures for the project. OFID staff had limited direct involvement as the loan was administered by ADB. OFID's performance is rated *satisfactory*.

III. EVALUATION OF PERFORMANCE

A. Relevance

40. The project was *relevant* both at appraisal and completion. The intended outcomes were aligned with the government's development priorities and did not duplicate the work of other development partners. The project design was generally appropriate for achieving the intended outcomes, although the DMF was overly complicated with too many indicators (para. 6). Feasibility studies and due diligence conducted were thorough (except for Taladanda field channels, para.13), with adequate stakeholder consultation. However, there were some weaknesses in design and implementation. DOWR's capacity to implement the scope of the project within the original implementation period was not adequately assessed. Better procurement and construction management support was required. The reforms expected and included in the sector road map and project framework were also, in retrospect, too ambitious. At the time of appraisal, strong DOWR leadership supported the reforms, and the design of such reforms was assessed as relevant. However, when high-level leadership changed, DOWR lost sight of some of its reform commitments. Appropriate adjustments were made to implementation arrangements to address capacity gaps (para. 28), and design deficiencies did not seriously affect the delivery of outputs. The project was implemented as designed with no changes in the scope.

B. Effectiveness in Achieving Outcome

41. Overall the project is rated *effective*. The two project outcomes were achieved and 10 outputs were substantially achieved (Appendix 1). For the outcome of "enhanced productivity, water use efficiency, and sustainability of irrigation systems", the project successfully improved agricultural practices in all subprojects, with an increase in crop production (from 3.5 to 6.0 tons per ha) and cropping intensity (an increase of 115% versus a target of 20%). The irrigated area of all subprojects increased by 56%, above the target of 40%. The project successfully rehabilitated 64,583 ha (95%) of irrigated area through infrastructure improvements and improved the schemes' water use (28%–48%, m³/ha). Water measurement structures were, however, only improved in Sunei. Water resources management in the subprojects improved with most WUAs strengthened and regularly engaging with DOWR staff on water demand and irrigation system operation. Most WUAs surveyed by ADB were satisfied with DOWR's service. At the institutional level, DOWR successfully created a PIM–CAD directorate and PIM has been replicated for other schemes in the state.²⁸ The State Water Policy and WUA Act and Rule were both revised, supporting improved water resources management in the state. Although more work is required, the institutional setup and functions to operate IWRM have been initiated with a road map produced and river basin plans prepared.

42. The project was categorized as Effective Gender Mainstreaming and a gender action plan (GAP) was prepared. A steering committee with Commissioner-cum-Secretary of the Women and Child Development Department was formed to provide overall guidance in promoting gender balance during implementation. The gender indicators in the DMF and the GAP were achieved and overall project GAP implementation was rated *successful* (Appendix 3).

43. The project was categorized A for involuntary resettlement because the land acquisition and resettlement compensation of the MCI subproject was planned to be done during project 1.²⁹

²⁸ The government has provided PIM–CAD support for the Rashtriya Krishi Vikas Yojana Project.

²⁹ An involuntary resettlement framework was prepared for the MFF and a resettlement plan for MCI was prepared and disclosed on ADB's website in July 2011.

In MCI, 1,398 people are losing agricultural land, and 85 acres of private land is to be acquired. Only 192 households are losing more than 10% of their productive land. To date, resettlement implementation has been consistent with the plan and framework, but is only 85% complete due to slow approvals. Grievances have been properly recorded and managed. The project was categorized as B for indigenous peoples due to a significant presence of scheduled tribes and castes in the project districts.³⁰ The actions focused on promoting social inclusion and improvement of livelihoods. Livelihood enhancement micro-plans were prepared for all WUAs, and linkages were made with government and NGO poverty reduction programs to implement the plans. Indigenous people's participation was 17% in WUA and 19% in executive committees. The project was classified B for environment.³¹ Environmental testing and monitoring was carried out in accordance with the environmental management plans, and two environmental monitoring reports were disclosed on ADB's website. No adverse environmental impacts were observed and no environment-related grievances were raised by the affected people.

C. Efficiency in Achieving Outcome and Outputs

44. The project is rated *efficient*. At appraisal, economic analysis indicated that the major and medium subprojects were viable with economic internal rates of return (EIRR) ranging between 19.8% and 22.7%. Re-estimation of the EIRR indicates that the subprojects were still economically viable, with EIRRs ranging from 25.2% to 38.6% (Appendix 12). The overall project EIRR at completion has been estimated at 29.0%. All resulting EIRRs were above the 12% ADB hurdle rate. The high EIRR result arises from the larger yield increases in key crops compared with those anticipated at appraisal, even though in recent years the areas irrigated during the dry season have generally been less than originally anticipated. Sensitivity analysis showed that reducing project benefits by 20% equates to similar EIRRs to appraisal values. With respect to process efficiency, there were significant implementation delays at the start of the project due to challenges in consultant selection, procurement and staff capacity that led to a 2-year extension (40% overrun). However, the EIRR re-estimation accounted for the time overrun and the project is still found to be efficient.

D. Preliminary Assessment of Sustainability

45. The project is rated *less than likely sustainable*. The key factors in sustaining investments in the rehabilitation of irrigation infrastructure in this project are the quality of the structures, ensuring adequate annual O&M, and effective participation of WUAs. O&M manuals are yet to be implemented in the subprojects except Sunei. By project design these were to be prepared early during implementation; however in reality, it is better to prepare them after the civil works have been completed. It is therefore too early to determine if DOWR is adequately sustaining the irrigation facilities. The O&M allocated budget has not been updated to the latest FCR recommendations. Furthermore, the government's collection of irrigation tariffs is not sufficient to achieve cost recovery. Thus, there is a risk that maintenance allocations may be underfunded over the long term and WUAs and DOWR will not be able to adequately maintain the system to the standard required. It was observed during the field visit that there was limited routine maintenance being carried out on subprojects such as repairs to canal embankments, lined channels, and seasonal sediment removal. The deferred maintenance problem that plagues irrigation systems in India and South Asia may persist and the physical infrastructure may degrade. The economic benefits for the project areas rely on the irrigation infrastructure being maintained.

³⁰ An indigenous people's development framework and specific action plan was prepared for the MFF and disclosed. The framework guided subproject classifications and specific actions were mainstreamed.

³¹ An environmental assessment and framework was prepared for the MFF, and IEE was prepared for each subproject.

As its quality decreases, so will the economic benefits. Improvements in yields and cropping intensity suggest that WUAs are willing to continue improving crop practices and maintaining field-level infrastructure on their own. Sustainability will nevertheless depend on the transfer of management of minor systems to WUA, including collection of water charges and O&M responsibilities, and continued support from DOWR, and there is limited evidence that DOWR has made sufficient steps toward this end.

E. Impact

46. Overall the project impact is rated *satisfactory*. The beneficiaries realized increased agricultural production, which, in turn, resulted in increased farm income in all subproject areas. The available data suggest that for many farm households, on-farm income has doubled as improved irrigation has secured production. The project demonstrated that PIM is effective in generating farmer participation in irrigation management, which in turn results in better system operation, better agricultural practices, and increased yields, cropping intensity, and crop diversification. Specifically, the crop yields for the project at 6 tons/ha are significantly higher than the state's average of 2.4 ton/ha (2014/2015).³² Project interventions supported improvement in water availability at the field level, and WUAs now actively engage with DOWR and Department of Agriculture staff on their irrigation and agricultural needs, and system O&M. The level of awareness of the effectiveness of PIM in the state has been raised through the project, and DOWR highlights the project as example of good PIM practice.

47. **Social impact.** The majority of farmers are enrolled in WUAs and benefited from undertaking collective action for input and output services. Before the project and the revision of the Pani Panchayat Act of 2008, the participation of women in WUAs was very limited. Now women are eligible for both WUA membership as members of farm households, as well as for election to WUA executive committees. The project demonstrated that inclusion of women in WUA membership and leadership provided opportunities for women to exercise decision-making in irrigation and agriculture, and directly benefit from improved household income.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

48. Based on assessment of the project as *relevant, effective, efficient, and less than sustainable*, the overall project is rated *successful*. It was implemented largely as designed and achieved most of the outcomes and output indicators. Overall the project successfully increased subproject crop yields and intensities, and implemented an effective PIM–CAD Directorate. Over 95% of the targeted irrigation area was rehabilitated and water management was improved. The sustainability of the projects is potentially at risk with maintenance allocations being underfunded. While the project design was generally sound and appropriate, it was overly complex and ambitious for DOWR to implement efficiently. The project period was extended by two years to achieve the outputs, but overall, it remained below project cost estimates.

B. Lessons

49. The major lessons from the project are (i) a more judicious and rigorous process should be undertaken to assess the technical limitations of existing and dated surface irrigation systems, (ii) DOWR's institutional capacity assessment needs to be rigorous to ensure the project design

³² Government of Odisha. 2016. *Odisha Agriculture at a Glance*. Bhubaneswar.

matches its capability for implementation, (iii) adequate institutional arrangements including proper staffing are necessary for timely and smooth project implementation, (iv) upfront capacity building of DOWR during project preparation on procurement and contract management is necessary for timely procurement and completion of works, (v) quality control can be improved through an effective internal MIS, dedicated and sufficient quality control staff, and third-party monitoring, (vi) increased policy dialogue with the government is needed to increase O&M allocations to ensure sustainability, (vii) continued monitoring and guidance to WUAs after completion of infrastructure works is necessary to ensure sustainable O&M and improved agricultural practices, and (viii) irrigation modernization projects could be implemented more successfully if a results-based approach was taken with verified irrigated area and sustained WUA leadership and action as objectives, not just the completion of contracts and activities.

C. Recommendations

1. Project Related

50. **Future monitoring.** Continued monitoring of the government's project 1 commitments through regular ADB review missions during project 2 is required. This should include monitoring (i) outstanding WUA elections, including the extent to which women and minority groups are represented, (ii) transfer of minor O&M management to WUAs, (iii) recruitment and retention of suitable staff in the PIM–CAD directorate, and development of linkages with other state departments to strengthen PIM, (iv) progress of DOWR's commitment to complete unfinished civil works and remedy deficiencies noted by WUAs, (v) progress in implementing the investment program's sector road map, including WALMI strengthening and steps toward IWRM.

51. **The timing of the project performance evaluation report** should be a few years after the completion of the investment program to ensure that outstanding commitments are completed, and to assess sustainability.

2. General

52. In designing projects, attention needs to be given in ensuring: (i) the DMF is succinct and targets are measurable; (ii) the capacity of DOWR to implement wide-ranging institutional and policy reforms is fully assessed; and (iii) the WUA support extends for a significant period after the civil works are completed to maximize impact.

53. In implementing projects, attention should be directed to: (i) establishing quality control and monitoring systems from inception; and (ii) providing intensive training to executing agencies on ADB's procurement and consulting procedures.

Results Chain	Performance Indicators with Targets and Baselines	Achievement on Project Completion (✓ = achieved, ✗ = not achieved)
	<p>The government maintains full maintenance fund allocation policy while fixing necessary tariff levels for cost recovery.</p> <p>WUAs substantially submitting the set water tariff.</p> <p>Appropriate institutional setup and functions are introduced to operate IWRM.</p>	<p>✓The government provides funds for maintenance attempts made at adjusting water tariffs.</p> <p>✓Overall collection of water tariffs has increased from ₹298 million in 2009 to ₹1,458 million in 2015–2016.</p> <p>✓IWRM institutional support initiated; RBO Baitarani River piloted; TA support provided.</p>
Outputs		
A. Productive and Sustainable Irrigated Agriculture Management Systems		
<p>1. Participatory Planning and WUA strengthening.</p> <p>(i) Participatory scheme planning with feasibility studies and subproject implementation plan (SIP).</p> <p>(ii) WUA-level micro-plans.</p> <p>(iii) Strengthened WUAs: Viable WUAs set up to become effective community organization ready to receive investment support and to enhance agriculture production.</p>	<p>For all the major & medium subprojects up to 3rd tranche, and 650 MLI (for 1st tranche) subprojects appraised with SIPs with clear output targets and programs.</p> <p>For major and medium schemes WUA level micro-plans prepared and endorsed.</p> <p>160 WUAs for major and medium, and 650 WUAs for MLI are strengthened with:</p> <ul style="list-style-type: none"> - Over 75% farmers enrolled - Elections held, committees set up and functional - Farmer contribution agreed - Number of women (Target 33%) and vulnerable group enrolled (no target) <p>WUAs endorse design.</p> <p>Implementation agreements are signed.</p>	<p>✓During project design, feasibility studies (SIPs) were developed for project 1 and project 2 major and medium subprojects. During implementation, feasibility studies were prepared for MLIs.</p> <p>✓WUA micro-plans were prepared and endorsed.</p> <p>✓WUAs strengthened in the major and 3 medium schemes and to a lesser extent in Taladanda as most elections are pending.</p> <p>✓Membership of farmers in the WUA at 80% (115210 out of 136086).</p> <p>✓Elections held in 82 out of 121 WUAs (62 completed during the project period).</p> <p>✓5% subminor or 10% CAD contract value contribution by farmer agreed upon.</p> <p>✓74% of women enrolled and 73% of vulnerable groups enrolled.</p> <p>✓WUAs endorsed the design of subminor and CAD works.</p> <p>✓Implementation agreements were signed.</p>

Results Chain	Performance Indicators with Targets and Baselines	Achievement on Project Completion (✓ = achieved, ✗ = <i>not achieved</i>)
2. Irrigation and Associated Infrastructure including command area development (CAD): Good quality infrastructure designed and constructed, following appraised plan and WUA micro-plans.	<p>Infrastructure provided to 68,000 ha of area with WUA monitoring and satisfaction.</p> <p>CAD and conjunctive use extended to 40% and 7% of area following WUA requests.</p>	<p>✓Infrastructure works were mostly completed as designed, although 856 ha in Gohira and 115 ha in Remal are not irrigated due to incomplete works. One contract in Taladanda was only 47% complete. Estimated irrigated area of 64,583 ha (95%). No end-line survey so satisfaction not determined.</p> <p>✓CAD works completed for 62% <u>✗No work was completed on extension of irrigated area through conjunctive use of groundwater.</u></p>
3. Agriculture Development and Livelihood Enhancement: Stipulated services in SIPs and micro-plans provided, and targets set therein are achieved.	<p>WUAs achieve plan targets in cropping pattern and intensity, inputs, yield levels, etc.</p> <p>WUAs establish linkages for collective input delivery, ex-tension and product marketing.</p> <p>Livelihood targets as set out in micro-plans are achieved.</p> <p>Trained women groups account for preferably 33% of total.</p>	<p>✓WUAs achieved the targets.</p> <p>✓Seed and fertilizer distributor links were established. Marketing linkages were not made.</p> <p>✓Livelihood plans were not implemented except for those areas supported by the related Grant 9134.</p> <p>✓Total 10,604 WUA members including 4,667 women (44%) are trained.</p>
4. Sustainable O&M Systems Established: Irrigation schemes operated and maintained on a sustainable basis.	<p>Scheme-wise O&M rules, annual O&M plans are prepared and implemented.</p> <p>Water management practice is improved to achieve irrigation area targets for each WUA.</p> <p>DOWR/WUA has sufficient fund to undertake the stipulated O&M activities.</p> <p>Regular annual WUA audit system is operational.</p>	<p>✓O&M plans prepared, but only implemented to date in Sunei.</p> <p>✓Water management has improved in 3 medium schemes with WUA participation. In Taladanda water plans are yet to be implemented.</p> <p>✓ DOWR has increased the grant value to irrigation operators in line with the 12th FCR.</p> <p><u>✗No annual audit carried out.</u></p>

Results Chain	Performance Indicators with Targets and Baselines	Achievement on Project Completion (✓ = achieved, ✗ = <i>not achieved</i>)
B. Institutions Strengthened and Project Management Systems Operational		
<p>1. Policy, Planning, and Legal Framework.</p> <p>(i) State Water Policy revised and implemented, with regular review by Water Resources Board (WRB).</p> <p>(ii) State Water Plan updated with development plans for the four northern river basins.</p> <p>(iii) WUA Act and Rule refined for more sustainable and inclusive PIM.</p>	<p>Revised Policy in March 2007.</p> <p>Implementation status is annually reviewed and further actions taken guided by WRB.</p> <p>State water plan detailed in four basins with stakeholder participation (2012).</p> <p>WUA Act and Rule revised with stronger WUA institutional continuity and head-tail representation by increased participation of women.</p> <p>Refined act and rule made operational (2010).</p>	<p>✓ State Water Policy revised in 2007 and 2012.</p> <p>✓ WRB meets infrequently, but a Water Advisory Committee meets once a year.</p> <p>✓ Odisha Water Planning Organization of DOWR prepared plans for all 11 river basins.</p> <p>✓ WUA Act and Rule refined as targeted and amended in 2008 (key gender element: provision mandating [33%] representation of women in WUA executive committees) and 2014; further refinements are planned.</p> <p>✓ Act and Rule operational.</p>
<p>2. DOWR Institutional Setup, Structure, Skill Mix, and Business Processes Strengthened.</p> <p>(i) Institutional development vision and strategy refined.</p> <p>(ii) Permanent PIM directorate established.</p> <p>(iii) Quality control cell established.</p> <p>(iv) DOWR capacity development plan (CDP) refined.</p> <p>(v) Water and Land Management Institute (WALMI) reforms with autonomy.</p>	<p>Vision and strategy document (2009).</p> <p>PIM directorate set up, staff deployed, and made operational with training (2008).</p> <p>QC cell set up, staff deployed, and made operational (2008).</p> <p>CDP refined to meet with PIM and other requirements (2010).</p> <p>WALMI reformed with stronger autonomy and new director recruited from market (2008).</p>	<p>✓ Vision and road map 2036 document published.</p> <p>✓ CAD–PIM directorate established and staff assigned (2008).</p> <p><u>✗ QC cell not established.</u></p> <p>✓ CDP refined in 2010–2011.</p> <p>✓ One WALMI director recruited from the market, but subsequent directors appointed. WALMI not strengthened.</p>

Results Chain	Performance Indicators with Targets and Baselines	Achievement on Project Completion (✓ = achieved, ✗ = <i>not achieved</i>)
<p>3. Systems to Support Sustainable O&M.</p> <p>(i) Fund allocation following Financial Commission (FC).</p> <p>(ii) Water rates revised to meet the allocation needs.</p> <p>(iii) Collection improved with WUA involvement.</p> <p>(iv) Land records improved providing WUA-specific data for collection/demand.</p> <p>(v) Scheme MIS for O&M performance monitoring and planning.</p> <p>(vi) DOWR establishes linkage between water rate collection and allocation.</p> <p>(vii) Pilot delegation of water tariff collection and retention by WUAs.</p>	<p>Allocation to follow FC recommendations (2011).</p> <p>Water rates revised following the FC report (2012).</p> <p>Percentage of collection against the target improved.</p> <p>Improved data base to generate the required data.</p> <p>MIS developed with monitoring data (2010).</p> <p>Fund allocation mechanisms improved, linked with WUA collection performance (2010).</p> <p>WUA performance for pilot tariff collection effective (2011).</p>	<p>✓ Fund allocation follows old 12th FCR report, Rs600/ha. 13th FCR recommends Rs1500/ha.</p> <p>✓ Water rates revised to 2002 values.</p> <p>✓ No target identified; 190% increase of collection of water charges from 2009–2010 to 2015–2016.</p> <p>✓ DOWR departments, accounts and billing are being computerized in a phased manner (not complete).</p> <p>✗✓ <i>Reports prepared, and steps made toward MIS development during project 2.</i></p> <p>✓ Fund allocation linked to revenues department percentage water charge collection.</p> <p>✗<i>No pilot tariff collection started; WUA act needs to be amended to allow for this.</i></p>
<p>4. Progress of Actions towards Operationalizing IWRM.</p> <p>(i) Appropriate IWRM functions and institutional arrangements defined.</p> <p>(ii) Institutions established to operationalize IWRM.</p> <p>(iii) Participatory RBO established with decision support systems (DSS).</p> <p>5. Project Management System Established and Made Fully Operational.</p>	<p>Institutional arrangements clarified for IWRM functions (2009).</p> <p>Establishment of IWRM institutions (2012).</p> <p>RBO set up and made operational with effective DSS (2012).</p> <p>PMU, SIOs established, staffed, and trained (2008).</p>	<p>✓ IWRM road map produced under TA and subsequently developed into an action plan by ISPMC, but not endorsed by the government.</p> <p>✗✓ <i>Partly completed with preparation of river basin plans.</i></p> <p>✓ RBO Baitarani established through notification in 2012, but not made operational.</p> <p>✓ PMU, SIOs established, staffed, and trained in 2008.</p>

Results Chain	Performance Indicators with Targets and Baselines	Achievement on Project Completion (✓ = achieved, ✗ = not achieved)
- DOWR offices	Project manuals prepared and fully operated (2008).	✓Project manuals completed in 2010.
- Line agencies	Consultants and NGOs engaged and provide effective support (2008).	✓Consultants and NGOs engaged, with most providing effective support.
-Local governments	Accountability measures for project institutions made operational (2009).	✓Improved DOWR accountability to WUAs through PIM, posting contract completion reports online.
-WUAs		
-NGOs		
-Private providers		
6. Training/Capacity Development: Capacities of project institutions are strengthened through training (for Project management, PIM, IWRM, & agriculture development).	Capacity Development Plan (CDP) is prepared and started to be implemented (2009). Project institutions are fully operational through project management support (2009).	✓CDP plan implemented by consultants, with training provided. ✓Project institutions such as CAD–PIM directorate operational; IWRM institutions were not formed.

ADB = Asian Development Bank; BME = benefit monitoring and evaluation; CAD = command area development; CDP = capacity development plan; DOWR = Department of Water Resources; DSS = decision support system; FC = Finance Commission; IWRM = integrated water resources management; HDI = human development index; MIS = management information system; MLI = minor lift irrigation; MOWR = Ministry of Water Resources; NGO = nongovernment organization; O&M = operation and maintenance; PIM = participatory irrigation management; PMU = project management unit; RBO = river basin organization; RP = resettlement plan; SIP = subproject implementation plan; QC = quality control; SIP = subproject implementation plan; SIO = subproject implementation office; WALMI = Water and Land Management Institute; WRB = Water Resources Board; WUA = water user association.

Source: ADB.

DMF Assessment Methodology

The project DMF is an old format, which has too many outcomes, outputs, and indicators compared to the current design. The PCR team, however, evaluated the DMF achievements with outputs substantially achieved.

Results Chain	Indicators achieved		Description
	Fraction	%	
Outcomes			
1. Enhanced productivity, water use efficiency, and sustainability of irrigated agriculture in the selected existing schemes in the river basins having 69,600ha designed command area.	4/4	100%	Significant achievements were made for this outcome. Although there was no end-line survey to evaluate one indicator for increased-on farm and allied activity employment, surveyed WUAs provided the days employed on farm activities.
2. Enhanced productivity, water use efficiency, and sustainability of irrigated agriculture in the selected	5/5	100%	All achieved.

Results Chain	Indicators achieved		Description
	Fraction	%	
existing schemes in the river basins having 69,600ha designed command area.			
Outputs			
A. Productive and Sustain-able Irrigated Agriculture Management Systems			
1. Participatory Planning and WUA strengthening.	9/9	100%	All achieved.
2. Irrigation and Associated Infrastructure including command area development (CAD): Good quality infrastructure designed and constructed, following appraised plan and WUA micro-plans.	2.5/3	83%	One indicator on conjunctive use was not achieved (aimed for 7% of area), but was only a small part of the project design; 95% of CAD area developed.
3. Agriculture Development and Livelihood Enhancement: Stipulated services in SIPs and micro-plans provided, and targets set therein are achieved.	4/4	100%	All achieved.
4. Sustainable O&M Systems Established: Irrigation schemes operated and maintained on a sustainable basis.	3/4	75%	Three targets were met. A major indicator is the preparation of the O&M plans, which will be implemented in the future. O&M funds match the 12th FCR report. Only one target not met: on "regular annual WUA audit system is operational".
B. Institutions Strengthened and Project Management Systems Operational			
1. Policy, Planning, and Legal Framework.	5/5	100%	All achieved.
2. DOWR Institutional Setup, Structure, Skill Mix, and Business Processes Strengthened.	4/5	80%	The key indicator for this output was the PIM–CAD directorate. The one target not met was in establishing quality control (QC), although other measures were put in place.
3. Systems to Support Sustainable O&M.	4.5/7	65%	Funds have been increasing collected for sustainable O&M, and water collection increasing. Changes to water tariffs have been attempted but are outside project control. No pilot tariff collection has started as the WUA act needs to be amended to allow for this, MIS developed to be implemented in project 2.
4. Progress of Actions toward Operationalizing IWRM.	2.5/3	83%	Substantial steps have been made toward operationalizing IWRM, including river basin plans and one RBO formed; regulatory body yet to be formed.
5. Project Management System Established and Made Fully Operational.	4/4	100%	All achieved.

Results Chain	Indicators achieved		Description
	Fraction	%	
6.Training/Capacity Development: Capacities of project institutions are strengthened through training.	2/2	100%	All achieved.
Outputs that achieved over 80% of indicators.	8/10	80%	Outputs substantially achieved.

Source: ADB.

WATER USER ASSOCIATIONS

Table 2a: Water User Associations

Name of the WUA scheme	WUA	GCA (ha)	CCA (ha)*	General Body			WUA Membership			Percentage Membership
				Total	Women	SC&ST	Total	Women	SC&ST	
Gohira	19	8,100	8,812	8,971	1,002	2,323	6,998	0	0	78%
Remal	9	4,300	4,708	9,717	467	3,852	9,230	859	1,035	95%
Sunei	20	10,000	9,825	22,321	2,048	12,306	22,321	1,541	12,306	100.00%
Taladanda	73	32,484	27,905	95,077	5,112	7,130	76,661	2,927	5,739	80.63%
Total	121	54,884	51,250	136,086	8,629	25,611	115,210	5,327	19,080	79.8%
								% of total members	5%	17%
								Of eligible group enrolled	62%	74%

CCA = certified command area; GCA = gross command area; SC = Scheduled Caste; ST= Scheduled Tribes.

Source: ADB.

Table 2b: WUA Executive committee members¹

Scheme	Total Exc. Members	No. of women	No. of SC&ST
Gohira	228	85	78
Remal	211	70	55
Sunei	415	204	147
Taladanda	1,228	9	116
Total	2,082	368	396
		18%	19%

Source: ADB.

¹ Data only for those WUAs that held elections during the project period.

Source: ADB.

IMPLEMENTATION OF GENDER ACTION PLAN AND ACHIEVEMENTS

A. Introduction

1. The *Orissa Integrated Irrigated Agriculture and Water Management Investment Project* (Project 1) was designed to enhance the productivity and sustainability of existing irrigation schemes. This involved renovating irrigation infrastructure, installing participatory irrigation management (PIM) systems with water user associations (WUAs) — or *pani panchayats (PP)*— and empowering WUAs as a cohesive platform for irrigation operation and maintenance (O&M) and agriculture development. The project intended to have beneficial social impacts. It placed emphasis on beneficiary participation with due attention to the diversity of their interests and vulnerability (e.g., tail end farmers). The strategy had two levels, including (i) WUA capacity enhancement to ensure sound governance including representation, participatory decision making, and equal water distribution and (ii) specific actions and programs to aid vulnerable groups including women by establishing links to the existing poverty reduction programs such as self-help groups.

2. Evidence collected during the fact-finding missions for the project and project feasibility study reports indicated that most of the farmers in the subproject area were landless people and marginal farmers (14% and 55%–60%, respectively), followed by small farmers (25%–28%), and medium-sized (6%–8%) and large (2%–3%) farm holdings. The subproject area had a higher poverty incidence (20%–69%) than the state average. Moreover, as many as 6.5% of the total households were below the “absolute poverty line” in terms of caloric intake and access to resources. Around 14% of the poor were landless and 58% were marginal farmers. During the project preparatory stage, discussions were carried out with women, the landless, and other vulnerable groups to assess local needs, including problems and/or constraints on (i) water resources in relation to agriculture, fisheries, transport, environment, and other uses, (ii) possible solutions to resolve the constraints identified including impacts on local interest groups, (iii) implications of solutions for poverty reduction, and (iv) prioritizing water resources needs compared with other development needs.

3. The project prioritized improving the productivity and sustainability of existing underutilized irrigation infrastructure by adopting participatory irrigation management (PIM) with (WUA) development as the critical step toward attaining sustainable water resources management. Within this context, the project aimed to institutionalize PIM and improve irrigation infrastructure, thereby promoting intensive and high-value irrigated agriculture in Odisha. The project recognized the need for active participation of small and marginal farmers including women in WUA development. An additional capacity building grant of \$2 million was financed by the Japan Fund for Poverty Reduction (JFPR)¹ and targeted capacity building and livelihood enhancement of poor water users, contributing to further address the various gender related constraints the vulnerable groups, including women, face.

4. A Gender Action Plan (GAP) was prepared and included activities such as (i) creation of a staff position in the Department of Water Resources (DOWR) PIM–Command Area Development (CAD) Directorate to look after social and vulnerable groups, (ii) capacity building training courses targeted toward women trainers, nongovernment organization (NGO) staff and women water users and the farmers themselves, (iii) inclusion of at least 20% women in the field implementation team, with increased female technical staff in DOWR, (iv) promotion of at least 33% women representatives elected to WUAs, (v) formation of women’s groups and delivery of

¹ JFPR Grant 9134-IND: *Capacity Building & Livelihood Enhancement of Poor Water Users*.

programs to support their empowerment within the WUA, and (vii) gender disaggregated baseline survey and monitoring.

B. Gender Issues

5. The project was categorized as Effective Gender Mainstreaming as it was designed to (i) contribute to gender equality and women's empowerment by enhancing women's participation in WUA Executive Committee irrespective of their land-ownership status and (ii) it supported economic empowerment of women through livelihood training programs. The key gender issues in the project included:

- (i) Low ownership by women of productive assets, particularly land, which has major implications for women's productivity, incomes, and well-being. Due to women's unequal access to productive resources and the gender discrimination within traditional households, women bear a disproportionately high burden of poverty.
- (ii) Land ownership and tenure issues often limit women's influence on decisions related to water management and use. Despite having critical interests in access to water and its use, land ownership is a condition for membership in many water management bodies. This excludes many women farmers who cultivate land they do not own from participating in decision making and management, as well as women concerned with access to water for household use.
- (iii) Women are underrepresented in WUAs in all project locations. Women's participation in WUAs is highly restrictive, which is attributed to—apart from social norms—low levels of awareness about the role and responsibilities of WUAs.
- (iv) Women's work participation is very low in project locations and restrictive both across main and marginal work (in the range of 9% to 20%). Women are important producers of homestead crops and livestock, and their post-harvest activities contribute over 50% of the value of crop produce. The 2011 census data for project areas (block level data) and the socio-economic surveys (feasibility reports 2007) also indicate that women contribute significantly to the local economy.
- (v) Women are major contributors to the rural economy, both through their remunerative work on farms (e.g. crop and livestock production and cottage industries) and through the unpaid work they traditionally render at home (e.g. gathering firewood) and in the community. However, they are often overlooked as farmers and cultivators or as workers producing goods and income. Women need opportunities to develop skills, to use productivity-enhancing technologies, to benefit from training and extension program that aid the income of the household.
- (vi) Women are bound by social restrictions that hamper their mobility. Lack of autonomy within the household and social restrictions on mobility prevent women from accessing education, skills training, and health facilities as well as labor markets.

C. Gender-related features of the project

6. The gender and development strategy of the project included various steps to enhance women's access to information, participation in irrigation management institutions, and ability to improve their livelihoods. The project gave specific attention to train field staff in gender-sensitive

and participatory planning and implementation. The salient features of the project to address gender equality issues and promote women's empowerment are as follows:

- (i) **Women's participation in WUA decision making.** The Orissa Pani Panchayat Amendment Act (2008) provided provision to ensure one-third (33%) women representation in the executive committee of every WUA. This encouraged participation of women in irrigation management. Before the election only 2.3% of WUA executive committee (PPEC) members were women.
- (ii) **WUA strengthening.** The project emphasized strengthening of WUAs to progressively take on O&M and implementation roles, with their capacity developed to facilitate links and bargaining power in input delivery, extension, and product marketing to achieve productive agriculture. Inclusion of 33 % target for women's participation provided opportunities to women to participate, exercise power and decision making in water/irrigation management. The Department of Water Resources (DOWR) conducted series of training for women farmers in WUA operations and agricultural related activities to enhance their knowledge and understanding that would help in increasing agricultural productivity and thereby income from farming.
- (iii) **Partnerships with NGOs.** The project design necessitated the implementation of the project in consultation with relevant state government agencies and NGOs. The NGOs (such as PRADAN and WALMI) were engaged for mobilization of community/farmers, information dissemination, and training and capacity building activities.
- (iv) **Convergence with the Department of Women and Child Development.** The Project Steering Committee had representation from Department of Women and Child Development, Odisha, to provide strategic guidance on gender mainstreaming activities. This helped to put gender equality and women empowerment in the forefront and provided focus to the need for mainstreaming women under the project.
- (v) **Institutional Strengthening and Project Management.** Toward project completion, the PIM–CAD Directorate of DOWR and PMU had 29% female staff, 20% female Support Services Teams (SSTs)/Community Organizers (COs) in the field. For DOWR staff, field staff/SIOs, 124 different training programs were organized in which 3,424 persons participated.

D. GAP Achievements Matrix

7. GAP Achievements are presented by project component in Table 1. Table 2 provides further information on project outcomes for women, collected from selected beneficiaries through in-depth interviews in April 2017.

Table 1: GAP Achievements Matrix¹

Activities	Achievements	Implementation Status
Gender Mainstreaming, Participatory Planning and Implementation		
1. Conduct baseline survey and ensure effective monitoring.	a) Questionnaire for gender disaggregated data collection (every six months) prepared and shared with the SIO/SST. b) Feasibility studies and Subproject Implementation Plans (SIPs) completed for all 5 major and 6 medium subprojects up to Project 2, and 650 MLI subprojects for Project 1. The feasibility studies included a section on Socio-Economic Assessment that required on (i) Population including sex and social category disaggregated data from Census 2001, (ii) Village Infrastructure and Services, (iii) Social and Economic Profile, (iv) Vulnerable Groups, (v) Beneficiary Needs Assessment, (vi) Beneficiary Interest in Project, and (vii) Government Welfare Schemes and Local/Village Level Organizations.	Completed. Baseline Survey completed. Process of MIS establishment started for further completion during Project 2.
2. Conduct project awareness campaign and social mobilization (Target: at least 50% women participation, incl. Scheduled Caste [SCs], Scheduled Tribes [STs] and Other Backward Classes [OBCs]).	a) 76 project awareness campaign and social mobilization meetings conducted, with 1,672 participants (793 women [47%] and 879 men [53%]). b) Benefits expressed by women included (i) enhanced knowledge of the gender-related provisions set out in the Pani Panchayat Amendment Act (2008) and (ii) motivation to actively participate in the WUAs.	Completed. Target achieved (women's participation: 94%).
3. Group formation under Water User Association (WUA) development process and basic technical skills training (Target: 50% women participation).	Under JFPR Grant 9134, 192 CIGs were established in 3 subprojects – Taldanda (120 CIGs), Sunei (40 CIGs) and Remal (32 CIGs). A total of 3,045 members of the CIGs were trained in which 1,827 (60%) were women. Topics of the training included: vegetable cultivation, seed treatment, bio pesticide- <i>Handi khata</i> , and <i>vermi</i> -composting preparation. Personal interviews with women revealed that women could apply the knowledge from the training in their house garden/kitchen, garden vegetable cultivation as well as in farms. These resulted in increase in yield. Women reported that their family income increased over the years because of the agriculture training they participated in under the project. In their view, their contribution to the increase in family income, as well as to the family savings helped them gain more respect from family members.	Completed. Target over-achieved.
4. Capacity building training courses targeted to women	The WUAs' women members' capacity, to engage in participatory decision-making with the Sub-Project Implementation Office (SIO), specifically on	Completed. Target over-achieved.

¹ The GAP Achievements Matrix provides results on the 12 activities included in the (original) Gender Action Plan (GAP), which was developed ahead of loan approval in 2008. During the initial time of implementation of JFPR Grant 9134-IND attached to the loan the newly formed Common Interest Groups (CIGs) selected a range of agriculture-related activities which differed from those foreseen during loan design (e.g. agriculture, fisheries and poultry). Activity 7 presents the gender-related results for training in mushroom cultivation, bamboo craft-making, cane products, and rice trading.

Activities	Achievements	Implementation Status
<p>trainers, NGO staff and women water users and farmers themselves.</p> <p>Targets²</p> <ul style="list-style-type: none"> • 30% women participation, (incl. SCs, STs, and OBC). • 20% women participation (DOWR CAD/Pani Panchayat directorate and NGO staff). 	<p>subproject planning, implementation, and O&M is crucial in enabling them to plan and implement specific works that are gender-responsive and socially inclusive. Hence, the project conducted training to build capacity for participatory decision-making at two levels (i) the institutional level (SSTs, COs, NGO staff) and (ii) the individual level (women water users and farmers).</p> <p>The project conducted agriculture-related training for the WUAs to equip them with the technical knowledge and skills on a range of agricultural activities.</p> <p><i>a) Training for Support Services Teams (SSTs) and Community Organizers (COs)</i></p> <p>The Pani Panchayat Support Unit (PPSU) and ISPMC experts conducted training for SST and COs on (i) women's participation in WUAs, (ii) participatory approaches, (iii) Training-of-Trainers (ToT) to reach women farmers for their role in agriculture, (iv) SHG/CIGs and WUA. A total of 10,604 members including 4,667 women (44%) participated in such training.</p> <p><i>b) Training for WUAs</i></p> <p>A total 19,826 people participated in 748 activities³ conducted in different villages/<i>chaks</i>⁴/WUAs where women comprised 7,276 (36.7%) of the trainees.</p> <p>Women's participation by groups were as follows:</p> <ul style="list-style-type: none"> • SCs with 2,832 participants, of whom 1,067 (38%) were women • STs with 6,972 participants, of whom 3,485 (50%) were women • OBCs with 7,358 participants, of whom 1,879 (26%) were women, and • General category with 2,664 participants, of whom 845 (32%) were women <p><i>c) Training for Women Trainers, NGO staff, and Female Water Users</i></p>	

² Specific targets derived from JFPR Grant 9134-IND: *Capacity Building & Livelihood Enhancement of Poor Water Users*.

³ Topics of agriculture related training were as follows (1) Chak level Plan and Crop Calendar, (2) Usefulness of Soil Testing and method of Soil Sample Collection, (3) Analysis of Soil Health Report and Recommended doses of Fertilizers, (4) Seed Germination Test, (5) Seed Treatment, (6) Seed Bed Preparation, (7) Seven Inputs for Kharif Preparedness, (8) Various Methods of Transplanting, (9) Top Dressing & Crop Management., (10) Integrated Pest & Nutrient Management (IPM), (11) Organic Pest Control-Pot Manure Preparation and Application, (12) Biological Pest Control – Trico and Bracon Application Card, (13) Seed Production, (14) Seed Village Program, (15) Water management and Weed control, (16) Post-Harvesting Management Technology, (17) Crop Cutting and Yield Assessment, (18) Mushroom and Vermin Compost Program, (19) Mixed Cropping, (20) Crop Diversification, and (21) Rabi Crop Water Management (Scheduling of Water Distribution).

⁴ An area irrigated by one outlet.

Activities	Achievements	Implementation Status
	<ul style="list-style-type: none"> 132 training programs⁵ were organized for women trainers, NGO staff, and female water users. A total of 4,216 participants took part in the training, with women participants comprising 1,475 (35%). <p>d) <i>Exposure Visits</i></p> <ul style="list-style-type: none"> Exposure visits were organized for a total of 1,290 participants, where 489 (38%) women participated. The exposure visits aimed to develop knowledge and understanding of new techniques in rice crop production and methods/techniques to increase rice yield. The participants visited the Central Rice Research Institute in Cuttack, Jodia, and Keonjhar, and the Krishi Vigyan Kendras (Agricultural extension centers created by Indian Council for Agricultural Research [ICAR]). 	
WUA Participation		
5. Inclusive formation of WUA and representation in the Executive Committee of WUA. <ul style="list-style-type: none"> Target 33% women 	<ul style="list-style-type: none"> All 121 Pani Panchayats under Project 1 were formed. Elections were held in 62 out of 121 Pani Panchayats/WUAs. The target of 33% of women in the WUA Executive Committee was achieved in all WUAs where elections were held. 64% of women and 74% of vulnerable groups enrolled in WUAs.⁶ Breakdown of women's representation at the subproject level/areas are as follows (i) Remal (9 PPs) – 33%, (ii) Sunei (20 PPs) – 49%, (iii) Gohira (19 PPs) – 37%, and (iv) Taladanda (14 out of 73 PPs) – 33%.⁷ 	Completed. Target over-achieved.
6. Organize women groups under PP, according to selected on-farm or off-farm activities and identify specific roles and responsibilities of members.	Under JFPR Grant 9134, 192, CIGs were established in three subprojects consisting of 3,045 members, with 1,827 (60%) women. CIGs selected the following agriculture-related activities (i) Goat Farming–170 CIGs, (ii) Mushroom cultivation–16 CIGs, (iii) Cane and Bamboo products–5 CIGs, (iv) Rice Trading–1 CIG.	Completed.
Agriculture and Livelihood		
7. Train women for income-generation and livelihood activities.	The purpose of JFPR Grant 9134-IND was to finance pilot or ongoing projects comprised of activities of highly promising interventions that have the potential	Completed.

⁵ Topics of training for Women Trainers, NGO Staff, and female water users were as follows: (1) Aims and Objectives of OIIAWMIP, (2) Participatory Walk Through: Need & Necessity With Special Reference to OIIAWMIP, (3) Participatory Planning and Preparation of Micro-Plan, (4) Basic orientation to Pani Panchayat (PP) Act and Rules, (5) Procedure for Conducting Elections With Special Reference to PP Act and Rules, (6) Clarification regarding PP Election as per PP Act and Rules 2008, (7) Procedure for Maintaining Books of Accounts and Other Statutory Records for PPs, (8) Sustainable Operation & Maintenance (O&M) THROUGH a Participatory Approach, (8) How to Mobilize Farmers for Collective Action, (9) Training on Capacity Building of Sub-Committees (10) Development of Participatory Kharif and Rabi Plan, (11) Role and Responsibilities of Officer Bearers, (12) Role and Responsibilities of Chak Committee, (13) Record Maintenance on Construction Skill and Quality Control of Civil Works. (14) Training on Social Audit and Financial Resources, (15) Training on the Organizational Aspects of PP, (16) Training on the Pani Panchayat's Financial Aspects.

⁶ Refer to Appendix 2.

⁷ Only 14 WUA elections were completed in Taladanda during the project period. 20 were completed after the project, with 39 WUA elections remaining (including 6 that were stalled due to legal disputes).

Activities	Achievements	Implementation Status
	<p>to benefit large numbers of the poor, but which are either not yet ready for widespread promotion in the subproject area or for which funding is not available from other sources. Training related to the following selected agricultural activities was conducted (i) Goat rearing⁸ (goat), (ii) Mushroom cultivation⁹ (mushroom), (iii) Bamboo Crafts making, (iv) Cane Products, and (v) Rice Trading. The training helped develop the skills of the CIGs in managing the agricultural activities they selected. The JFPR also provided support to CIGs to enable them to efficiently manage their selected agricultural activities.</p> <p>(i) Goat Farming. One hundred seventy (170) (88.5%) CIGs, which includes 2,731 members across 192 villages, selected this agricultural activity. The participants came from vulnerable households—mainly landless, marginal farmers and destitute women. The organization of women into CIGs and the strong emphasis on participatory planning and implementation through the group activity enhanced self-confidence and reduced the sense of isolation, especially of the tribal households mainly in Sunei and Remal subprojects.</p> <p>(ii) Mushroom Cultivation. 16 CIGs (8.3%), mainly in Taladanda-II subproject opted for mushroom cultivation as an alternative livelihood activity. The project covered a total of total 239 members across 16 villages (CIGs) of Tritol & Rahama block, Jagatsinghpur districts. The beneficiaries were selected from vulnerable families residing in the villages. Through the project's support, the communities have acquired technology related to straw and oyster mushroom cultivation, and collection of paddy straw for mushroom cultivation. The knowledge and skills that the women acquired from the training motivated them to pursue mushroom cultivation as their livelihood activity.</p> <p>(iii) Cane & Bamboo Products. 5 CIGs in the Taladanda-I subproject participated. Of these, 4 (2.1%) were involved in Bamboo products and 1 (0.5%) was involved in Cane products. The CIG members have been involved in these activities for 2 to 3 decades. Hence, the project focused on providing technical and hand holding support to improve marketing of the products and sustainability of the activities.</p> <p>(iv) Rice Trading. 1 CIG opted for this activity, which is a traditional activity in</p>	

⁸ Training goals related to goat farming (1) Awareness, Accounts and Book Keeping, (2) Technical Training-Shed construction/ Procurement of goat & buck, (3) Technical Training-Disease, vaccination & feeding practice of goat and buck, and (4) Exposure visit to State Livestock Breeding Center, and Bargarh.

⁹ Training related to Mushroom Cultivation: (1) Accounts and Bookkeeping, (2) Technical Training on shed, water tank, and bamboo rack construction, (3) Technical training related to Oyster mushroom cultivation, (4) Technical training related to Paddy Straw Mushroom cultivation, and (5) exposure visit to the private entrepreneur Kalinga Mushroom in Dandamukundapur, Puri.

Activities	Achievements	Implementation Status
	which the members have been involved in for many years. To boost its growth and sustainability, the project provided financial assistance for training as well as hand holding support.	
8. Development of micro-plans. Indicator: Micro-plans include gender-sensitive monitoring of agricultural and livelihood activities	WUA Micro-plans prepared for all 121 WUAs and endorsed. ¹⁰	Completed.
Institutional Strengthening and Project Management		
9. Participation of women in all project related implementation activities. Indicator: Participatory Irrigation Management (PIM) field unit staff recruited/ contracted. - Target 10% women initially - Target 20% women by Year 3	Field Staff for the Support Services Teams (SST) were recruited. A total of 186 field staff were recruited for SST/COs, consisting of 148 (80%) males and 38 (20%) females. The project's target of having 20% women among the staff was achieved. Women field staff provided support by helping reach out to women farmers in the area.	Completed.
10. Creation of staff positions in DoWR, CAD/PIM Directorate responsible for gender sensitive irrigation management planning. Indicator: Involvement of female DOWR staff in project activities - Vacant and new positions (under CAD/PIM Directorate) are filled by women professionals	The PIM–CAD Directorate of DOWR has 53 staff including 23 PIM–CAD staff and 30 PMU Staff. Male – 38 (71%) Female – 15 (29%)	Completed.
11. Gender Specialist at the PMU level. Indicator: Gender Specialist is recruited for 24 person-months at the PMU.	Gender Focal Point identified in PMU and TORs of vulnerability expert in the PMC [Institutional Strengthening and Project Management Consultants (ISPMC)] included responsibility for GAP implementation.	Completed.
12. Directorate of Women and Child Development will be a	Commissioner-cum-Secretary of the Women and Child Development Department is member of the Project Steering Committee.	Completed.

¹⁰ For major and medium-sized schemes, the planning process has two tiers. The first is Scheme Planning (completed prior to the Periodic Financing Request [PFR]), which provides an overall framework for the scheme, including the main infrastructure. The second is on WUA micro planning, which details WUA implementation plans for minor infrastructure, command area development (CAD), agriculture, livelihood, and O&M. A multidisciplinary team including NGO staff and local facilitators are designated to prepare the plan with individual WUAs.

Activities	Achievements	Implementation Status
<p>member of the Project Steering Committee and will provide guidance to the Project in promoting gender balance during implementation.</p> <p>Indicator: Project Steering Committee has member from the Department of Women and Child Development.</p>		

CO = Community Organizer; DOWR = Department of Water Resources; GAP = Gender Action Plan; GC = General Category; KVK = Krishi Vigyan Kendra; OAUT = Orissa University of Agriculture and Technology; OBC = Other Backward Classes; PPMS = Project Performance Management System; PPSU = Pani Panchayat Support Unit; SC = Scheduled Castes; Scheduled Tribes; SIO = Sub-Project Implementation Office; SST = Support Services Team; WUA = Water User Association.

Source: ADB.

D. Evidence of Project Outcomes on Women

8. In-depth interviews were conducted with select women beneficiaries in Taldanda and Sunei subproject areas in Mayurbhanj, Jagatsinghpur and Cuttack districts (Table 2). The findings reflect positive impacts that are expected to sustain even after project completion. During our discussion, most women acknowledged positive changes in their day to day lives after participation in WUA meetings, training, and awareness programs. The project activities including training, demo programs, and exposure visits were very helpful to these women to enhance awareness on irrigation management and agricultural practices. The women utilized this learning in their fields to increase agricultural productivity and explored alternative livelihood activities such as dairy farming, fisheries, etc. for increasing their family income. After receiving training on new and improved farming techniques, the women also reported savings in time and effort during the sowing and harvesting seasons.

Reflection of WUA Executive Committee Member

"This time I have been elected from a reserved seat for women. But next time, I'll again compete for the WUA Executive Committee, when this seat will not be a reserved one. This is a very important position and we (women) are heard in the meeting(s) and we (women) can take decisions. I participate in all monthly meeting and ensure that interests of all farmers (male/female) are taken care of."

- Ms. Nalini Lenka from village Kothi, District Jagatsinghpur is a WUA Executive Committee Member from PP No. 56 in Taldanda subproject area

Women experience benefits from the project

"I managed to save at least \$750 over the last 10 years as my yield constantly increased leading to an increase in savings. We learned paddy line transplantation techniques and applied them in our farmland. I learned goat rearing as well from the project and both types of training have helped increase my household income. I'm not only contributing to my family income, but have started taking decisions as well. I opened a bank account and I'm depositing money for future use."

- Ms. Dipti Rani Pradhan from village Paitya, District Jagatsinghpur is a WUA Member from PP No. 36 in the Taldanda subproject area.

Women are able to voice their opinion

"I was elected in 2014. The last three years have been very rewarding. My participation in PPEC has led to several learning and rewarding avenues. I participate regularly in monthly PPEC meeting and I learned that I can take and implement decisions that can benefit my community. This gives me immense satisfaction."

- Ms. Sarita Padhi, from village Bhalubhasa, District Mayurbhanj is WUA Executive Committee President from PP No. 6 in the Sunei subproject area.

Awareness campaigns led to more women joining WUAs

"Earlier we did not know about women's participation in the WUA, but NGO staff held an awareness session in our village and more women wanted to join WUAs. We came to know that WUAs are not only for land holders and that women can be nominated by a family member (husband) who is a land holder. After my three-year association with WUA I feel I can discuss matters with outsiders (other than family members) with confidence."

- Ms. Minoti Swain from village Irikundal, District Jagatsinghpur is Chal leader from PP No. 31 in the Taldanda subproject area.

Table 2: Information on project achievements collected from selected beneficiaries through in-depth interviews ¹

1.	Project covered	Area	Taldanda (PP No. 24, 31, 36, 41, 56, 58 and 59) and Sunei (PP No. 6)					
2.	Village and District		Village Paita, District Jagatsinghpur Village Irikundal, District Jagatsinghpur Village Kanapur, District Jagatsinghpur Village Thoriapara, District Cuttack Village Kothi, District Jagatsinghpur Village Adhankura, District Jagatsinghpur Village Bhalubasa, District Mayurbhanj					
3.	Basic Information	10 Women Beneficiaries						
		Age Group		Marital Status		Education		
		20-30 years	0	Unmarried	0	Primary School	2	
		30-40 years	3	Married	10	Middle school	5	
		40-50 years	6	Widow	0	Matriculation (Tenth)	2	
		50-60 years	1	Divorced	0	Graduation	1	
		Religion		Social Category		Ownership of land		
		Hindu	9	General category	2	Owns land		
		Muslim	1	Other backward class	8	Do not own land		
		Others	0	Scheduled Caste	0			
				Scheduled Tribe	0			
4.	Association with Water User Group	Years of association with WUA		WUA Membership category				
		5—10 years	4	PP member	5			
		1—4 years	6	Chak leader	2			
		Less than 1 year	0	PPEC Member	2			
				PPEC Office Bearer	1			
5.	Project Participation	Participation in awareness campaigns			Participation in training programs			
		Yes	10	Yes	9			
		No	0	No	1			
6.	Economic Benefits	Increase in yield		Increase in income		Bank Accounts for self		
		Yes	10	Yes	10	Yes	10	
		No	0	No	0	No	0	
7.	Control over financial resources	1. Able to save money. 2. Able to take decision on spending of income. 3. Able to manage (household) finances. 4. Contribute towards family income.						
8.	Project Benefits	1. Enhanced awareness on irrigation management, agriculture development, new technology 2. Awareness of WUA, its workings, and the role and of PPEC office bearers. 3. Awareness about new agricultural techniques; the training has saved time and efforts in pre- and post-harvest activities as well as during the harvesting process. 4. Better understanding about irrigation, saves time and labor during harvesting. 5. Better understanding on agriculture techniques, sowing, germination etc.						

¹ Information provided in the table is based on the response provided by the beneficiaries during the PCR Mission conducted in April 2017.

9.	Information on project	<ol style="list-style-type: none"> 1. Sufficient information about the project and main interventions. 2. Information regarding a WUA, its structure, and workings. 3. Information about PPEC, PP Amendment Act 2008 and its benefits, especially those related to women. 4. Information on benefits of community mobilization for government works. 5. Received regular information from project staff and NGO staff.
10.	Social (Relations in family, community, public spaces)	<ol style="list-style-type: none"> 1. Gained confidence and can speak in public and with men other than family members. 2. Associate and work on other state government schemes and programs. 3. Increased respect from husband, children, and other family/community members. 4. Views are being respected by community and villagers. 5. Are able to support other women in the community (in decision-making).
11.	Voice and Decision making	<ol style="list-style-type: none"> 1. Can take decisions for self, family, and community. 2. Able to take decisions in WUA meetings that benefit all (women). 3. Joint decisions within the household about spending money. 4. Meaningful contribution to WUA committee meetings. 5. Not afraid to voice opinion in (public) meetings.
12.	Changes in women's lives	<ol style="list-style-type: none"> 1. More (financially) secure and confident. 2. Informed about other government programs, can avail (are availing) benefits of government (livelihood) program and schemes. 3. Can take household decision at par with husband and other male family members. 4. Are able to take decisions for household purchase and regarding children's education, health, etc. 5. Able to go out of village for reasons other than familial (meetings) and proud to be associated with WUAs (as coveted position).

Source: ADB.

IRRIGATION WORKS ACHIEVEMENTS

Table 4a: Irrigated area

Sub project	Net Irrigation Area (Ha)		Increase in Irrigated Area
	Pre-project	Post Project Reported by Govt.	
Gohira	6,030	8,812	46%
Remal	2,729	4,708	73%
Sunei	4,930	9,825	99%
Taladanda	21,383	27,905	31%
MLI	6,300 ¹	13,333	112%
TOTAL	41,372	64,583	
DMF target 68,000		(95%)	56%

¹ Based on 45% as described at appraisal
Source: ADB.

Table 4b: CAD works summary

Scheme	Post project Net Irrigation Area (ha)	Completed CAD (ha)	Drains (ha)
Gohira	8,812	8,304	1,715
Remal	4,708	4,313	600
Sunei	9,825	10,000	3,003
Taladanda	27,905	17,273	
Total	64,583	39,890	5,318
Percentage		62%	

Source: ADB.

TRAINING AND WORKSHOPS**Table 5a: Meetings / Training programs / Workshops**

No	Activities	Total
1	Weekly review meeting at NGO Level	616
2	Monthly review meeting at SIO Level	159
3	State level review meeting	19
4	Training programme PP/Chak level	6762
5	Workshop at state level	7
6	Workshop at SIO level	6

Source: Government PCR.

Table 5b. Inter State / Intra State Training–Exposure Visit

Training-cum-Exposure Visit	Numbers conducted	Participation of Departmental Officers	Participation of PP members/Farmers
Inter-State	13	16	513
Intra-State*	1	1	39

* Intra-state exposure training to EC Aided Minor irrigation project at Darpanarayanpur in Nayagarh district.
Source: ADB.

PROJECT COSTS AND DISBURSEMENTS

PROJECT COST AND FINANCING PLAN In \$

No.	Category	Appraisal Cost					Actual Cost				
		ADB	State	OFID	WUAs	Total	ADB	State	OFID	WUAs	Total
1	Civil Works	5.6	5.5	23.8	1.3	36.2	7.3	8.8	21.6	1.3	38.9
2	Land Acquisition and Resettlement	0.0	3.6	0.0	0.0	3.6	0.0	0.9	0.0	0.0	0.9
3	Vehicles and Equipment	1.2	0.2	1.0	0.3	2.7	0.1	1.5	3.0	0.0	4.6
4	Specialist Services	4.8	0.4	0.0	0.0	5.2	5.5	1.5	0.0	0.0	7.0
5	Survey and Investigation	0.5	0.2	0.0	0.0	0.7	0.9	0.4	0.0	0.0	1.3
6	Training	1.2	0.0	0.0	0.0	1.2	0.4	0.1	0.0	0.0	0.5
7	Operational Costs	0.9	3.0	0.0	0.0	3.9	2.3	4.9	0.0	0.0	7.2
8	Contingencies	2.3	1.8	5.2	0.2	9.5	0.0	0.0	0.0	0.0	0.0
9	Financing Charges	0.0	3.4	0.0	0.0	3.4	0.0	1.6	0.0	0.0	1.6
	Total	16.5	18.1	30.0	1.8	66.4	16.5	19.8	24.6	1.3	62.1

Source: ADB.

ADB LOAN ANNUAL DISBURSEMENTS BY CATEGORY (in \$)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
01A Works—Major & Medium Schemes (Main and Distributary Canals)	45,464	103,654	1,008,130	778,527	774,840	404,796	420,741			3,536,151
01B Works—Major & Medium Schemes (Minor Canals)										-
01C Works—Command Area Development		50,883	432,662	771,114	647,764	120,937	520,541	18,763	4,100	2,566,765
01D Works—Minor Lift Schemes										-
01E Works—O&M Support					42,298	32,052				74,349
01F Works—Other		342,098	233,300	319,118	125,641	11,733	47,901			1,079,791
02A Vehicles & Equipment—Minor Lift Equipment										-
02B Vehicles & Equipment - Vehicles										-
02C Vehicles & Equipment—Equipment & Materials				78,636	4,917	16,100	1,338			100,990
03A Specialist Services—NGO Special Mobilization		60,893	100,309	112,953	196,274	110,322	211,584			792,335
03B Specialist Services—TA Consultant		802,691	1,016,720	633,433	496,469	351,220	748,746			4,049,279
03C Specialist Services—Minor Lift Implementation		27,155	217,773	140,133			223,972			609,033
03D Specialist Services—Resettlement Plan Implementation					30,920					30,920
03E Specialist Services—Studies										-
04 Survey & Investigation		55,295	48,219	119,254	131,605	158,735	403,091			916,199
05 Training		106,056	51,851	58,772	102,363	10,568	120,365			449,976
06 Incremental operational costs		566,138	433,637	509,044	293,365	18,198	477,928		(4,100)	2,294,210
Total	45,464	2,114,864	3,542,602	3,520,983	2,846,455	1,234,660	3,176,207	18,763	0	16,500,000

Source: ADB.

OFID LOAN ANNUAL DISBURSEMENTS BY CATEGORY (in \$)

	2009	2010	2011	2012	2013	2014	2015	2016	Total
01A Works—Major & Medium Schemes (Main and Dist Canals)		216,300	2,009,574	2,815,145	1,083,389	2,711,000	1,443,638	296,562	10,575,609
01B Works—Major & Medium Schemes (Minor Canals)				338,340	571,809	5,082,967	2,392,979	1,212,172	9,598,266
01C Works—Command Area Development				236,118	153,704	265,552	130,296	608,781	1,394,451
02 Minor Lift Equipment			235,341	987,094	86,052	70,227	972,882	633,908	2,985,504
Total	-	216,300	2,244,915	4,376,697	1,894,954	8,129,746	4,939,795	2,751,423	24,553,831

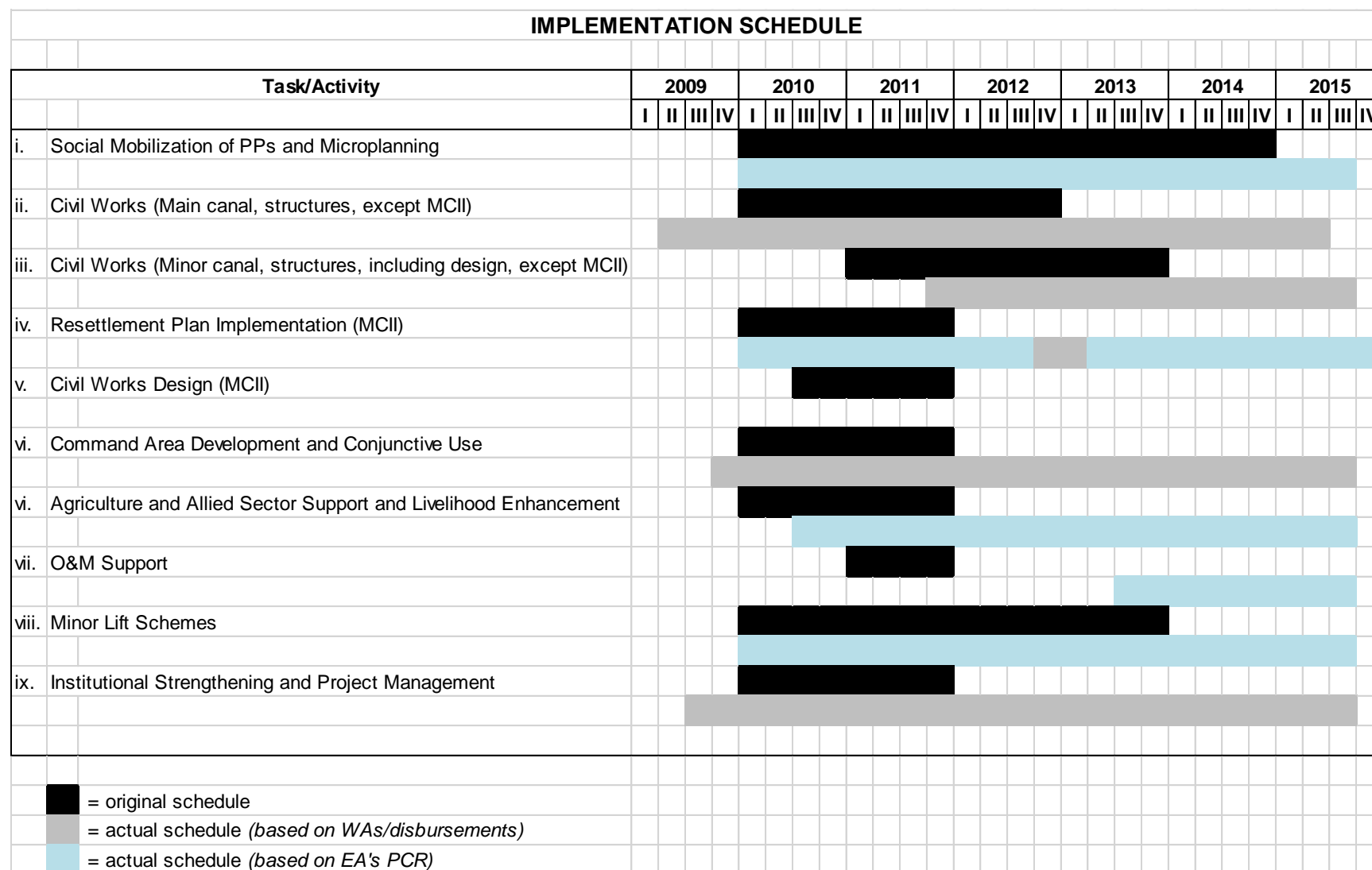
Source: ADB.

ANNUAL DISBURSEMENTS BY FINANCIER (in \$)

	2009	2010	2011	2012	2013	2014	2015	2016	Total
ADB	0.05	2.11	3.54	3.52	2.85	1.23	3.18	0.02	16.50
OFID	0.00	0.22	2.24	4.37	1.90	8.13	4.94	2.75	24.55
State	1.63	1.42	2.17	3.43	4.06	3.15	3.12	0.81	19.79
WUA	0.02	0.00	0.06	0.27	0.30	0.10	0.33	0.22	1.29
Total	1.69	3.75	8.01	11.59	9.10	12.62	11.57	3.80	62.13

Source: ADB.

PROJECT IMPLEMENTATION SCHEDULE



Source: ADB.

STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference in loan agreement	Status of Compliance
The project executing agency shall be the State of Odisha (the State) acting through the Department of Water Resources (DOWR) of the State. DOWR shall be responsible for overall strategic guidance, supervision and quality assurance of works while ensuring compliance with assurances and due diligence.	Loan Agreement (LA), Schedule 5, para. 1	Complied with.
A State-level project steering committee (PSC) shall provide policy guidance, inter-ministerial coordination, and shall take decisions on the Project. The PSC shall be chaired by the agriculture production commissioner, or an officer not below the level of secretary to the state, and the members shall include secretaries, directors, and/or representatives of all relevant departments and agencies of the State. Under the PSC, a project coordination working group (PCWG) chaired by secretary of DOWR shall provide regular coordination with the nodal officers assigned by the concerned departments and agencies of the State.	LA, Schedule 5, para. 2	Partly complied with. PSC and PCWG formed and met once in 2010, but were not active bodies in implementation.
The project management unit (PMU), which has been established in DOWR under the command area development/participatory irrigation management (CAD/PIM) directorate and with the assignment of a full-time project director, shall be responsible for the identification, formulation, implementation, and O&M of all subprojects including conformance with the State, national and ADB social and environmental safeguards policies. The PMU shall (i) coordinate with other agencies concerned, (ii) prepare an overall implementation plan and annual project budget; (iii) guide the feasibility studies and endorse subproject appraisal reports including the safeguards documents, (iv) monitor and guide the activities of the subproject implementation offices (SIOs) on subproject planning, implementation and O&M, (v) manage and guide safeguards action plans and implementation; (vi) establish and maintain a management information system (MIS), (vii) monitor overall project progress and evaluate project benefits and social and environmental impacts, (viii) arrange for necessary staff training programs; (ix) manage procurement, consulting and NGO services, and loan disbursement; (x) maintain financial accounts; and (xi) prepare periodic implementation progress reports. The project director shall be responsible for overall management of the project, and coordination with and reporting to the State and ADB. A dedicated	LA, Schedule 5, para. 3	Complied with.

Covenant	Reference in loan agreement	Status of Compliance
design cell for the project shall be established and made functional under chief engineer design.		
For major and medium schemes, under the PMU, the EA shall ensure that six SIOs are established for the six major subprojects and six SIOs are established for the nine medium subprojects, building on the existing establishments at the field level.	LA, Schedule 5, para. 4	Complied with. For project 1, SIOs were formed for 1 major (Talandanda) and 3 medium (Gohira, Remal, and Sunei) schemes.
For minor lift schemes, the EA shall ensure that the PMU has a lift irrigation cell comprising deputed engineer(s) from Odisha Lift Irrigation Cell, two economists, one of whom shall be the team coordinator, one monitoring and evaluation expert and three mobile teams comprising an engineer and an agriculture specialist.	LA, Schedule 5, para. 5	Complied with.
Withdrawals from the loan account may be made for reimbursement of reasonable expenditures incurred under the project before the effective date, but not earlier than 12 months before the date of this loan agreement in connection with items to be retroactively financed, subject to a maximum amount equivalent to 20% of the loan amount.	LA, Schedule 3, para. 6	Complied with.
In support of the implementation of the Project, the EA through the Water and Land Management Institute (WALMI) shall provide necessary backup and training support; along with other organizations engaged for training purposes.	LA, Schedule 5, para. 6	Complied with.
<p>The EA shall put into operation the specific arrangements to improve quality of implementation of the Investment Program as identified below:</p> <p>(a) The EA will make joint decision making systems operational with their counterpart WUAs and their higher-tier committees regarding all planning and implementation matters as well as subproject O&M, through regular WUA-SIO meetings on progress review, annual and periodic work plans and schedules. The WUAs will also be assigned and trained to participate in monitoring of civil works contracted by the SIO.</p> <p>(b) The EA shall post the physical and financial details and project progress in the department website, along with the tenders and contracts awarded. For individual subproject, the SIOs will post the abstract of all contracts executed, including the quantity of works and their associated costs.</p> <p>(c) The EA shall ensure that the grievance reporting and redressal mechanisms are in place to assist stakeholders in resolving their complaints in a timely manner. To this end, the PMU and SIOs will organize awareness campaigns for WUAs and other stakeholders.</p>	LA, Schedule 5, para. 7	<p>(a) Complied with. Joint decision-making systems are operational for Pani Panchayat areas. PP executive committees and joint walk through were completed in all subprojects except Talandanda where elections are needed.</p> <p>(b) Complied with, but not on time. Quarterly progress reports and contract completion reports were posted on DOWR's website.</p> <p>(c) Complied with. Grievance cell established in Pani Panchayats support unit.</p> <p>(d) Complied with.</p> <p>(e) Partially complied with. Works contracts</p>

Covenant	Reference in loan agreement	Status of Compliance
<p>(d) The EA, through its internal audit wing, shall undertake annual financial audit for all SIOs and associated offices, which will include investigation of all financial records' and transactions.</p> <p>(e) The EA shall strengthen its construction supervision, recording, and reporting system with the use of modern technologies, establish a quality control cell, and operationalize internal third party technical audit mechanism. Accordingly, all work contracts will include provisions for third party inspection for quality control. External monitoring, supervision, and technical audit consultants will also be mobilized under the ISPM consultant team.</p> <p>(f) All contracts financed by ADB for the project will include provisions stipulating ADB's right to audit and examine the records and accounts of the contractor.</p> <p>(g) The EA shall carry out the subprojects under the Facility in a manner consistent with the Poverty Reduction and Social Strategy, including the Gender Action Plan, dated 20 December 2007, prepared in relation to the Investment Program.</p>		<p>did not include provisions for the third-party inspection for quality control and no quality control cell was established. Quality control was undertaken by ISPMC.</p> <p>(f) Complied with.</p> <p>(g) Complied with.</p>
<p>(a) The EA shall ensure that all Subprojects are selected and processed for approval, in accordance with the criteria and procedures included under Schedule 4 to the FFA, as agreeable to ADB, the Borrower and the State.</p> <p>(b) The EA shall post the procurement documents, the criteria for Subproject selection and details of sanctioned contracts/Subprojects on the State's investment program office bulletin board and its website.</p>	(a) LA, Schedule 5, para 8	<p>(b) Complied with.</p> <p>(c) Partially complied with. Only contract completion reports were posted on DOWR's website.</p>
<p>The State shall implement all policy and institutional actions as specified in Table 2 of Appendix 11 and stipulated as the sector roadmap in the FFA, including actions to implement State Water Policy 2007 and State Water Plan 2004; organizational reforms and strengthening of DOWR and associated institution reforms in the pani panchayat legal framework; progress in irrigation management transfer; sustainable O&M; and steps towards operationalizing IWRM. (Loan Agreement [LA], Schedule 5, para. 9.</p>	LA, Schedule 5, para 9	<p>Partially complied with. The State Water Policy was revised in 2012 and a state-level Water Advisory Committee was created to monitor policy implementation; it meets once a year. The Pani Panchayat Act and Rules were refined as envisaged, with amendments in 2008 and 2014. DOWR refined its vision and strategy and established a PIM-CAD Directorate, but challenges in staff recruitment remain. A quality control system, as</p>

Covenant	Reference in loan agreement	Status of Compliance
		envisaged for project 1, was not established. Strengthening of WALMI as a center of excellence on PIM, and actions toward IWRM were not fully implemented.
The State shall ensure adequate funds towards O&M of the Project facilities through budgetary allocations or other means, to be provided to DOWR during and after subproject completions.	LA, Schedule 5, para 10	Complied with. DOWR reported that O&M funds are adequate, with an increase in the budget by 5% and income from water tariffs by 30%.
<p>The EA shall ensure that:</p> <ul style="list-style-type: none"> (a) the project is carried out and all subproject facilities designed, constructed, operated, maintained, and monitored in compliance with environmental laws and regulations of the Borrower, the State, ADB's Environment Policy (2002), and the environmental assessment and review framework (EARF); (b) an Initial Environmental Examination (IEE) as required, including an Environment Management Plan (EMP) with budget identifying the cost of its implementation as incorporated in the related bid document, if any, in consultation with stakeholders for each Subproject, in accordance with the EARF shall be submitted to ADB for review and clearance before award of related contract. In case of any environmental assessment for a Subproject classified as A or B sensitive, this shall be subject to the 120 day public disclosure requirement under ADB's Environment Policy (2002); (c) all mitigation measures identified in the EMP for each subproject shall be incorporated in subproject design, and carried out during construction and O&M, and disclosed to stakeholders; (d) if there are any changes in specific locations or alignments of any subproject facilities after completion of the process of IEE (or environmental impact assessment) or due to detailed design or implementation that has an impact on the environmental assessment carried out thus far, then additional environmental assessment shall be carried out in accordance with applicable laws and regulations of the Borrower, the State, and ADB's Environmental Policy (2002) and the EARF, and prior clearance of ADB obtained before further physical implementation of the Subproject; 	LA, Schedule 5, para. 11	<ul style="list-style-type: none"> (a) Complied with. (b) Complied with. (c) Complied with. (d) Complied with. (e) Complied with. (f) Partially complied with. Only two monitoring reports submitted during the project period, but environmental monitoring was regularly reported in QPRs.

Covenant	Reference in loan agreement	Status of Compliance
<p>(e) all environmental clearances required by applicable laws, and regulations at Borrower, State, or local levels shall be obtained in a timely manner, prior to commencement of civil works for the relevant subproject; and</p> <p>(f) semi-annual progress reports on the implementation the EMPs shall be carried out as part of project implementation and submitted to ADB for review and disclosure in accordance with ADB's Public Communications Policy (2005).</p>		
<p>The EA shall</p> <p>(a) undertake the project in accordance with the Borrower's and State laws and regulations, ADB's Policy on Involuntary Resettlement (1995) and the Resettlement Framework (RF);</p> <p>(b) ensure that to the extent possible, subprojects will not require land acquisition or involuntary resettlement; however, if land acquisition and/or involuntary resettlement are required for any subproject, the EA shall ensure the following:</p> <p>(i) a resettlement plan (RP) for the subproject acceptable to ADB is prepared, in accordance with applicable laws and regulations of the Borrower and the State, and the RF, and submitted to ADB for review and approval before award of related civil works contract proper consultation during preparation of the RP with the affected persons, as also disclosure of the RP to the affected persons including information on land acquisition and compensation process undertaken;</p> <p>(ii) all land, rights of way and other land-related rights required for the Subproject are acquired or made available;</p> <p>(iii) all affected persons are compensated in accordance with the agreed RP before commencement of civil works under the related subproject including any section-wise handover thereof, strictly in accordance with the stipulation in the related civil works contract. If during detailed design and implementation, any modification and/additional land acquisition or involuntary resettlement impacts are identified, the RP will be prepared (or modified if existing) in accordance with applicable laws and regulations of the Borrower and the State, and the RF and prior approval of ADB obtained before further implementation of RP; and</p> <p>(iv) ensure that efficient grievance redressal mechanisms are in place in accordance with</p>	LA, Schedule 5, para 12	<p>(a) Complied with.</p> <p>(b) Complied with.</p>

Covenant	Reference in loan agreement	Status of Compliance
the related RP to assist affected persons resolve queries and complaints if any, in a timely manner.		
The EA shall ensure that if any impact is identified during planning, design, or implementation of any subproject on indigenous peoples, that an Indigenous Peoples Development Plan (IPDP) or integration of specific actions for the indigenous people in the RP is prepared in accordance with ADB's Policy on Indigenous People (1998) and the Indigenous Peoples Development Framework (IPDF) and that the same is further (i) approved by ADB before award of related civil works contract, and (ii) implemented before commencement of related civil works contract. Any update to the IPDP due to detailed designs or during implementation shall follow requirements similar to the RPs.	LA, Schedule 5, para 13	Complied with. Indigenous people's specific action plan prepared, approved, and regularly updated.
The EA shall ensure that civil works contracts under the project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination by the State/EA in case of any breach of the stated provisions by the contractors.	LA, Schedule 5, para. 14	Partially complied with. Contract completion reports include certification from contractors that statutory provisions on labor were complied with. HIV/AIDS awareness programs were not included in works contracts and not conducted.
The EA shall ensure that an Investment Program performance monitoring system (IPPMS) satisfactory to ADB is established within three months of effective date. The IPPMS shall monitor and evaluate the performance of the investment program, facility, as well as of the project and subprojects, including key impact and outcome indicators and associated assumptions with corresponding target dates.	LA, Schedule 5, para 15	Partially complied with. DOWR agreed to develop computerized MIS as critical basis for IPPMS, but this was not done.
The State shall, after physical completion of the Project, but in any event not later than three months thereafter or such later date as ADB may agree for this purpose, prepare and furnish to ADB a report under intimation to the Borrower, in such form and in such detail as ADB shall reasonably request on the Project.	LA, Schedule 5, para 15	Partially complied with. Draft PCR submitted by EA to ADB in August 2016.
In addition to regular reviews, including a midterm review for the Project, a detailed midterm review of the Facility will be undertaken within no later than four years of the Effective Date. The midterm review shall	LA, Schedule 5, para 16	Complied with.

Covenant	Reference in loan agreement	Status of Compliance
include a detailed evaluation of the scope of the Facility, implementation arrangements, any outstanding issues, environment, resettlement and other safeguard issues, achievement of scheduled targets, contract management progress, and other issues, as appropriate.		
The State through DOWR shall (i) maintain separate accounts for the Project; (ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; and (iii) furnish to ADB, promptly after their preparation but in any event not later than 9 (nine) months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Loan proceeds and compliance with the covenants of the Loan Agreement as well as on the use of the procedures for imprest account/ statement of expenditures), all in the English language. The State, through DOWR, shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request.	Project Agreement Section 2.09	Complied with All annual APFS from effective date to closing (FY2010 to FY2016) have been complied with, mostly on time. Specific opinions on use of funds, and compliance with FC were issued. Audit opinions were unqualified.
(a) The Borrower shall cause the State to carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental and irrigation practices. (b) In the carrying out of the Project and operation of the Project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Loan Agreement.	LA, Section 4.01	Complied with.
The Borrower shall make available to the State, promptly as needed, the funds, facilities, services and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	LA, Section 4.02	Complied with.
The Borrower shall cause the State to ensure that the activities of its departments and agencies with respect to the carrying out of the Project and operation of the Project facilities are conducted and coordinated in accordance with sound administrative policies and procedures.	LA, Section 4.03	Complied with.
The Borrower shall take all action which shall be	LA, Section 4.04	Complied with.

Covenant	Reference in loan agreement	Status of Compliance
necessary on its part to enable the State to perform its obligations under the Project Agreement, and shall not take or permit any action which would interfere with the performance of such obligations.		
(a) The Borrower shall exercise its rights under the financing arrangements to the State in such a manner as to protect the interests of the Borrower and ADB and to accomplish the purposes of the Loan. (b) No rights or obligations under the financing arrangements shall be assigned, amended, abrogated or waived without prior notice to ADB.	LA, Section 4.05	Complied with.

TECHNICAL ASSISTANCE COMPLETION REPORT

TA Number, Country, and Name: TA 7131-IND: Institutional Development of Integrated Water Resources Management in Orissa		Amount Approved: \$250,000 Revised Amount: \$250,000	
Executing Agency: Orissa Department of Water Resources (DOWR)	Source of Funding: Multi-Donor Trust Fund under the Water Financing Partnership Facility ¹	Amount Undisbursed: \$27,551.00	Amount Utilized: \$222,449.00
TA Approval Date: 18 Sep 2008	TA Signing Date: 30 Mar 2009	Fielding of First Consultant: 12 Jan 2010	TA Completion Date: Original: 30 Sep 2009 Actual: 31 Dec 2010 Account Closing Date: Original: 30 Sep 2009 Actual: 26 Mar 2011
Description Odisha is endowed with relatively abundant rainfall compared with the rest of India, with an annual average of 1,500 millimeters. However, with rapid industrialization and urbanization including substantial foreign direct investments in the industrial and mining sectors, competition among bulk water users and environmental requirements within its river basins has become a burning issue particularly during the lean seasons. To respond to the looming crisis, the Government of Odisha promulgated a revised Water Policy in March 2007, which set out the step-by-step actions to introduce and operationalize integrated water resources management (IWRM), or comprehensive water management systems to achieve maximum water security. The IWRM approach promotes water for all, access to other economic uses of water, and healthy riverine environments. The Water Policy called for (i) establishment of necessary institutions, economic and other instruments, and their legal and regulatory frameworks, and (ii) initiation of participatory basin investment plans with river basin organizations (RBOs). The technical assistance (TA) supported the initial process of the policy actions, with the consultative processes managed by the Water Resources Board (WRB), a state apex body.			
Expected Impact, Outcome and Outputs The expected impact of the TA was contributions to improve water security in the state and in selected river basins. The expected outcome was specific steps toward establishing and operationalizing IWRM with stakeholder consultations and awareness, and capacity building of the concerned sector organizations. The intended outputs were (i) recommendations on appropriate institutional framework for IWRM, (ii) work plan or roadmap to establish the recommended organizations, functions, and legal and regulatory basis, (iii) increased awareness on the looming water crisis in Odisha and consultations on necessary reforms, and (iv) establishment and initial operation of a pilot RBO in the Baitarani River basin with the initial steps to prepare participatory river basin water resources management and investment plan. The TA design is considered <i>relevant</i> since it was aligned with the state's Water Policy and plans, and it was appropriate to achieve the outcome.			
Delivery of Inputs and Conduct of Activities TA commencement was delayed by 10 months, due to the startup delay of the associated loan project. ² The executing agency—the Department of Water Resources (DOWR)—lacked experience in office setup, consultant selection, and procurement, and required handholding support and guidance by ADB. After mobilization of the TA consultants, the Odisha Water Planning Organization (OWPO) within DOWR provided counterpart support efficiently as an implementing agency (IA), with designation of an experienced TA manager and executive engineers. TA activities were also reported to and guided by the WRB, chaired by Chief Secretary, DOWR and comprising the heads of all the relevant departments. A stakeholder advisory group comprising local experts in Odisha and representatives of civil society organizations (CSOs) was formed to advise DOWR and TA consultants on TA work planning, implementation, and delivery of outputs. The performance of DOWR and the government was <i>satisfactory</i> . Three consultants (international IWRM specialist, water resources economist, and national IWRM specialist) provided 8 and 6.6 person-months of international and national inputs, respectively. The TA implementation period was extended from 9 months (Jan 2009–Sep 2009) to 15 months (Oct 2009–Dec 2010) to provide sufficient time for stakeholder consultations and reflect their views in the final report, and to undertake additional studies as advised by the stakeholder advisory group. As per its design, a consultative approach was taken to implement the TA, with regular stakeholder interactions. The draft TA report was posted on DOWR's website, and diverse comments were received from the public			

¹ Administered by ADB. Contributors: the governments of Australia, Austria, Norway, Spain, and Switzerland.

² Loan 2444: Orissa Integrated Irrigated Agriculture and Water Management Improvement Investment Program—Project 1.

and reflected in the final report. The consultants performed in accordance with their terms of reference and provided satisfactory outputs.

The performance of ADB was *satisfactory*. ADB efficiently managed all TA administration requirements, including timely engagement of consultants, and facilitated dialogue among stakeholders.

The TA is rated *efficient*. Although longer time was required for DOWR and the government to initiate the specific reform steps, TA extension was justified to give more time for stakeholder consultations and additional studies. TA resources were used efficiently and TA benefits significantly outweighed the costs. TA administration was efficient, with no changes in scope.

Evaluation of Outputs and Achievement of Outcome

The TA was *effective* as its outputs were all achieved and the outcome was substantially achieved.

The TA delivered all envisaged outputs as well as additional materials suggested by stakeholders. The final report included a recommended institutional framework of IWRM systems, building on the existing OWPO and expanding functions such as water allocation and pricing. The recommendations proposed that a regulator be established as a water regulatory authority or commission. A short- to medium-term IWRM roadmap or work plan was drafted as a basis of further state-level consideration and consultations, encompassing (i) stakeholder awareness and consultative processes, (ii) capacity building of the concerned agencies, (iii) database and information systems, (iv) state water planning, (v) water allocation, (vi) water pricing, (vii) regulations on water quality and environment, (viii) state regulator and RBOs, and (ix) legal and regulatory framework. The TA contributed to widening stakeholder awareness-building and consultations, as well as increased publicity that led to wider debate among CSOs and citations of the TA outputs by the mass media. In December 2010, the government issued the gazette notification to establish an RBO in the Baitarani River basin. As additional outputs, the TA also produced a number of discussion papers, including international and national best practices of IWRM, data and information systems, water allocation, pricing, RBOs, and a legal and regulatory framework.

In relation to the intended outcome, the TA contributed to the initiation of wider discussions on steps and institutional reforms to improve the water security. Some CSOs expressed reservations on the TA recommendations for water allocation and pricing, which may allow capturing of water by economic interests at the cost of reduced allocation for the basic human and environmental needs. The final TA report was substantially strengthened in response; the recommended framework provides sufficient safeguards to regulate the economic use of water to protect vital social and environmental interests. However, as a result, DOWR decided to take a cautious approach to implementing the TA recommendations. While the Baitarani RBO was established on paper, it has never been convened. At the time of TA completion, local CSOs objected to the representation of industrial water users in the RBO, and progress was stalled. The TA is therefore rated *less than likely sustainable*. The PCR for the project 1 loan describes DOWR's current plans for operationalizing IWRM.

Overall Assessment and Rating

Overall the TA is rated successful since it is rated *relevant, effective, efficient, and less than likely sustainable*.

Major Lessons

- TA design used ADB's Water Policy framework and tools in recommending IWRM reforms in ADB's developing member countries. The specific socio-economic contexts of the countries need to be duly assessed and taken into account in recommending reforms that are best suited to the country.
- Water has diverse stakeholders and interests that are mutually conflicting, and establishing an effective resolution mechanism is time consuming. Reforms may be started where consensus is easier to reach, such as data and information system including water use inventory, and state and basin water planning, as opposed to pursuing comprehensive reforms all at the same time.
- Reforms require shepherding by officials at high levels of government. TAs outputs cannot be sustained without the vision and commitment of "champions" within DOWR and the government.

Recommendations and Follow-Up Actions

- OWPO/DOWR may consider adopting practical steps for IWRM systems strengthening in the immediate term, such as state and basin level water resources planning, strengthening of hydrological data base including basin modeling and water user inventorying, and operationalization of RBOs and state level consultative processes.

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In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

CONSULTANT INPUTS

Category	Contract Date	Contractor	Description	Final Contract Amount (₹)
03B	20 Aug 09	HYDROSULT INC. ¹	Consultants' services for institutional strengthening	140,660,286
				V. (\$1,520,861)
03C	17 Nov 09	AARVEE ASSOCIATES, ARCHITECTS, ENGINEERS ²	MLI planning and implementation	28,790,702
03A	16 Nov 09	RENEWABLE ENERGY AND AGRICULTURAL DEVELOPMENT	Strengthening pani panchayats in Remal and Sunei medium irrigation systems	2,740,000
03A	17 Nov 09	PROFESSIONAL ASSISTANCE FOR DEV. ACTION	Strengthening pani panchayats in Gohira medium irrigation system	4,370,000
03A	9 Dec 11	INSTITUTE OF RURAL DEVELOPMENT & MANAGEMENT	Strengthening pani panchayats in Taladanda irrigation system (26 pani panchayats)	7,312,915
03A	9 Dec 11	ASSOCIATION FOR DEVELOPMENT INITIATIVE	Strengthening pani panchayats in Sunei medium irrigation subproject	17,841,011
03A	9 Dec 11	KRUSHI ADIVASI SELF HELP SOCIETY (KASS)	Strengthening pani panchayats in Remal medium irrigation subproject	10,213,118
03A	28 Jun 13	INSTITUTE OF RURAL DEVELOPMENT & MANAGEMENT	Strengthening pani panchayats in Taladanda (2nd year - 22 pani panchayats)	1,482,050
03A	25 Nov 10	MIND MART	Consulting services (various national consultants) for strengthening pani panchayats Sunei & Remal	2,775,598
03D	1 Jul 12	DEVELOPMENT SUPPORT CENTER	Services for implementation of land and livelihood assistance plan in MCI project	3,031,500
04	18 Mar 13	EGIS INDIA CONSULTING ENGINEERS PVT LTD	Survey, design and related services for main and distributaries of Ramial irrigation system	4,690,383
04	18 Mar 13	HYDROPNEUM SYSTEMS	Survey, design and related services of canals and structures on main and distributaries canals of Machhagaon irrigation system	8,148,447

¹ No. of person-months allocated – International: 174, National: 665.2; Actual use – International: 96.4, National: 549.8.

² No. of person-months national allocated: 288; Actual use: 477.

Category	Contract Date	Contractor	Description	Final Contract Amount (₹)
04	14 Mar 13	AECOM INDIA PVT LTD	Survey, design and related services of canals and structures on main and distributaries canals of Pattamundai irrigation system	11,797,800
04	30 Mar 13	N.K. BUILDCON PVT LTD	Survey, design and related services for canals and structures on main and distributaries canals of High Level Canal Range-1 irrigation system	6,863,875
04	30 Sep 11	SUMADHURA GEOMATICA PVT. LTD	Survey and design of subminor canals in Sunei irrigation scheme	3,558,372
04	25 May 12	SUMADHURA GEOMATICA PVT. LTD	Survey and design of subminor canals in Taladanda irrigation scheme	2,727,472
03C	30 Dec 10	VARIOUS	WUA specialists for MLI planning and implementation	900,000
03C	14 Apr 15	AARVEE ASSOCIATES, ARCHITECTS, ENGINEERS	Support for MLI	23,017,489
			Total	₹280,921,288
				\$1,520,861

CIVIL WORKS CONTRACTS

No.	Contract No.	Start Date	Original Completion Date	Revised Completion Date	Contractor	Description	Final Contract Amount (₹)
Gohira							
1	CW-NCB-G1	20 Nov 10	19 Nov 2012	19 Nov 2012	Surendra Mohanty	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 1, reach 1 (RD 00 TO 2475m of Gohira left main canal and Tentlabhal distributary).	30,873,238
2	CW-NCB-G1 Reach 2A	21 Sep 12	20 Mar 2014	3 Jan 2015	Sundar Pravat Das	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 1 reach 2(A) (RD 2475m to 14130m of Gohira left main canal).	55,437,472
3	CW-NCB-G1 Reach 2B	14 Sep 12	13 Mar 2014	27 Dec 2014	Surendra Mohanty	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 1 reach 2(B) (RD 14130m to 22350m OF Gohira left main canal).	44,391,082
4	CW-NCB-G2 Reach 1	20 Nov 10	19 Nov 2012	15 Jun 2014	Vibgyor Structural Construction Pvt Ltd	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 2, reach 1 (RD 00 to 14000m of Gohira right main canal).	45,866,652
5	CW-NCB-G2 Reach 2A	20 Nov 10	19 Nov 2012	14 Aug 2013	Jagdish Panda	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 2, reach 2(A) (RD 14000 to 25840m of Gohira right main canal and Bijabereni distributary).	25,977,846
6	CW-NCB-G2 Reach 2B	1 Jul 11	30 Jun 2013	1 Jun 2014	Sundar Pravat Das	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 2, reach 2(B) (Remal and Rengalbeda distributary).	46,003,314

No.	Contract No.	Start Date	Original Completion Date	Revised Completion Date	Contractor	Description	Final Contract Amount (₹)
7	CW-NCB-G3	17 Sep 2012	16 Sep 2013	13 Jul 2014	Chhita Ranjan Pradhan	Rehabilitation, extensions and modernization of Gohira irrigation subproject package 3 – all minors.	32,120,031
						Subtotal	280,669,635
Remal							
1	CW-NCB-R1	9 Mar 2011	8 Mar 2013	28 Feb 2015	Laxmidhar Mishra	Rehabilitation, extensions and modernization of Remal irrigation subproject.	120,080,170
2	CW-NCB-R3	1 Jun 2012	31 May 2013	28 Feb 2015	H.L. Infrastructure	Rehabilitation, extensions and modernization of Remal irrigation subproject.	29,335,411
						Subtotal	149,415,581
Sunei							
1	CW-NCB-S1	12 Jun 2009	11 May 2011	31 Mar 2013	D.D. Builders Ltd.	Rehabilitation, extensions and modernization of Sunei irrigation subproject.	124,767,170
2	CW-NCB-S2(A)	22 Dec 2011	21 Nov 2012	31 Aug 2013	Nilagiri Engineering Cooperative Society Ltd.	Rehabilitation, extensions and modernization of minor canals of Sunei irrigation subproject (Gendagadia, Kaptipada, Badakhaladi minor canals.	25,794,519
3	CW-NCB-S2(B)	22 Dec 2011	21 Nov 2012	31 Aug 2013	Nilagiri Engineering Cooperative Society Ltd.	Rehabilitation, extensions and modernization of minor canals of Sunei irrigation subproject (Khuntapal, Badabadi, Siripur, Mouda minors).	31,634,834
4	CW-NCB-S2C	6 Mar 2012	11 Feb 2013	31 Aug 2013	Kamalakanta Panda	Rehabilitation, extensions and modernization of minor canals of Sunei irrigation subproject (Khuntapal, Badabadi, Siripur, Mouda minors).	26,514,707
						Subtotal	208,711,230

No.	Contract No.	Start Date	Original Completion Date	Revised Completion Date	Contractor	Description	Final Contract Amount (₹)
Taladanda							
1	CW-NCB-T1(A)	28 May 2010	27 May 2012	27 May 2013	Rudra Madhab Construction Pvt Ltd.	Rehabilitation, extensions and modernization of Taladanda main canal from RD 11.78km TO 24.46km.	100,218,761
2	CW-NCB-T1(B)	2 Jun 2010	1 Jun 2012	1 Jul 2013	M.S. Infraengineers Pvt Ltd	Rehabilitation, extensions and modernization of Taladanda main canal from RD 24.46km TO 41.935km.	102,225,785
3	CW-NCB-T2	16 Jul 2010	15 Jul 2012	TERMNATE D	M/S Bamadev Nayak Infrastructures Ltd.	Rehabilitation, extensions and modernization of Taladanda main canal from RD 41.935km TO 79.02km.	93,229,179
4	CW-NCB-T3(A)	24 Jun 2011	23 Jun 2013	15 Feb 2015	H.L. Infrastructure	Rehabilitation, extensions and modernization of district no. 12 from RD.00km to RD.10.140km & district no.12E of Taladanda canal package T3(A).	76,704,386
5	CW-NCB-T3(B)	15 Jul 2011	14 Jul 2013	28 Feb 2015	M.S. Infraengineers Pvt Ltd (formerly Sri Mahendra Swain)	Rehabilitation, extensions and modernization of district no. 12 from RD10.140km to tail, district no. 12G and 12G1 of Taladanda canal package T3(B).	67,942,919
6	CW-NCB-T3(C)	15 Jul 2011	14 Jul 2013	30 Apr 2015	M.S. Infraengineers Pvt Ltd (formerly Sri Mahendra Swain)	Rehabilitation, extensions and modernization of district no. 13, 13C,14,14A AND 14B of Taladanda canal.	77,031,405
7	CW-NCB-T4(A)	21 Aug 2012	20 Aug 2013	15 Feb 2015	M/S PARIDA AGENCY	Rehabilitation, extensions and modernization of minor canals of Taladanda canal system (RD 11.78km to RD41.935km).	25,023,236
8	CW-NCB-T4(B)	10 Dec 2012	9 Mar 2014	5 Jun 2015	INFRA ENGINEERS PVT LTD	Rehabilitation, extensions and modernization of minor canals of Taladanda canal system (RD41.935km to 49.010km).	97,638,213

No.	Contract No.	Start Date	Original Completion Date	Revised Completion Date	Contractor	Description	Final Contract Amount (₹)
9	CW-NCB-T4(C)	1 Feb 2013	31 Jan 2014	15 Jun 2015	BHAGABAN MAHAPATRA CONSTRUCTION	Rehabilitation, extensions and modernization of minor canals of Taladanda canal system (RD49.010km to 79.020km).	42,927,951
						Subtotal (₹)	682,941,835
						Total (₹)	1,321,738,281
						Total (\$)	19,797,467

PROJECT ECONOMIC RE-EVALUATION

A. Introduction

1. This re-evaluation of Tranche 1 of the project assesses the economic performance of the project at completion and compares the results with those estimated at project appraisal. The re-evaluation draws on the government project completion report (PCR), the available project monitoring data and field visits to all four schemes, and a small selection of the minor lift irrigation schemes (MLI) included under Tranche 1.¹

B. Methodology and Assumptions

2. The objective of the economic re-evaluation was to compare the economic internal rate of return (EIRR) at project completion with that estimated at project appraisal. EIRRs are estimated for each of the Gohira, Remal, Sunei, and Taladanda irrigation schemes and for the overall project. The re-evaluation is based on incremental gross margins for crop production that arise from (i) increased crop production arising from improved water delivery, (ii) crop diversification supported by better water availability, (iii) increased irrigation in kharif and rabi seasons, and (iv) increased cropping intensity. The impact of the project on production was variable and not all of these effects occurred in all locations or in all of the schemes. The crop benefits accruing in each scheme are offset against the direct costs of the scheme and a proportion of the project management, institutional strengthening, and other costs of the project that are not specific to any scheme.

3. All costs and benefits are expressed in Indian rupees in 2016 prices using the domestic price numeraire. A shadow exchange rate factor (SERF) of 1.11 has been estimated using trade data for the years 2011 to 2016 and is applied to convert foreign costs at the border to domestic prices (Table 2). Investment costs of tradable goods have been adjusted to constant 2016 values using the manufacturing unit value (MUV) index published by the World Bank and non-tradable costs by the all-India wholesale price index for the project period. Table 3 shows the indices used.

4. Project costs in financial prices are converted to economic prices by (i) assuming no residual value for civil works and equipment, (ii) converting foreign currency costs at a conversion factor of 1.11, and (iii) converting local currency costs at a conversion factor of 1.0. An exchange rate of ₹67.966 = \$1 (average rate for 2016) has been used to convert constant dollar values into their local currency equivalents. A 25-year project life period is used to cover the economic life of the infrastructure and no residual value is assumed for civil works and equipment. Project costs are shown in Table 4.

5. A shadow wage rate factor (SWRF) of 0.85 is applied to the costs of unskilled labour. It is noted in some areas that farmers have to pay above the government-mandated rate of ₹200 per day for labour (to which the cost of meals is added), indicating growing shortages of labour for on-farm work. Alternative values of the SWRF are tested in the sensitivity analysis for their impact on the results of the analysis.

¹ For the PCR, the mission visited and discussed the project impact with farmers from 32 Pani Panchayats: 5 in Gohira, 4 in Remal, 5 in Sunei, 9 in Taladanda, and in 9 MLIs.

C. Benefit Estimates

1. Input and Output Prices

6. Economic prices for key traded inputs and outputs (namely, rice, wheat, groundnuts, sugar, and fertilizers) have been calculated based on World Bank commodity price data for 2009 to 2016 and price projections for 2017–2025 and exclude all taxes and subsidies. All prices are expressed in 2016 prices, and are adjusted using the MUV index. Export parity prices were estimated for rice, wheat, and groundnuts and import parity prices for sugar and fertilizers (Table 5).

7. Financial prices for non-traded goods and services are 2016 market prices reported by farmers during the mission's field visits and verified where possible against available price data, such as that on the Ministry of Agriculture's AgMarkNet website. Since the domestic price numeraire is the basis of calculations, economic prices are derived by removing all taxes and duties, where appropriate, from these prices. The government has minimum support prices for key grain, pulse, and oilseed crops, of which the relevant crops for this project are paddy, groundnut, and green gram (moong). There are also support prices for sugarcane, sunflower, and jute. While these prices provide support to the market, they are available only at the local market (*mandi*) and many farmers do not take advantage of them, and sell to local traders at prices below the support prices. This is because doing so avoids transport costs, a certain amount of bureaucratic procedure, and provides cash in hand rather than an electronic transfer to a bank account. The financial prices used in the analysis for paddy, groundnuts, and green gram take into account the information provided to the mission about selling prices and are in some cases below the minimum support prices.

8. Support prices for key crops, urea, and other fertilizers are subsidised through the central government budget. For 2016–2017, the total allocations for these subsidies are ₹510 billion for urea and ₹190 billion for other chemical fertilizers. Actual local prices for fertilizers vary from place to place reflecting the differences in distribution costs. In our analysis, an average of the prices recorded during the mission is applied.

2. Crops and Cropping Patterns

9. The quantified incremental production generated by the project comes from (i) rainfed or partially irrigated crops becoming fully irrigated with consequent increases in yields of paddy and other crops, (ii) increased cropping intensity made possible by improved water supply, and (iii) some limited crop diversification.

10. The changes in cropping achieved under the project are somewhat different from those anticipated at appraisal. Table 1A shows the areas of kharif and rabi cropping expected at project appraisal and the status at project completion. At appraisal, the areas reported under rabi cropping for the pre-project year of 2009 are greater than those achieved in three of the four subproject areas in three years up to and including the 2015–2016 season, immediately after completion of the project. The appraisal assessment also assumed areas under rabi with the project would be greater than those before project implementation. The differences between the rabi areas at appraisal and those achieved so far with the project may be due to seasonal variations or perhaps related to climate change or to over-estimation of the actual and potential rabi areas at appraisal. It should also be noted that in the DOWR draft PCR, the areas recorded for kharif and rabi irrigated areas in the base year (2009–2010) are much lower than those assumed at appraisal (Table 1B), which suggests that the appraisal assessments were optimistic. In any case, the areas actually irrigated during rabi reflect the availability of water in each subproject area during recent years. Cropping intensities achieved with the project are therefore significantly lower than those assumed at appraisal.

11. The PCR mission's visits to the subprojects focused to some extent on tail-end areas, since if the tail ends receive water satisfactorily, it is reasonable to assume that the rest of the system is also duly supplied. In both Gohira and Remal, some WUAs reported that they had not had water for rabi for several years or only for a limited number of ha. within their command areas. In Sunei, because of water limitations, there is a standing agreement that each WUA area only receives water for rabi cultivation in alternate years, and even this level has not been reached in recent years.

Table 1A: Cropping Areas and Intensities (ha)

Subproject	CCA	Appraisal				Project Completion		
		Kharif	Rabi (A)	Rabi (B)	CI (B)	Kharif	Rabi	CI
Gohira	8,812	8,304	4,152	5,813	170%	8,812	3,017	134%
Remal	4,708	4,313	1,294	2,830	166%	4,708	177	104%
Sunei	9,825	10,000	2,640	5,300	153%	9,825	2,867	129%
Taladanda	27,905	30,960	21,278	23,700	177%	27,100	19,655	168%

Source: DOWR draft Project Completion Report.

- Notes:
- 1) Project completion areas are average areas planted for the 3 years 2013–2014 to 2015–2016.
 - 2) Areas at appraisal (Appraisal kharif and Rabi [A]) are the pre-project areas for 2009.
 - 2) Rabi (A) = area planted at appraisal; Rabi (B) = appraisal estimate of area planted with the project.
 - 3) CCA (cultivated command area) as at project completion.

Table 1B: Cropping Areas and Intensities from Base Year (ha)

Subproject	CCA	Base Year 2009–2010			Project Completion			Change
		Kharif	Rabi	CI	Kharif	Rabi	CI	
Gohira	8,812	4,587	3,602	93%	8,812	3,017	134%	41%
Remal	4,708	2,344	9	50%	4,708	177	104%	54%
Sunei	9,825	5,939	1,835	79%	9,825	2,867	129%	50%
Taladanda	27,905	8,977	0	32%	27,100	19,655	168%	136%
Subtotal	51,250	21,847	5,446	53%	50,445	25,716	149%	115%

Source: DOWR draft Project Completion Report.

12. For the MLI areas, the situation is rather different. While many of these small schemes were not able to irrigate their areas fully during rabi, and maybe also kharif, immediately prior to improvement or revival, this was due to technical reasons (e.g. a non-functioning pump), but with project implementation they can achieve cropping intensities of 200% or more.

13. The assessment of the economic benefits of the project has been based on the appraisal pre-project scenario, including the crops, crop budgets and crop areas. The post-project scenario is based on the most recent data available from the subproject areas sourced from PCR mission discussions with farmers in 32 Pani Panchayats in the four subprojects and MLI areas and subproject implementation office (SIO) staff, the DOWR draft PCR, and district level data on crop areas and yields published by the Odisha Department of Agriculture. In particular, the cropping pattern for each subproject has been based on Department of Agriculture data for 2014–2015 and 2015–2016 for the respective districts coupled with the available information from each subproject area, including the information provided by farmers during the visits of the PCR mission. Cropping patterns are summarised in Table 6.

3. Yields

14. Whereas at appraisal cropping intensities and rabi irrigation areas appear to have been somewhat overestimated, the yield increases that could be achieved were conservatively estimated. In particular, paddy yields in the subproject areas have reached a higher average than was assumed likely. At appraisal the yields of fully irrigated improved rice varieties were assumed to reach 3.5 to 4.0 tons per ha. However, yields reported by DOWR for the project areas have increased to 5.5 tons per ha and during the mission's meetings with farmers in all four areas, yields for kharif and rabi paddy of 20 quintals per acre (5 tons per ha) were commonly reported and even up to 25 quintal per acre (6.25 tons per ha) were achieved in some cases. One reason for the increase in yields has been the introduction under the project of system of rice intensification (SRI) methods and line transplantation. These methods have also been promoted more generally by the Department of Agriculture in recent years, which may have reinforced the message coming from project staff. Assessing the relative impacts of the project and department in this matter would be speculative.

15. Other key groups of crops, vegetables, and oilseeds (represented in this analysis by groundnuts) showed yield increases similar to those expected at appraisal, but yields for pulses reported by farmers are generally 20% to 30% higher than assumed—generally 0.6 to 0.65 tons per ha rather than 0.5 tons.

D. Cost Estimates

16. The only costs available for the individual subprojects are contract disbursement data that cover most, but not all, of the project costs for major, distributary, and minor canals for the major and medium schemes, and most of the infrastructure, equipment and implementation costs for the minor lift irrigation schemes. Total expenditure for Tranche 1 is available and all costs apart from those mentioned above have been pro-rated to each subproject. Civil works costs apart from those for the canals, and excluding costs for MLI, have been pro-rated according to the distribution of canal costs among the four subprojects. All other costs have been pro-rated among the four subprojects and the MLI in proportion to their respective command areas. These costs have been adjusted to 2016 values in the same manner as the total costs in Table 5. The costs assigned to each subproject and MLI are shown in Table 6.

E. Economic Evaluation

17. At appraisal EIRRs were only estimated for individual subprojects. For the Tranche 1 medium- and large-scale subprojects, EIRRs varied between 19.8% and 22.7% and for the small selection of MLIs assessed, EIRRs were between 30.1% and 38.2%.

18. The estimated EIRR for Tranche 1 at project completion is 29.0%. EIRRs have been estimated for the four subprojects using the estimated costs mentioned above. As shown in the Table 2, the project completion EIRRs are all higher than those assessed at appraisal. These results are mainly due to the higher yields achieved, especially for paddy, than those projected at appraisal. For the MLIs, only EIRRs for individual schemes were estimated at appraisal. At project completion, an estimate for the whole group of MLIs has been made based on the data from interviews, supplemented by Department of Agriculture district data.

Table 2: EIRRs at Appraisal and Project Completion

Subproject	Appraisal	Project Completion	
		Base	Benefits -20%
Gohira	22.0%	25.2%	19.2%
Remal ¹	19.8%	38.6%	29.6%
Sunei	20.9%	25.0%	19.2%
Taladanda	22.7%	28.0%	17.8%
MLI	30.1% - 38.2%	55.3%	12.9%
Tranche 1	-	29.0%	19.5%

Note: 1. Some of the infrastructure costs for Remal are missing; as a result the estimated costs for this subproject are lower than the true level, which exaggerates the EIRR.

Source: ADB.

19. EIRRs for each subproject have also been estimated based on the DOWR draft PCR base year cropped area data. Since these areas are lower than those in the appraisal report but project completion areas remain the same, the EIRRs are higher than those in Table 2. These estimates give EIRRs of 35.2% for Gohira, 41.9% for Remal, 36.4% for Sunei, and 48.1% for Taladanda. For the overall project, the EIRR is 44.2%. The DOWR draft PCR data comes from baseline surveys carried out at the beginning of the project, but this did not result in any re-evaluation of the without project or potential with project economic scenarios.

20. The EIRRs for the subprojects have also been estimated in cases where benefits are 20% lower than the base-case estimate. With the exception of Remal, these results are similar to the EIRRs estimated at appraisal. Given the yield increases that have been achieved for major crops, this suggests that the basis for the re-evaluation is not unreasonable.

F. DMF Targets

1. Water Use Efficiency

21. Data on volumes of water released from reservoirs for the years 2009 to 2016 (i.e. for the agricultural years 2009–2010 to 2015–2016) are available for the Gohira, Remal, and Sunei projects. Estimates of system losses are not available. Furthermore, data for the rabi seasons, when matched with the data on areas cultivated in each rabi season do not appear to be reliable. For the kharif season, the data is more consistent and estimates have been made for the volume of water supplied per ha and the volume supplied per ton of kharif paddy produced. Non-paddy crops have been disregarded, which are minor anyway, in this season. The calculations are made on the assumption that total water losses are 33%. The results are in Table 3.

22. Based on this data, the volume of water supplied per ha has declined between 28% and 48% between 2009 and 2015. Although this is for the kharif season, when rainfall may reduce the need for irrigation water, it more or less meets the DMF target for this indicator. Changes in the volume of water per unit production are much lower, except in Sunei. At best, these results are only indicative of the current situation and detailed studies are required to determine exactly what improvements in water use efficiency have actually been achieved as a result of the project.

Table 3: Water Use Efficiency

Subproject	m3 / ha				m3 / ton			
	2009	2014	2015	% change	2009	2014	2015	% change
Gohira	7,422	4,741	5,309	28%	1,954	1,736	1,783	9%
Remal	6,019	3,261	3,758	38%	1,448	1,179	1,292	11%
Sunei	7,589	3,763	3,941	48%	1,999	1,221	1,186	41%

Source: ADB.

2. On-Farm Employment

23. The project targets include increased on-farm and allied activity employment of 40 days per ha (per year). While employment in allied employment, which can only be properly assessed with an appropriate survey, may have increased it seems unlikely that on-farm employment has increased and is more likely to have decreased. During project implementation the mechanization of on-farm activities has increased. In particular, land preparation prior to the planting of crops is now usually carried out by a tractor or power tiller instead of labour-intensive bullocks and the harvesting of paddy is almost universally carried out by small harvesters. In the project areas labour costs are increasing due to increased competition from alternative off-farm employment. For the Tranche 1 subprojects, this is particularly true in the Taladanda area. With rising labour costs, the mechanization of on-farm tasks will only increase and the demand for on-farm labour will continue to decrease.

G. Farm Incomes

24. Implementation of the project has had positive impacts on farm incomes in all subproject areas. The available data suggests that for many farm households, on-farm income will have doubled as improved irrigation has secured production. The relatively wide adoption of SRI, line transplantation, and other on-farm improvements has resulted in higher paddy yields, but other crops have also benefited.

H. Sustainability

25. The sustainability of the improved irrigation systems and the improved crop production that they support will depend on the implementation of a regular system of maintenance to keep the systems in good order and to ensure that farmers can be supplied with irrigation in a timely manner. This will only be possible if sufficient resources are available to carry out maintenance tasks, either at the WUA level or at the system and department levels. Rising farm incomes as a result of project implementation suggest that farmers could contribute more to system maintenance than they currently do through the modest level of water taxes levied by the government.

Table 4: Estimate of Standard Conversion Factor

	2011–2012	201–2013	2013–2014	2014–2015	2015–2016
Total Imports (CIF) (I)	24,354,630	26,691,169	27,154,339	27,340,491	24,813,672
Total Exports (FOB) (E)	14,659,590	16,343,182	19,050,111	18,970,258	17,088,414
Import Duties (Iduty)	1,396,100	1,590,144	1,643,379	1,821,730	2,013,970
VAT on Imports (Ivat)	3,034,587	3,325,720	3,383,431	3,406,625	3,091,784
Other Customs Receipts (Icr)	37,830	34,814	49,262	55,000	58,450
Subsidies on Imports (Isub)	1,468,610	870,368	759,412	430,332	418,210
Export Duties + Cess (Eduty)	64,800	28,504	28,212	1,040	10,940
Export Rebates (Ereb)	0	0	0	0	0
SCF	0.930	0.914	0.915	0.905	0.898
SERF	1.075	1.094	1.093	1.105	1.114

Notes:

1) Trade Data from Directorate of Statistics & Intelligence, Ministry of Finance.

2) Subsidy and tax revenue data from budget documents for the respective years.

Source: ADB.

$$SCF = \frac{(I + E)}{(I + Iduty + Ivat + Icr - Isub) + (E - Eduty + Ereb)}$$

Table 5: Indices

Index	2009	2010	2011	2012	2013	2014	2015	2016
MUV	97.9	100.0	108.9	106.8	106.1	108.0	97.6	93.8
WPI	130.3	142.0	156.2	168.8	180.7	185.0	176.5	183.2

Note: MUV = Manufacturing Unit Value; WPI = wholesale price index (mid fiscal year values)

Source: ADB.

Table 6: Project Costs (₹.'000)

Category	2009	2010	2011	2012	2013	2014	2015	2016	Total
Civil Works	78,042.7	96,828.7	271,857.4	411,858.7	651,527.9	351,922.9	401,203.8	99,125.8	2,362,367.9
Equipment	693.0	2,931.0	27,878.0	80,554.0	4,690.0	44,447.5	103,737.3	6,856.9	271,787.7
Social mobilisation, implementation activities	1,426.5	5,404.9	22,420.6	21,438.0	18,972.3	27,435.0	21,577.9	19,435.7	138,110.9
TA consultants	0.0	53,362.2	47,085.0	41,371.0	50,174.0	66,367.0	4,211.0	0.0	262,570.2
Surveys & investigations	4,192.0	1,117.0	1,667.0	17,568.0	13,977.0	31,380.7	11,193.5	1,280.3	82,375.5
Training	5.0	1,171.2	5,513.4	6,634.9	3,248.0	8,141.3	4,809.6	0.0	29,523.4
Salaries & other costs	41,380.6	61,942.4	67,490.0	70,217.0	80,483.0	68,720.0	62,973.0	0.0	453,206.0
Land acquisition	6,000.0	13,604.0	8,415.0	34,990.0	0.0	0.0	0.0	0.0	63,009.0
Total foreign costs (adjusted by SERF)	154.9	40,004.8	41,765.5	49,492.9	38,450.0	60,084.2	27,049.3	1,523.8	258,525.4
Total local costs	131,584.8	196,356.6	410,560.9	635,138.7	784,622.2	538,330.2	582,656.8	125,174.9	3,404,425.2
TOTAL	131,739.8	236,361.4	452,326.4	684,631.6	823,072.2	598,414.4	609,706.1	126,698.7	3,662,950.6
MUV index (2010 = 100)	97.9	100.0	108.9	106.8	106.1	108.0	97.6	93.8	
WPI mid FY (all India)	130.3	142.0	156.2	168.8	180.7	185.0	176.5	183.2	
Foreign costs adjusted to 2016 prices	148.5	37,524.5	35,974.4	43,468.5	33,992.6	52,184.2	25,996.1	1,523.8	230,812.5
Local costs adjusted by WPI	185,006.5	253,327.6	481,528.5	689,321.2	795,477.5	533,092.4	604,774.7	125,174.9	3,667,703.3
Total costs in 2016 prices	185,154.9	290,852.2	517,502.8	732,789.6	829,470.1	585,276.6	630,770.8	126,698.7	3,898,515.8

Source: ADB.

Table 7: Costs Assigned to Subprojects

Category	2009	2010	2011	2012	2013	2014	2015	2016	Total
Gohira	30,054.7	41,260.9	62,590.8	116,779.1	146,661.2	109,445.9	46,354.1	10,698.6	563,845.4
Remal	16,082.8	19,009.1	21,162.8	62,129.6	84,006.6	50,880.8	40,989.0	5,725.3	299,986.0
Sunei	27,585.8	63,569.8	82,360.5	116,995.5	128,966.2	43,659.9	42,247.9	9,754.1	515,139.7
Taladanda	96,196.6	138,552.8	269,506.9	279,348.3	411,008.5	284,351.5	303,501.7	34,254.7	1,816,720.9
Minor Lift Irrigation	15,235.0	28,459.5	81,881.9	157,537.1	58,827.6	96,938.6	197,678.1	66,266.0	702,823.8
Total costs in 2016 prices	185,154.9	290,852.1	517,502.9	732,789.6	829,470.1	585,276.7	630,770.8	126,698.7	3,898,515.8

Source: ADB.

Table 8: Prices for Traded Goods (₹/ton)

Economic prices	2009	2010	2011	2012	2013	2014	2015	2016
Rice (export)	20,844	18,507	22,905	23,331	20,561	17,121	13,692	13,473
Wheat (export)	10,208	13,723	19,700	19,965	18,412	16,262	11,600	8,981
Groundnuts (export)	49,802	56,800	103,388	105,755	65,199	62,257	53,689	56,496
Sugarcane (import)	3,297	3,972	5,270	4,247	3,488	3,366	2,446	3,155
Urea (import)	24,826	28,717	43,622	41,342	35,027	33,315	26,734	19,742
Diammonium phosphate (import)	31,115	47,335	62,577	54,004	44,816	48,181	42,692	32,529
Muriate of potash (import)	57,579	32,491	44,992	46,414	38,685	31,530	29,301	23,561

Economic prices	2017	2018	2019	2020	2021	2022	2023	2024	2025 – 2034
Rice (export)	13,171	13,751	14,255	14,766	15,267	15,774	16,271	16,838	17,365
Wheat (export)	8,981	8,981	8,981	8,981	8,981	8,981	8,981	8,981	8,981
Groundnuts (export)	56,496	56,496	56,496	56,496	56,496	56,496	56,496	56,496	56,496
Sugarcane (import)	3,186	3,273	3,341	3,410	3,387	3,451	3,511	3,575	3,639
Urea (import)	22,456	23,389	24,239	25,106	25,969	26,849	27,722	28,634	29,661
Diammonium phosphate (import)	33,284	34,588	35,843	37,033	38,301	39,500	40,778	42,114	43,474
Muriate of potash (import)	22,040	23,047	24,065	25,017	26,060	27,126	28,192	29,304	30,439

Source: ADB.

Table 9: Cropping Patterns at Appraisal and Project Completion

	<i>areas in ha</i>									
	Gohira		Remal		Sunei		Taladanda		MLI	
	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR
<i>Kharif crops / total area</i>	8304	8812	4313	4708	10000	9825	30960	27100	13333	13333
Paddy (PI to I) - HYV	60%	58%	63%	64%	59%	76%	57%	86%	30%	83%
Paddy (rainfed/PI) - local	27%	20%	31%	8%	32%	10%	37%	8%	50%	0%
Vegetables	5%	6%	2%	10%	4%	4%	2%	6%	20%	7%
Pulses	6%	10%	1%	10%	5%	10%	-	-	-	9%
Oilseeds/groundnut	2%	6%	2%	8%	-	-	-	-	-	-
Jute	-	-	-	-	-	-	2%	0%	-	-
Sugarcane	-	-	-	-	-	-	2%	0%	-	1%
<i>Rabi crops / total area</i>	4152	3017	1294	177	2640	2867	21278	19655	13333	13333
Paddy - HYV	17%	0%	12%	0%	19%	10%	5%	0%	15%	8%
Paddy - local									40%	0%
Vegetables 1	7%	27%	1%	27%	2%	10%	15%	18%	10%	15%
Vegetables 2	-	-	-	-	-	-			0%	8%
Pulses	10%	58%	86%	53%	57%	35%	15%	18%	20%	46%
Oilseeds/groundnut	24%	15%	1%	20%	13%	45%	0%	0%	15%	22%
Wheat	15%	0%	-	-	-	-	-	-	-	-
Sunflower	1%	0%	-	-	-	-	-	-	-	-

	Gohira		Remal		Sunei		Taladanda		MLI	
	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR	Apprai sal	PCR
Mustard	26%	0%	-	-	9%	0%	-	-	-	-

Source: ADB.

Table 10: Prices Used

	Unit	Financial	Economic	MSP ²⁾ ₹/qtl
<i>Outputs:</i>				
Paddy ¹⁾	₹/kg	12.00	13.47	1470
Groundnuts (in shell) ¹⁾	₹/kg	45.00	56.50	4120
Sugarcane ¹⁾	₹/ton	2400.00	3155	230
Green gram (moong)	₹/kg	45.00	45.0	4800
Vegetables	₹/kg	7.00	7.00	
Wheat	₹/kg	16.25	8.98	1625
Mustard	₹/kg	30.00	30.00	
Sunflower	₹/kg	38.50	38.50	3850
Jute	₹/kg	35.0	35.0	3500
Straw	₹/ton	600.0	600.0	
Legume haulm	₹/ton	1000.0	1000.0	
<i>Inputs: Seed</i>				
Paddy	₹/kg	16.0	16.0	
Groundnut	₹/kg	45.0	45.0	
Sugarcane	₹ each	2.0	2.0	
Greengram	₹/kg	55.0	55.0	
Vegetables	₹/kg	1200.0	1200.0	
Wheat	₹/kg	20.0	20.0	
Sunflower	₹/kg	13.0	13.0	
Mustard	₹/kg	30.0	30.0	
Jute	₹/kg	60.0	60.0	
<i>Other inputs:</i>				
Urea ¹⁾	₹/kg	8.0	19.74	
DAP ¹⁾	₹/kg	34.0	32.53	
MOP ¹⁾	₹/kg	20.0	23.56	
Manure	₹/ton	750.0	750.00	
Micronutrients	₹/kg	120.0	114.0	
Pesticides/fungicides, etc	unit	200.0	190.0	
Bullocks for ploughing (pair per day)	day	400.0	400.0	
Tractor	hour	800.0	800.0	
Power Tiller	hour	400.0	400.0	
Harvester (for paddy)	hour	2250.0	2250.0	
Transport (field/village to market)	₹/ton	400.0	400.0	
Labour ⁴⁾	day	250.0	212.5	
<i>Other prices:</i>				
Milling cost for rice	ton	600.0	600.0	
Transport farm to market (paddy) ³⁾	ton	300.0	300.0	
Rice milling conversion factor	65%			
Peanut shelled: unshelled ratio	70%			
Sugar: sugarcane conversion ratio	10%			

Port handling charges (% of landed costs)	5%		
Transport costs	2%		
Transport, bagging, handling	ton	1800.0	1800.0
Sugarcane transport farm to mill	ha	400.0	400.0

Notes:

- 1) Values for 2016 only
 - 2) Minimum support price; currently applicable values
 - 3) Costs reported to the mission for transport from farm to market varied between about Rs.20 and Rs 30 per quintal. The higher value has been used in the analysis.
 - 4) Labour costs: sometimes men & women are same rate; sometimes men about Rs50 more than women. This may reflect relative scarcity, although that is not clear.
- Source: ADB.