



# Technical Assistance Consultant's Report

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TA Number: 4815  
November 2007

## INDIA: Orissa Integrated Irrigated Agriculture and Water Management Project

### PPTA Final Report Vol. 1 Main Report

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ASIAN DEVELOPMENT BANK, TA-4815-IND

**Orissa Integrated Irrigated Agriculture  
and  
Water Management Project**

**Volume 1**

**Main Report**

**November 2007**

**PPTA Consultants**



## CURRENCY EQUIVALENTS

(as of 2 July 2007)

Currency Unit	–	Indian rupee(s) (Re/Rs)
Rs1.00	=	\$0.0246
\$1.00	=	Rs40.70

## ABBREVIATIONS

ADB	–	Asian Development Bank
AP	–	affected person
CAD	–	Command Area Development
CPS	–	Country Partnership Strategy
CSP	–	Country Strategy and Programs
DOWR	–	Department of Water Resources
DPR	–	detailed project reports
EARF	–	environmental assessment and review framework
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
FC	–	Finance Commission
FFA	–	Framework Financing Agreement
FYP	–	five-year plan
GDP	–	gross domestic product
ICB	–	international competitive bidding
ID	–	irrigation department
IEE	–	initial environmental examination
IPRPMS	–	investment program and roadmap performance monitoring system
ISPM	–	institutional strengthening and project management
IWRM	–	integrated water resources management
LIBOR	–	London interbank offered rate
MFF	–	multitranches financing facility
MIS	–	management information system
MLI	–	minor lift irrigation
NCB	–	national competitive bidding
NGO	–	nongovernment organization
NIA	–	net irrigated area
NWP	–	National Water Policy
O&M	–	operation and maintenance
OSG	–	Orissa state government
PFR	–	periodic financing request
PIM	–	participatory irrigation management
PMU	–	project management unit
RD	–	Revenue Department
RF	–	resettlement framework
RP	–	resettlement plan
SAP	–	state agriculture policy
SDP	–	state domestic product

SIO	–	subproject implementation offices
SIP	–	subproject implementation plans
TA	–	technical assistance
WALMI	–	Water and Land Management Institute
WUA	–	water user association

## NOTES

- (i) The fiscal year 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., FY2007 ends on 31 March 2007.
- (ii) In this report, "\$" refers to US dollars.

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## LOAN AND PROJECT SUMMARY

<b>Borrower</b>	India
<b>Classification</b>	<p>Sector: Agriculture and natural resources Subsector: Irrigation and drainage Themes: Sustainable economic growth, Governance, Capacity development. Subthemes: Developing rural areas, Public governance, Institutional development Targeting classification: General intervention</p>
<b>Environment Assessment</b>	<p>Project 1 was classified as category B according to the Environment Policy (2002) of the Asian Development Bank (ADB). An initial environmental examination (IEE) for Project 1 was undertaken for five major and medium irrigation schemes, and two sample community-based minor lift irrigation schemes. An environmental assessment and review framework (EARF) was also prepared to guide the environmental assessment of further subprojects.</p>
<b>Sector Investment Program</b>	<p>The proposed Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program) will enhance the productivity and sustainability of the existing major and medium irrigation schemes and community-based minor lift irrigation systems in the four northern river basins and a part of the Mahanadi River delta in Orissa state. The selected schemes are suffering from low performance in irrigated agriculture due to inefficient operation, system deterioration, and limited integration with agriculture support services and marketing systems. The investment program will include water user association (WUA) strengthening and empowerment; renovation and extension of irrigation and associated infrastructure; agriculture and related support services including livelihood enhancement of the poor; and transfer of the operation and maintenance (O&amp;M) to WUAs. The investment program will also strengthen the institutional basis for participatory irrigation management (PIM) and integrated water resources management (IWRM) with management reforms and capacity strengthening of the relevant institutions.</p>
<b>Multitranches Financing Facility</b>	<p>The multitranches financing facility (MFF, or the Facility) will finance projects under the Program, provided the Government of India and the Orissa state government comply with the assurances to ADB and the constituent projects are in line with those assurances and with the criteria set out in the Framework Financing Agreement (FFA).</p> <p>ADB will provide loans to finance projects under the Facility as soon as the projects are ready for financing upon submission of satisfactory related periodic financing request. Each loan will</p>

constitute a tranche and may carry terms different from the financing terms of previous or later loans. The choice of financing terms will depend on the project and ADB's financing policies at the time the loan is documented in a legal document. Tranches may be provided in sequence or simultaneously, and may overlap.

## **Rationale**

India's rapid overall economic growth is contributing to growing urban-rural disparity and high rural poverty that have recently emerged as major concerns. Growth in agriculture and related rural non-farm sectors has been stagnant, and the sector is making a slow transformation to more intensive and high-value production and processing systems. Bottlenecks in both rural and urban water resources are also increasingly seen as a major constraint to economic growth. In this context, irrigation is drawing major attention because of its high share (84%) of total water use, as well as its crucial importance for agriculture and rural growth. A significant part of the existing irrigation infrastructure remains underutilized with low water use efficiency and insufficient O&M. The Government of India is promoting state-level sector reforms through its National Water Policy (NWP) 1987 and 2002, which advocates PIM and IWRM to promote and sustain more efficient water use.

In Orissa, agriculture is the backbone of the economy and the central focus of the strategy of the Orissa state government (OSG) to reduce rural poverty, which remains among the highest in India. However, the low performance of the existing irrigation infrastructure seriously constrains agricultural productivity growth and diversification. About 30% of the present command area hardly receives irrigation due to poor system design, lack of field channels, limited accountability in system management to farmers, and insufficient maintenance. Following the NWP, the OSG is prioritizing the improved performance of existing infrastructure in partnership with WUAs, as this fastest and most cost-effective way to expand reliable irrigation and serve as a pathway to intensified, high value agriculture.

To support the process, the OSG has progressively developed the policy, planning and institutional basis for the irrigation and water resources sector since the late 1990s. Specific steps taken include (i) promulgation of the State Water Policy and State Water Plan adopting PIM and IWRM principles, (ii) establishment of a legal framework for WUAs, (iii) substantial increase in the water tariff and O&M financing, and (iv) capacity strengthening of the Department of Water Resources (DOWR). In line with this, OSG initiated formation of WUAs, renovation of irrigation infrastructure, and progressive transfer the O&M responsibility to WUAs. So far, this has reached 40% of the total command areas under public irrigation systems. The overall impacts of the process are positive, particularly where WUAs are sufficiently strengthened and provided with functioning infrastructure, although capacity

development of WUAs and DOWR requires long-term support and partnership.

The OSG also initiated comprehensive economic reforms in the early 2000s, aiming at inclusive growth with stronger public sector accountability and community and private sector participation. Within this context, the OSG is keen to further advance PIM in the remaining schemes, and to incorporate the lessons learned so far, as well as the best practices from other Asian countries and Indian states to attain higher impacts in terms of productivity and sustainability. The Program is designed to meet this need, with an improved institutional basis including enhanced DOWR accountability to WUAs, further refinement of the WUA legal framework, and steps towards sustainable O&M financing and IWRM. Program delivery and governance will also be upgraded to ensure sufficient WUA empowerment upfront, infrastructure quality, integration with the agriculture value chain and support systems, and sound provider-recipient relations for O&M. Prepared as a part of the investment plan to operationalize PIM state-wide, the Program will support the realization of sound sector operations from the OSG initiative.

The MFF modality is most suitable for the Program, since it provides an opportunity for (i) flexibility in investment decision making based on subproject readiness, in particular ensuring sound progress in planning and WUA institutional building; (ii) higher implementation quality, reflecting lessons learned and progressive and incremental improvement of the institutional basis during the program period at the time of processing subsequent loans; (iii) longer term program engagement allowing sufficient monitoring of critical institutional development process, and (iv) wider program coverage that allows more significant sector impacts under the proposed Program.

**Impact and Outcome**

The expected impact of the Program is enhanced rural economic growth and reduced poverty in the selected river basins, and institutionalization of effective mechanisms to put into operation PIM-based agricultural growth.

The expected outcome is enhanced productivity and sustainability of irrigated agriculture in the selected existing schemes in the river basins, and improved performance of irrigation service delivery and water resources management.

**Program Investment Plan**

The investment cost of the Program is estimated at \$270 million, including taxes and duties of \$12.5 million.

**Financing Plan**

<b>Source</b>	<b>Total (\$ million)</b>	<b>Share (%)</b>
ADB	189.2	70
The Orissa State	73.5	28
Beneficiaries	7.6	3
<b>Total</b>	<b>270.3</b>	<b>100</b>

**Financing Amount and Terms**

A facility of up to \$189 million from the ordinary capital resources of the Asian Development Bank (ADB) will be provided under ADB's London interbank offered rate (LIBOR)-based lending facility. The Government of India will cause the OSG to use the proceeds of each tranche for the expenditures of the investment program, according to the conditions set forth in the FFA and the legal agreements for each tranche.

**Allocation and Relending Terms**

The Government of India will provide the loan proceeds in local currency to OSG on the same terms and conditions as received from ADB. OSG will bear the foreign exchange risk on the loan.

**Period of Utilization**

The investment program resources will tentatively be available in four (or more if needed) tranches until June 2017 (the last periodic financing request is expected to be submitted by 31 January 2015).

**Estimated Project Completion Date**

December 2016

**Executing Agency**

Department of Water Resources, Orissa

**Implementation Arrangements**

Project implementation will institutionalize effective program delivery mechanisms for planning, implementing, and sustaining irrigated agriculture development with PIM within the regular and improved setup of DOWR, with outsourcing to the private sector and nongovernment organizations (NGOs). A multi-disciplinary project management unit (PMU) will be established in the new PIM/Command Area Development (CAD) directorate of DOWR to manage overall Program implementation. Day-to-day implementation will be done through subproject implementation offices (SIOs) set up in DOWR's field offices having enhanced multidisciplinary staff, under the guidance and coordination of the district development committee chaired by the district collector. WUAs will have a major role in the process by endorsing the concerned implementation plans, monitoring program delivery, and executing minor civil works. Regular SIO-WUA meetings will be institutionalized as a major forum for decision making.

**Procurement**

Procurement financed from the ADB loans under the MFF will conform to ADB's *Procurement Guidelines* (2006, as amended

from time to time). Civil works contracts of at least \$10 million will be through international competitive bidding (ICB), and those costing less than \$10 million will be under national competitive bidding (NCB) procedures acceptable to ADB. Single-stage, two envelope bidding with post qualification will be adopted for all NCB and ICB contracts under the Program. Specialized and small community works costing less than \$100,000 may be directly contracted with the concerned WUAs.

In the procurement of goods and related services, ICB will be used for contracts of at least \$1 million and NCB for contracts of less than \$1 million. For contracts valued less than \$100,000 ADB's shopping procedures may be followed.

### **Consulting Services**

Consultants will be hired for institutional development and capacity building, project management, design and construction monitoring, and benefit monitoring. Agencies or institutions including established registered NGOs will also be engaged for participatory planning, WUA strengthening, minor work execution by WUAs, agriculture and livelihood programs, and facilitation and monitoring of resettlement plans. All consultants and NGOs will be engaged according to ADB's *Guidelines on the Use of Consultants* (2006, as amended from time to time).

### **Program Benefits and Beneficiaries**

The Program will improve the incomes and livelihoods of about 3.6 million people by raising the performance of 215,000 hectares (ha) within the command area of existing irrigation schemes. The main benefits are increased agriculture production—brought about by reliable water supply, particularly in areas with little or no access to irrigation, through renovation of the existing infrastructure and improved reservoir and canal operation—along with increased labor opportunities, better nutrition, and increased incomes and lowered poverty. The economic internal rate of return (EIRR) of five major and medium schemes is between 18.8% and 22.7%, whereas the EIRR of the two sample minor lift schemes are 30.1% and 38.2%. At the state level, the Program will improve irrigation service delivery to attain maximum sustainable benefits through renovating infrastructure and installing PIM systems, along with improved sector governance with associated institutional actions.

Between 22–69% of the population in the five major and medium irrigation subprojects fall below the poverty line, generally higher than the national average. The social and gender strategy will enhance the participation of the poor in WUAs, linking them to existing poverty reduction programs of OSG with delivery of targeted support under the Program as required, enhancing the role of women in project institutions and WUAs, and strengthening the capacities of DOWR in addressing gender development issues in promoting PIM.

**Risks and Assumptions**

The Program has several risks that could adversely affect its effectiveness and sustainability: (i) inadequate WUA development; (ii) ineffectiveness of institutional mechanisms for delivering programs and establishing O&M sustainability; and (iii) implementation delays. The Program has incorporated mitigation measures to address these risks. Beneficiary mobilization will be pursued by ensuring upfront WUA strengthening with measurable targets at pre-construction stage, with sufficient resources for facilitation and capacity building. Institutional effectiveness will be pursued with DOWR restructuring to support PIM, outsourcing of critical non-engineering services, and capacity development programs, with stringent process and output monitoring to address any shortcomings during implementation. O&M risk is mitigated through comprehensive agreements covering provision of financial resources in compliance with Government guidelines, associated revision of water tariff structures, progressive transfer of O&M responsibilities to WUAs, and improved systems for O&M performance monitoring, planning, fund allocation and management. The risk of implementation delay is being addressed through the early implementation of startup activities including Program staff assignment and training, advance recruitment of consultants and NGOs, and advance procurement of key infrastructure works requiring early initiation, through a component technical assistance provided to India for this purpose.

## I. INTRODUCTION

1. The Asian Development Bank (ADB) has agreed with national and state governments to fund the preparation of a project in Orissa, which will include support for irrigated agriculture development and integrated water resources management. Following consultations, the Orissa state government (OSG) and the Government of India (GOI) confirmed a request for technical assistance (TA) to prepare the Orissa Integrated Irrigated Agriculture and Water Management Investment Program. The project has been prepared during the period November 2006 to August 2007 in the form of a sector loan to utilize multi-tranche financing facility (MFF).<sup>1</sup> The design and monitoring framework for the Program is in Appendix 1.

### A. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

#### 1. Performance Indicators and Analysis

2. **National Context of Rural Economy and Water Resources.** India has seen rapid economic growth over the past decade and achieved a per capita income of \$588 in 2005. However, many people still remain poor: among the total population of 1.1 billion, 35% were living on less than \$1 a day, and 80% on less than \$2 a day, mostly in rural areas,<sup>2</sup> causing a growing concern about the urban-rural divide. The growth rate of agriculture (accounting for 25% of gross domestic product [GDP] but 58% of employment) slowed recently to just 1.8% per annum during 2002-07. Crop production stagnated with less than 1% growth, even though Indian yields are much lower than those in other developing countries.<sup>3</sup> While diversification is progressing with the share of horticulture and livestock reaching 21% and 29% of agriculture GDP, growth in these subsectors also decelerated to less than 4% in recent years despite high potentials. Growth of the rural non-farm sector, now larger than agricultural GDP, is also strongly correlated with agriculture performance. In view of the wide regional disparity in productivity, and overall self sufficiency in cereal crops, the growth strategy of the 11<sup>th</sup> five-year plan (FYP: 2008-13) envisages a multi-pronged approach in response to diverse agro-climatic conditions, aiming at diversification to high value agriculture in areas endowed with better climate and marketing conditions, while intensifying food crops in less advantaged areas.

3. In India, bottlenecks in water resources are increasingly seen as a major threat to economic growth. Per capita availability of water is rapidly declining to one third of the level at independence. Water stress is increasing in many river basins, while water quality is deteriorating. In this context, more efficient irrigation has become crucial for both accelerating rural growth and conserving water resources. Irrigation is an essential to agriculture, and accounts for 84% of total water use. Yet significant part of the existing infrastructure (20% of 57 million hectare [ha] developed for surface water irrigation) remains non utilized, due to low water use efficiency and inadequate operation and maintenance (O&M). Management capacity of the state water agencies is a constraint in terms of the quality of service delivery and farmer participation. A sound regulatory framework for efficient inter-sectoral water management is only in an initial stage of implementation.<sup>4</sup> The Government is promoting state level reforms through the National Water Policy (NWP) of 1987 and 2002, which advocates participatory irrigation

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<sup>1</sup> Project preparatory technical assistance was provided under ADB. 2006. *Technical Assistance to India for Preparing the Orissa Integrated Irrigated Agriculture and Water Management Project*. Manila.

<sup>2</sup> The country's urban-rural population ratio is 29%:71% in 2006.

<sup>3</sup> The average rice yield is half that of Indonesia and Viet Nam.

<sup>4</sup> Improving the management of existing irrigation infrastructure is critical to reduce the burden on India's limited water resources endowment, amidst the increasing demand for food and other water uses, and increasing financial, social, and environmental costs and time required to develop storage facilities.

management (PIM) in partnership with water user associations (WUAs),<sup>5</sup> and integrated water resources management (IWRM). Several states have introduced improved institutional frameworks, but implementation varies across the country.

4. **Status in Orissa.** Orissa remains one of India's poorest states, with a per capita income of Rs12,400 (60% of national average) in 2003/04 and 47% of the population (about 39 million) below the poverty line in 2000. Nearly 90% of the state's poor live in rural areas. Agriculture is the backbone of the economy, accounting for 33% of state domestic product and employing over 60% of total labor and 80% of the rural work force. Yet its productivity remains low. The value of agriculture output per ha is 78% of the national average due to low yields and cropping intensity. Diversification also lags behind, with food crops accounting for 75% of cropped area against the national average of 67%. Key constraints are: (i) limited physical capital, including irrigation and other rural infrastructure; (ii) limited access to and use of modern inputs and financial services; (iii) low technology base; (iv) small and fragmented land holdings (average size of 1.3 ha); (v) lack of effective local institutions and linkages from input delivery to output marketing; and (vi) limited effectiveness of public research and extension systems.

5. Orissa is endowed with relatively high rainfall: 1,500 millimeters annual average. Yet irrigation is a critical input for agriculture across the year, as 80% of annual rainfall occurs in the June–September period in a highly erratic pattern.<sup>6</sup> The State has a net sown area of 6.0 million ha, of which 5.9 million ha can be irrigated. So far, 2.69 million ha of net irrigation potential has been created, comprising 1.24 million ha in major and medium schemes; 0.50 and 0.39 million ha in minor flow and lift schemes, respectively; and 0.57 million ha in other modalities including private groundwater irrigation. An additional 0.47 million ha of potential irrigated area is being created through ongoing projects. Yet the actual area with irrigation remains at most 70% of the designed area. This is due to: (i) infrastructure deterioration caused by insufficient maintenance; (ii) lack of water control structures, inefficient system operation, and lack of accountability of facility operators to farmers, all leading to high levels of loss; (iii) lack of farmer participation in O&M; and (iv) lack of field channels to distribute water across farm plots.<sup>7</sup> Productivity in irrigated agriculture is also constrained due to limited integration with input delivery, agriculture support services, and output marketing, with limited coordination among the line departments.

6. As to overall water resources management (as against irrigation service delivery), competition among bulk water users and environmental requirements within a basin perspective are gradually becoming issues.<sup>8</sup> This calls for: (i) further developing water resources through water storage; (ii) improving the water use efficiency of existing systems in particular for irrigation; and (iii) introducing effective institutional mechanisms for regulatory and other water management functions on the basis of river basins from a IWRM perspective.

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<sup>5</sup> PIM promotes establishing WUAs and progressively transferring O&M responsibilities (presently held by state irrigation departments) to WUAs, while enhancing the department accountability to WUAs with institutional reforms.

<sup>6</sup> There is a marked difference between the yields of major crops in rainfed and irrigated areas. The average yield level of rainfed paddy is less than 1.0t/ha whereas irrigated areas produce at least 2–3t/ha.

<sup>7</sup> Efficient water distribution in the dry season is a particular challenge, requiring stronger management to efficiently allocate the limited amount of available water among farmers. Moreover, limited efforts have been made to promote conjunctive use of groundwater irrigation within the irrigation schemes.

<sup>8</sup> In 2001, irrigation accounted for 93% of surface water use, followed by domestic users (4%) and industry (3%). With the announced large foreign direct investments in the industrial sector, intersectoral allocation and coordination in water use is an emerging issue, despite overall abundance of water except for the very lean period.

## 2. Analysis of Key Problems and Opportunities

7. **Agriculture and Support Systems.** In its draft “Vision 2020,” a long-term development strategy prepared for the 11<sup>th</sup> FYP, OSG envisions accelerating economic growth to 6–6.5% per year and reducing poverty by 15% during 2008–12.<sup>9</sup> Key priorities include (i) improving agriculture productivity and market orientation with PIM and formation of farmer groups; (ii) expanding rural non-farm business opportunities; and (iii) enabling broad-based industrial growth. These priorities will be supported by reforms in the enabling environment for private sector entry, and to improve fiscal and financial management, and public sector accountability. In this context, OSG amended the Agriculture Produce Marketing Act in April 2006, which has opened ways for private investments in storage and marketing facilities and contract farming. OSG has also drafted a state agriculture policy (SAP), which aims at more commercially oriented agriculture, with emphasis on crop diversification and marketing reforms. The SAP promotes participatory and comprehensive planning at district and lower levels, based on which support will be delivered through coordination by line departments, private providers and NGOs.

8. Despite the improving policy environment, dynamic market-oriented responses are still at an early stage of emergence. While availability of fertilizer improved after deregulation of private distribution, its use remains half the national average, leading to degrading soil fertility in large areas. Availability and use of improved seeds also remains a constraint, meeting only 25% of the annual replacement needs for food grains. Formal rural credit reaches up to 60% of farm households, but the remainders require specific solutions such as a group approach. Agriculture extension suffers from lack of outreach, calling for improved accountability of public extension workers, and increased use of private providers and media technology. In output marketing, despite the rapidly expanding transport network, marketing chains are fragmented with information dissymmetry, requiring collective approaches and local leadership to form value chain networks. In general, local conditions are highly varied. Some areas have progressed towards intensive crop production and diversification, particularly with irrigation and good market connectivity, while subsistence-oriented cropping also prevails in large areas. These conditions call for careful planning of the most suitable production systems for each locality, concerted efforts to facilitate input delivery and output marketing, and strategic provision of support services. Farmer capacities also need strengthening so that they can drive the process.

9. **Irrigation Infrastructure and Management System.** In OSG’s strategy, development and sound management of irrigation infrastructure in partnership with WUAs is recognized as a pathway to productive and high value agriculture, and poverty reduction. Accordingly, following the NWP 1987 and 2002, the OSG has progressively improved the policy and institutional framework since the late 1990s with the assistance of external financiers, including the World Bank and the European Union, amongst others. The specific reforms include (i) adopting the State Water Policy (1994, revised in 2007), which embodies the principles of PIM and IWRM; (ii) finalizing the State Water Plan in 2004 to provide a prioritized investment framework; (iii) establishing a legal framework for WUAs with the enactment of Pani Panchayat Act 2002; (iv) substantially increasing the irrigation water tariff and O&M fund allocation; and (v) strengthening the capacities of the Department of Water Resources (DOWR) for participatory skills and infrastructure development and management.

10. Following this framework, the process of WUA formation, infrastructure improvement, and transfer of minor facilities to WUAs was initiated. While all externally assisted projects were completed by 2005 with a combined coverage of 0.4 million ha of net irrigated area (NIA), OSG

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<sup>9</sup> The macroeconomic indicators show a sign of improvement. Real annual growth is estimated at 8.4% in 2003–05.

maintained the drive and the area under WUA transfer of minor facilities reached 0.9 million ha by mid 2007, focusing on schemes with better infrastructure performance. However, this transformation process remains incomplete and needs higher momentum and farmer enthusiasm so that the reform can fully achieve sound sector operations. To this end, sufficient institutional development of WUAs and further strengthening of DOWR remain critical, in combination with infrastructure improvement.<sup>10</sup> Specifically, WUAs need to be empowered as equal partners of DOWR, whereas DOWR needs to be transformed from an implementer of irrigation construction to an accountable service provider. An equally critical issue is that existing irrigation infrastructure needs not only rehabilitation but also modernization, with clear operational rules for efficient water distribution<sup>11</sup> before WUAs can take over O&M. This calls for well-sequenced interventions for participatory planning and WUA strengthening, facility renovation, agricultural support services, and institutionalization of self-sustaining O&M. Unutilized opportunities also exist to develop WUAs into a cohesive platform to drive agriculture development by forming effective linkages to input supply, technical support, and marketing with a collective bargaining power. Likewise, the institutional basis for PIM needs to be further advanced, along with the framework for IWRM that needs to guide improved service delivery.

**11. Investment Plan for Irrigation Scheme Modernization.** In line with the above initiatives, OSG's State Water Plan has prioritized improving the productivity and sustainability of existing underutilized irrigation infrastructure by adopting PIM with WUA development, as the critical first step for attaining sustainable water resources management of the state within its long-term planning horizon. A specific investment plan to this end, amounting to some \$660 million (shown in Table 1 in Appendix 2) has been prepared by DOWR as a priority program for the 11<sup>th</sup> Five-year Plan (2008–12). The proposed Program has been formulated to support the implementation of this plan, covering major and medium irrigation schemes, and minor lift schemes in the four northern river basins, and a part of the Mahanadi delta. The remaining schemes are to be implemented with the support of the Government and other external financiers.<sup>12</sup> The Program aims to intensify and diversify agriculture with a focus on high value crops. As an effort to meet the challenges of the irrigation and water resources sector in a long-term partnership, it will also support participatory and integrated basin planning and relevant institutional development towards IWRM, following the framework of the State Water Plan.

**12. Policy and Institutional Development Actions.** To support the implementation of the investment plan, OSG has taken initiatives to further improve relevant policy, planning, and institutional frameworks. First, revised State Water Policy was adopted in 2007 reaffirming OSG's resolve to pursue PIM with full O&M cost recovery by users while initiating specific steps to introduce IWRM. Second, DOWR is establishing a specialized multidisciplinary directorate for PIM, with reforms of the Water and Land Management Institute, a state PIM training institute, for greater autonomy. Other actions to improve business processes and capacities of DOWR as a multi-disciplinary service oriented agency were also developed. Third, OSG has taken steps to enhance O&M fund allocation complying with the Government's 12<sup>th</sup> Finance Commission (FC), and revising water tariff for industrial sector to meet the increased allocation. OSG will also improve its management system and take steps to enhance cost recovery, such as introducing direct linkages between tariff collection (by Revenue Department) and fund allocation (by DOWR). Fourth, OSG is refining the existing WUA legal framework, for longer term tenure,

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<sup>10</sup> The recent progress and performance is increasingly constrained due to the limited fund made available for WUA development and infrastructure renovation.

<sup>11</sup> Including the provision of: (i) sufficient water control structures, appropriately sized outlets, and measuring devices; and (ii) equipment, communication systems and supporting software to support the operational plan. Establishing agreed water distribution rules and adopting necessary adjustments after initial operations, are also critical.

<sup>12</sup> A state wide community tank rehabilitation project is being prepared with World Bank assistance.

institutional continuity, and better representation of head, middle, and tail-end farmers. Finally, following the new State Water Policy, OSG is initiating consultative steps towards establishing appropriate IWRM institutions and instruments, such as a regulatory commission or authority for water tariff setting and water allocation, as well as the establishment of a pilot river basin organization. (The sector roadmap and investment plan are shown in [Appendix 2.](#))

13. **Lessons Identified.** The preparation of the Program has been based on the exploration and incorporation of best practices and lessons learned from other Indian states and countries of Asia.<sup>13</sup> While the performance of PIM projects in India including Orissa is generally deemed successful, key lessons include: (i) a conducive policy and institutional framework with political support is essential to improve and sustain irrigation embedding PIM; (ii) sustainable O&M with user financing should be pursued with specific actions to improve the management systems; (iii) DOWR's commitment and capacities to establish PIM and to become a service oriented agency should be deepened with appropriate internal incentives provided for the reform; (iv) stringent planning is needed to tap maximum growth potentials with linkages to input delivery, technical support, and output marketing; (v) WUAs need to be developed upfront in the project cycle with clear targets and continuous support; (vi) critical attention is needed to deliver quality infrastructure and set up sound operational rules agreed with WUAs; (vii) field channel networks should be pursued as an integral part of the program; (viii) WUAs are generally willing to expand their tasks beyond irrigation O&M to facilitate collective agriculture development; (ix) an effective interagency coordination mechanism should be in place, for which district level coordination by district heads can be used; and (x) NGOs and private providers can be utilized for program delivery such as WUA strengthening and agriculture extension, with necessary capacity development. (External assistance and lessons learned are shown in [Appendixes 3 and 4.](#))

14. **ADB's Strategy.** ADB's Country Strategy and Programs (CSP) for India (2003–06) expanded ADB's operations in agriculture, irrigation, and rural infrastructure as its most important feature to address the country's rural poverty problems and looming water crisis. This was followed by relevant sector studies to accumulate a sector knowledge base and disseminate best practices and lessons learned (footnote 13), based on which opportunities for supporting PIM were identified as a priority area of ADB support, given the country's vast sector needs, both for finance and transfer of best practices. The new draft Country Partnership Strategy (CPS) for India (2008–12) envisages enhanced ADB roles in rural infrastructure development for irrigation, water resources including disaster risk management, rural market and transport infrastructure. This follows the Government's 11<sup>th</sup> FYP that places emphasis on addressing the growing regional and rural-urban disparities. Within this context, the Program is needed to institutionalize PIM and to improve irrigation infrastructure thereby promoting intensive and high value irrigated agriculture in Orissa. The proposed program is also consistent with ADB's Water Policy and Water Financing Program.<sup>14</sup>

15. **Multitranches Financing Facility.** ADB's MFF modality is most appropriate for the Program, since it provides an opportunity for high implementation quality while reflecting further lessons in the implementation design and pursuing progressive improvement of the institutional basis. These can be undertaken during the program period at the time of processing subsequent loans. It also allows flexibility in investment decision making based on subproject

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<sup>13</sup> ADB undertook studies on: (i) international and Indian best practices on PIM and on IWRM; (ii) minor tank irrigation systems in India; (iii) the Government's priority programs in the irrigation sector; and (iv) agribusiness development. In the mean time, a loan for Chhattisgarh to support minor irrigation infrastructure renovation with PIM was approved in 2005, for which PPTA outputs and initial implementation experience were also explored.

<sup>14</sup> With a primary focus on irrigation infrastructure and its management system with WUAs, it is also consistent with ADB's Medium Term Strategy II where irrigation is included in the priority sector (group 1) list.

readiness, in particular ensuring sound planning and WUA institutional building, which are most critical in developing PIM systems. Higher incentives will be provided to the concerned parties to ensure sufficient implementation performance for all relevant indicators. The MFF modality also allows a longer term partnership with sufficient monitoring of critical institutional development process with continued dialogues. Its progressive commitment structure also facilitates wider area coverage in the Program design, and hence more significant sector impacts.

## II. THE PROPOSED PROGRAM

### A. Impact and Outcome

16. The impact of the OIIAWMIP will be enhanced rural economic growth and reduced poverty in the selected river basins/geographical areas, and institutionalization of effective mechanisms to put into operation PIM-based agriculture growth.<sup>15</sup> The outcome will be enhanced productivity and sustainability of irrigated agriculture in the selected existing schemes in the river basins, and improved performance of irrigation service delivery and water resources management.<sup>16</sup>

### B. Outputs

17. The outputs of OIIAWMIP are (i) productive and sustainable irrigated agriculture management systems, and (ii) strengthened capacities of the institutions in delivering services and sustaining irrigation schemes with WUAs.

#### 1. Part A: Productive and Sustainable Irrigated Agriculture Management Systems

18. This component will establish productive and sustainable irrigation systems through WUA strengthening, renovation of irrigation and associated infrastructure, agriculture and livelihood support services, and O&M support. It covers 6 major and 6 medium existing irrigation schemes (having a designed net irrigated area [NIA] of 185,000 ha, including 6,000ha of extension in a major scheme), and up to about 2,500 existing minor lift irrigation schemes (having NIA of 50,000 ha) in the OIIAWMIP area. The component will also include (i) other major and medium schemes in the same geographical area which are functional but requires WUA strengthening and minor refinement of the existing infrastructure, and (ii) minor creek irrigation schemes to be undertaken as a pilot. The following subcomponents are provided, and aligned with the step-by-step implementation procedure. In principle, substantial WUA institutional strengthening and participatory planning will be pursued upfront with performance targets, after achievement of which infrastructure<sup>17</sup> and other services are provided.

##### a. Participatory Planning and WUA Strengthening/Empowerment

19. **Participatory Scheme Planning.** Following the sample planning documents prepared under the preceding technical assistance (TA: footnote 1), the Program will support participatory feasibility studies and preparation of subproject implementation plans (SIPs) for the concerned irrigation schemes in consultation with the WUAs. The SIP will stipulate specific programs and output targets for the scheme level at large while meeting any safeguards requirements. All

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<sup>15</sup> This will be measured through reduced poverty incidence, incremental incomes and social indicators of farmers and vulnerable people, and application/replication of the said institutional mechanisms across the state.

<sup>16</sup> Productivity will be measured through increased irrigated area (from 170,000ha [including partially irrigated area] to 221,000ha for monsoon and from 77,000ha to 155,000ha for dry season), crop production (focusing on crop intensification [monsoon] and diversification into high value crops [dry season]), efficiency in water use (production value per unit of water, etc.), and employment created including allied activities. Sustainability will be measured in individual schemes (at both scheme and individual WUA levels) achieving targets for water distribution, tariff collection and O&M fund allocation, and DOWR and associated agencies delivering the set institutional functions.

<sup>17</sup> Excluding main and key distributary facilities that will be implemented in parallel to WUA strengthening, to ensure the timely delivery of water when branch and minor canal systems (for WUA management) are renovated.

subprojects will be appraised and cleared by the OSG, the Government of India, and ADB prior to their inclusion in the periodic financing request (PFR) of the concerned MFF tranche.

20. **WUA-level Micro-Planning.** For major and medium schemes, the planning process has two tiers: scheme-level planning (completed prior to PFR), and WUA-level micro-planning. The former will provide an overall framework for the scheme including the main infrastructure, whereas the latter will detail WUA level implementation plans for minor infrastructure, command area development (CAD), agriculture, livelihood, and O&M. A multi-disciplinary team including NGO staff and local facilitators will be designated to prepare the plan with individual WUAs.

21. **WUA Strengthening/Empowerment.** The Program will strengthen WUAs to manage planning, construction, and O&M responsibilities as an equal partner of DOWR. WUAs will play effective organizational, operational, resource mobilization, and networking functions as a stable platform to pursue irrigated agriculture development including. Specific targets will be set out and achieved including membership enrollment of more than 70% of farmers, election and formation of an executive committee and sub-committees, and implementation of routine O&M. Upon achieving the set targets, implementation of the micro plan activities will be started.

#### **b. Irrigation and Associated Infrastructure Development**

22. **Irrigation and Associated Infrastructure.** The Program will renovate and extend infrastructure,<sup>18</sup> including minor repair of reservoirs, renovation of head and cross regulators, canals and ancillary facilities, and minor drainage works, along with the community-based minor lift irrigation facilities. As to major and medium schemes, main facilities requiring early completion to ensure timely delivery of benefits across the command area are implemented following the scheme-level plans,<sup>19</sup> whereas other facilities are implemented upon achievement of the WUA development targets. Scheme renovation will upgrade the system with sufficient water control structures and adequately sized outlets to support improved distribution efficiency. Necessary communication equipment and software will be provided to ensure sound operation at the scheme and individual WUA levels. During the process, WUAs will be made aware of seasonal water entitlements with the provision of measuring devices to monitor and coordinate for the delivery of the stipulated discharges. Construction quality will be monitored by the concerned WUAs, along with a third party quality monitoring being introduced by DOWR. WUAs will also be involved in the implementation of the minor works within their constituencies.

23. **CAD and Conjunctive Use.** The Program will place significant emphasis on placing field channel systems and strengthening WUA capacities for on-farm water management as essential conditions to attain high water use efficiency, and intensification and diversification of cropping. Specific plans will be laid out in the micro plan. The concerned WUAs will implement the minor CAD facilities. With the utilization of field channel systems, the Program will also promote conjunctive use of groundwater for rabi cropping, by supporting groundwater surveys, monitoring and information campaigns for private investments in groundwater irrigation, and provision of pilot wells targeted to marginal farmer groups in the tail end areas.<sup>20</sup>

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<sup>18</sup> All schemes need to renovate the existing infrastructure, except for one major scheme, Mahanadi Chitropala Island Irrigation (MCII) scheme, which will expand the existing canal system to create an additional 6,000ha of irrigated area to complete its original scope.

<sup>19</sup> That is, in parallel to the WUA micro planning and strengthening process.

<sup>20</sup> CAD will be primarily implemented through existing Government programs, whereas provision under the Program will also be kept to implement it where Government program support are not readily made available.

### c. **Agriculture and Allied Sector Support, and Livelihood Enhancement**

24. **WUA Agriculture and Horticulture Development.** The Program will provide support to this end, with WUA capacity development as a platform to plan, coordinate, and arrange for the program implementation. Specific programs will be prepared in conformity with the existing district level agricultural plans and stipulated in the WUA micro plans. This subcomponent will cover: (i) production systems including farmer field schools for crop intensification and diversification, soil nutrient management, seed multiplication, and integrated pest management; and (ii) formation of organizational linkages with input suppliers and marketing chains with market intelligence such as catalogues for existing organizations and their programs.<sup>21</sup> New technologies and approaches (e.g., system of rice intensification, participatory variety selection, and farmer producer companies) will be introduced and expanded upon demonstration. Participatory technology development of other innovations (e.g., aerobic rice and rice-fish integrated farming) will also be implemented in partnership with local research agencies. These will be delivered by the resource persons of the line departments, private sector, or NGOs arranged through the implementation team. WUAs will sustain activities through and training in-house extension staff who will form regular links with the relevant institutions.<sup>22</sup>

25. **WUA Livelihood Enhancement Support.** The Program will also support the formation of linkages between the vulnerable groups within the WUA area and the existing programs for poverty reduction, such as forming self help groups and facilitating delivery of rural credit and training for income generation activities. While primary efforts will be made to deliver the above agriculture and horticulture support services to these vulnerable groups, provisions targeted for skills development of these groups are also included in the Program, such as fisheries, fodder planting along the water channels, livestock, organic fertilizer production, group cultivation through leasing in of land, and community-based participatory works.<sup>23</sup>

### d. **Sustainable O&M System**

26. **Minor Facilities.** The Program will institutionalize sustainable O&M for the concerned irrigation schemes. At present, the facilities are classified into those managed jointly by DOWR and WUAs (project committees at main canal level, and distributary committees at secondary canal level), and minor facilities for which O&M is transferred to WUAs. Under the Program, WUA capacities to sustain minor facilities will be set up first. This will be attained by forming water management subcommittee and preparing the O&M plans during the micro plan stage, and engaging subcommittees in implementing the works. Upon completion of the civil works, training will be provided to: (i) prepare and implement operational plans; and (ii) undertake joint walk-throughs to identify and plan maintenance works. For major and medium schemes, WUAs will implement the maintenance plan with the grant-in-aid provided by the DOWR. In case of its insufficiency, WUAs will mobilize necessary fund from its members.<sup>24</sup> As to the minor lift schemes, WUAs will mobilize all resources from members to implement the plan.<sup>25</sup>

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<sup>21</sup> Resources for existing state and externally assisted programs will be sought prior to tapping Program funding.

<sup>22</sup> Demonstration works will be undertaken with a focus on the land plots of marginal farmers. WUAs will recover the cost of input materials from the service recipients as a revolving fund to continue the activities.

<sup>23</sup> A separate program to develop WUA capacities to enhance the livelihoods of the poor is also being prepared for possible JFPR funding.

<sup>24</sup> Please refer to [paras. 41-42](#) on the financial perspective for sustainable O&M.

<sup>25</sup> Responsibilities for fee collection has also been transferred to minor lift WUAs, who are also responsible for all repairs and future replacement of assts. They will also establish and build up a reserve fund to meet the purpose.

27. **Main and Secondary Facilities.** At the higher levels of major and medium schemes, the Program will establish participatory joint management systems between DOWR and the WUA committees, and pursue further O&M transfer to the WUA during the later part of the Program period. Under joint management, system operational plans will be jointly prepared on a seasonal basis. As to maintenance, they will assess maintenance requirements through joint walk-throughs and the demands from lower-tier WUAs, and jointly decide on and implement the scheme-wide maintenance plan allocating necessary fund from DOWR. Guidelines for O&M performance monitoring, planning, and fund allocation will be established to guide the process, along with a scheme-wise management information system (MIS) to be applied state wide.

## 2. Part B: Institutional Strengthening and Program Management (ISPM)

28. This component comprises: (i) institutional strengthening for PIM and IWRM; and (ii) Program management. Necessary hardware and software (civil works for office refurbishment and extension, vehicles and equipment, consultants, and incremental operational costs) will be provided to support these ends. A capacity development plan applied to the Program institutions has been prepared and is shown in the institutional report in **Volume 3**.

### a. Institutional Strengthening

29. **PIM.** This subcomponent will establish self-sustaining mechanisms for accountable irrigation services while developing the capacities of the relevant institutions. Specifically, this will include: (i) operationalizing the functions of new PIM/CAD directorate of DOWR; (ii) establishing upgraded O&M guidelines and the MIS for scheme O&M performance monitoring and planning; (iii) operationalizing a third party internal technical auditing using externally hired experts; (iv) developing and delivering training programs for Program staff and WUAs;<sup>26</sup> (v) undertaking information, education, and communication campaigns for PIM; (vi) advising on implementing the institutional actions specified in the roadmap (Appendix 2), and (vii) setting up staff incentive systems to internalize PIM, including improved staff performance evaluation and reward system. The WALMI will also be strengthened with remodeling and (i) assignment of its director from the market; (ii) upgrading of training programs, (iii) developing most up-to-date information, technology, and knowledge base for efficient water use and best practices and lessons; and (iii) a twinning arrangement with a reputed international institute.<sup>27</sup>

30. **IWRM.** In accordance with the roadmap, this subcomponent will support: (i) studies to assess appropriate IWRM functions and institutional arrangements for setting up an authority or commission for water tariff fixation and other regulatory functions such as water allocation and entitlement; (ii) studies for appropriate legislation for operationalizing IWRM functions; (iii) preparation of multi-sectoral river basin plans with establishment of participatory river basin organizations; (iv) strengthening of the hydrological database and decision support systems for the concerned river basins; and (v) staff training on IWRM, basin planning and associated analytical methodologies. The Program will also support organizing a participatory advisory council to guide the above IWRM institutional development process.

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<sup>26</sup> The specific training subjects include participatory planning, WUA development, design and construction management, quality control, O&M, PIM, resettlement, environmental management, and support services.

<sup>27</sup> WALMI is an autonomous institute registered under the Societies Act. Subject to the implementation of the reforms for higher autonomy and staff quality, WALMI will provide necessary technical and institutional backup and training support for PIM and IWRM. To sustain research and training after Program completion, the Program will consider providing a corpus fund in its subsequent loan by establishing an arrangement acceptable to ADB.

## **b. Project Management**

31. This subcomponent will operate the program management system through multi-disciplinary project management unit (PMU) and subproject implementation offices (SIOs) comprising the OSG and outsourced experts, consultants, and NGOs. The Program will be implemented with participatory decision making system with WUAs. The latter are trained to jointly make individual decisions on the subproject planning, implementation, and O&M, based on which specific works will be implemented by the responsible organizations, and monitored by the WUAs. This will be supported by the project-specific MIS and quality control system that ensures due recording and reporting at SIO on institutional, physical, financial and other progress against the set targets specified in SIP and micro plans; and regular PMU-SIO review meetings. Along with these, this subcomponent will also support the consulting services for preparing further schemes for the subsequent loans, and implementation performance review.

## **3. Special Features**

32. The Program will operationalize effective irrigation service delivery to enhance efficiency, productivity and sustainability in water use by implementing key policy principles, furthering reforms for improved sector governance, and progressively incorporating the knowledge gained:

- (i) The Program will support implementation of the key principles of the 2002 NWP and 2007 State Water Policy, in particular the full operationalization of PIM in the presently low performing irrigation schemes, with associated institutional reform actions owned by DOWR and OSG, which are in line with ADB's Water Policy.
- (ii) Its components are designed consistently with step-by-step implementation procedures to establish PIM-based productive agriculture, incorporating best practices collected through national and cross-country studies, including sound planning with clear result targets for each step with upfront WUA strengthening, and process management with strict quality control and WUA involvement in monitoring and execution, among others.
- (iii) Compared with conventional projects, it has a specific focus on extending field channel networks (to convert field-to-field flood irrigation into a more efficient plot-to-plot irrigation through channel turnouts) and promoting conjunctive use of groundwater, as essential conditions for improving water use efficiency, crop intensification and diversification.
- (iv) The Program will empower WUAs to progressively take on O&M and implementation roles, with their capacity developed to facilitate linkages and bargaining power in input delivery, extension, and product marketing to achieve more productive agriculture.
- (v) The efforts of institutionalizing PIM is ongoing as a national priority, yet the process is still at an intermediate stage, and needs to be strengthened by incorporating the latest lessons. The MFF modality allows flexibility to refine the process, and well suited to pursue the agenda with progressively improved arrangements.

## **4. Program Investment and Financing Plan**

33. **The Program.** The program investment cost is estimated at \$270 million, including taxes and duties of \$12.5 million (Table 1) to be financed by the Government.

Table 1: Cost Estimates

Project Components	Amount (\$ million)
<b>I. Base Cost <sup>a</sup></b>	
Part A. Irrigated Agriculture Management Systems	
a. Participatory Planning and WUA Strengthening	6.7
b. Irrigation Infrastructure	138.6
c. Agriculture Development and Livelihood Enhancement	11.3
d. Sustainable O&M Systems	6.3
Part B. Institutional Strengthening and Project Management	27.6
<b>Subtotal (A)</b>	<b>190.5</b>
<b>II. Contingencies <sup>b</sup></b>	<b>55.8</b>
<b>Subtotal (B)</b>	<b>246.3</b>
<b>III. Financing Charges during Implementation <sup>c</sup></b>	<b>23.9</b>
<b>Total</b>	<b>270.2</b>

<sup>a</sup> In mid 2007 prices.

<sup>b</sup> Physical contingencies computed at 10% of civil works, NGO and consultancy costs, and project management, totalling \$12.7 million. Price contingencies are computed at 0.8% per annum for foreign exchange costs and 4.0-5.0% per annum for local currency costs

<sup>c</sup> Includes interest and commitment charges. Interest during construction has been computed at the 5-year London interbank offered rate plus a spread of 0.4%.

Source: Asian Development Bank Estimates.

34. To finance the Program, the Government has requested financing of up to \$189.2 million from ADB's ordinary capital resources through the Facility in accordance with ADB's Pilot Financing Instruments and Modalities<sup>28</sup> approved in August 2005. The Facility may extend four (or more if needed) loans (or Projects) to implement the Program, subject to the submission of the related periodic financing request (PFR) by the Government and the signing of the related loan agreements. The Government has confirmed its intention to enter into a framework financing agreement (FFA) with ADB in the form attached, which satisfies the requirements set forth in Appendix 4 of the said ADB policy (footnote 27). All of the provisions of the ordinary loan regulations applicable to the London interbank offered rate (LIBOR)-based lending facility made from ADB's ordinary capital resources, dated 1 July 2001, would apply to each loan, subject to any modifications that may be included under individual loan agreements. The specific terms of each loan will be based on the related PFR, with interest to be determined according to ADB's LIBOR-based lending facility. The Government may choose a currency (from among several eligible currencies) and interest rate regime for each loan. The financing plan for the Program is in Table 2. Detailed cost estimates and financing plan are shown in Appendix 5.

Table 2: Financing Plan

<sup>28</sup> ADB. 2005. *Pilot Financing Instruments and Modalities*. Manila

Source of Financing	Total (\$ million)	Percent
Asian Development Bank	189.2	70.0
Government	73.5	27.2
Beneficiaries <sup>a</sup>	7.6	2.8
<b>Total</b>	<b>270.3</b>	<b>100.0</b>

<sup>a</sup> To contribute 10% of the cost of command area development and conjunctive use, and 20% of the cost of minor lift schemes. In addition, beneficiaries will also deposit 5% of the minor canal civil work costs in WUA bank account as a fund to support their own O&M works.

Source: Asian Development Bank estimates.

Table 3: Cost Estimates and Financing Plan for Project 1

Project Components	Amount (\$ million)	ADB (\$ million)	ADB (%)	OSG (\$ million)	OSG (%)	WUAs (\$ million)	WUAs (%)
<b>I. Base Cost</b>							
Part A. Irrigated Agriculture Management Systems							
a. Participatory Planning and WUA Strengthening	2.0	1.7	85	0.3	15	0.0	0
b. Irrigation Infrastructure	31.6	22.3	71	8.5	27	0.8	3
c. Agriculture Development and Livelihood Enhancement	0.7	0.7	100	0.0	0	0.0	0
d. Sustainable O&M Systems	0.1	0.1	100	0.0	0	0.0	0
Part B. Institutional Strengthening and Project Management	9.6	8.9	93	0.7	7	0.0	0
<b>Subtotal (A)</b>	<b>44.0</b>	<b>33.7</b>	<b>77</b>	<b>9.5</b>	<b>22</b>	<b>0.8</b>	<b>2</b>
<b>II. Contingencies</b>	<b>7.6</b>	<b>5.9</b>	<b>78</b>	<b>1.6</b>	<b>21</b>	<b>0.1</b>	<b>1</b>
<b>Subtotal (B)</b>	<b>51.6</b>	<b>39.6</b>	<b>77</b>	<b>11.1</b>	<b>22</b>	<b>0.9</b>	<b>2</b>
<b>III. Financing Charges during Implementation</b>	<b>4.9</b>	<b>0.0</b>	<b>0</b>	<b>4.9</b>	<b>100</b>	<b>0.0</b>	<b>0</b>
<b>Total</b>	<b>56.5</b>	<b>39.6</b>	<b>70</b>	<b>16.0</b>	<b>28</b>	<b>0.9</b>	<b>2</b>

Source: Asian Development Bank Estimates.

35. **First Project.** In line with the FFA, the Government has confirmed its intention to submit the first PFR in the format attached. The Project 1 is estimated to cost the equivalent of \$56.5 million, including taxes and duties of \$2.8 million (Table 3). Detailed cost estimates are also shown in [Appendix 5](#). It will cover the initial implementation of two major and three medium schemes appraised prior to the submission of the PFR,<sup>29</sup> and up to 300 minor lift schemes to be appraised following the sample appraised subprojects. It will also cover a part of the costs of ISPM, including NGO and consulting services. A loan of \$39.6 million is to be requested under the first PFR from ADB's ordinary capital resources to cover part of the cost of Project 1. The loan will have a term of 25 years, including a grace period of 7 years, with interest rate to be determined according to ADB's LIBOR-based lending facility, a commitment charge of 0.35% per annum, and such other terms and conditions as agreed in the FFA, and the loan agreement.

## 5. Implementation Arrangements

### a. Program Management<sup>30</sup>

36. **Organization and Management.** DOWR will be the executing agency of the Program. A state level project steering committee chaired by Agriculture Production Commissioner will be

<sup>29</sup> The scope of the Mahanadi-Chitropala Island scheme will include only the pre-construction works, including WUA strengthening with micro planning, and finalization and implementation of its resettlement plan.

<sup>30</sup> Implementation arrangements have drawn lessons from the models followed in Orissa, other Indian states and Asian countries, and incorporated necessary improvements such as sufficiency in WUA institutional support, soundness in process management and quality control, and effective use of outsourcing modality, among others.

set up to provide policy guidance and interdepartmental coordination. Program implementation will institutionalize effective mechanisms to plan, improve and manage irrigation systems through the improved regular setup, with outsourcing to private sector and NGOs. DOWR is setting up a permanent multi-disciplinary PIM/CAD directorate to monitor, guide, implement, and coordinate for PIM and associated integrated development services for the entire state. A program management unit (PMU) will be established in the directorate with the assignment of a full-time Program Director at the rank of chief engineer. PMU will have a multi-disciplinary structure comprising staff from DOWR, line departments, and those recruited from the market,<sup>31</sup> and assisted by consultants for ISPM. The organizational structure is in [Appendix 6](#).

37. In implementing the Program, the PMU will: (i) prepare an overall implementation plan and annual project budget; (ii) coordinate with other concerned departments; (iii) guide the feasibility studies and endorse subproject appraisal reports including 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) monitor project progress and evaluate project benefits and social and environmental impacts with MIS; (viii) arrange necessary training programs for staff and other providers; (ix) manage procurement, consulting and NGO services, and loan disbursement; (x) maintain financial accounts; and (xi) prepare periodic implementation progress reports.

38. To implement a total of 15 major and medium schemes, 12 SIOs will be set up in the existing DOWR field offices enhanced with cells for WUA support and CAD. Each SIO will be headed by a subproject manager at the rank of superintending engineer (or executive engineer for medium schemes) and assisted by a PIM specialist/deputy subproject manager (to be engaged from the market), and two senior NGO staff who supervise NGO support teams to work with WUAs for institutional development, water management, and agriculture. The SIOs will: (i) prepare an annual work plan endorsed by PMU; (ii) establish and operate (a) coordination systems through a district coordination committee headed by district collector, (b) participatory decision making system with WUAs on subproject implementation matters, and (c) reporting systems on physical, institutional and other progress and impacts; (iii) provide inputs to subproject planning and design process; (iv) undertake WUA strengthening and micro-planning; (v) implement safeguards actions following the relevant plans;<sup>32</sup> (vi) execute civil works; (vii) coordinate for and/or implement support services for agriculture and livelihoods; (viii) manage subproject O&M in collaboration with WUAs while ensuring the capacities and resources for the latter; and (ix) arrange training programs for the staff, NGOs and WUAs.

39. For implementing community-based minor lift schemes, PMU will have a lift irrigation cell comprising a senior superintending engineer in lift irrigation, an economist, and three mobile teams comprising a lift irrigation engineer and an agricultural specialist. They will be entrusted with procurement of equipment and goods, and subproject feasibility studies. At the field level, two mobile SIOs will be set up, comprising a PIM specialist (assigned as subproject manager), irrigation engineer, agriculture engineer, work inspector, and monitoring and evaluation officer. The lift irrigation cell and SIO staff are primarily engaged from a local firm as implementation

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<sup>31</sup> Including project planning, design, lift irrigation, implementation, quality control, WUA mobilization, agriculture and allied sectors, economics, environment, resettlement and rehabilitation, and vulnerable groups.

<sup>32</sup> Deputy subproject manager will be assigned as chief officer for environmental management, resettlement, and vulnerable peoples to undertake the required tasks through the designated SIO staff.

consultants, who will also be associated with local NGOs to mobilize field level facilitators to support institutional building and coordination for program delivery on the ground.<sup>33</sup>

40. **Subproject Selection Criteria and Implementation Procedure.** All subprojects to be included under the Program will meet the selection criteria shown in [Appendix 7](#), including: (i) water availability; (ii) technical, social, institutional and economic feasibility; (iii) insignificant social and environmental impacts; (iv) compliance with safeguards requirements; (v) endorsement by WUAs including the set beneficiary contribution requirements (shown in Table 2); and (vi) proposal clearance by the Government as applicable. Implementation procedures for individual subprojects are shown in [Appendix 8](#), and detailed in **Volume 4 (I to VII)**.

41. **Investment Program Management.** The five major and medium subprojects proposed for Project 1 were studied under the TA (footnote 1) and appraised by OSG, the Government, and ADB, along with two sample minor lift irrigation schemes. PMO, with the support of the ISPM consultants, will prepare further subprojects proposed for the subsequent Projects. At that time PMO will also assess the implementation progress and performance of the ongoing Project(s). This will cover the policy and institutional actions, progress in achieving the capacity development and other targets, lessons learned, and compliance in managing safeguards requirements. On the basis of these, specific measures to enhance the Program effectiveness will be identified for incorporation into the subsequent Project as necessary. ADB will engage with the OSG and the Government while the work is being carried out to provide advice. After ADB appraisal, the Government will submit a PFR of the concerned Project, together with the appraisal reports of new subprojects and the Program performance assessment report.

42. **Sustainable O&M.** In Orissa, water tariffs are collected by the Revenue Department (RD) and allocated to individual schemes and WUAs by DOWR from OSG fund, except for minor lift schemes where responsibility of fee collection is given to WUAs. OSG has a policy of full maintenance funding with user financing, including: (i) allocating O&M fund complying with the Government's Finance Commission (FC), and (ii) recovering the cost through tariffs levied to users. However, there are still gaps. Regarding fund allocation, while OSG has adopted the 12<sup>th</sup> FC report and raised the allocation to Rs600/ha from Rs450/ha in FY2005, the fund available for DOWR for works (Rs300/ha) is less than FC norm (Rs480/ha) due to the higher establishment cost of DOWR. As to cost recovery, efforts to increase water tariffs for industries is in progress to fully meet the increase of allocation in FY2005.<sup>34</sup> Yet actual collection for irrigation remains about 50% of the targets, due to large gaps between the irrigated areas claimed by DOWR and areas certified by RD (40%), and shortfalls in collection in the certified areas (10%). This reflects the poor performance of irrigation delivery. The present system of collection by RD and fund allocation by DOWR without no linkage between the two also poses a constraint.

43. To sustain O&M, OSG is committed to revising the fund allocation following future FC reports, and increasing water tariffs including irrigation (with the progress of the present efforts to enhance system productivity and farmer incomes with PIM). DOWR is also rationalizing the non-technical field staff (taking the bulk of establishment costs) with natural attrition. In the context of the Program, DOWR will: (i) establish sound scheme-wise MIS for O&M monitoring and planning, (ii) introduce needs- and performance-based allocation system, (iii) operationalize participatory decision making for fund allocation of O&M in each scheme, and (iv) seek WUAs to

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<sup>33</sup> The functions of SIOs remain mostly the same as SIOs of major and medium schemes, except for civil works, (mostly carried out by WUAs) will be implemented through the field office of Orissa Lift Irrigation Corporation with quality control undertaken by SIO work inspectors and monitored by the trained WUA members.

<sup>34</sup> Irrigation tariff rates in Orissa are generally at par with other Indian states, whereas industrial rates are lower than national average, based on which OSG is now pursuing the tariff increase in industries.

address any shortfalls through their own cash or labor contribution. To reduce the shortfalls in cost recovery, DOWR will: (i) enhance the certified areas by the RD with improved irrigation, (ii) involve WUAs in the collection process; and (iii) introduce direct linkage between the O&M fund allocated and the water tariffs submitted. The Program will also support the assessment of appropriate regulatory mechanism for water tariff fixation and its initial operation.

44. **Governance and Anti-corruption Measures.** Good governance is an essential element for ensuring and sustaining the intended benefits from irrigation infrastructure renovation with PIM. The Government and OSG were advised of ADB's *Anticorruption Policy* (1998, as amended to date) and policy relating to the *Combating of Money Laundering and the Financing of Terrorism* (2003).<sup>35</sup> In this context, ADB has also assessed the financial management system of DOWR (**Volume 8-II**) and the Program has incorporated due measures for ensuring governance, accountability and transparency. The specific measures will pursue participatory management of processes and outputs with quality control mechanisms ([Appendix 8, section B](#)).<sup>36</sup> Under the Program, subprojects are prepared by setting out clear input and output targets in SIPs and WUA micro plans, and progressively implemented by confirming that the set targets are achieved at each stage, including upfront WUA strengthening. WUAs are empowered to participate in all decision making such as endorsing micro plans and periodic work plans. Program expenditures including the civil work contract amounts and quantities will be posted at the subproject sites, which will be monitored by trained WUA members, and quality monitors of the consultants. With awareness campaigns, grievance mechanisms will be operated through local government grievance officers. In addition, DOWR will: (i) annually undertake, through its internal audit wing, full financial audit of SIOs and PMU inspecting all financial transactions; and (ii) establish and operate a third party technical audit mechanism through DOWR's newly created quality control cell, with the support of the ISPM consultants.

## 6. Implementation Period

45. The Program will be implemented over eight years with four provisional Projects ([Appendix 9](#)) from January 2009 to December 2016, with fund utilized up to June 2017. The first Project comprises mainly consulting and NGO services, equipments, and civil works for two major and three medium irrigation schemes,<sup>37</sup> and about 300 minor lift irrigation schemes. These subprojects were selected based on implementation readiness and their representative character. The ISPM support will continue over the entire period, and an emphasis is placed to achieve the progressive reform milestones as set forth in the sector roadmap ([Appendix 2](#)).

## 7. Procurement

46. Procurement to be financed from the ADB loans under the Facility will be carried out in accordance with ADB's *Procurement Guidelines* (2006, as amended from time to time).

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<sup>35</sup> Consistent with its commitment to good governance, accountability and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Program. To support these efforts, relevant provisions of ADB's *Anticorruption Policy* are included in the loan regulations and the bidding documents for the Program. In particular, all contracts financed by ADB in connection with the Project shall include provisions specifying the right of ADB to audit and examine the records and accounts of the EA and all contractors, suppliers, consultants, and other service providers as they relate to the Program.

<sup>36</sup> Ordinary measures are also applied, such as preparation of the financial management manual and staff training.

<sup>37</sup> These subprojects will be implemented during the first six years (except for O&M that extends to the year 8). They are also divided into three tranches, broadly comprising (i) WUA strengthening, civil works for main and distributary facilities and a part of minor facilities; (ii) civil works for minor facilities and a part of agriculture programs and O&M support; and (iii) all remaining activities. The division into separate phases will ensure the incorporation of findings and lessons based on the performance evaluation of the preceding phase.

International competitive bidding (ICB) will be followed for civil work contracts costing \$10 million or more. Civil works contracts costing less than \$10 million will be procured through national competitive bidding (NCB). ADB standard bidding documents with post qualification under the two-envelope system will be adopted. In addition, small community works costing less than \$100,000 in value may be directly contracted with the concerned WUAs. In procuring goods and related services, ICB procedures will be used if the estimated cost is at least \$1 million and NCB procedures if the cost is between \$0.1 million and \$1 million, and shopping if the estimated contract amount is less than \$0.1 million. The detailed procurement plan for Project 1 is shown in [Appendix 10](#).

## **8. Consulting Services**

47. The Program will include consultancy packages including: (i) ISPM consultancy to fill the capacity gaps in delivering the intended project outputs while institutionalizing the PIM process and supporting steps for IWRM (158 person-months [p-m] of international and 738 p-m of national consultants); and (ii) implementation support consultancy for community-based minor lift irrigation schemes (1,080 p-m of national consultants). PMU will select and engage the consultants using ADB's quality and cost based selection procedures. In addition, NGOs, independent agencies, and/or institutions will be hired to carry out community participation and program delivery activities, and to facilitate and monitor land acquisition and resettlement. All consultants, NGOs, and other institutions will be hired in accordance with ADB's Guidelines on the Use of Consultants (2006, as amended from time to time).

## **9. Advance Contracting and Retroactive Financing**

48. ADB Management approval will be sought at MRM for advance contracting for consultant and NGO engagement and procurement of goods and civil works, and retroactive financing for the Projects under MFF. These arrangements will facilitate the readiness of the Project 1 and subsequent Projects under the Program. Total eligible expenditure under retroactive financing will not exceed an amount equivalent to 20% of the individual loans, and must have been incurred not more than 12 months before the signing of the relevant legal agreements. The Government will be informed that the approval of advance action and retroactive financing does not commit ADB to finance the relevant Projects under the Program.

## **10. Disbursement Arrangements**

49. Disbursement of each loan proceeds under the Facility will be in accordance with ADB's *Loan Disbursement Handbook* (January 2007, as amended from time to time). Each loan under the Facility will have its own imprest account in the Reserve Bank of India. The State through DOWR will establish a second-generation imprest account (SGIA) for each loan, if necessary, in a current account with a commercial bank. The DOWR will be responsible for administering and managing the imprest account and the SGIA shall be equivalent to six months of estimated expenditures or 10% of the relevant loan amount, whichever is lower. Individual payments under the statement of expenditures procedures (SOE) will be at \$100,000.

## **11. Accounting, Auditing, and Reporting**

50. The DOWR, through the PMU, will establish and maintain separate records for works, goods, and services financed out of loan proceeds. The DOWR will also maintain separate Project accounts according to generally acceptable accounting principles for all expenditures incurred under the Facility and the Projects, whether out of loan proceeds or other sources. The

DOWR will record in a transparent manner all funds received from the OSG, ADB, and beneficiaries. Detailed consolidated annual project accounts as maintained by the DOWR through the PMU, will be audited by independent auditors whose qualifications, experience, and terms of reference are acceptable to ADB, and will be submitted to ADB within 9 months of the end of the fiscal year. The annual audit report will include the audit of the imprest account, the SGIA, and the SOE procedure, and will include a separate audit opinion on the use of loan proceeds, the operation of the SGIA, and compliance with SOE procedures and loan covenants. The DOWR has been made aware of ADB's policy regarding the delayed submission of audits and the requirements for a satisfactory and acceptable audit of accounts.

## **12. Program Performance Monitoring and Evaluation**

51. DOWR will establish an investment program and roadmap performance monitoring system (IPRPMS) acceptable to ADB within three months of the effectiveness of the first loan. The IPRPMS will first select a set of result based performance monitoring indicators relating to physical implementation, institutional development, and socio-economic and other conditions (disaggregated into gender and other social classes), including those set out in the design and monitoring framework (Appendix 1). DOWR will establish baseline data within six months of the date the first Project takes effect. After that, DOWR will conduct annual surveys with the assistance of the consultants, and update OSG and ADB on the progress against each indicator. The DOWR will also provide the Government and ADB with quarterly progress reports in the format to be attached with the Facility administration memorandum, within 30 days of the end of each quarter. The report will cover the relevant indicators as specified in IPRPMS, and recommendations for enhancing the effectiveness of the Program implementation. The monitoring report will also be used for shaping the subprojects to be developed for succeeding PFRs and loan tranches. Prior to submitting individual PFRs, a report will also be prepared to review program progress and performance (shown in para 40). A further detailed study will be conducted prior to the midterm review (MTR). Within three months of physical completion of any Loan under the MFF, OSG will submit to ADB a project completion report. Within three months of the completion of the Facility, DOWR will submit to ADB a program completion report.

## **13. Investment Program Review**

52. The Program's performance will be reviewed monthly at the field level through regular SIO-WUA meetings where the progress of field activities delivered through field implementation teams and other providers will be assessed, and work plans for the subsequent period decided. PMU will also organize PMU-SIO review meetings, which will be reflected in the quarterly progress reports. At the country level, the progress is reviewed by a tripartite project review meetings chaired by the Government and attended by DOWR and ADB. ADB will undertake Program review twice a year, covering the performance of DOWR and other institutions, loan covenants, and physical and non-physical progress of implementation. Prior to the submission of individual PFRs, a detailed review of the Program performance will also be undertaken. A comprehensive MTR will be done in year 4 (possibly coinciding with the review of the draft PFR for the third Project) to evaluate the progress of roadmap actions, performance of the Program institutions, and of all process and output indicators, and future implementation plans.

## **14. Project Readiness**

53. In line with the progressive steps taken by OSG to institutionalize PIM for which momentum has been enhanced during the preparatory process of the Program, there is a high need for seamlessly taking remaining preparatory steps and to launch Program activities in a

timely manner. To this end, OSG requested support from the TA cluster developed to improve project preparedness for new projects in India.<sup>38</sup> A component TA under the TA cluster has been provided to help OSG and DOWR with necessary institutional strengthening and project readiness measures, including: (i) support for initiating steps for institutional reform actions for PIM and IWRM specified in the roadmap; (ii) establishment of PIM/CAD directorate of DOWR, PMU and SIOs; (iii) preparation of training materials and provision of staff training; (iv) preparation of detailed project implementation manuals; (v) participatory feasibility studies of subprojects proposed for the second PRF; (vi) pre-construction activities for the subprojects included in the first PRF including WUA strengthening, micro plan preparation, and participatory detailed designs; and (vii) advance recruitment of ISPM consultants and NGOs. The component TA has a budget of \$1.875 million, including \$1.5 million from the TA cluster.

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<sup>38</sup> ADB. 2006. *Technical Assistance to India for Project Processing and Capacity Development*. Manila (TA No. 4814-IND for \$15 million, approved on 30 June 2006). The cluster TA provides support in institutional strengthening, planning, appraisal, and advance procurement and consultant/NGO selection process.

### **III. INVESTMENT PROGRAM BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS**

#### **A. Economic Impacts**

54. The Program will renovate and extend 185,000 ha of major and medium irrigation systems and 30,000 ha of community-based minor lift irrigation systems, which are existing and low-performing at present, potentially benefiting about 3.6 million people. The main quantifiable benefits will be the incremental agriculture production brought about by reliable water supply and expansion of irrigated areas in the kharif (monsoon), rabi (winter) and summer seasons (through renovated irrigation infrastructure system and improved operations of the reservoir and water distribution networks including field channels). The generated incremental labor demand will particularly benefit the poor. Major quantified benefits are shown in [Appendix 1](#). Non-quantified benefits include the operation of sound irrigation service delivery systems with PIM, improved sector governance pursued through progressive institutional reform actions, and follow-on impacts on non-farm sectors associated with incremental agriculture production.

55. Economic and financial impacts were analyzed for two major schemes (in the Mahanadi delta), three medium schemes and two sample minor lift systems (in the northern basins), which are included in the first PFR to evaluate the investment returns (summarized in [Appendix 11](#) and detailed in [individual subproject feasibility reports](#)). All have year-round irrigation opportunities. Cropping intensities will increase from 165% to 173% for the major renovation scheme and from 128% to 183% for the major extension scheme; by 20–35% for medium schemes from the present level (125–150%); and up to 220–230% for minor lift schemes through full operation of the community pumps. The EIRR, estimated incorporating the yield increase and modest crop diversification observed in similar interventions, is 18.8% for the major extension scheme, 19.7– 22.7% for major and medium renovation schemes, and 30.1% and 38.2% for minor lift schemes. Sensitivity analyses to test the impacts of a range of risks including adverse changes in investment costs, output prices, and yields showed that project returns are generally robust. The greatest risk appears to be reduction of crop prices, but even in this case a drop of 31% in the price of non-cereals will still produce the EIRR of 12% in the subproject with lowest EIRR.

56. Under the Program, the OSG will bear most of the investment costs in line with State Water Policy 2007, while seeking farmer contribution at 5% of the cost of minor facilities to be managed by WUAs, 10% for CAD, and 20% for minor lift works. As to O&M, OSG collects the set water tariff for the major and medium schemes and allocates fund to individual schemes, while O&M including fee collection is also transferred to the WUAs for minor lift schemes. The investment contribution remains about 6–15% and 25–35% of incremental income for major/medium and minor lift schemes, respectively, whereas O&M contribution will remain 3–6% and 9–17% of incremental income for major/medium and minor lift schemes, respectively.

#### **B. Households and Poverty Reduction Impacts**

57. The Program will have positive poverty reduction impacts on income, employment opportunities, and food security in particular for the marginal farmers (having less than 1 ha of land). According to the socio-economic survey, poverty ratio in the scheme areas is highly variable: 22% and 37% for major renovation and major extension scheme (i.e., presently non-irrigated) areas of the Mahanadi delta, 35–69% for the three medium schemes, and 6% and

40% for sample minor lift scheme areas.<sup>39</sup> Anticipated incremental incomes for marginal farmers are in the ranges of 45% and 95% for major renovation and major extension schemes in the Mahanadi delta, 60–80% for medium schemes, and 70% and 105% for the two sample minor lift schemes. The benefit will be higher for presently non-irrigated areas, where poverty incidence is higher compared with the areas with higher albeit unreliable irrigation access.

### **C. Social and Gender Development Strategy**

58. The Program will primarily focus on the rehabilitation and modernization of existing irrigation schemes. As such, it will have beneficial social impacts to the concerned population at large. Nevertheless, it is erroneous to assume that physical improvement will induce the DOWR and WUA capacity to manage the infrastructure efficiently and equitably. The Program will therefore place strategic emphasis on the beneficiary participation with due attention to the diversity of their interests and possible vulnerability (e.g., tail end farmers) under the framework of the WUAs. The strategy has four levels, including: (i) policy measures to equalize opportunities and access, including the refinement of WUA Act to support equal representation of head, middle, and tail reach farmers and increased participation of vulnerable groups including women; (ii) WUA capacity enhancement to ensure sound governance including representation, participatory decision making, and equal water distribution; (iii) specific actions and programs targeting vulnerable groups including women with establishing linkage to the existing poverty reduction programs such as self help groups; and (iv) compliance with social safeguards measures. Summary poverty reduction and social strategy is in [Appendix 12](#).

59. The Program's gender action plan ([shown in Volume 5-III](#)) includes: (i) creation of a staff position in DOWR PIM/CAD Directorate to look after social and vulnerable groups; (ii) development of training programs to enhance gender participation to Program staff; (iii) at least 20% women engaged as field implementation team, with increased female technical staff in DOWR; (iv) promotion of at least 33% women representatives elected to WUAs; (v) establishment of links with Department of Women and Child Development at central and field levels; (vi) formation of women groups and delivery of programs to support their empowerment within the WUA; and (vii) gender disaggregated baseline survey and monitoring.

### **D. Indigenous Peoples**

Orissa has relatively high percentage of tribal population compared with that of other States: 22.2% of its population. Higher concentration is seen in inland districts including those covered under the Program. An approved Indigenous Peoples Development Framework (included in [Volume 5-II](#)) will be the basis for developing indigenous peoples development plans for schemes having project impacts on affected tribal people. Regarding the seven schemes studied for the first PRF, three medium schemes were found to have high percentage of tribal populations at 23%, 26%, and 63%. 'Indigenous peoples specific actions' were prepared for these schemes to enhance the positive impacts and to avoid or at least to minimize adverse impacts, if any (included in the said [Volume 5-II](#)). The specific actions include: (i) promoting due representation of indigenous peoples in the concerned WUAs and their decision making systems; (ii) undertaking separate information campaigns and need assessment, and pursuing that their interests are met in the WUA development and Program delivery process; (iii) forming tribal peoples groups within the WUAs and empowering them with establishing linkage to the

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<sup>39</sup> The low poverty in one of the lift scheme is related with its close vicinity to a national highway and urban areas, and advanced diversification of high value crops with a pump providing irrigation in part of the command area.

existing OSG programs and supporting specific activities under the Program, and (iv) developing WUA capacities to address the needs of tribal farmers.

## **E. Resettlement**

60. The Program investments will only involve the renovation of the existing irrigation infrastructure, except for the MCII scheme ([footnote 17 in para. 21](#)) where the irrigation system will be expanded with minor canals. For the five subprojects appraised, only MCII involves strip land acquisition, whereas the existing right of way is sufficient to undertake renovation works in all other schemes, with no affected encroachment. For the purpose of the Program, a resettlement framework (RF) has been prepared following the ADB's *Policy on Involuntary Resettlement* (1995) and agreed by OSG. A resettlement plan for the MCII is being prepared, following closely RF, although further work would be most effectively undertaken in parallel with the WUA formation process.<sup>40</sup> Under the Program, all affected persons (APs) will be entitled to compensation for land acquired and lost assets at their replacement cost. They will also be assisted in improving or at least restoring their pre-intervention income and livelihood standards, and productive capacity. The PMU will supervise RP preparation and implementation by the concerned SIO with the support of the ISPM consultants, and with supporting NGO for RP implementation. The RPs as prepared for individual PFR as well as those for finalization with detailed designs will be sent to ADB for approval. Before implementing an RP, An independent monitoring and evaluation agency will also be engaged to assess performance and impacts. The provisional cost estimates for resettlement is about \$4.7 million. [Appendix 13](#) presents a summary RF. The RF and resettlement due diligence assessments for other subprojects under the Project 1 are in [Volume 6-II](#), whereas a preliminary draft resettlement plan for MCII is in [Volume 6-I](#).

## **F. Environmental Impacts**

61. During the PPTA, initial environmental examinations (IEEs) were prepared for the seven subprojects proposed for the first PRF, which were classified as environmental category B, along with an environmental assessment and review framework (EARF), following the ADB's *Environment Policy* (2002). Overall, the Program will have positive impacts on the environment, including improved water availability and water use efficiency, increased agriculture production, and institutional system of PIM to manage and distribute water efficiently. Institutional strengthening for IWRM will deliver further benefits, through development and implementation of a framework and steps at the state and the basin levels for improved water resources, and associated environmental management. Potential negative environmental impacts include (i) increased competition in water use within the subprojects and with other water uses (with a prospect for increasing water use in industrial and urban sectors in the medium term);<sup>41</sup> (ii) deterioration of water quality due to agriculture intensification; and (iii) impacts during construction of irrigation and associated infrastructure. These impacts are mitigated by (i) sufficient consultation at the scheme level to develop operational plans and instruments agreeable to all the concerned WUAs; (ii) operationalizing effective coordination mechanisms among the concerned water users at times of drought; (iii) introducing integrated pest management and effective soil nutrient management; and (iv) ensuring safe and environmentally sound construction practices. Environmental capacity development for the

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<sup>40</sup> As such, the scope for MCII under Project 1 will include only the pre-construction works including WUA formation, micro planning, and finalization and implementation of the resettlement plan. (There is overwhelming support for the extension of the canal systems to the presently non-irrigated areas among the beneficiary people.)

<sup>41</sup> For major and medium schemes, water balance was assessed to reconfirm the overall water availability with the updated hydrological data.

Program will be supported by having a dedicated environmental cell in the PIM/CAD directorate of DWR, which will be strengthened by the ISPM consultants. For future subprojects, IEEs or environmental impact assessments, if required, will be prepared following the EARF and included in the subproject appraisal report, with due public consultations and information disclosure. Summary IEEs for the subprojects proposed for the first PFR is in [Appendix 14](#), whereas EARF and IEEs are in [Volume 7-I to VII](#).

## **G. Risks**

62. The Program has several risks that could adversely affect effective implementation and sustainable benefits, at the levels of WUAs as well as executing and supporting agencies, for which mitigation measures have been included. Refinement of Program design and diversion of additional resources will be considered, if needed under the subsequent PFRs.

63. **Sound WUA Development and O&M Sustainability.** The WUAs need to develop their capacity to take over O&M responsibility sufficiently representing stakeholders in the command area and managing and sustaining the facilities. Experience in India including Orissa and elsewhere demonstrates farmer willingness and improved performance in irrigation delivery. However, this requires identifying leadership that represents genuine farmer interests and providing sufficient facilitation and motivational support, which is included under the Program with the NGOs engaged. The Program will also ensure: (i) enrollment of at least 70% of farmers in the WUA; (ii) stipulation of water distribution plans in the WUA micro plan agreed upon by members; (iii) equal representation of head to tail end farmers; and (iv) provision of sufficient support for operationalizing participatory O&M planning and implementation. O&M sustainability risks are addressed through measures stipulated in paras. 25–26 and 41–42.

64. **Effectiveness of Institutional Mechanisms to Support Program Outputs.** Attainment of sound WUAs including their development as cohesive platforms for agriculture development will require effective supporting systems, along with institutional structure and mechanisms and capacity development for all supporting organizations. The risk of failure is mitigated by DWR restructuring to have a specialized multi-disciplinary PIM/CAD directorate, stringent process and output management following the set indicators, interdepartmental coordination through district collectors proven effective in India, and the capacity development plan prepared under the TA and amplified through the component TA, which includes all Program organizations.<sup>42</sup>

65. **Reform Ownership.** There is strong political and administrative support to advance the PIM reform process as reflected in the latest SWP 2007 and the agreed institutional actions. However, the initiatives need to be fully operationalized with improved accountability of DWR field staff to WUAs on the ground. This will be addressed through the institutional mechanism ensuring WUA empowerment, transparent decision making mandating WUA endorsement as a requirement, and monitoring of Program delivery by WUAs. On the other hand, staff incentive and reward systems will also be strengthened with improved staff performance evaluation system to include client relations with WUAs, and training and scholarships to be provided to well performing staff, which will be provided by WALMI as its regular program.

66. **Implementation Risk.** Timely initiation and implementation of the Program and adherence to ADB operating policies and procedures remain another area of risk.<sup>43</sup> To mitigate

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<sup>42</sup> In view of the limited experience of local NGOs for developing viable WUAs, NGO services envisage recruitment of experienced regional or national NGOs that will associate with local NGOs and develop the capacities of the latter.

<sup>43</sup> The implementation completion report of the Orissa Water Resources Consolidation Project (assisted by the World Bank for \$290 million and implemented from 1996–2004) also noted, despite overall successful rating,

the risk of startup and implementation delay, a component TA is being provided ([para. 54](#)) to support the early establishment of Program organizations with training, advance recruitment of consultants and NGOs, and advanced procurement of civil works with detailed designs. Safeguards risks are mitigated with the relevant frameworks and plans prepared under the project preparatory TA, as well as the support for addressing the safeguards issues included in the component TA, and in the ISPM consultancy under the Program. ADB will also assist the process through regular review and supervision missions.

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administrative constraints and lengthy processes for procurement and contract management. Ongoing ADB loan for irrigation in Chhattisgarh (Loan No. 2159-IND, approved in March 2005) also suffered from startup delay.

## 1. DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/ Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risks
<p><b>Impact</b></p> <p>1. Enhanced economic growth and reduced poverty in the selected river (sub-)basins in Orissa</p> <p>2. Institutionalization of effective mechanisms to put into operation PIM-based agriculture growth</p>	<ul style="list-style-type: none"> <li>• Reduced poverty incidence in subproject areas</li> <li>• Incremental farm and allied activity incomes</li> <li>• Livelihoods of the poor improved with better HDIs and incomes</li> <li>• Replication of the institutional mechanisms across the state and the country</li> </ul>	<ul style="list-style-type: none"> <li>• State and district statistics on agriculture, incomes, and HDIs</li> <li>• Baseline data and follow on BME reports</li> <li>• Annual report of MOWR and DOWR</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Stable political and local security conditions</li> <li>• Damage from natural calamities are rehabilitated and managed</li> </ul> <p><b>Risks</b></p> <ul style="list-style-type: none"> <li>• International terms of trade of agriculture products turns adverse</li> </ul>
<p><b>Outcome</b></p> <p>1. Enhanced productivity and sustainability of irrigated agriculture in the selected existing schemes in the river basins</p>	<p>Following result targets specified in SIPs and achieved:</p> <ul style="list-style-type: none"> <li>• Increased irrigated area and cropping intensity</li> <li>• Increased crop production, and values per ha of land</li> <li>• Improved efficiency in water use (area and production value per unit of water)</li> <li>• Increased on-farm and allied activity employment</li> </ul>	<ul style="list-style-type: none"> <li>• State and district statistics</li> <li>• Project progress and completion reports</li> <li>• Project MIS comprising baseline, targets (benefits, disaggregated into gender, ethnicity, and land operational sizes), and process/management indicators</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Political support to sustain and proceed with reforms</li> <li>• Sound fiscal conditions to sustain O&amp;M revenue and expenditure management</li> <li>• Project institutions including WUAs sustains their performance targets</li> </ul> <p><b>Risks</b></p> <ul style="list-style-type: none"> <li>• Extraordinary climates such as droughts and cyclones</li> </ul>
<p>2. Improved institutional performance of irrigation service delivery (with PIM) and water resources management (with IWRM)</p>	<p>Following institutional performance achieved:</p> <ul style="list-style-type: none"> <li>• Outputs for institutional actions are functional</li> <li>• DOWR in-house capacity to establish and operate PIM in irrigation schemes developed</li> <li>• Local linkages to support WUA agriculture development activities functional</li> <li>• DOWR and WUAs sustains irrigation facilities while fully achieving annual targets</li> <li>• OSG maintains full maintenance fund allocation policy while fixing necessary tariff levels for cost recovery</li> <li>• Appropriate institutional functions and setup is established to operate IWRM</li> </ul>	<ul style="list-style-type: none"> <li>• Baseline data and BME reports</li> <li>• Project progress and completion reports</li> <li>• Project MIS comprising baseline, targets, and process indicators</li> <li>• DOWR's MIS for monitoring and planning irrigation scheme O&amp;M</li> <li>• DOWR's annual reports</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• (Same as above)</li> <li>• Beneficiary willingness to pay for set water tariffs</li> </ul> <p><b>Risks</b></p> <ul style="list-style-type: none"> <li>• Local or internal conflicts threatening WUA performance</li> </ul>
<p><b>Outputs</b></p> <p><b>A. Productive and Sustainable Irrigated Agriculture Management Systems</b></p> <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>	<ul style="list-style-type: none"> <li>• Subprojects appraised with SIPs with clear output targets (including market linkages) and programs, and endorsed.</li> <li>• For major and medium schemes WUA level micro-plans prepared and endorsed.</li> </ul>	<ul style="list-style-type: none"> <li>• Prepared appraisal reports</li> <li>• Project progress reports</li> <li>• Consultants' reports</li> <li>• ADB review missions</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Participatory process is duly followed by all.</li> <li>• Monitoring and quality support are effective.</li> <li>• Beneficiaries support collective action.</li> </ul>
<p>(iii) Strengthened WUAs:</p>	<ul style="list-style-type: none"> <li>• WUAs are strengthened, with</li> </ul>	<ul style="list-style-type: none"> <li>• Project MIS</li> </ul>	<p><b>Assumptions</b></p>

Design Summary	Performance Targets/ Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risks
Viable WUAs set up to become effective community organization ready to receive investment support and to enhance agriculture production	achievement of targets: <ul style="list-style-type: none"> <li>- Over 75% farmers enrolled</li> <li>- Elections held, (sub-) committees established, and functional with operation rules</li> <li>- Farmer contribution and water rate targets achieved</li> <li>- Target number of women and vulnerable group enrolled</li> <li>• WMAs endorse design</li> <li>• Implementation agreements are signed</li> </ul>	<ul style="list-style-type: none"> <li>• Project progress and completion reports</li> <li>• Consultants' reports</li> <li>• ADB review missions</li> <li>• WUA constitution and its rules</li> <li>• Signed implementation agreements</li> </ul>	<ul style="list-style-type: none"> <li>• (Same as above)</li> <li>• WUAs comply with beneficiary contribution requirements</li> </ul>
2. Irrigation and Associated Infrastructure including command area development (CAD): Good quality infrastructure designed and constructed, following appraised plan and WUA micro plans	<ul style="list-style-type: none"> <li>• Stipulated infrastructure provided with WUA monitoring and satisfaction</li> <li>• Stipulated area achieved CAD and conjunctive use</li> <li>• RPs have been implemented prior to civil works</li> </ul>	<ul style="list-style-type: none"> <li>• Project MIS</li> <li>• Project progress and completion reports</li> <li>• Consultants' reports</li> <li>• ADB review missions</li> <li>• Third party inspectors' report</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• (Same as above)</li> </ul>
3. Agriculture Development and Livelihood Enhancement: Stipulated services in SIPs and micro plans provided, and targets set therein are achieved	<ul style="list-style-type: none"> <li>• WUAs achieve plan targets in cropping pattern and intensity, inputs, yield levels, etc.</li> <li>• WUAs establish linkages for collective input delivery, support services, and product marketing</li> <li>• Livelihood targets as set out in micro plans are achieved, in terms of program delivery and incomes of vulnerable people</li> </ul>	<ul style="list-style-type: none"> <li>• (Same as above)</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• (Same as above)</li> <li>• WUA members are willing to adopt modern agriculture practices</li> </ul> <b>Risks</b> <ul style="list-style-type: none"> <li>• Natural calamities</li> <li>• Volatile price reduction of agriculture products</li> </ul>
4. Sustainable O&M Systems Established: Irrigation schemes operated and maintained on a sustainable basis	<ul style="list-style-type: none"> <li>• Scheme-wise O&amp;M rules, annual O&amp;M plans are prepared and implemented</li> <li>• DOWR/ WUA allocates sufficient fund to undertake the stipulated O&amp;M activities</li> <li>• WUAs collect/submit sufficient fund to support the stipulated O&amp;M activities</li> <li>• Regular annual WUA audit system is operational</li> </ul>	<ul style="list-style-type: none"> <li>• (Same as above)</li> <li>• Irrigation scheme O&amp;M MIS (annual resource need, planned and actual mobilization at scheme and WUA levels)</li> <li>• Scheme performance and WUA performance audit reports</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• (Same as above)</li> <li>• Damages from natural calamities duly rehabilitated</li> <li>• DOWR staff pay due attention to O&amp;M performance</li> </ul>
<b>B. Institutions Strengthened and Project Management Systems Operational</b> 1. Policy, Planning, and Legal Framework (i) State Water Policy revised and implemented, with regular review by Water Resources Board (WRB)  (ii) State Water Plan updated with development plans for the four northern river basins	<ul style="list-style-type: none"> <li>• Revised Policy in March 2007</li> <li>• Implementation status is reviewed and further actions taken guided by WRB</li> <li>• Expanded state water plan</li> <li>• Participatory basin development plans for the four river basins</li> </ul>	<ul style="list-style-type: none"> <li>• Policy document</li> <li>• Policy review reports</li> <li>• Updated state water plans</li> <li>• Basin development plans</li> <li>• Refined WUA Act and Rules</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• Political support to sustain and proceed with reforms</li> <li>• Active stakeholder support and participation</li> </ul>
(iii) WUA Act and Rule refined	<ul style="list-style-type: none"> <li>• Refined WUA Act and Rule</li> </ul>		

Design Summary	Performance Targets/ Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risks
for more sustainable and inclusive PIM	<ul style="list-style-type: none"> <li>• with stronger WUA institutional continuity and head-tail representation</li> <li>• Refined act and rule made operational</li> </ul>		
<p>2. DOWR Institutional Setup, Structure, Skill Mix, and Business Processes Strengthened</p> <ul style="list-style-type: none"> <li>(i) Institutional development vision and strategy refined</li> <li>(ii) Permanent PIM directorate established</li> <li>(iii) Quality control cell established</li> <li>(iv) DOWR capacity development plan (CDP) refined</li> <li>(v) Water and Land Management Institute (WALMI) reforms with autonomy</li> </ul>	<ul style="list-style-type: none"> <li>• Refined vision and strategy document</li> <li>• PIM directorate set up, staff fully deployed, and made operational with training</li> <li>• QC cell set up, staff deployed, and made operational</li> <li>• CDP refined to meet with PIM and other requirements</li> <li>• WALMI reformed with new director recruited from market and with stronger autonomy</li> </ul>	<ul style="list-style-type: none"> <li>• DOWR Institutional vision and strategy document</li> <li>• Revised service rules (job descriptions)</li> <li>• QC guidelines</li> <li>• CDP document and program lists</li> <li>• WALMI organizational rule</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Political support to sustain and proceed with reforms</li> <li>• DOWR leadership dynamic and supportive to support the change process</li> <li>• Staff level support for necessary reforms</li> <li>• Active stakeholder support and participation</li> <li>• Work effectiveness of the selected consultants</li> </ul>
<p>3. Systems to Support Sustainable O&amp;M</p> <ul style="list-style-type: none"> <li>(i) Fund allocation following Financial Commission (FC)</li> <li>(ii) Water rates revised to meet the allocation needs</li> <li>(iii) Collection improved with WUA involvement</li> <li>(iv) Land records improved providing WUA-specific data for collection/demand</li> <li>(v) Scheme MIS for O&amp;M performance monitoring and planning</li> <li>(vi) DOWR establishes linkage between water rate collection and allocation</li> <li>(vii) Pilot delegation of water tariff collection and retention by WUAs</li> </ul>	<ul style="list-style-type: none"> <li>• Annual allocation to follow FC report recommendations</li> <li>• Water rates revised following the change in allocation</li> <li>• Percentage of collection against the target improved</li> <li>• Improved data base to generate the required data</li> <li>• MIS developed with comprehensive monitoring data</li> <li>• Fund allocation mechanisms improved to be linked with WUA collection performance</li> <li>• WUA performance to this end demonstrated effective</li> </ul>	<ul style="list-style-type: none"> <li>• FC reports</li> <li>• OSG annual budgets</li> <li>• Gazette notification of water rates</li> <li>• Finance Department data on water rates collection performance</li> <li>• Consultants reports and special study reports</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Political support to sustain and proceed with reforms</li> <li>• DOWR leadership dynamic and supportive to support the change process</li> <li>• Effective coordination between DOWR and Finance/Revenue Depts</li> <li>• Staff level support for necessary reforms</li> <li>• Active WUA support and participation</li> <li>• Work effectiveness of the selected consultants</li> </ul>
<p>4. Progress of Actions towards Operationalizing IWRM</p> <ul style="list-style-type: none"> <li>(i) Appropriate IWRM functions and institutional arrangements defined</li> <li>(ii) Legislation for IWRM organization and groundwater management defined</li> <li>(iii) River basin plans, decision support systems (DSS), and pilot basin organization (RBO)</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional arrangements clarified for (a) water tariff setting, (b) allocation and entitlements, (c) instruments for water use efficiency, (d) basin planning, and (e) data management</li> <li>• Legislative actions taken for IWRM organization and groundwater management</li> <li>• Basin plans prepared, DSS strengthened, and RBO set up and made operational</li> </ul>	<ul style="list-style-type: none"> <li>• IWRM action plan</li> <li>• State WRB reports</li> <li>• Pilot river basin organization reports</li> <li>• Consultants reports and special study reports</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Political support to sustain and proceed with reforms</li> <li>• DOWR leadership dynamic and supportive to support the change process</li> <li>• Active stakeholder support and participation</li> <li>• Work effectiveness of the selected consultants</li> </ul>

<b>Design Summary</b>	<b>Performance Targets/ Indicators</b>	<b>Data Sources/ Reporting Mechanisms</b>	<b>Assumptions and Risks</b>
5. Project Management System Established and Made Fully Operational - DOWR offices - Line agencies - Local governments - WUAs - NGOs - Private providers	<ul style="list-style-type: none"> <li>• PMU, SIOs established and fully staffed with trained staff</li> <li>• Project Implementation Plan prepared and fully operated</li> <li>• TA consultants and NGO support team engaged and support project effectively</li> <li>• Accountability measures for project institutions made operational</li> </ul>	<ul style="list-style-type: none"> <li>• Detailed operational guidelines</li> <li>• Consultants reports</li> <li>• Special study reports including the third party</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• Project institutions are supportive including DOWR leadership</li> <li>• Sufficient counterpart funding</li> <li>• Active stakeholder support and participation</li> <li>• Work effectiveness of the consultants and NGOs</li> </ul>
6. Training/Capacity Development: Capacities of project institutions are strengthened through training (for Project management, PIM, IWRM, & agriculture development)	<ul style="list-style-type: none"> <li>• Capacity Development Plan (CDP) is prepared and implemented, achieving the set targets</li> <li>• Project institutions are fully operational through project management support</li> </ul>	<ul style="list-style-type: none"> <li>• CDP</li> <li>• CDP implementation report (by consultants)</li> <li>• Project progress reports</li> <li>• ADB review missions</li> <li>• DOWR annual report</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• Effectiveness of training and trainers</li> <li>• Retention of the developed capacities</li> <li>• Work effectiveness of the consultants and NGOs</li> </ul>
<b>Activities with Milestones</b>		<b>Inputs</b>	
<b>1. By the Government/ OSG</b> 1.1 Establishment of DOWR PIM Directorate, PMU and SIOs by 2007, recruitment of consultants and NGOs by mid 2008. 1.2 Preparation of all project-related guidelines and manuals including project implementation plan by 2008. 1.3 Finalize FS/SIP for all major medium schemes by 2011, and minor lift schemes by 2015. 1.4 Implementation of all actions for policy and institutional strengthening between 2008-16. <b>2. By Consultants</b> 2.1 Capacity development and project management activities until 2016. 2.2 Support for preparing FS/SIPs by 2011, operationalization of project arrangements and institutional actions by 2016. 2.3 Completion of training by 2016. <b>3. By WUAs/ Beneficiaries</b> 3.1 Information campaign, member enrollment, participation in FS/SIP preparation, and upfront cash contribution by 2014. 3.2 Participation in design, construction monitoring, and simple civil work implementation by 2015. 3.3 Self-sustain O&M of transferred facilities by 2016. <b>4. By Support Organizations</b> 4.1 FS/SIP preparation and NGO training by 2011. 4.2 Implement resettlement plans by 2011. 4.3 Detailed design and construction by 2014. 4.4 Provision of follow-up support by 2016. <b>5. By ADB</b> 5.1 Project approval by early 2008. 5.2 Inception mission within 2008, mid-term review mission in 2012, and regular review missions		<ul style="list-style-type: none"> <li>• Incremental staff, operating, and other implementation expenses</li> <li>• Training (through support organizations)</li> <li>• Mobilization of counterpart fund</li> </ul> <ul style="list-style-type: none"> <li>• International and national consultant support (158 person-months [p-m] of international and 1,818 p-m of national consultants), and NGO/CBO support to set up and strengthen 450 WUAs (807 person-year)</li> <li>• Arrangements for project institution training</li> </ul> <ul style="list-style-type: none"> <li>• Local resource mobilization for minor civil works, and for regular O&amp;M including calamity fund and minor lift replacement fund</li> <li>• Implementing regular O&amp;M</li> </ul> <ul style="list-style-type: none"> <li>• NGO inputs (person-months to be specified)</li> <li>• Training and capacity building of support organizations</li> <li>• Monitoring and evaluation</li> </ul> <ul style="list-style-type: none"> <li>• Staff resources and staff consultants</li> </ul>	
<b>Project Cost</b>		<b>Total: 270 million</b>	

ADB = Asian Development Bank, CAD = command area development, CBO = community based organizer, CDP = capacity development plan, DDS = decision support system, DOWR = Department of Water Resources, FS = feasibility studies; IWRM = integrated water resources management, HDI = human development index, MIS = management information system, MOWR = Ministry of Water Resources, NGO = nongovernment organization, OSG = Orissa state government, 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.

## 2. SECTOR ASSESSMENT, ROADMAP AND INVESTMENT PROGRAM

### Sector Development Strategies and Partnership Opportunities<sup>1</sup>

1. **Policy Framework.** The Orissa state government's (OSG's) draft "Vision 2020", an overall development strategy envisages reducing poverty by 15% during 2008-12, and sets out key strategic pillars comprising: (i) improving agriculture productivity and market orientation forming farmer groups and promoting participatory irrigation; (ii) expanding rural non-farm business opportunities; (iii) enabling broad-based industrial growth, and (iv) reforming fiscal and financial management with public sector accountability. Under the Vision, development and sound management of irrigation infrastructure with water user associations (WUAs) is prioritized as a pathway to productive and high value agriculture, and poverty reduction in rural areas. In line with this, OSG has progressively improved its policy and institutional framework for irrigation and water resources sector since the 1990s. A new State Water Policy, revised from 1994 policy, was declared in March 2007, reconfirming the principles of participatory irrigation management (PIM) and integrated water resources management (IWRM), and full cost recovery of operation and maintenance (O&M) from users. The 2007 Policy also called for expeditious implementation and completion of WUA formation and transfer of O&M. It has further set out specific tasks towards operationalizing IWRM.

2. **Institutional Setup.** The key public institutions associated with irrigated agriculture include: (i) the Department of Water Resources (DOWR); (ii) the Departments of Agriculture (DOA), Horticulture (DOH), and Fisheries and Animal Husbandry (DOFAH); and (iii) local government institutions at village, sub-district and district levels. For the purpose of holistic water resources management, the OSG has established the State Water Resources Board chaired by Chief Secretary as the apex body for policy formulation, intersectoral water planning and allocation, to which the Water Planning Organization of DOWR serves as secretariat. In general, the concerned departments have requisite technical capacities, but are constrained by (i) limited operational finance due to high overhead costs; (ii) insufficient incentives and capacity to implement irrigated agriculture works using participatory processes; (iii) lack of coordination among line departments, local government institutions, and WUAs; (iv) deficient O&M due to shortage of funds; and (v) insufficient accountability to service recipients.

3. **State Water Plan.** The State completed the State Water Plan in 2004. It provides a basic framework to pursue the necessary interventions to meet the needs of diverse water users while maintaining the integrity of the environment, with broad basin plans prepared with a time horizon of up to 2051. Key priorities include: (i) reviving the investments in irrigation in particular improved efficiency of existing systems; (ii) ensuring safe drinking water and waste disposal in rural and urban areas giving financial autonomy to local bodies; (iii) reducing the gaps between environmental regulations and practices; and (iv) enhancing O&M sustainability through imposition of reasonable water charges. Overall, the Plan provides a solid initial basis to pursue integrated water sector planning and investment at the river basin level. Yet it largely remains a qualitative strategic framework, calling for quantitative and analytical investment planning with stakeholder participation starting at the level of individual basins.

4. **Legal Framework of PIM.** The OSG enacted the Pani Panchayat Act in 2002 and framed the Pani Panchayat Rules in 2003. They provide a legal basis for the progressive transfer of O&M responsibilities to WUAs by empowering and delegating minor facilities to them. It outlines arrangements whereby the WUAs would undertake necessary works from grant funds

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<sup>1</sup> Please see paragraphs 2–6 of the main text for the key sector performance and issues.

received from DOWR and/or from collection of fees from their members.<sup>2</sup> While they provide a satisfactory framework to promote PIM, initial operation of WUAs has led to the recognition that several areas of improvement are needed. The present 3-year tenure of elected representatives is too short for institution building and continuity, and could be extended with tenure overlap. Better representation is needed by head, middle, and tail-end users among WUA office bearers. There is also a need for stronger WUA involvement in planning and implementation of system maintenance, and stronger participation of women and other vulnerable groups.

**5. Agriculture Sector Policy and Strategic Framework.** In line with its market oriented economic reform principles, the OSG amended the Agriculture Produce Marketing Act in 2006. This opened opportunities for private investment in storage and marketing facilities, and contract farming. The OSG has also drafted a state agriculture policy for finalization in 2008. It aims at more commercially oriented agriculture, and promotes participatory planning at local levels to be implemented with the private sector and NGOs. Despite such improving policy environment, however, agricultural productivity remains low, with farmers beginning to respond to the new policies but facing constraints, including: (i) low use of fertilizer (30% of the recommended level) despite the recent deregulation of private distribution; (ii) limited availability and use of improved seeds (seed replacement of only 6% against the 25% recommended); (iii) limited outreach of rural credit (40% of farm households have no access to formal credit, calling for other solutions such as group-based approaches); (iv) limited effectiveness of extension (calling for improved accountability of field extension workers and use of private providers); and (v) the fragmented marketing chain and information asymmetry. In general, local conditions vary considerably with some areas progressing in intensive paddy production and crop diversification, particularly where they have irrigation and ready access to markets. Strategically, these conditions call for careful planning of the most suitable production systems for the locality, and concerted efforts to facilitate delivery of inputs and marketing of outputs, as well as support services.

**6. WUA Formation and O&M Transfer.** In the late 1990s, the process of forming WUAs was initiated with assistance from the World Bank (for major and medium schemes),<sup>3</sup> the European Union (EU: for minor tank schemes),<sup>4</sup> and DFID and KFW (for minor lift schemes),<sup>5</sup> following the foregoing institutional framework, with infrastructure renovation, and transfer of O&M for minor canals and structures to WUAs. Following completion of these projects, the OSG has continued the process of forming WUAs building on the prior experience. As of July 2007, WUAs have been formed for 1.25 million ha (of the state's net irrigated area of 2.7 million ha), and O&M has been transferred to WUAs in 0.92 million ha. This process has received strong political support and is further buttressed by the OSG's most recent economic reform programs.

**7.** The overall response and impacts of the process are positive, with strong enthusiasm by WUAs, particularly where sufficient motivation and facilitation was provided along with sound irrigation infrastructure. However, recent progress has been slower mainly because continuous institutional development support could not be provided to the WUAs. In general, experience in PIM in India suggests that long-term support is needed for WUAs to become a vibrant institution with financial sustainability. Moreover, much of the irrigation infrastructure is in a deteriorated condition and cannot function as desired by WUAs, posing significant difficulties in orderly water distribution. Other lessons include: (i) WUAs need to be developed upfront in the project cycle,

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<sup>2</sup> For the minor lift schemes, the PP Act exempts WUAs from water rates and authorizes them to carry out necessary O&M works by collecting fees from members. In other schemes, water rates are collected by the Revenue Department and WUAs are provided with grant-in-aid from DOWR.

<sup>3</sup> Orissa Water Resources Consolidation Project, approved in 1995 for \$290 million, covering 315,000 ha.

<sup>4</sup> Orissa Minor Irrigation Project, implemented in 1995-2005 for 10.7 million Euros, covering 9,600 ha.

<sup>5</sup> DFID and KFW provided Rs385 million and Rs994 million, respectively, covering a total of about 60,000 ha.

with full participation in the decision making process; (ii) critical attention is needed to deliver quality infrastructure and sound operational rules agreed to with the WUAs; (iii) limited attention has been provided to field channel networks, which should be pursued as an integral part of interventions for efficient water use; (iv) WUAs are willing to expand their scope beyond irrigation to pursue agriculture development, which could be facilitated; (v) effective mechanisms of planning and delivering agriculture support systems are needed; and (vi) NGOs and private providers can be effectively utilized, but this requires their capacity development.

8. **DOWR.** In DOWR, there is significant organizational support for PIM and good technical capacities to design and implement quality irrigation infrastructure. However, the capacity of DOWR to establish PIM systems needs further strengthening. Specifically, DOWR still remains an engineering agency with high establishment costs and an aging staff structure. At the field level, sound provider-recipient relationship between DOWR and WUAs that would support accountable service delivery by DOWR vis-à-vis water tariff payments by WUAs are still developing. To this end, DOWR needs to enhance its service orientation with a clearer mission statement and performance management. There is also a need to enhance multidisciplinary managerial skills, as well as capacities of sound infrastructure operation. Support systems for PIM need strengthening with a more effective institutional setup and mechanisms to develop viable WUAs while promoting productive agriculture. Finally, DOWR needs to strengthen its management information system (MIS) to more effectively monitor, plan, and implement O&M.

9. **O&M Framework and Arrangements.** To foster PIM, the OSG has taken progressive steps to move towards sustainable O&M. Specifically, the OSG has been allocating O&M funds following the Government's Finance Commission Reports (FCRs). Allocation was increased from Rs450/ha to Rs600/ha for major and medium schemes in 2005/06 following the 12<sup>th</sup> FCR. On the revenue side, the irrigation water tariff was increased by 150% in 2002 (to a level at par with a national average) to recover the O&M cost, and is presently in the process of raising industrial water tariff to fully meet the recent rise in allocation. However, O&M sustainability is constrained due to the higher establishment cost of DOWR (Rs260/ha as compared with FCR norm of Rs120/ha). Cost recovery also remains at about 50% in 2005/06, due to the large gap (about 40%) between the irrigated areas claimed by DOWR and those certified by Revenue Department (RD), and the underachievement of the collection targets (by about 10%). Efforts are needed to reduce the gaps by improving the reliability of irrigation with better system performance, and motivating farmers for due certification of irrigated areas and payment of the water tariff. The present system of collecting the water tariff by RD and allocation of O&M funds by DOWR with no linkage between the two also poses a constraint that must be addressed.

10. **IWRM.** In parallel with pursuing productive and sustainable irrigated agriculture through PIM, the OSG is also taking steps towards further operationalizing IWRM. The specific agendas have been set out under the State Water Policy 2007 that include: (i) preparing multi-sector river basin plans with participatory river basin organizations; (ii) strengthening database; and (iii) setting up a regulatory authority to set water tariff rates; among others. These initiatives are timely and need to be transformed into actions and operation with suitable institutional setup.

### **External Assistance to Irrigated Agriculture Sector**

11. In the irrigated agriculture sector, the World Bank has been the most dominant external financier for India, with provision of 22 investment projects for a total funding of \$4.4 billion in 10 states since 1986, including one completed project for Orissa (footnote 3). Major joint studies were undertaken in 1991 and 1998 with the Government of India, which defined directions for key policy, institutional, and investment reforms for the sector. Over the years, World Bank

assistance has moved from project to sector loans at the state level to develop and sustain water resources infrastructure and its management with critical policy and institutional reforms. The ongoing portfolio (eight projects in six states) pursues institutional reforms of the state irrigation departments towards greater accountability, decentralization with WUA participation, O&M cost recovery, and progress towards establishment of regulatory frameworks to support IWRM.<sup>6</sup> The Japan Bank for International Cooperation (JBIC) is the second largest financier that has increased sector operation in the recent years, with four loans in four states for \$700 million, including one in Orissa. JBIC's assistance is also focusing on effective physical improvement in combination with capacity building of the state irrigation departments, and financial viability to sustain O&M. Other key partners include EU (financing about \$110 million for minor irrigation schemes), Canada, and Department for International Development (DFID), which have also focused on institutional strengthening of WUAs with minor infrastructure renovation.

12. In Orissa, the projects assisted by four external funding agencies cited in para. 7 were implemented from the mid 1990s and completed by 2005. Among these, the Water Sector Restructuring Project assisted by the World Bank has been instrumental in setting out and proceeding with the relevant sector reforms during its implementation. At present, JBIC-assisted Rengali Irrigation Project, a major new irrigation scheme, is the only externally assisted project in the sector, whereas the World Bank envisages the Community Tank Irrigation Project for approval in 2008, to renovate the minor tank irrigation systems covering the entire state with PIM, agriculture development and livelihood enhancement. In the agriculture sector, DFID is preparing the Orissa Agriculture Sector Support Program to assist implementing the State Agriculture Policy, which has been drafted for finalization in 2008.<sup>7</sup>

### **ADB's Sector Strategy**

13. ADB's overall strategic direction in India is to assist the country in promoting efficient and sustainable economic growth to increase employment opportunities and reduce poverty. While ADB's sector operation started only recently in 2001, the Country Strategy and Programs for India (2003–06) expanded the operational area to include agriculture and rural infrastructure including irrigation as its most important feature to address the country's chronic rural poverty problems and looming water crisis. Accordingly, a number of sector studies were undertaken to accumulate knowledge base and disseminate the best practices and lessons learned in India and other Asian countries. A loan to support minor irrigation system renovation with PIM in Chhatisgarh was approved in 2005, and its implementation is accelerating with increasing state ownership. The new draft Country Partnership Strategy (2008–12) further envisages enhanced ADB roles in rural infrastructure including irrigation, water resources and disaster management, rural market and transport facilities. This is in consideration of the high priorities accorded by the Government and the stakeholders, vast country sector needs in terms of finance, and in particular the prospects for transferring the best practices and lessons learned from ADB's sector operations in other Asian countries. Operational focus on water management is also in line with ADB's Medium Term Strategy II (2006) and Water Financing Program (2006).

14. Within this framework, and following ADB's Water Policy, the assistance strategy for irrigation and water resources sector envisages gradual extension of ADB operations in India with a selective focus on the states willing to pursue critical investments with requisite policy and

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<sup>6</sup> Despite large lending level, the external funding compared with the overall sector budgets in India is deemed small, and the country assistance evaluation by the World Bank in 2002 indicated the need for higher selectivity of states in terms of reform ownership and orientation, and closer collaboration with other development partners.

<sup>7</sup> ADB-assisted MFF loan for Rural Road Sector II Investment Program, approved in 2005 for \$750 million is also ongoing in Orissa, along with two other states.

institutional reforms, and with a long-term partnership with ADB. The specific reform measures will be set out within a context of a comprehensive policy framework to pursue sustainable service delivery, IWRM, and other key policy principles, which is to be refined or developed with policy dialogues. Recognizing institutional development is a long-term process requiring continued dialogues, assistance will be selectively focused on most critical agendas in line with the specific contexts and needs of the state, with sequenced capacity building and investments, in collaboration with other development partners. Over the medium term, improving deteriorated irrigation infrastructure while institutionalizing PIM will be accorded high priority in an effort to promote productive and high value agriculture in rural areas dominated by smallholders, while strengthening the capacities of local WUAs to progressively take over the management of the infrastructure, and of the state irrigation agencies as accountable bulk water service providers. Based on the best practices and lessons learned, ADB assistance will pursue institutionalizing comprehensive planning and stringent process management to put PIM principles into sound sector operation, with an emphasis on upfront capacity development of WUAs with their firm confirmation of their willingness to take over O&M, following which infrastructure and other support services are provided. Assistance will also emphasize on capacity development of and incentives for all agencies involved, with the strengthening of their institutional basis. Gaining valuable local experience and reflecting those in the further improved implementation arrangements is also an important part of the strategy. WUAs will also be promoted to serve as a stable platform to facilitate local agriculture development and poverty reduction, linking the vulnerable groups with existing or project-specific self help schemes.

### **Sector Road Map and Investment Program**

15. In line with the foregoing partnership opportunities, the road map and investment program for the Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program) have been prepared to assist the OSG in completing the establishment of WUAs, renovating infrastructure, and transferring the O&M of minor facilities. In general, critical actions are to be taken upfront, and then followed by incremental steps during the program period. The road map also envisages supporting further steps for management transfer of higher-level facilities while putting IWRM into operation. It is built on initiatives that the OSG has proposed or already taken, and on consultations held during the program preparatory stage.

16. **Vision, Goals and Principles.** The road map and investment program envision improving irrigation service delivery with WUA empowerment to enhance the productivity and sustainability of irrigated agriculture, thereby contributing to rural poverty reduction. Specific goals include: (i) enhancing productivity and incomes by realizing full development potential of irrigation infrastructure, (ii) setting up sustainable management systems, (iii) improving the livelihood of the poor, and (iv) putting into operation effective processes and mechanisms based on a sound policy and institutional framework. Implementation will be guided by the principles of: (i) informed participatory decision making by stakeholders, (ii) coordinated and integrated organizational linkages at all stages, (iii) accountability and transparency, (iv) effectiveness to be monitored based on clearly defined result targets, (v) efficiency pursued with sound step-by-step process management, and (vi) a knowledge driven approach with flexibility for adjustments.

17. **Institutional Strengthening of DOWR.** The roles and capacities of DOWR are most critical for the effective implementation of the Program. The following actions are envisaged:

- (i) DOWR has initiated the process of establishing a permanent directorate for PIM and command area development (CAD) with three functional divisions: (a) WUA institutional support, (b) O&M of transferred facilities, and (c) CAD. The leadership of this Directorate

will be appointed from qualified multidisciplinary staff. The existing technical setup of the DOWR will also be realigned into directorates for irrigation service delivery and IWRM.

- (ii) To reduce the establishment costs, DOWR has adopted the rationalization of its non-technical field staff through natural attrition without new recruitment. In the meantime, they will be trained and placed under the WUAs to ensure their accountability to WUAs.
- (iii) To ensure that PIM-based accountable service delivery systems are firmly embedded, DOWR will initiate a change management process to formulate an institutional vision, strategy, and action plan for staff management. This will be reflected in staff instructions on client orientation and staff performance evaluation systems. A capacity development plan will be expanded to include new requirements and implemented.
- (iv) DOWR will strengthen its quality control systems with the establishment of: (i) a work process to engage WUAs for construction quality monitoring of DOWR-engaged contractors and for executing minor works, and (ii) quality control cell to undertake third party testing and internal technical auditing.
- (v) Finally, to enhance the effectiveness of Water and Land Management Institute (WALMI) as a state training and research institute, WALMI will be reorganized with improved representation of relevant institutions and stakeholders, and stronger autonomy.<sup>8</sup>

18. **Legal Framework of PIM.** To address the present constraint in WUA establishment and management, the OSG will revise the PP Act 2002 and Rules 2003, with specific improvements including: (i) longer tenure of elected members (six years) with overlapping of two separate terms at 3-year intervals; (ii) equal representation of head, middle, and tail-end users as office bearers; (iii) participation of WUAs and higher level committees in the decision making of scheme-wide maintenance planning and implementation; and (iv) instruction to tariff collectors to provide information on WUA-wise performance (to establish a linkage between tariff collected and O&M fund allocated) with corresponding changes in Irrigation Rules; among others. In the context of the Program, the OSG will also: (i) establish and implement clear operational rules specifying WUAs' seasonal water entitlements; (ii) set up and operate district level coordination committees headed by district collectors to meet the WUAs' development concerns; (iii) promote participation of women in the elected members (at least 33%); and (iv) promote livelihood enhancement of other vulnerable people within the WUA framework. Upon sound demonstration of these functions, their inclusion in the legal framework will be further pursued.

19. **Sustainable O&M Financing.**<sup>9</sup> The roadmap includes several short- to medium-term measures to ensure sustainable O&M. For overall macro planning, the OSG will (i) maintain the policy of providing O&M funds following the Government's FCRs (completed in the context of 12<sup>th</sup> FC); and (ii) maintain the full O&M cost recovery policy by revising irrigation, industrial, and other water tariffs following the changes in the O&M allocation. Over the medium term, the OSG will establish a regulatory authority or commission to define appropriate water tariff levels. To reduce the burden of establishment costs in the allocated O&M fund, DOWR is also to maintain the present natural attrition of its field non-technical staff. For the purpose of reducing the immediate shortfalls between O&M allocation and revenue, the OSG will (i) strengthen the MIS for O&M performance monitoring and planning; (ii) reduce the gap between irrigated areas recorded by DOWR and certified by RD through joint verification with WUAs; (iii) improve the revenue record database to monitor WUA-wise performance; and (iv) establish guidelines for

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<sup>8</sup> Measures include: (i) expansion of board of governors to include wider stakeholders; (ii) appointment of its director from the open market; and (iii) substantial upgrading of training programs.

<sup>9</sup> These measures are applicable to major and medium schemes. For minor schemes, all responsibility for O&M, including fund collection and work execution, is envisaged to be transferred to the WUAs

O&M fund allocation with a clear performance-based criteria (i.e., a linkage between the tariff collected and funds allocated). To ensure sustainable O&M at the scheme level, DOWR will introduce a system of (i) jointly deciding on the O&M plan with WUAs; (ii) providing additional available funds to WUAs for the facilities requiring higher maintenance; and (iii) pursuing WUAs to mobilize their own resources in case funds from DOWR cannot meet the requirements.

20. **Irrigation Management Transfer.** The OSG is in the process of establishing WUAs for all public irrigation schemes by 2008. To strengthen state-wide awareness and support for PIM, DOWR is preparing an information, education, and communication strategy, and will put the strategy into operation in 2008. The WUA establishment process is accompanied by the transfer of the responsibility for minor facility O&M to WUAs with necessary infrastructure renovation for ready O&M management by WUAs. Upon completion of this process, further transfer of O&M responsibility of higher-level canals is also envisaged in the longer term.

21. **IWRM.** Along with pursuing the above steps to improve irrigation service delivery, the roadmap envisages a step-by-step progress in introducing IWRM following the actions specified in the State Water Policy 2007. Specifically, the OSG will: (i) assess and define appropriate IWRM functions and institutional arrangements for setting up an authority or commission for fixing water tariffs and other regulatory functions including water allocation and entitlement, and environmental management, and establish and put them into operation; (ii) prepare multi-sector river basin plans while establishing participatory river basin organizations; and (iii) strengthen the database and decision support systems for the concerned river basins. The process will be guided by the existing State Water Resources Board with wider stakeholder participation.

22. **OSG's Investment Plan and the Investment Program.** In accordance with the above roadmap, a specific investment plan to improve the efficiency and sustainability of existing underutilized irrigation infrastructure based on PIM and WUA development, as summarized below, has been prepared and included by DOWR and the OSG as a priority program for the 11<sup>th</sup> Five-year Plan (2008–12). The Program has been formulated to implement the investment plan, covering major, medium, and minor (lift) schemes in the four northern basins, and priority major schemes in the Mahanadi delta. The remaining schemes are to be implemented with the support of the Government and external financiers.

**Table 1. Investment Plan for Irrigation Infrastructure in Orissa**

Item	Region/Basin			Total
	Northern	Mahanadi	Southern	
Number of basins	4	1	6	11
Geographical area	43,800 km <sup>2</sup>	65,600 km <sup>2</sup>	41,013 km <sup>2</sup>	150,400 km <sup>2</sup>
Net Irrigated Area (NIA: '000 ha)	481.0	940.1	417.3	1838.4
Modernization Requirement				
NIA for Major & Medium ('000ha)	200.2	114.2	121.6	436.0
NIA for Minor (lift: '000ha)	30.0	50.0	20.0	100.0
NIA for Minor (flow: '000ha)	50.6			
Investment Need (except minor flow)	\$270 million	\$185 million	\$86 million	\$541 million
Investment Need (minor flow)	\$123 million			
Total Investment Need	\$664 million			

= OIIAWMIP, including priority scheme modernization in the Mahanadi delta

23. The overall sector roadmap stipulating policy and institutional actions and their timeframe is shown in Table 2.

**Table 2. Sector Roadmap**

<b>Key Issues and Actions</b>	<b>Actions by</b>	<b>Timeframe</b>	<b>Performance Indicators</b>
<b>A. Overall Policy and Plan Framework</b>			
<b>1. State Water Policy</b>			
a. Finalize the Policy (revising the policy adopted in 1994)	OSG	Mar. 2007	Policy adopted in Mar. 2007.
b. SWRB activated to initiate and guide the actions specified in the Policy to put the Policy principles into operation	OSG	Mar. 2008	Actions specified in the Policy initiated
<b>2. State Water Plan</b>			
a. Expand the state plan with the river basin plans, building on the state plan approved in 2004	DOWR	Dec. 2010	Basin plans for the river basins prepared in consultation with stakeholders
<b>B. Participatory Irrigation Management (PIM)</b>			
<b>1. Organizations</b>			
<b>1a. Department of Water Resources</b>			
a. Establish multidisciplinary PIM/CAD directorate headed by Additional Secretary level staff on a permanent basis	OSG	Dec. 2007 (OSG clearance)	Directorate established (with O&M, PIM, CAD, and training divisions) and staff assigned
b. Realign the DOWR setup into directorates of irrigation and of IWRM	OSG DOWR	Dec. 2007	DOWR offices realigned (IWRM to include water planning, tariff, hydrology, and groundwater)
c. Initiate organizational change management process (with TA support) to formulate institutional vision and strategy	DOWR	Starting 2008	Vision and strategy adopted by mid 2009; Institutional change momentum gained to meet the Policy principles
d. Issue staff instructions on the client orientation to WUAs, and reflect it in the staff performance evaluation system	DOWR	Dec. 2008	Staff attitudes on working relations improved to take WUAs partners
e. Start implementing a capacity development plan for PIM including design skills for structures and O&M arrangements	DOWR	Dec. 2008	Capacity development plan adopted, training started and capacity improved
f-1. Rationalize field level non-technical staff with natural attrition and non-recruitment policy.	DOWR	Ongoing	Field level staff to reduce by 50% by 2017
f-2. Train existing non-technical staff as canal operators and WUA support staff, and deploy them to work closely with WUAs		Starting Jan. 2008	Canal operations improved with deployment of DOWR workers in WUAs
g. Establish improved MIS for scheme-wise O&M performance monitoring and planning	DOWR	2008 (framework); 2010 (operation)	Data collection and entry systems in place and reports produced and distributed to managers.
h-1. Establish quality control cell to engage third party consultants and initiate third party testing and internal technical auditing	OSG DOWR	Dec 2007 (OSG clearance)	Quality control cell established, and made operational with operational rules; construction quality improved
h-2. Improve field quality monitoring by operationalizing the work process to engage WUAs as monitor	DOWR	Starting 2008	Construction quality ensured with the WUA engagement in quality monitoring
h-3. Implement annual full financial audit of all field offices through internal audit wing of DOWR inspecting all transaction records	DOWR	Starting 2008	Efficiency of internal financial management enhanced with reduced audit observations

Key Issues and Actions	Actions by	Timeframe	Performance Indicators
<b>1b. Water and Land Management Institute (WALMI)</b>			
a. To remodel WALMI on the following accounts, as a center of excellence on PIM, IWRM, and irrigation technology: - Reorganization of board of governors to include institutions outside OSG and WUA representatives - Appointment of qualified director, with greater autonomy	OSG DOWR	Dec. 2007 (Board approval); Dec. 2008 (Director assigned)	A full functioning and revitalized Board in place that has established a clear operating mandate. Day-to-day leadership provided by well qualified director. Faculty in place who are qualified and dedicated.
b. Upgrade and update training programs, with focuses on staff training, and WUA trainer training	WALMI	Dec. 2010	Well defined programs defined and made operational
<b>2. PP Act 2002 and PP Rules 2003, and Irrigation Rules</b>			
a. To refine the PP Act 2002 and Rules 2003 on following: - Extending tenure of elected members to 6 years, with overlapping of two terms in 3-year intervals - Equal representation of head, middle, and tail reaches in the executive committee and office bearers - Participation of WUA and higher level committees in the decision making of maintenance planning and implementation - Water tariff collectors to submit the abstract of WUA-wise water rate demand and collection to WUAs and DOWR - Change in <b>Irrigation Rules</b> to effectuate the above with the instruction to the tariff collectors to this end - Conformation of the date of election across the state (or at individual scheme level) once in every 3 years	OSG	Dec. 2007 (cabinet approval) June 2009 (PP Act); Dec. 2009 (PP Rules and Irrigation Rules)	Improved functioning of WUAs doing O&M on an on-going basis WUA EC and office bearers represent the equal mix of head, middle, and tails Planning and implementation recognizes WUA inputs Basic data provided to introduce the system of allocating irrigation water and O&M fund with direct linkage to the water rate collected Increased efficiency, awareness, and support for WUA election
b. To implement the following in OIIAWMIP: - Promote participation of women and other vulnerable groups as formal and informal groups to work with WUAs - Set up and operate district level development and coordination committee headed by district collectors	DOWR	Mar 2008 (to start)	WUAs establishes capacities to deal with the interest of vulnerable people Improved reflection of WUA views in district development activities
<b>3. Progress in PIM and Irrigation Management Transfer</b>			
a. Establish information, communication, and education strategy and plan, and start its implementation	DOWR	June 2008	Strategy prepared and implementation started, resulting in enhanced awareness
b. Advance WUA formation in public irrigation schemes	DOWR	Dec 2008	Process of WUA formation completed except for schemes with poor infrastructure
c. Extend the irrigation management transfer to distributary canal levels with good WUA performance	DOWR	Dec 2012	O&M of distributary canals of advanced WUAs transferred and managed well
<b>3. Sustainable O&amp;M</b>			
<b>3a. O&amp;M Fund Allocation and Revenue Targets</b>			
a. To allocate O&M fund following the Finance Commission (FC)	OSG/FD	2005/06 (12 <sup>th</sup> FC) completed	Annual allocation reflecting the level recommended by FC

<b>Key Issues and Actions</b>	<b>Actions by</b>	<b>Timeframe</b>	<b>Performance Indicators</b>
b. To revise water tariff levels to meet the O&M fund allocation: to increase industrial water tariff following 2005/06 increase	OSG	Mar 2008	Water tariff levels set to fully recover the O&M fund allocation
c. Undertake institutional assessment and establish a regulatory authority or commission for water tariff fixation	OSG/ DOWR	Dec 2010	Regulatory organization set up, and water rates defined with a set of standards and guidelines
<b>3b. Reducing O&amp;M Revenue Gaps</b>			
a. Strengthen MIS for scheme performance monitoring	(See B.1a.d above)		(See B.1a.d above)
b. Joint verification of irrigated areas by DOWR and RD to reduce the present wide gaps, using the MIS	DOWR/ RD	Jan 2008 (OSG order)	Reduced gap (40% at present) in irrigated area assessed by DOWR and certified by RD
c. Prepare and operationalize guidelines for scheme-wise O&M fund allocation with performance-based criteria	DOWR	Dec 2010	Improved water rate collection through performance based fund allocation
d. Improve revenue data base to specify WUA-wise water rate submission performance	RD/ DOWR	Dec 2010	RD to provide WUA-wise performance of water rate collection regularly
e. Introduce performance bonus or penalty in DOWR's grant-in-aid system to WUAs	OSG/ DOWR	Dec 2010	Performance based provision of grant-in-aid operational, and water rate collection improved
<b>3c. Reducing Scheme-wise Shortfalls in Allocated Fund</b>			
a. Reduce the DOWR overheads through natural attrition	(See B.1a.c-1 above)		Overhead cost reduced to FC norm (Rs120/ha)
b. Joint decision making on scheme-wise O&M plan with WUAs, and providing fund to top up grant-in-aid to WUAs	DOWR	Jan 2008 (start)	Decision making on O&M that substantially reflects WUA views
<b>C. Integrated Water Resources Management</b>			
a. Assess appropriate IWRM functions and institutions (e.g., an authority or commission) including water tariff fixation, allocation, entitlements, and other regulatory functions	DOWR/ SWRB	Dec 2010	Improved planning, regulation, and coordination mechanisms for water resources management operational
b. Undertake studies for appropriate legislation of the above organization and functions	DOWR/ SWRB	Same as above	Institution roles with respect to policy, regulation, and service delivery defined
c. Put into operation river basin organizations (RBOs) initially with pilot, to be replicated after successful demonstration	DOWR	Jan 2009 (pilot to start);	Improved planning, coordination, and conflict resolution, and management within basins
d. Undertake studies to pursue appropriate environmental regulation, and prepare an action plan	DOWR and DOE	Jan 2009 (start)	Improved regulation that maintains the chemical and biological integrity of water resources
e. Strengthen data base and decision support systems (DSS)	DOWR	Jan 2009 (start)	Improved data base and DSS contributing to objective river basin water resources management

### 3. EXTERNAL ASSISTANCE (1995–2007)

Funding Source	Project Title	Amount (\$million)		Year
		Grant	Loan	
ADB	Madhya Pradesh Integrated Water Resources Management Strategy	0.6	-	2001
	Preparing Chhattisgarh Irrigation Development Sector Project	0.9	-	2003
	Chhattisgarh Irrigation Development Project	-	46.1	2005
	Water User Association Empowerment for Improved Irrigation Management in Chhattisgarh	1.9	-	2005
	Irrigation and Water Resources Sector Studies *	0.2	-	2005
	Integrated Coastal Management and Related Investment Development	0.2	-	2006
	Preparing Orissa Integrated Irrigated Agriculture and Water Management Project	0.8	-	2006
	Preparing North Eastern Integrated Flood and Riverbank Erosion Management Project (Assam)	0.9	-	2006
Canada	Rehabilitation of Integrated Tank Management Systems in Kalivelli and Ousteri Watersheds, Tamil Nadu	2.5	-	1999
	Restoration and Management of Irrigation Systems by Water Users in Madhya Pradesh	3.0	-	2002
European Union	Orissa Minor Irrigation Project	12.8	-	1995
	Pondicherry Tank Rehabilitation Project	8.0	-	1996
Japan	Kurnool-Kuddapah Canal Modernization Project	-	173.5	1996
	Rajghat Canal Irrigation Project	-	109.7	1997
	Rajasthan Minor Irrigation Improvement Project	-	100.0	2004
	Rengali Irrigation Project (Orissa)	-	117.0	2004
	Andhra Pradesh Irrigation and Livelihood Improvement Project	-	200.0	2007
World Bank	National Hydrology Project	-	242.0	1995
	Orissa Water Resources Consolidation Project	-	290.9	1995
	Tamil Nadu Water Resources Consolidation Project	-	282.9	1995
	Third Andhra Pradesh Irrigation Project	-	280.0	1997
	UP Water Sector Restructuring Project	-	149.0	2002
	Rajasthan Water Sector Restructuring Project	-	140.0	2002
	Karnataka Community Based Tank Management Project	-	98.9	2002
	National Hydrology Project II	-	105.0	2004
	Madhya Pradesh Water Sector Restructuring Project	-	396.0	2004
	Maharashtra Water Sector Improvement Project	-	325.0	2005
	Tamil Nadu Irrigated Agriculture Modernization and Water-bodies Restoration and Management Project	-	485.0	2006
	Andhra Pradesh Community-based Tank Management Project	-	189.0	2006

Notes: \* Including (i) Rehabilitation and Management of Tanks in India (2006), (ii) Accelerated Irrigation Benefit Program and Other Irrigation Schemes (2006), (iii) Irrigation Management Transfer: Strategies and Best Practices from International and National Experiences (2006); (iv) Institutional Options for Improving Water Management in India: The Potential Roles of River Basin Organizations (2007)

## 4. LESSONS LEARNED

Lessons Learned	Incorporation of Lessons Learned
<p><b>A. Policy-related Issues</b></p> <ul style="list-style-type: none"> <li>• Efforts to improve irrigation service delivery needs to be accompanied with enabling changes in policy, legal and institutional framework. (IMT, CAPEs, WB)</li> <li>• Institutional reforms require careful nurturing ensuring recipient ownership, calling for close monitoring, dialogues and long-term partnership. (CAPEs, WB)</li> <li>• Successful PIM requires an appropriate legal framework to clearly define responsibilities of the irrigation agency and WUAs, with rights to the latter to do O&amp;M enforcing regulations against its members (IMT, WB)</li> </ul>	<ul style="list-style-type: none"> <li>• Building on the existing framework and basis developed so far, further progressive policy-related actions were agreed and included as Appendix 2.</li> <li>• The Program adopts MFF modality that allows close monitoring, dialogue, and reflection of the progress and prospects into its subsequent tranches.</li> <li>• While the existing act has requisite provisions, it is further refined to support institutional continuity (with longer tenure) and equal representation of head, middle, and tail reaches (Also see Appendix 2).</li> </ul>
<p><b>C. Project Institutions</b></p> <p><b>(i) DOWR</b></p> <ul style="list-style-type: none"> <li>• Capacity development of irrigation agencies should be carefully prepared and included as an essential part of PIM projects (IMT, CAPE, WB).</li> <li>• It is essential to have efficient Program management including procurement system upfront, with advanced procurement and engagement of critical service providers for timely initiation of projects. (WB)</li> <li>• DOWR recognizes the need for farmer participation, yet their capacity and field staff commitment needs strengthening with deeper ownership. Staff incentives to support PIM are also critical. (OSWR, IMT, WB)</li> <li>• Specialized PIM Division/Directorate needs to be established to effectively pursue PIM. (IMT, NWPIM, OWSR) DOWR capacity in addressing social and environmental agenda needs strengthening. (OWSR)</li> <li>• Quality control systems need rigorous attention for ensuring quality outputs. (OWSR, NWPIM, CIDP).</li> <li>• Integration of institutional, physical and financial performance monitoring systems and effective use of its analysis is needed. (NWPIM)</li> <li>• DOWR should be reoriented from supply enhancement to demand management. Bifurcating irrigation service delivery and water management functions is also becoming an issue. (RBO, NWPIM)</li> </ul>	<ul style="list-style-type: none"> <li>• A draft capacity development plan has been developed and included in the Program, covering DOWR and other Program institutions to address the identified gaps.</li> <li>• This has been pursued with early establishment and staff assignment for PMU, advanced procedures for key contracts, and other capacity development support through a separate TA (para. 54).</li> <li>• DOWR is initiating a change management process to revise its vision, to reflect the need for client orientation. Staff performance evaluation system will be revised, along with incentive and reward systems.</li> <li>• DOWR has taken its own initiative to create PIM/CAD directorate and assign staff prior to Program initiation, to mainstream PIM while integrating CAD. The directorate has sections to address social environmental issues.</li> <li>• Quality control will be pursued through WUA empowerment and monitoring of Program delivery, and stronger internal quality control with third party audits.</li> <li>• The Program MIS will monitor comprehensive target indicators, to be used as a tool to guide implementation including adjustments based on lessons learned.</li> <li>• DOWR is realigning its offices into directorates for irrigation and for IWRM. The Program has included a consultative study on suitable IWRM functions and institutional setup, based on which further actions are envisaged.</li> </ul>
<p><b>(ii) DOA (and Other Line Departments)</b></p> <ul style="list-style-type: none"> <li>• Despite technical capacity, DOA staff skills and incentives in disseminating techniques to farmers remain insufficient. They may not be readily available for timely service provision. (OWSR, NWPIM)</li> <li>• Inter-departmental coordination in PIM generally remains a constraint. District coordination committee chaired by district heads may be used. (OWSR)</li> </ul>	<ul style="list-style-type: none"> <li>• The Program envisages the use of qualified private providers and local NGOs. WUAs will also be given the choice depending on the performance and quality of available services. (EPA)</li> <li>• The committees were organized during the preparatory TA with effectiveness, and will be further utilized, with WUA participation.</li> </ul>
<p><b>(iii) Local Government (Panchayat Raj) Institutions</b></p> <ul style="list-style-type: none"> <li>• Experience of LGI involvement in PIM in India is mixed, with some WUAs suffering from political conflicts while others gaining access to rural services (e.g., employment programs) provided by LGIs, calling for careful management of the relations.</li> </ul>	<ul style="list-style-type: none"> <li>• While the Program will not envisage strong involvement of LGIs in WUA formation process and management, establishing productive linkage would be pursued once WUAs are established and willing to pursue the associated benefits.</li> </ul>

Lessons Learned	Incorporation of Lessons Learned
<p><b>(iv) WUAs (Pani Panchayat)</b></p> <ul style="list-style-type: none"> <li>• It is possible to form viable WUAs that can take on subproject decision making and O&amp;M. This requires rights and responsibilities to be devolved to them legally, continuous capacity building, structured awareness campaign, commitment of resources, and monitoring and support. (OWSR, NWPIM, IMT)</li> <li>• Institutional basis for capacity building of the WUAs and the OWRD has to be established. (IMT)</li> <li>• Farmers have genuine interests in agriculture development taking water management as its means. WUAs can provide a platform for farmer group efforts to lead to sustained income enhancement. (OWSR, NWPIM, IMT, CIDP)</li> <li>• Involving women can bring about highly positive development impacts on the functions of WUAs in terms of motivation, rule making, administration, etc. although this requires progressive efforts with demonstration. (IMT)</li> </ul>	<ul style="list-style-type: none"> <li>• Program design has incorporated these elements.</li> <li>• The Program will support sound monitoring and training systems with reforms to WALMI for stronger autonomy and leadership, knowledge base, and training capacity.</li> <li>• Upon due development of capacities for irrigation management, the Program will provide support for WUAs forming organizational linkages between farmer (sub-) groups and input delivery, agriculture extension, and output marketing.</li> <li>• The Program pursues step-by-step efforts with demonstration starting with women sub-group formation with specific roles and training, and at least 33% representation in WUA committees as a target.</li> </ul>
<p><b>D. Managing Subproject Development Cycle</b></p> <p><b>(i) Overall Management</b></p> <ul style="list-style-type: none"> <li>• Stakeholder involvement is an integrated part of PIM and their participation should be ensured at all stages of the subproject cycle. (All reports)</li> <li>• Effective compliance with the set participatory arrangements should be ensured. (OWSR)</li> </ul>	<ul style="list-style-type: none"> <li>• This is incorporated with WUAs participation in joint decision making process at all stages, their legal empowerment, and O&amp;M transfer of facilities. (PAFWRO)</li> <li>• Individual subprojects will be implemented with specific performance targets at each stage.</li> </ul>
<p><b>(ii) Planning for Schemes</b></p> <ul style="list-style-type: none"> <li>• A reliable and equitable access to water including tail-enders has to be ensured as an indispensable element of PIM. (NWPIM, IMT, OWSR)</li> <li>• Access to inputs, output markets, and agriculture services remains an issue. Institutional linkages and provider capacities are needed. Concrete scope of support activities and required resources should be confirmed at the planning stage (OSWR).</li> <li>• Realistic targets should be set for cropping intensities and yields. (OWSR). Planning stage should also capture diverse stakeholder interests with effective conflict resolution mechanisms. (OWSR)</li> </ul>	<ul style="list-style-type: none"> <li>• Structure design is pursued with due consideration of most appropriate operational requirements (beyond rehabilitation). Operational rules are defined and confirmed with the WUAs at the planning stage.</li> <li>• WUA-level micro-plans will specify actions and programs to address these constraints. The Program will also provide alternative service delivery such as NGOs, and technologies such as participatory seed selection, SRI, ICT, Farmers Producer Companies, etc.</li> <li>• Feasibility targets are fixed incorporating the impacts observed in similar interventions. Issues on water distribution—possible source of inter- and intra- WUA conflicts—will be resolved at the earliest stage.</li> </ul>
<p><b>(iii) WUA Strengthening</b></p> <ul style="list-style-type: none"> <li>• Sufficient time and resources should be provided in organizing WUAs. A firm institutional basis to ensure coordinated and sustainable O&amp;M should be set up prior to physical works. (All reports)</li> <li>• The approach of seeking upfront cash contribution from farmers is sound, but this should be kept as O&amp;M reserve fund in lieu of capital cost contribution. (NWPIM: reports by various NGOs)</li> <li>• Identifying and working with local leadership representing genuine farmer interests is most critical. WUAs should develop capacities for irrigation management (before attending to multi-dimensional development activities). (IMT)</li> </ul>	<ul style="list-style-type: none"> <li>• This will be attained through a combination of structured awareness campaign and the use of NGOs. Specific WUA institutional targets will be attained prior to the physical works of the concerned WUA facilities.</li> <li>• The Program pursues 5% contribution for WUA facilities that will lead to a sense of ownership and involvement. This will be used to build a reserve fund</li> <li>• Particular efforts will be made to develop genuine local leadership. Capacity building will focus on organizational, (including financial management) aspects on irrigation O&amp;M. Other development activities will be taken based on farmer sub-groups or user groups.</li> </ul>

Lessons Learned	Incorporation of Lessons Learned
<p><b>(iv) Water Management and Associated Infrastructure</b></p> <ul style="list-style-type: none"> <li>• (See the need for quality control: 4<sup>th</sup> point for DOWR.)</li> <li>• CAD needs to be integrated into the PIM programs as their essential element. Efforts for conjunctive use could also be provided to expand rabi irrigation. (IMT)</li> </ul>	<ul style="list-style-type: none"> <li>• The Program promotes CAD as an essential element, which is integrated in the planning process. DOWR also establishes PIM/CAD directorate to support integration.</li> </ul>
<p><b>(v) Agriculture, Fishery and Livelihood Development</b></p> <ul style="list-style-type: none"> <li>• (See the need for concerted efforts: 2<sup>nd</sup> point, C(ii))</li> <li>• In PIM interventions, promotion of participation of vulnerable groups and women in the WUAs remains limited. (IMT, RMTI)</li> </ul>	<ul style="list-style-type: none"> <li>• The Program pursues steps to increase the participation of vulnerable groups, with formation of self help groups and extending employments such as earth works, etc.</li> </ul>
<p><b>(vi) Sustainable O&amp;M</b></p> <ul style="list-style-type: none"> <li>• O&amp;M arrangements require critical attention and planning at the level of policy, irrigation departments, and field levels. (All reports) Key constraints are lack of accountability of agency staff in O&amp;M, non-transparent fund allocation and management among schemes, and lack of WUA capacity. (OWSR, IMT)</li> <li>• Commitment of DOWR and capacities of the WUAs are essential for effective O&amp;M. Its requirements and responsibilities should be clearly agreed during appraisal with MOUs, water entitlements, and gradual shift to volumetric supply (OWSR, NWPIM,IMT).</li> <li>• WUAs should be sufficiently trained to undertake annual O&amp;M with preparation and implementation of O&amp;M plans with on-the-job training. (NWPIM, IMT)</li> <li>• Effective MIS needs to be in place to monitor the scheme performance. Water audit as practices in Maharashtra can provide a framework. (IMT)</li> </ul>	<ul style="list-style-type: none"> <li>• The Program is designed with specific measures at policy (principles on progressive management transfer of O&amp;M fund allocation and collection), DOWR (management system), and field (arrangements with WUAs and their systems) levels to address the constraints.</li> <li>• WUAs will have agreements with DOWR that will clarify water entitlements. They will also be provided with measuring devices at their water intake for effective monitoring and communication. Progressive O&amp;M transfer at higher-tier level is also envisaged.</li> <li>• The Program will pursue this under the specific sub-component dedicated to this purpose.</li> <li>• The Program will support the establishment of most effective MIS, which will also be used for O&amp;M planning and fund allocation based on the improved guidelines.</li> </ul>
<p><b>E. Other Supporting Organizations</b></p> <p><b>(i) NGOs and CBOs</b></p> <ul style="list-style-type: none"> <li>• WUA formation requires special social mobilization skills given the diversity of members and farmer resource mobilization needs. NGOs should be duly trained for this purpose. (OWSR, CIDP, NWPIM, IMT). Their performance should be monitored focusing on outputs as opposed to inputs. (EPA)</li> </ul>	<ul style="list-style-type: none"> <li>• The Program has incorporated the arrangements for engaging experienced regional/national NGOs in association with local NGOs, as well as TA resources for capacity development. Performance monitoring will be based on set WUA development target indicators. WUAs will also be trained to evaluate the performance.</li> </ul>
<p><b>(ii) Private Sector Experts and Contractors</b></p> <ul style="list-style-type: none"> <li>• Outsourcing of non-technical expertise to private sector experts is used in PIM projects. While it is possible to obtain required services, effective capacity development is needed to ensure their quality. (OWSR, NWPIM, IMT)</li> <li>• There are capacities to undertake civil works included under the Program in the local contractors, yet selection of duly qualified contractors is critical, with effective monitoring. (OSWR)</li> </ul>	<ul style="list-style-type: none"> <li>• The capacity development plan has included the programs to train the outsourced experts in the Program positions.</li> <li>• Selection of qualified contractors will be pursued through appropriate packaging and information campaign to bidders. Program will also adopt stringent quality control systems with WUA and third party monitors.</li> </ul>

**Evaluations referred to:** CAPE = Country Assistance Program Evaluation (IND 2007, PAK 2007, BAN 2003); EPA = Effectiveness of Participatory Approaches (OED 2004); IMT = Irrigation Management Transfer: Strategies and Best Practices (INRM 2007); IOIWMI = Institutional Options for Improving Water Management in India (INRM 2007); CIDP = Chhattisgarh Irrigation Development Project (progress reports); NWPIM = National Workshop on PIM (Proceedings, 2007); PAFARO = Participatory Approaches in Forest and Water Resources Operation (OED 2003); OWSR = Orissa Water Sector Review (2007); RBO = Institutional Options for Improving Water Management in India: The Potential Role of River Basin Organizations; RMTI = Rehabilitation and Management of Tanks in India (INRM 2006); WB = World Bank Implementation Completion Reports (irrigation sector projects)

## 5. COST ESTIMATES AND FINANCING PLAN

**Table A5.1: Total Investment Program <sup>a</sup>**

Item	Tranche 1 (2008/09-11/12)				Tranche 2	Tranche 3	Tranche 4	Total
	ADB	State	WUAs	Subtotal	2010/11-13/14	2012/13-15/16	2014/15-15/16	
<b>A. Irrigated Agriculture Management Systems</b>								
A1. Planning and WUA Development								
i. WUA Mobilization through NGOs	1.5	0.2	0.0	1.7	2.2	1.3	0.9	6.0
ii. WUA Elections, buildings, etc.	0.2	0.2	0.0	0.3	0.2	0.1	0.1	0.7
A2. Irrigation and Associated Infrastructure								
i. Land Acquisition and Resettlement	0.0	3.6	0.0	3.6	1.2	0.0	0.0	4.7
ii. Infrastructure (major & Medium schemes)	18.9	4.1	0.0	23.1	44.8	31.2	3.9	103.0
iii. Minor Lift Irrigation	1.9	0.6	0.6	3.2	4.3	5.4	2.1	15.0
iv. Command Area & Conjunctive Use	1.4	0.1	0.2	1.7	4.5	5.8	3.8	15.9
A3. Agriculture and Livelihoods Support	0.7	0.0	0.0	0.7	0.5	0.4	0.5	2.1
A4. Sustainable O&M	0.1	0.0	0.0	0.2	1.0	2.2	2.9	6.3
<b>Subtotal</b>	<b>24.8</b>	<b>8.9</b>	<b>0.9</b>	<b>34.5</b>	<b>58.6</b>	<b>46.5</b>	<b>14.2</b>	<b>153.8</b>
<b>B. Institutional Development</b>								
B1. Institutional Strengthening								
i. Department of Water Resources	1.8	0.0	0.0	1.8	2.5	1.6	0.9	6.7
ii. Training	0.7	0.0	0.0	0.7	0.8	0.7	0.3	2.4
iii. Consulting Services	3.9	0.5	0.0	4.5	2.0	0.8	0.6	7.9
B2. Project Management								
i. Project Management	2.4	0.0	0.0	2.4	3.4	2.6	1.3	9.7
ii. Minor Lift Implementation Services	0.2	0.0	0.0	0.2	0.2	0.2	0.2	0.8
<b>Subtotal</b>	<b>8.9</b>	<b>0.6</b>	<b>0.0</b>	<b>9.5</b>	<b>8.9</b>	<b>5.9</b>	<b>3.3</b>	<b>27.6</b>
<b>Total (Base Cost)</b>	<b>33.7</b>	<b>9.4</b>	<b>0.9</b>	<b>44.0</b>	<b>67.5</b>	<b>52.4</b>	<b>17.4</b>	<b>181.4</b>
Price and Physical Contingencies	5.9	1.7	0.1	7.6	22.9	22.7	11.7	65.0
<b>Total Project Cost</b>	<b>39.6</b>	<b>11.1</b>	<b>0.9</b>	<b>51.7</b>	<b>90.4</b>	<b>75.1</b>	<b>29.1</b>	<b>246.3</b>
Financing Charges	0.0	4.9	0.0	4.9	9.4	8.6	1.1	23.9
<b>Total Cost Including Financing Charges</b>	<b>39.6</b>	<b>16.0</b>	<b>0.9</b>	<b>56.5</b>	<b>99.8</b>	<b>83.7</b>	<b>30.2</b>	<b>270.3</b>
 <b>Indicative ADB Financing Amount</b>				<b>39.6</b>	<b>69.8</b>	<b>58.6</b>	<b>21.1</b>	<b>189.2</b>
	70.0%	28.3%	1.7%					

<sup>a</sup> In mid-2007 prices.

<sup>b</sup> Physical contingencies computed at 10% for civil works, NGO and consultancy costs, and project management, totaling 12.7 million. Price contingencies are computed at 0.8% per annum for foreign exchange costs and 4.0-5.0% per annum for local currency costs.

<sup>c</sup> Includes interest and commitment charges. Interest during construction has been computed at the five-year forward London interbank-offered rate plus a spread of 0.4%.

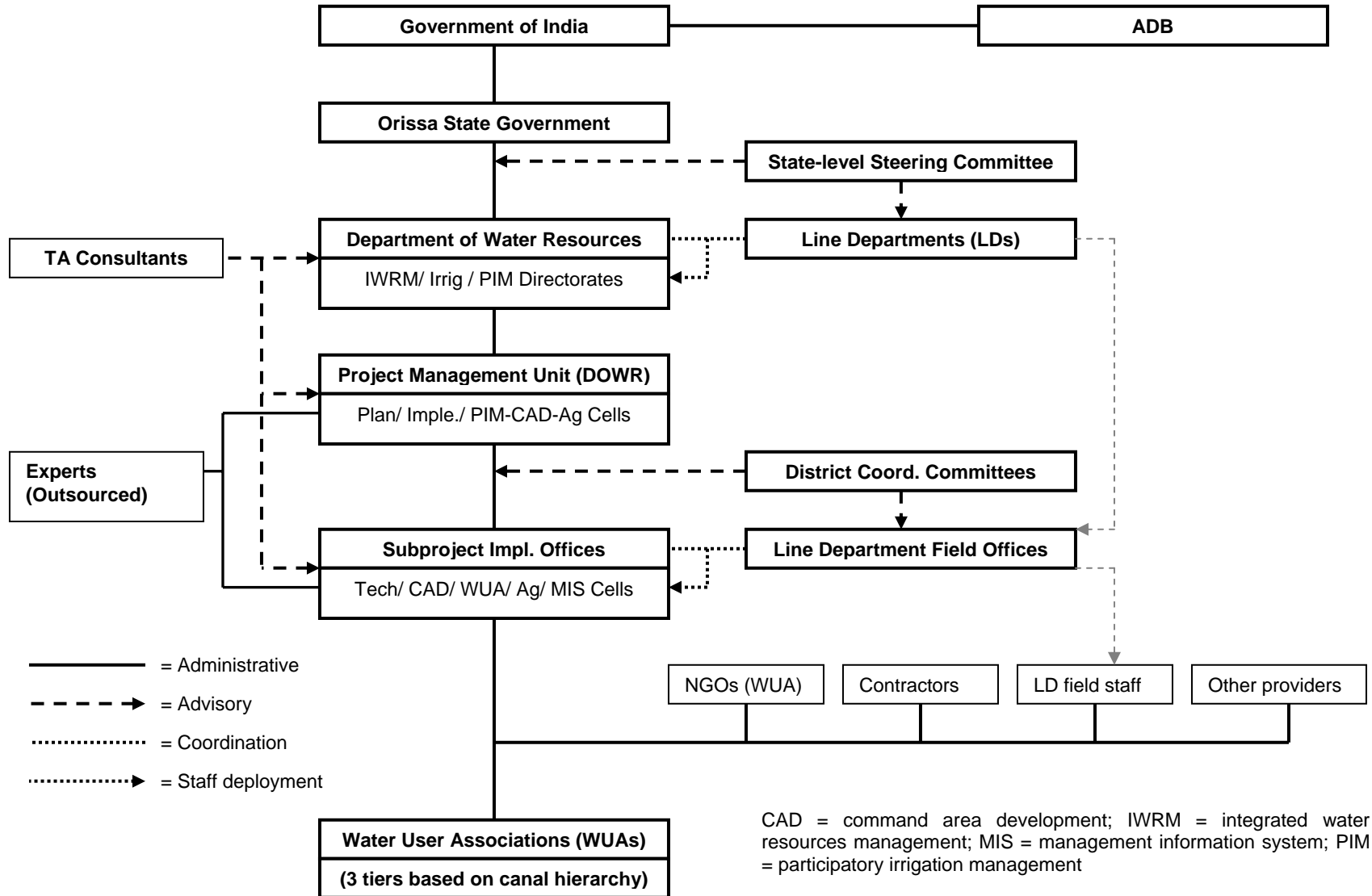
Source: Asian Development Bank estimates.

**Table A5.2. Expenditure Cost by Financiers (Total Investment Program) (US\$ million)**

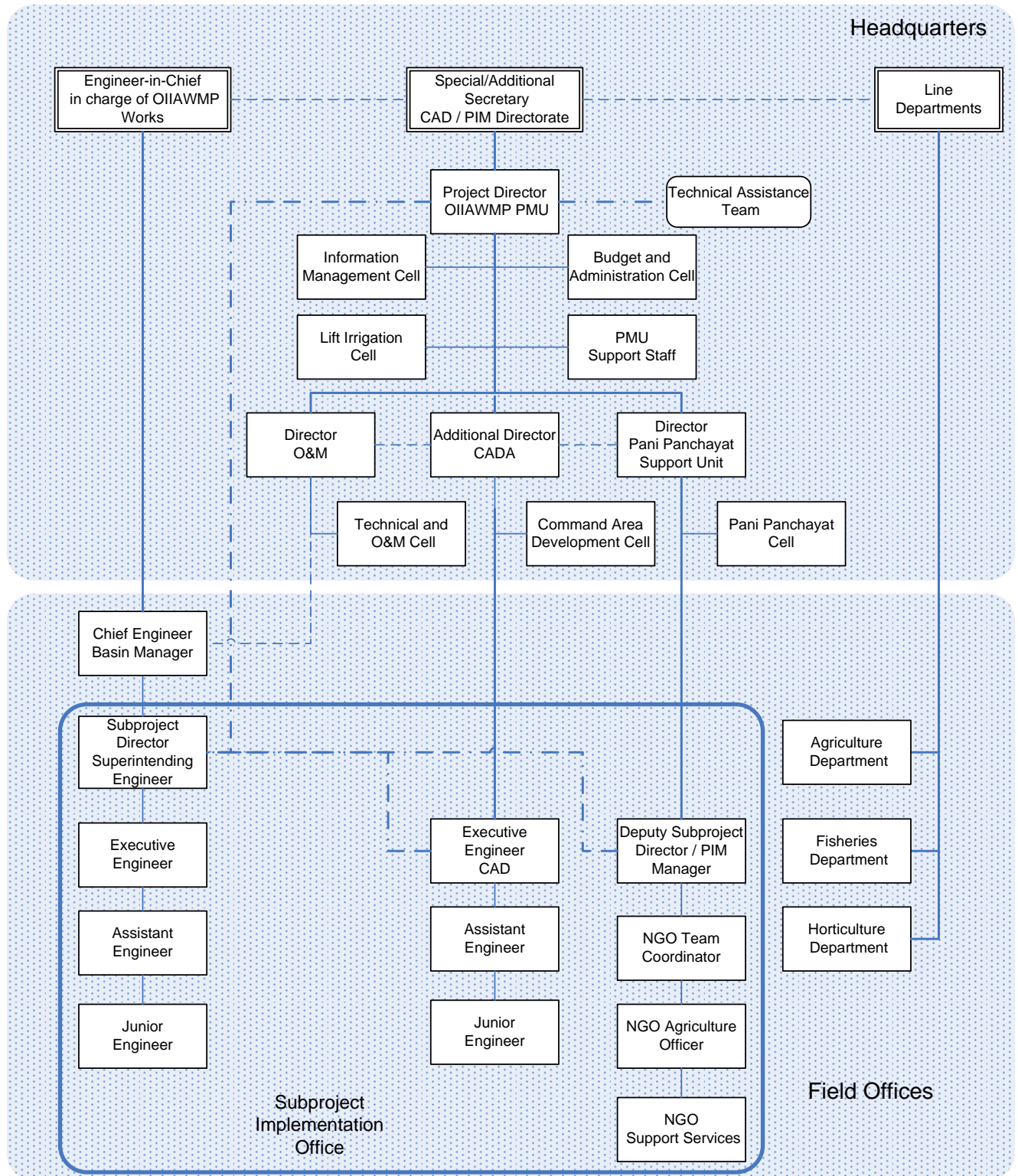
Item	ADB	State	WUAs	Total	Cost Share		
					ADB	State	WUAs
<b>A. Civil Works</b>							
Major and Medium Schemes	78.5	23.5	0.0	102.0	77.0%	23.0%	0.0%
Command Area Development	11.4	1.9	1.5	14.8	77.0%	13.0%	10.0%
Minor Lift Schemes	3.8	2.2	1.5	7.5	51.0%	29.0%	20.0%
O&M Support	3.1	1.9	1.3	6.3	50.0%	30.0%	20.0%
Others	1.1	0.1	0.1	1.2	91.8%	4.1%	4.1%
<b>Subtotal</b>	<b>98.0</b>	<b>29.5</b>	<b>4.3</b>	<b>131.8</b>			
<b>B. Land Acquisition and Resettlement</b>	0.0	4.7	0.0	4.7	0.0%	100.0%	0.0%
<b>C. Vehicles and Equipment</b>							
Vehicles	0.0	0.0	0.0	0.0	100.0%	0.0%	0.0%
Equipment and Materials	2.1	0.0	0.0	2.1	100.0%	0.0%	0.0%
Minor Lift Equipment	3.8	2.2	1.5	7.5	51.0%	29.0%	20.0%
<b>Subtotal</b>	<b>5.9</b>	<b>2.2</b>	<b>1.5</b>	<b>9.6</b>			
<b>D. Specialist Services</b>							
NGO Social Mobilization	5.4	0.7	0.0	6.0	88.9%	11.1%	0.0%
TA Consultants	7.0	0.9	0.0	7.9	88.6%	11.4%	0.0%
Minor Lift Implementation	0.8	0.0	0.0	0.8	100.0%	0.0%	0.0%
RP Implementation	0.3	0.0	0.0	0.3	100.0%	0.0%	0.0%
Studies	3.1	0.0	0.0	3.1	100.0%	0.0%	0.0%
<b>Subtotal</b>	<b>16.5</b>	<b>1.6</b>	<b>0.0</b>	<b>18.0</b>			
<b>E. Survey and Investigation</b>	1.9	0.5	0.2	2.6	73.5%	17.8%	8.7%
<b>F. Training</b>							
Irrigation Management	2.4	0.0	0.0	2.4	100.0%	0.0%	0.0%
Agriculture and Livelihood	11.3	0.0	0.0	11.3	100.0%	0.0%	0.0%
<b>Subtotal</b>	<b>13.7</b>	<b>0.0</b>	<b>0.0</b>	<b>13.7</b>			
<b>G. Incremental Operational Costs</b>	<b>10.1</b>	<b>0.0</b>	<b>0.0</b>	<b>10.1</b>	100.0%	0.0%	0.0%
<b>Total (Base Cost)</b>	<b>146.1</b>	<b>38.4</b>	<b>6.0</b>	<b>190.5</b>			
Physical Contingencies	9.7	3.0	0.0	12.7	76.6%	23.4%	0.0%
Price Contingencies	33.3	8.2	1.6	43.1	77.3%	19.1%	3.6%
<b>Total Project Cost</b>	<b>189.2</b>	<b>49.6</b>	<b>7.6</b>	<b>246.3</b>			
Financing Charges	0.0	23.9	0.0	23.9	0.0%	100.0%	0.0%
<b>Total Cost Including Financing Charges</b>	<b>189.2</b>	<b>73.5</b>	<b>7.6</b>	<b>270.3</b>	70.0%	27.2%	2.8%

Source: Asian Development Bank estimates.

## 6. ORGANIZATIONAL STRUCTURE



**Figure A6.2: Organizational Structure of Project Management Office and Subproject Implementation Offices**



--- Monitoring and communication relationship  
 - - - Communication and coordination relationship

## 7. SUBPROJECT SELECTION CRITERIA AND APPROVAL PROCESS

1. **Selection Criteria.** Under the Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program), the following criteria will apply in selecting subprojects intended for financing under the Program.

- (i) The subprojects will be located within Brahmani, Baitarani, Burhabalanga, and Subernarekha River basins, and a part of the Mahanadi River delta areas.
- (ii) The subprojects will involve rehabilitation, extension, and modernization of the existing irrigation and associated infrastructure. Subprojects will either be major (having a command area of over 10,000ha), medium (between 1,000-10,000ha), or very minor community-based lift (less than 50ha) irrigation schemes. (Candidate major and medium schemes are annexed.)<sup>1</sup>
- (iii) For each subproject, a participatory feasibility study and support due diligence will have been prepared, covering technical design, economic and financial viability, institutional arrangements, social assessments including social safeguards plans as applicable, environmental analysis, and implementation plan.
- (iv) All necessary central and state government approvals will be in place.
- (v) For individual subproject feasibility assessments, the following criteria will apply.
  - a. Technical feasibility, with insignificant technical risks that would undermine efficacy, economic return, safety, or sustainability.
  - b. Reliable water availability and quality, with insignificant negative impact on the other users of the same source or the ecosystem downstream.
  - c. Financial and economic viability with an economic internal rate of return of over 12% with robustness under sensitivity and risk analysis.
  - d. Marginal farmers (less than 1ha land holding) constituting more than 50%.
  - e. Social and environmental soundness with insignificant negative impacts.
  - f. Fulfillment of safeguards requirements (involuntary resettlement, indigenous peoples, and environment) of the Government and ADB, and efforts to minimize land acquisition and resettlement in the planning and design process
  - g. Concurrence of the concerned water user associations (WUAs) on the basic design, including farmer contribution for minor facilities (5%), command area development works (10%), and operation and maintenance (O&M) of the minor facilities within the WUA boundary.
- (vi) For minor lift irrigation schemes, the following criteria will also apply:
  - a. Operational status being either operational by the WUA or non-operational in less than five years due to the causes addressed through rehabilitation.
  - b. Technical soundness and sustainability with little risk of river bank erosion or sand casting due to flood damages.
  - c. WUA members' agreement to assume full responsibility of O&M including all major repair and future asset replacement, with beneficiary contribution equivalent to 20% of the investment costs, and additional amount as reserve fund to prepare for future asset replacement.
  - d. Sound O&M plan developed to fully irrigate the command area.
  - e. The subproject cost of less than Rs30,000 per hectare of net irrigated area.
  - f. Relatively equal land distribution, with less than 50% of net irrigated area operated by the largest 10 operators.

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<sup>1</sup> The investment program will also accommodate as a pilot a small number of minor (less than 1,000ha) creek irrigation schemes, which will also follow the same criteria.

2. **Procedures.** For the purpose of the first periodic financing request (PFR) under the Program, appraisal process has been undertaken for two major (Taladanda and Mahanadi Chitropala Island Irrigation) and three medium (Gohira, Remal, and Sunei) schemes, along with the two sample subprojects for community-based minor lift irrigation.<sup>2</sup>

3. For all irrigation schemes to be proposed for inclusion in the subsequent PFRs, each subproject will be processed in accordance with the following procedures:

- (i) Feasibility study will be conducted by the executing agency (EA) including its cost estimates. The EA will also prepare (a) an initial poverty and social assessment (IPSA) and fill out checklists for (b) involuntary resettlement; (c) indigenous peoples; and (d) environment; and submit the same for ADB's review and categorization.
- (ii) Based on the categorization and the feasibility studies, the EA will prepare the draft appraisal reports for all subprojects to be considered under the respective PFRs following the selection criteria, together with required attachments, i.e., draft resettlement plan (RP),<sup>3</sup> draft indigenous peoples development plan (IPDP), and draft environmental assessment.<sup>4</sup>
- (iii) During the above process, the EA, with the assistance of the institutional strengthening and project management consultants, will also assess the progress and performance of the implementation of the preceding loans under the Program, with necessary actions to enhance their effectiveness. ADB will closely engage with the EA while the work is being carried out.
- (iv) If a proposed subproject is not likely to satisfy the eligibility criteria and/or the agreed procedures, ADB will advise the EA to either (a) modify the subproject proposal in a manner that will make it eligible or (b) reject the subproject. In the latter case, the EA may propose a replacement subproject under the respective Loan.
- (v) Upon completing the feasibility assessments of the concerned subprojects and progress and performance review of the preceding loans under the Program, the EA will submit the same with form of PFR to ADB for approval. The EA will ensure that the necessary approvals of the Government of India or Orissa state government have been obtained prior to submission of the PFR.

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<sup>2</sup> About 300 subprojects are envisaged to be implemented for minor lift irrigation schemes under the first loan. For these subprojects, the executing agency (EA) will conduct feasibility studies and prepare the appraisal reports following the selection criteria together with required attachments, i.e., draft resettlement plan (RP), draft indigenous peoples development plan (IPDP) and draft environmental assessment, if required, and submit the same to ADB for approval. Once it has been established that the appraisal reports have achieved a desired level of quality, these will be submitted to ADB for information, except for those appraisal reports that have safeguards documents requiring prior approval by ADB.

<sup>3</sup> The EA will translate the RP in the local language and disclose it to the affected people and incorporate the results of the consultation. The final RP will also be disclosed on the ADB website and the website of EA.

<sup>4</sup> If any of the subprojects is categorized as environmental category A or B sensitive, in any subsequent Loan, compliance is required with the 120-day advance disclosure rule. The summary environmental impact assessment (SEIA) or summary initial environmental examination (SIEE) must be circulated to the ADB Board and made available to the general public 120 days before the PFR is submitted to ADB.

## 8. SUBPROJECT IMPLEMENTATION PROCEDURE AND ARRANGEMENTS

### A. Implementation Procedure

Feasibility Studies and Subproject Implementation Plan Preparation	
<p><b>Confirmation of Candidate Subproject Selection</b></p> <ul style="list-style-type: none"> <li>(i) Existing major, medium, or MLI scheme in the set geographical area requiring renovation</li> <li>(ii) Technical feasibility with insignificant risks</li> <li>(iii) Reliable water availability, insignificant negative impacts on downstream users and ecosystems</li> <li>(iv) EIRR greater than 12%, robustness against risks</li> <li>(v) Marginal and small farmers constituting more than 50% beneficiary households and land areas</li> <li>(vi) No major environmental issues</li> <li>(vii) No major social and land-related issues</li> <li>(viii) Beneficiaries support overall subproject concept, and agree on contribution for 5% of minor works, 10% of CAD and 20% of MLI works</li> </ul>	<p><b>Feasibility Studies and Subproject Implementation Plan</b></p> <ul style="list-style-type: none"> <li>(i) Field confirmation of the issues on the left</li> <li>(ii) Initial formulation of ad hoc WUA (and its higher tier committees)</li> <li>(iii) Data collection on physical, socioeconomic, and institutional setting</li> <li>(iv) Problem assessment on agriculture, infrastructure, and irrigation/water management</li> <li>(v) Inventory of existing and planned programs</li> <li>(vi) Participatory rapid rural appraisal at village, WUA and higher tier levels</li> <li>(vii) Identification of priority investment requirements focusing on water and associated interventions</li> <li>(viii) Feasibility studies (FS) of identified interventions</li> <li>(ix) Formulation of subproject implementation plan (SIP) specifying input and output targets</li> <li>(x) Associated safeguard and other assessments</li> <li>(xi) Presentation of FS and SIP and endorsement by WUA</li> </ul>



(See footnote 1 for main facilities requiring early implementation)

WUA Micro-Plan (Major and Medium Schemes) <sup>1</sup>
<p><b>WUA Micro Plan Preparation</b></p> <ul style="list-style-type: none"> <li>(i) WUA institutional development plan prepared, with full land and household records</li> <li>(ii) Infrastructure development plan (including CAD layouts and conjunctive use promotion), including beneficiary contribution targets of WUAs</li> <li>(iii) Agriculture and livelihood enhancement plan, prepared with synergy for other ongoing programs</li> <li>(iv) Environmental and social safeguards plans (as required)</li> <li>(v) Endorsement of draft WUA micro plan by WUA general assembly</li> </ul> <p><b>Field confirmation and approval by PMU with support of the consultants</b></p>

WUA Beneficiary Mobilization
<p><b>During Micro Plan Preparation</b></p> <ul style="list-style-type: none"> <li>(i) WUA working group established to work with SIP team for micro plan preparation</li> <li>(ii) Information campaign on Project and its requirements</li> <li>(iii) Endorsement of draft micro plan by general assembly</li> </ul> <p><b>After Micro Plan Approval</b></p> <ul style="list-style-type: none"> <li>(i) Start implementing WUA institutional development plan with facilitation of NGOs</li> <li>(ii) Membership enrollment over 70%</li> <li>(iii) Election, and executive and subcommittee formation</li> <li>(iv) Participate in and endorse detailed design and beneficiary contribution targets</li> <li>(v) Achievement of set beneficiary contribution targets</li> </ul> <p><b>Full achievements of the targets in (ii) – (vii) confirmed by qualified staff of PMU</b></p>



WUA Level Implementation Agreement Signing
<p>Implementation agreement to stipulate schedules, programs, and responsibilities of the concerned organizations to implement the micro plans – to be signed by heads of SIO and WUA</p>



<sup>1</sup> Implementation will be based on the canal units constituting individual WUAs. Facilities encompassing more than one WUA (e.g., branch canals) will be implemented on the basis of the progress of the institutional development of the concerned WUAs. For main and key distributaries requiring early works for timely availability of water across the subprojects, however, detailed design and procurement of civil work may be initiated upon completion of the FS and SIP preparation and endorsement of the concerned WUA project-level committee.

Construction of Irrigation and Associated Infrastructure	
<b>Preconstruction</b> (i) Implementation of RP with support of NGOs (ii) Tender process of construction works (for main, distributary, and branch canals and structures) (iii) WUA engaged for minor infrastructure within their territories with necessary training (iv) WUA training on construction monitoring and O&M	→
	<b>Construction</b> (i) Improved construction supervision including internal technical audit (ii) WUA monitors construction works of contractors (iii) WUA implements minor infrastructure (iv) Consultant QC specialist sign off prior to payments (v) Full disclosure of contract information at sites



Agriculture and Livelihood Support
<b>Agriculture Development Support</b> (i) Agriculture plan refined with WUA subgroups (ii) Agriculture extension focus on groups with better group performance, e.g., beneficiary contribution, and marginal farmers with smaller operational size (iii) Demonstration beneficiaries to repay the cost of inputs to WUA as seed money to continue program (iv) Group leaders trained as WUA extensionist to disseminate improved technology within WMA (v) New cropping management with intensification, diversification, seed multiplication, water saving and other new technologies (vi) Facilitation of forming farmer linkages for input delivery and output marketing (vii) NGOs and private providers engaged to enhance program effectiveness  <b>Livelihood Enhancement Programs</b> (i) Programs for the poor, e.g., vegetable gardening, fodder collection, etc. for poor women organized (ii) Promote self help group formation and forming linkage with existing poverty reduction programs (iii) Delivery of services for practical knowledge of income generation, e.g., livestock <b>Program completion report stipulating amount of services and impacts prepared by SIO and submitted to PMU after WUA endorsement</b>

Infrastructure Completion and O&M
<b>WUA Managed (minor) Facilities</b> (i) Preparation of O&M plan by WUA with trained project staff with the consultant O&M specialist (ii) Test run and joint confirmation of the quality of infrastructure constructed (iii) On-the-job training for O&M up to full year, in preparing and implementing (a) seasonal operation plans with efficient water management, (b) annual maintenance plans with joint walk-through, and (c) resource mobilization plans (iv) WUA establishes O&M reserve fund using up-front cash contribution and maintain the fund with appropriate replenishment mechanism (v) Close monitoring of status of O&M <b>Facility O&amp;M transfer agreement signed between SMO and WUA</b>  <b>Jointly Managed Facilities</b> (i) Preparation of scheme O&M plan, and MIS for scheme O&M performance monitoring and planning (ii) Test run for joint confirmation of structure capacity (iii) Joint decision making on system O&M, including seasonal operation plans, maintenance plans with joint walk throughs, and resource mobilization plans (iv) Policy measures to enhance resource mobilization <b>Progressive O&amp;M transfer at this level envisaged in the medium term</b>



Regular Monitoring for Sustainable O&M
Project to maintain annual technical, social, and financial audit of WUA through field project staff and engagement of NGOs, with a particular focus on the performance of O&M at system, distributary, and WUA levels

CAD = command area development, EIRR = economic internal rate of return, FS = feasibility studies, IEE = initial environmental examination, MLI = minor lift irrigation, NGO = nongovernment organization, O&M = operation and maintenance, PMU = project management unit, RP = resettlement plan, QC = quality control, SIP = subproject implementation plan, SIO = subproject implementation office, WUA = water user association.

## B. Good Governance Measures

Area	Measures
Institutional Development	<ul style="list-style-type: none"> <li>• State Water Policy 2007 adopted reconfirming the State's resolve to pursue participatory irrigation management (PIM) and integrated water resources management (IWRM).</li> <li>• Legal framework being refined to enable water user associations (WUA) institutional continuity, representation of tail enders, and stronger involvement in O&amp;M</li> <li>• Department of Water Resources (DOWR) reforms on:               <ul style="list-style-type: none"> <li>- Establishing multi-disciplinary PIM directorate to operationalize PIM state wide</li> <li>- Initiating change management process for better client orientation with revision of staff performance evaluation and reward systems</li> <li>- Establishing quality control cell to undertake internal third party technical audit with the independent third party experts to inspect quality of works</li> <li>- Internal independent audit wing to do annual financial audit of all offices including investigation of all financial records and transactions</li> <li>- Establishing management information system (MIS) for scheme O&amp;M performance monitoring and planning, with clear performance-based guidelines for fund allocation linked with the performance of water tariffs collected from WUAs</li> <li>- Implementing capacity development plan to strengthen the capacities in policy, planning, program implementation, staff training, monitoring, and quality control</li> </ul> </li> <li>• Water and Land Management Institute strengthened with stronger autonomy and leadership, and capacity strengthened with upgraded staff training programs</li> </ul>
Transparency and Accountability	<ul style="list-style-type: none"> <li>• Project offices to operationalize joint decision making with the counterpart WUAs regarding all planning, implementation, and O&amp;M matters, with WUAs to endorse subproject and WUA micro plans, and periodic work plans and schedules</li> <li>• DOWR to place field level non-technical staff to work under the concerned WUAs</li> <li>• WUAs to be informed about their water allocation/entitlements with measuring devices</li> <li>• DOWR to post physical and financial details and project process in the DOWR website</li> <li>• Project offices to post the abstract of all contracts executed, including the bills of quantities and associated contract amount in the subproject and construction sites</li> <li>• DOWR to operationalize, with awareness campaign, grievance reporting mechanisms to the district public information officers and vigilance officers, elected local representatives and DOWR's chief vigilance officer</li> </ul>
Procurement	<ul style="list-style-type: none"> <li>• Compliance with ADB's guidelines on procurement and consultancy services</li> <li>• Use of ADB's standard bidding documents and request for proposal documents</li> <li>• Stringent contract packaging for maximum efficiency, maximum competition in bidding, and adequate and advance advertisement</li> <li>• Disclosure of tender results in the DOWR website</li> <li>• Engagement of WUAs for minor civil works for facilities to be handed over for their O&amp;M</li> </ul>
Audit and Quality Control	<ul style="list-style-type: none"> <li>• WUAs to be informed about the Program details (inputs, target outputs, and schedules), and trained to monitor the delivery including civil work contracts</li> <li>• DOWR to undertake internal full financial audit for all financial records and transactions</li> <li>• DOWR to operationalize internal technical audit with third party quality control experts</li> <li>• Program to further mobilize construction quality control monitor through the institutional strengthening and project management consultancy</li> <li>• Program to provide support to DOWR for improving the construction recording arrangements with the use of modern survey equipment and photographs</li> <li>• Stipulation in all contracts financed by ADB for the Program, ADB's right to audit and examine the records and accounts of the contractor</li> </ul>

### 9. INDICATIVE IMPLEMENTATION SCHEDULE

Task / Activity	Tr-1 (\$39.6M)			Tr-2 (\$69.8M)			Tr-3 (\$58.6M)		Tr-4 (\$21.1M)	
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	
<b>Preparatory Works</b>										
Establishment of PMU and SIOs, Appointment of PD and key Project staff	[Gantt bar: Year 0 to Year 1]									
Preparation of project implementation plan and manuals	[Gantt bar: Year 0 to Year 1]									
Feasibility Studies of Tranche 2 Subprojects	[Gantt bar: Year 0 to Year 1]									
Advance requirement (NGOs and consultants) and procurement (equipment)	[Gantt bar: Year 0 to Year 1]									
<b>Tranche 1 Subprojects (2 major and 3 medium schemes)</b>										
Social mobilization of PPs and Micro-planning	[Gantt bar: Year 1 to Year 5]									
Civil works (Main structures, except MCII)	[Gantt bar: Year 1 to Year 3, labeled DD&AP]									
Civil works (minor structures including design, except MCII)	[Gantt bar: Year 2 to Year 5]									
RP implementation (MCII)	[Gantt bar: Year 1 to Year 2]									
Civil Works (MCII)	[Gantt bar: Year 2 to Year 5, labeled DD&AP]									
Agriculture and allied sector support, and livelihood enhancement	[Gantt bar: Year 2 to Year 5]									
O&M support	[Gantt bar: Year 3 to Year 8]									
Minor Lift Schemes (300 subprojects)	[Gantt bar: Year 1 to Year 2]									
<b>Tranche 2 Subprojects (4 major and 2 medium schemes)</b>										
Feasibility Studies of Tranche 3 Subprojects	[Gantt bar: Year 2 to Year 3]									
Social mobilization of PPs and Micro-planning	[Gantt bar: Year 2 to Year 5]									
Civil works (Main structure)	[Gantt bar: Year 2 to Year 5, labeled DD&AP]									
Civil works (minor structures, including design)	[Gantt bar: Year 3 to Year 6]									
Agriculture and allied sector support, and livelihood enhancement	[Gantt bar: Year 3 to Year 6]									
O&M support	[Gantt bar: Year 4 to Year 8]									
Minor Lift Schemes (400 subprojects)	[Gantt bar: Year 3 to Year 4]									
<b>Tranche 3 Subprojects (4 medium schemes, PP refinement, pilot creek schemes)</b>										
Feasibility studies of Tranche 4 Subprojects (Minor Lift Schemes)	[Gantt bar: Year 3 to Year 3]									
Social mobilization of PPs and Micro-planning	[Gantt bar: Year 5 to Year 7]									
Civil works (Main structure)	[Gantt bar: Year 4 to Year 7, labeled DD&AP]									
Civil works (minor structures, including design)	[Gantt bar: Year 5 to Year 7]									
Agriculture and allied sector support, and livelihood enhancement	[Gantt bar: Year 5 to Year 7]									
O&M support	[Gantt bar: Year 6 to Year 8]									
Minor Lift Schemes (500 schemes for tranche 3, 200 schemes for tranche 4)	[Gantt bar: Year 5 to Year 7]									
<b>Institutional Strengthening and Project Management</b>										
Project management	[Gantt bar: Year 0 to Year 8]									
Capacity building activities for DoWR, WALMI, NGO and other project related staff	[Gantt bar: Year 0 to Year 8]									
TA consultants	[Gantt bar: Year 0 to Year 8]									
Social mobilization NGOs	[Gantt bar: Year 0 to Year 8]									
IWRM component including Institutional Studies	[Gantt bar: Year 0 to Year 8]									
Reporting	[Gantt bar: Year 0 to Year 8]									

DD&AP = detailed design and advance procurement

## 10. PROCUREMENT PLAN (PROJECT-1)

Project Information:	Rehabilitation, extension, and modernization of existing 2 major, 3 medium, and about 200 minor lift irrigation schemes with establishment of sustainable operation and maintenance systems with farmer water user associations
Country:	India
Borrower:	India
Project:	Orissa Integrated Irrigated Agriculture and Water Management Investment Program (OIIAWMIP)
Loan No.:	To be determined (t.b.d.)
Date of Effectiveness:	t.b.d.
Amount:	\$56.5 million
Of which Committed, US\$	\$39.6 million
Executing Agency	Orissa Department of Water Resources
Approval Date of Original Procurement Plan	Targeted for 31 December 2007
Approval of Most Recent Procurement Plan	Not applicable
Publication for Local Advertisement <sup>1</sup>	1 February 2008 (for consulting and NGO services) 1 June 2008 (for works contracts)
Period Covered by this Plan	18 months

Procurement Methods	To be used above/below (\$)
NCB works	All works contracts less than \$10,000,000 other than community works contracts
NCB goods	All goods greater than \$100,000 and less than \$1,000,000
Shopping Goods	Less than \$100,000
Exceptional Methods	Simple civil works contracts costing less than \$12,500 may be directly awarded to WUAs as a community works contract following relevant provisions of ADB guidelines regarding community participation

Procurement Methods – Consulting Services	To be used above/below (\$)
Quality Cost Based Selection (QCBS)	Greater than \$200,000 <sup>2</sup>
Consultants Qualifications Selection (CQS)	Only for specific specialist services (<\$200,000) with prior agreement of Project Director and ADB
Least Cost Selection (LCS)	Less than \$100,000

<sup>1</sup> General procurement notice, invitations to pre-qualify and to bid, calls for expressions of interest

<sup>2</sup> Full Technical Proposal required

## Procurement Package under the First Periodic Financing Request

### 1. Civil Works

Contract Package No.	Contract Description	Value (million)	Expected date of Advertisement	Mode of Procurement	Prior Review Y/N
<b>1. Taladanda Scheme</b>					
CW-NCB-T1	Rehabilitation of main canal including lining (Km 11.75 to 41.45), distributary nos. 3 to 10 and associated structures	Rs192.8 (\$4.76)	June 2008	NCB	Y
CW-NCB-T2	Rehabilitation of main canal (Km 41.69 to 54.85, distributary nos. 11 to 13, repairs to canal embankment road of distributary 12, canal lining and associated structures.	Rs200.0 (\$4.94)	June 2008	NCB	Y
CW-NCB-T3	Rehabilitation of main canal including lining (Km 54.85 to Km 83.24), distributary nos, 14 to 18 and repair of Chaumuhani canal embankment.	Rs198.0 (\$4.89)	June 2008	NCB	Y
<b>2. Sunei Irrigation Scheme</b>					
CW-NCB-S1	Repair of dam, spillway and gate hoists. Rehabilitation of Bisol main canal, Kaptipada and Behrampur distributary canals including sections of lining and structures	Rs72.2 (\$1.78)	June 2009	NCB	Y
<b>3. Gohira Irrigation Scheme</b>					
CW-NCB-G1	Repair to earth dam, spillway and associated structures. Rehabilitation of left main canal, selective lining and provision of structures	Rs72.9 (\$1.80)	June 2008	NCB	Y
CW-NCB-G2	Rehabilitation of right main canal including selective lining and structures.	Rs57.2 (\$1.41)	June 2009	NCB	Y
<b>4. Remal Irrigation Scheme</b>					
CW-NCB-R1	Repair main dam, spillway and other associated structures. Rehabilitation of the Left Main Canal and provision of system control structures.	Rs29.7 (\$0.73)	June 2008	NCB	Y
CW-NCB-R2	Rehabilitation of right main canal including channel reshaping, provision of structures and selective reaches of lining	Rs24.8 (\$0.61)	June 2009	NCB	Y
<b>5. Taladanda, Sunei, Gohira, and Remal Irrigation Schemes</b>					
Various	Construction of minor canals and associated structures	Rs93.2 (\$2.30)	- Starting 2009 <sup>3</sup> - Not applicable <sup>4</sup>	- NCB - Direct engagement of WUAs	Y (initial contracts)
<b>6. Minor Lift Irrigation Schemes</b>					
MLI-Various	Installment of pump sets and pipe systems, and other minor works	Rs52.2 (\$1.29)	Same as above	Same as above	Same as above

<sup>3</sup> For contracts to be undertaken by contractors.

<sup>4</sup> For contracts to be undertaken by WUAs.

Contract Package No.	Contract Description	Value (million)	Expected date of Advertisement	Mode of Procurement	Prior Review Y/N
7. Others					
DOWR-Variou	Office refurbishment and extension of DOWR	Rs23.0 (\$0.57)	April 2009	NCB	Y
<b>Total</b>		Rs1,016.0 (\$25.1)			

## 2. Equipment and Supplies

Contract Package No.	Contract Description	Value (million)	Expected date of Advertisement	Mode of Procurement	Prior Review Y/N
MLI-1 to MLI-4	Central procurement of lift irrigation equipment including pump sets and distribution pipes	Rs78.0 (\$1.92)	1 – June 2009 2 – Dec 2009 3 – June 2010 4 – Dec 2010	t.b.d.	Y
DOWR-1	Purchase of laboratory equipment for quality control cell	Rs10.0 (\$0.24)	Jan 2009	NCB	Y
DOWR-various	Purchase of equipment and furniture of existing establishments	Rs20.0 (\$0.50)	Jan 2009 – Dec 2010	Shopping, direct purchase	Y (initial contracts)
<b>Total</b>		Rs108.0 (\$2.7)			

## 3. Consulting Services

Contract Package No.	Contract Description	Value (million)	Expected date of Advertisement	Mode of Procurement	Prior Review Y/N
CS-1	Institutional strengthening and project management support	Rs350.0 (\$8.64)	1 Jan 2008	QCBS	Y
CS-2	Minor lift irrigation implementation support services	Rs28.3 (\$0.70)	1 Jan 2008	QCBS	Y
NGO-1	Social Mobilization Support for Taladanda and MCII Schemes	Rs60.0 (\$1.48)	1 Jan 2008	QCBS	Y
NGO-2	Social mobilization support for 3 medium schemes	Rs35.0 (\$0.86)	1 Jan 2008	QCBS	Y
NGO-3	Resettlement plan implementation support for MCII scheme	Rs4.0 (\$0.10)	1 Jan 2008	QCBS	Y
<b>Total</b>		Rs477.3 (\$11.8)			

## 11. SUMMARY ECONOMIC AND FINANCIAL ANALYSIS

### A. Objective

1. The economic and financial analyses assessed the two major and three medium irrigation schemes, and the two sample community-based minor lift irrigation (MLI) schemes, which are to be included in the first multi-tranche financing facility (MFF) loan for the Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program). All are existing schemes, with one major scheme<sup>1</sup> to extend the branch and minor canal systems to complete its incomplete scope, whereas the rest are to renovate the existing irrigation infrastructure.<sup>2</sup> The analysis has focused on (i) affordability and sustainability, and (ii) economic feasibility. For each subproject, the capacity of individual farm households to bear the additional on-farm costs associated with the Project was assessed. The beneficial impacts of rehabilitated irrigation schemes and all non-engineering support including agricultural extension on crop profitability are weighed against the capital costs and operation and maintenance (O&M) costs. Given that the remaining subprojects under the Program are all to renovate existing infrastructure, the results can be both representative and indicative of the remaining sites.

### B. Approach and Major Assumptions

2. To assess the expected direct benefits of the subprojects, quantifiable effects are valued by comparing the with- and without-Program scenarios. The input-output coefficient of farm production, including cropping patterns and yields, fertilizer use, and labor costs was estimated based on farm surveys in the subproject areas and cross-checked with the data reported in completed irrigated agriculture projects in Orissa.<sup>3</sup> All subprojects were assumed to have an economic life of 25 years and to achieve the full benefits in the third year after civil work completion. The investment costs were estimated based on the basic design data.<sup>4</sup> All overhead costs including consulting services, training, and administration were included into the analysis. The analysis uses a domestic price numeraire, and economic prices for traded inputs and commodities (rice and wheat with export parity, and fertilizers with import parity prices) were based on the World Bank Commodity Price Projections. The prices of other crops and farm inputs were derived based on the market prices in the subproject areas in June 2007. Standard conversion factor of 0.90 and shadow wage rate of 0.75 were used.

### C. Estimated Benefits

3. **Increased Crop Production.** Crop production is expected to increase both in terms of quantity and value as a result of scheme renovation, because of: (i) expanded command area; (ii) increased yields; and (iii) changes in cropping patterns and intensities. Low reliability of water is a major factor constraining the productivity of the irrigation systems both in monsoon

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<sup>1</sup> Mahanadi Chitropala Island Irrigation (MCII) subproject in the Mahanadi delta (12,361ha, of which 5,937ha new).

<sup>2</sup> Taladanda subproject (Mahanadi delta: 32,630ha), Gohira subproject (Brahmani basin: 8,300ha), Remal subproject (Baitarani basin: 4,310ha), Sunei subproject (Burhabalanga basin: 10,000ha), Jhanlda MLI subproject (Subernerekha basin: 20ha), and Parimukundapur MLI subproject (Brahmani basin: 40ha).

<sup>3</sup> While the Program aims to achieve high potential yield levels with integration with command area development and agriculture extension and other services, conservative estimates were adopted in terms of the assumed changes in input use and yields that are comparable to those observed in other irrigation projects (having less CAD and agriculture support services provided) for the purpose of the analyses.

<sup>4</sup> O&M cost has adopted the figure cited in the Government's 12<sup>th</sup> Finance Commission (December 2004), and present level of water tariff for households financial analysis for major and medium schemes, plus data obtained for O&M requirement of CAD works. For MLI schemes, actual requirements including electricity fees and depreciation costs were calculated on a case by case basis.

and dry seasons, which is associated with deteriorated infrastructure and inefficient canal operation. Improved canal network with installment of field channel systems will increase the distribution efficiency thereby enabling the expansion of the irrigated area. In reservoir-based medium schemes, dry season command area can be increased by improving the reservoir operational practices. Crop yields are also expected to increase because of: (i) more reliable water supply (via improved canal and operation systems); (ii) increased use of modern inputs (induced by stable and assured water supply); and (iii) provision of extension and other support services. Crop diversification is also expected to be facilitated through: (i) introduction of field channels (to distribute water efficiently to the tail ends without resorting to plot-to-plot flooding irrigation constraining the crop choice); and (ii) intensification of staple crops (that will increase the food self sufficiency of marginal farmers motivating the adoption of high value crops). WUAs will also be motivated to pursue water saving crops in the dry season among their members.

4. **Nonquantified Benefits.** The Project will also generate non-quantifiable benefits, including: (i) improved planning system with comprehensive implementation plans; (ii) strengthened WUAs to undertake O&M of at least minor facilities and serve as local agriculture development facilitators as cohesive platform for input supply, technical support, and output marketing with collective bargaining power; and (iii) improved irrigation and related service delivery mechanism with transparent and accountable governance through WUAs. Benefits derived from strengthening policy, planning, and institutional framework for participatory irrigation management (PIM) and integrated water resources management (IWRM) will also have wider and far reaching impacts at state and field levels.<sup>5</sup>

#### **D. Assessment of Financial Returns**

5. Farm budget analysis was conducted for typical farm households in the subproject areas, differentiating fully or partly irrigated and non-irrigated areas, and marginal, small, and medium/large farm households.<sup>6</sup> The gains in farm net income as a result of the Project are compared with the farmers' share of investment costs (Table A11). The annual gains with the Project exceed the one-time investment costs for all categories of farm households. The annual net gain with the Program (Rs10,000–Rs11,200/ha [\$245–275/ha] for major/medium renovation, Rs20,000/ha for major extension, and Rs15,000–20,000/ha for MLI renovation) represents a 50–98% increase in annual income for major/medium renovation, 109% for major extension, and 64–108% for MLI renovation on the average. The expected increase is higher for currently non-irrigated or deprived areas, and reduces their income difference with the irrigated areas.

6. **Two Major Schemes in Mahanadi Delta.** The first MFF tranche will include one major scheme for extension (MCII: footnote 1) and another for rehabilitation (Taladanda: footnote 2). MCII scheme will provide irrigation to 5,940ha of presently non-irrigated area (except some 5% irrigated with groundwater), whereas Taladanda scheme will provide irrigation to its original command of 32,700ha. The areas are mostly cultivated with paddy in the monsoon, although irrigation is not provided in MCII and reaches only 65% of the command area in Taladanda with limited reliability due to deteriorated infrastructure and limited water control structures, field channels, and communication systems. Cropping is limited to 28% of the area in MCII and 65% in Taladanda in the dry season, mainly due to the limited water availability. It is well diversified, with non-cereal crops accounting for 54% of the cropped area in MCII and 41% in Taladanda. The area under high-value crops (vegetables, groundnuts, and sugarcane) are also relatively

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<sup>5</sup> Economic analysis has not taken into account impacts associated with canal maintenance roads and bridges to reduce transport time, as well as follow-on impacts on non-farm sector derived from increased crop production.

<sup>6</sup> Marginal, small, and medium/large farmers are defined as those having landholdings of up to 1.0 ha, 1.0-2.0 ha, and above 2.0ha, respectively.

high, reaching 53% of the cropped area in MCII and 30% in Taladanda. In crop production, limited use of improved cereal seeds (as well as their availability) and fertilizer are issues (due partly to the unreliability of water), along with limited contacts with agriculture extension. On the other hand, the areas have good and close connectivity with key urban centers (the state capitol and nearby city with a combined population of 1.4 million) through state and national road networks to sell the market surplus of food and non-food crops.<sup>7</sup> The Program will generate several benefits. First, reliable water supply, provided through canal and field channel systems, will lead to paddy yield increases in the monsoon season, particularly in the currently non-irrigated or deprived areas. Second, irrigation will also be provided in the dry seasons, increasing the percentage of cropped area from 28% to 83% in MCII and from 65% to 73% in Taladanda, with yield increase associated with much more reliable irrigation.<sup>8</sup> The dry season cropping is assumed to have a similar cropping pattern that prevails at present with marginal increases of high value crops. The area will have a large market surplus of all crops.

**7. Three Reservoir-based Medium Schemes.** The three schemes (footnote 2) have similar characteristics, having a storage reservoir (constructed by mid 1980s) that can provide irrigation covering a part of the command area during the dry season.<sup>9</sup> All aim at restoring the design command areas with full assured irrigation for 8,300ha for Gohira, 4,310ha for Remal, and 10,000ha for Sunei. Paddy remains the predominant crop in the monsoon, and irrigation reaches about 66% of the command area in Gohira with limited reliability, and 63% in Remal and Sunei. Key constraints include the deteriorated infrastructure (particularly severe in Remal and Sunei), and limited water control structures and virtual non-existence of field channels. As a result, reservoir water is generally overdrawn in the monsoon, reducing the scope of dry season irrigation, for which present cultivation remains at 50% in Gohira, 30% in Remal, and 26% in Sunei, all with partial or no irrigation. Diversification in dry season is varied, with non-cereal crops accounting for 45% in Gohira, 15% in Sunei, and only 2% in Remal. The low figures in the latter are due to the large areas devoted to pulse, which is cropped without irrigation. High value crops are cultivated in 17% of the cropped area in Gohira, and 15% in Sunei. Productivity is constrained by limited use of improved seeds and fertilizer, of which availability is also an issue, along with limited contacts with agriculture extension.<sup>10</sup> The Program will enhance the reliability of irrigation in the monsoon season, thereby increasing the paddy yields. As to the dry season, renovation of irrigation infrastructure, placement of field channels, and improved reservoir and system operation will expand the irrigated area to 70% of the command area in Gohira, 66% in Remal, and 50% in Sunei, with increased yields.<sup>11</sup> High value crop cultivation (vegetable and groundnuts) is anticipated to reach 28–35% of the cropped area (11–20% of the command area) during the dry season. The area will have market surplus for all crops.

**8. Two MLI Schemes.** The two sample MLI schemes (Jaldha for groundwater lift and Parimukundapur for river lift) are only partially operational at present due to the deteriorated conditions of pump sets and distribution channels. At present, irrigation remains at 45% of the command area in the monsoon and the dry seasons for Jaldha, and 25% in the monsoon and 35% in the dry seasons for Parimukundapur. Paddy is the sole crop produced in both areas,

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<sup>7</sup> Many farmers have shown interest in high value cropping once reliable irrigation is made available in dry seasons.

<sup>8</sup> The reported yield levels for monsoon paddy are about 3.0t/ha for irrigated areas (albeit with unreliable supply) and 2.0t/ha for deprived areas, which is anticipated to attain 3.5t/ha after the project. For dry season crops, about 20-30% yield increase is anticipated in presently partly irrigated area, and slightly more for non-irrigated area.

<sup>9</sup> All schemes are located in lower plateau zones having slightly undulated topography.

<sup>10</sup> Although distant from the state capitol (120–250km) the subproject areas are relatively well connected with national roads with close vicinity to regional towns (population of 100,000-200,000) and industrial and mining areas.

<sup>11</sup> The reported yield levels for monsoon paddy are about 2.6-2.7t/ha for irrigated areas and 2.0t/ha for deprived areas at present, which is expected to increase to 3.2-3.3t/ha. For dry season, crop, about 20-40% yield increase is anticipated in partly irrigated area at present, and slightly more for non-irrigated area.

whereas Jaldha has small area (8% of cropped area) devoted to vegetable in the dry season, and Parimukundapur has 35% of the area cultivated with high value crops, reflecting its very good connectivity and vicinity to urban centers of the state.<sup>12</sup> The renovation will support the expansion of the irrigated area to 100% of the command in both monsoon and dry seasons (and additional 20–30% in the summer season for triple cropping), increasing the cropping intensity and yield levels, although scope for yield increase in the monsoon in Jaldha is limited due to the poor drainage conditions. It is expected that the share of high value crops will increase to 20% in Jaldha and 50% in Parimukundapur.

## **E. Assessment of Economic Returns**

9. Results of the economic analysis show that the economic internal rates of return (EIRR) for MCII, Taladanda, three medium schemes, and two MLI schemes are 18.8%, 22.7%, 19.8–22.0%, and 30.1–38.2%, respectively. Switching values were estimated to determine the maximum level of cost overrun, delay in years to achieve the benefit targets, reduced incremental benefits, and reduced cereal and non-cereal prices, at which the schemes will still be economically viable. These schemes remain economically viable with cost overruns of at least 51%, delay of 4–8 years in achieving full benefit targets, 33–54% reduction in incremental benefits, and cereal and non-cereal crop price reduction of at least 31%. A separate sensitivity analysis of smaller diversification to high value crops was also undertaken, which resulted in 12.3–17.5% EIRR under the assumption that the share of high value crops remains the same as present, for the major and medium schemes.

## **F. Impacts on Poverty**

10. The percentage of the poor in the subproject areas were variable among subprojects, at 37% in MCII extension area (population of 32,000), 22% in Taladanda (with 210,000 people), 35–69% in medium schemes (total population of 101,000, with highest poverty in Sunei), and 40% and 6% in Jaldha and Parimukundapur, respectively. Farmers in these subprojects are also predominantly marginal in size, with an average size of 1.0ha in MCII and Taladanda, 0.9–1.1ha in the three medium schemes, and 0.3–0.4ha in MLI schemes, and landless, marginal, and small farmers (up to 2ha of landholding) accounting for about 90% in major and medium schemes, and almost 100% for MLI schemes. Given that the poor households are within this group (as well as near-poor households with an average per capita daily income of \$2/day who account for 80% of the total households in India), the Program will have significant direct benefits to the poor and near-poor people. The percentage of net financial income gains that will be captured by landless, marginal, and small farmers accounts for 74–78% in major and medium schemes, and 94–100% for MLI schemes.

11. Poor people will also benefit from increased opportunities for family and hired on-farm labor. Annual on-farm labor opportunities are estimated to increase by 1.56 million days for MCII and Taladanda combined, and 0.94 million days for the three medium schemes, of which 0.88 million days and 0.72 million days will be hired labor opportunities. It is anticipated that most hired labor opportunities will be provided to the landless and marginal farm households with less land. The incremental labor amounts to 35–97 days per landless and lower half of marginal family household for major and medium schemes, and 21–24 days for MLI schemes.

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<sup>12</sup> Jaldha scheme is also closely connected with state and national roads.

**TABLE A11. SUMMARY OF FINANCIAL AND ECONOMIC ANALYSIS**

Item	MCII (Expansion)	Taladanda (Renovation)	Gohira/Remal (Renovation)	Jhalda (Renovation)
<b>Command Area (ha)</b>	5,937	32,684	8,304/ 4,313	20
Presently Partly/Fully Irrigated	317	21,383	6,030/ 2,729	9
Presently Non Irrigated/ Deprived of Irrigation	5,620	11,301	2,274/ 1,584	11
<b>Households</b>	5,840	31,300	11,010	60
Landless	590 (10%)	2,700 ( 9%)	890 ( 2%)	11 (18%)
Marginal (Up to 1.0ha)	2,950 (51%)	16,700 (53%)	7,200 (65%)	47 (78%)
Small (1.0-2.0ha)	1,670 (29%)	8,400 (27%)	1,660 (17%)	2 ( 3%)
Med/Large (Above 2ha)	630 (10%)	3,500 (11%)	1,260 (16%)	0 ( 0%)
<b>Population</b>	32,000	210,000	47,000	60
<b>Incremental Net Crop Revenue (Rs'000)</b>	119,000	337,000	86,000/48,000	300
<b>Subproject Cost (Rs'000)</b>	436,000	1,064,000	294,000/172,000	556
<b>Economic Internal Rate of Return %</b>	18.8	22.7	22.0/ 19.8	30.1
<b>Economic Net Present Value (Rs'000)</b>	160,000	624,000	161,000/ 68,000	629
<b>Switching Values</b>				
Cost Overrun (%)	51	88	77/ 55	>100%
Benefit Delay (years)	4.5	6	7/ 5	8
Incremental Benefit Shortfall (%)	33	45	42/ 34	54
Cereal Crop Price Reduction (%)	-	-	- / 41	84
Non-cereal Crop Price Reduction (%)	31	48	40/ 48	46
<b>Sensitify Analysis</b>				
EIRR at same high value cropping share	14.8	17.5	16.6/ 13.9	20.2
<b>Financial Internal Rate of Return (%)</b>	15.0	18.7	18.8/ 17.8	21.3
<b>Incremental Income per Household (Rs)</b>				
Landless	4,180	2,750	3,720/ 3,790	1,220
Marginal	17,460	9,130	9,450/ 8,980	5,680
Small	23,790	12,900	12,480/11,670	16,730
Med/Large	43,400	21,750	23,030/21,430	-
Average	20,380	10,770	10,940/10,650	5,000
<b>Average Incremental Income (Rs/ha)</b>	20,040	10,310	10,360/11,130	15,000
<b>Project Investment Cost Contribution (Rs/ha)</b>	1,303	1,010	1,302/ 1,303	3,805
<b>Annual O&amp;M Cost (Rs/ha)</b>	569	532	509/ 469	2,300
<b>O&amp;M as % of Incremental Income (average)</b>	2.8	5.2	4.9/ 4.1	15.3
<b>Incremental Annual Labor Inputs ('000 days/year)</b>	435	1,120	312/ 179	2.14
<b>Incremental Hired Labor ('000 days/year)</b>	200	680	238/ 128	0.84
<b>Crop Production ('000 tons)</b>				
Total (Without Project/ With Project)	25.0/53.9	175/267	40.7/ 66.9	0.067/0.137
Food Grains (Without Project/ With project)	13.0/18.3	87/110	31.0/ 41.7	0.056/0.079
High Value Crops (without Project/ With Project)	9.4/27.1	42/ 76	9.1/ 23.8	0.011/0.054
Others (Without Project/ With Project)	2.6/ 8.5	46/ 81	0.6/ 1.4	0.000/0.004
<b>Poverty Incidence</b>	37%	22%	35%/ 44%	40%
<b>Share of Net Benefits (%)</b>				
Landless and marginal farmers	45%	46%	52%/ 49%	89%
Small	33%	31%	22%/ 26%	11%
Medium/Large	23%	22%	26%/ 25%	-

Figures for household number and crop production for Gohira and Remal are combined totals of the two.

O&M = operation and maintenance

Source: Asian Development Bank estimates.

## 12. SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

### A. Linkages to the Country Poverty Analysis

Is the sector identified as a national priority in country poverty analysis? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the sector identified as a national priority in country poverty partnership agreement? <input type="checkbox"/> Yes <input type="checkbox"/> No
<p><b>Contribution of the sector or subsector to reduce poverty in Orissa:</b>                  India's 10<sup>th</sup> Five Year Plan (2002-07) focuses on promoting equitable growth through sustainable agriculture, irrigation and rural development. Agriculture, irrigation, and rural development are an important components of the state of Orissa. According to the 5 year plan (2002-2007) of the Irrigation sector and draft Vision 2020, increased productivity in agriculture is the primary means to reduce poverty since the overwhelming majority of the poor live in rural areas. Irrigation sector would contribute tremendously to increase the farm incomes of marginal and small farmers who constitute about 80% of the total cultivator population. The sector would improve the existing condition of labor intensive agro based industry and would also provide job opportunities for unemployed and marginal workers.</p> <p>In Orissa, poverty is predominantly a rural phenomenon, as more than 80% of the poor live in rural areas and are engaged predominantly in agriculture and related non-farm activities, For them, access to and control of irrigation water are of fundamental importance as water is the foundation for many livelihood activities, including agriculture, pisciculture, agro-forestry, and livestock. Irrigated agriculture is a major source of food and income for rural households below and above the poverty line who depend on irrigation, including smallholders and tenant farmers who make up the majority of cultivators. Sufficient and timely access to irrigation reduces vulnerability risk and increases livelihood security. Therefore, ensuring equitable and secured access to irrigation water and participation in water management has a major impact on the livelihood opportunities for poor rural people.</p> <p>The Orissa Integrated Irrigated Agriculture and Water Resources Management Investment Program (the Program) will contribute to increased agricultural production, improve food security and increase the household income of farmers, water users and poor rural people. The project consists of rehabilitation of the irrigation infrastructure, including canal lining, field channels, regulators and retention structure, sluices, outlets and water ways improvement. Through the expansion of the irrigated area, and by providing water in the dry season (rabi), and improving the agricultural farming systems, the project will improve crop yields due to double cropping (in kharif and rabi), diversify agricultural production and support pisciculture in reservoirs and canals. The formation of water user associations or pani panchayat (PP) will empower farmers and other water users to manage water and organizational affairs effectively. Agricultural improvement and livelihood enhancement, implemented by water user organizations, are particularly targeted at small and marginal farmers who constitute part of vulnerable group in the irrigation subprojects.</p> <p>Group mobilization will motivate farmers and disadvantaged groups alike to overcome barriers to organization into larger units, and form PPs, thus enabling them to better cope with risk, and improve access to agricultural technology, agricultural markets, fertilizers and seeds. Group formation is a strategy to cope with small land size and land fragmentation, and to achieve critical mass not just for easier access to agricultural inputs easier, but also for sustainable operation and maintenance of the irrigation system by means of collective water tax collection and join organization of renovation works. In terms of poverty reduction, the empowerment of the PPs and the livelihood component are expected to provide positive impact for the poor and vulnerable groups; many of them are marginal and subsistence farmers, sharecroppers and agricultural laborers. With a more dynamic rural economy through irrigated agriculture, a multiplier effect of growth in the non-agricultural sector is expected.</p>	

### B. Poverty Analysis

#### Targeting Classification: General Intervention

According to the project feasibility study reports of the five major and medium irrigation schemes and two sample minor lift irrigation schemes, the majority of the farmers in the subproject area are landless people and marginal farmers (14% and 55-60%), followed by small farmers (25-28%), and medium-sized (6-8%) and large (2-3%) holdings. The subproject area has a poverty incidence of 20-69% (in 2007) as against the State average of 47% (in 2000). As many as 6.5% of the total households are below the "absolute poverty line" in terms of caloric intake and access to resources. Around 14% of the poor are landless and 58% are marginal farmers. The higher poverty incidences are seen amongst the scheduled tribes (SG)

and scheduled castes (ST).<sup>1</sup> The caste groups are mainly occupational. As ST and SC are particularly poor illiterate, and own less land than higher and general caste people hence are disadvantaged. They, together with women, are referred to as vulnerable people.

Surveys conducted during project preparation noted that agricultural operations are seasonal and single crop (during monsoon, kharif) without irrigation, which provides only for subsistence agricultural outputs and employment only for about six months in a year. This leads to underemployment and poverty for less than half the year. Besides, the size of landholdings and subsistence cropping pattern of the poorest people do not give enough yields for food processing and marketing of agricultural produce. Unless there is multiple and intensive cropping most of the people will remain only partially employed. Ancillary occupations such as animal husbandry and poultry farming are not very developed, which could have provided substantial employment. About 1.5% of the sample household is earning less than Rs.500 (\$12.5) per month, which is Rs.6,000 per year for an average family size of 6.4.

The community expectations of the benefits and impacts of the project are (i) increased agriculture and fish production, (ii) more opportunities for disadvantaged groups to become involved in farming and non farming activities, and (iii) increased income opportunities. All interviewed women expected to benefit from the subproject mainly by employment and income generation through improved post harvest work, livestock and fish production, farm and homestead production, cottage industries, improved water supply and sanitation services, and access to credit.

### C. Participatory Process

Is there a stakeholder analysis?  Yes  No  
Is there a participation strategy?  Yes  No

A participatory process was used during the project preparatory stage and discussions were carried out with women, the landless, ST and other vulnerable groups in the subproject areas using participatory rapid rural appraisal (PRRA) techniques. An inventory of local needs was prepared, covering problems/constraints on (i) water resources in relation to agriculture, fisheries, transport, environment, and other uses; (ii) possible solutions to resolve the identified constraints including both its positive and negative impacts on various local interest groups; (iii) implications of solutions for poverty reduction; and (iv) prioritizing water resources needs compared with other development needs. The role of service providers, people's willingness to contribute to O&M, and the scope of enhancing impacts of water interventions with others such as micro credit, and extension services were also discussed. Nongovernment organizations (NGOs) were engaged to facilitate this process, which identified the future actions to institutionalize community participation in the expected implementation areas.

Agricultural benefits constitute the largest part of the total project benefits and are likely to accrue mainly to landowners, most of whom are marginal and small farmers who are also poor or near poor in the subproject areas. The project design ensures that the poorer population, including the landless, marginal farmers, and women attain a certain share in the distribution of the income growth benefit from the project through increased agricultural production and employment opportunities. The poor will benefit from shared cropping and labor income as the land area will increase and the poor will be hired on a wage basis to cover the increased labor needs of medium-sized and large landholders. In addition, labor for earthworks and other project-related construction and maintenance work will be drawn from poor households, with preference for destitute women.

The primary purpose of a participatory process is to promote transparency, success, and sustainability, and prevent delays and manage conflicts. The activities supported under the loan will focus on empowering water user associations (WUAs) and their federations in governance of irrigation systems. Irrigation field staff of Department of Water Resources (DOWR) and contracted NGOs/training institutions will assist in establishing and strengthening WUAs. WUAs will prepare cropping plans, enter into irrigation management agreements with the DOWR, take over governance of the scheme, and undertake O&M and improvement activities on a cost-sharing basis. NGOs will provide leadership and confidence-building

<sup>1</sup> The percentage of ST and SC in the sample households are: Taladanda (32,630ha: 5% and 22%), Mahanadi Chitropala Island (5,940ha: 0% and 16%), Gohira (8,300ha: 20% and 23%), Remal (4,320ha: 18% and 26%), Sunei (10,000ha: 1% and 63%), Jhalda (20ha: 17% and 3%), and Parimukundar (40ha: 0% and 0%). Indigenous people's specific actions have been prepared for Gohira, Remal, and Sunei subprojects.

training for organizational and capacity building among the poor and women's groups in preparation for developing independent WUAs capable of managing and operating their schemes. During the process, particular efforts will be provided to the due representation of women and other vulnerable groups in the decision making system of the WUAs, through the village facilitators selected and trained by the NGOs. WUA subgroups of vulnerable people will be formed through these NGOs and facilitators, and facilitated to form an effective linkage with the district administration so that the subgroup will be able to attain the benefit of existing poverty reduction programs such as self-help groups. The project will also deliver specific programs to enhance the livelihood of the WUA vulnerable peoples' subgroup to supplement those existing poverty reduction programs.

#### **D. Gender Development**

##### **Strategy to maximize impacts on women:**

In the project area, all Hindu castes and most of the tribal groups are patrilineal and follow a patrilocal residence at marriage. As political decision making and legislature is dominated by Brahmin and Chetri, access to resources, assets, power, decision making, labor and responsibility in decision making is male dominated. These social norms limit women's participation in political and other forms of decision making that may affect their lives. The restrictions are particularly hard to overcome for women who head households, whether as widows or through divorce or abandonment. Women workers earn considerably less than male workers and there is persistent lower average calorie consumption for females, indicated by higher severe malnutrition, mortality, and morbidity rates for girls and women than for males.

Women are important producers of homestead crops and livestock, and their post harvest activities contribute over 50% of the value of crop produce. The division of labor is prescribed by social norms that by tradition limit women to remaining in seclusion in the immediate household area. Women therefore do not take produce to market or interact in public with men except in ST dominated area. These restrictions on women's mobility also limit their capacity to control the proceeds of their labor or to access extension services, especially when male officers deliver the services. Women also have little or no access to land other than through their relationship with male family members.

The gender and development strategy includes various steps to enhance women's access to information, participation in irrigation management institutions, ability to protect their interests and improve their livelihoods. The project will give specific attention to employment of female staff at all levels and train field staff in gender-sensitive and participatory planning and project implementation. Furthermore the Gender Action Plan (GAP) will ensure (i) employment opportunities generated by the project and O&M works, (ii) train women to be involved in WUAs and all aspects of O&M; (iii) support women's work in farm and homestead production; (iv) strengthen the extension system to be gender-equitable to ensure its effectiveness; (v) identify and respond to women's agricultural and household needs for technology in close collaboration with implementing agencies and NGOs; (vi) support women in their home-based post harvest production and marketing activities, (vii), improve processing of agricultural produce and diversify to high value vegetable production, (viii), supporting credit and saving groups, (ix) provide women with training in crop and horticulture production, poultry and small livestock rearing, fisheries and processing.

One Social Development/Gender specialist will be posted in the project management unit of DOWR to further develop and implement the GAP, and to supervise social development and gender specialists engaged through NGOs who will be posted in the field to implement and monitor the GAP, which includes:

- (i) 33% reservation in WUAs
- (ii) 25% of women and indigenous community to be trained in WUA operations and farmer's training to enhance the existing farming skills and knowledge about diversified crops and livelihood opportunities by establishing self help groups (credit and saving for instance)
- (iii) 30% job opportunities during construction phase
- (iv) Provision for equal wages during construction at par with men
- (v) Sensitize DOWR about the gender concerns and mainstreaming gender issues

**Has an output been prepared?**

Yes. GAP is in Supplementary Appendix I.

No

### E. Social Safeguards and Other Social Risks (Project 1)

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
<b>Resettlement</b>	<input checked="" type="checkbox"/> Significant (One scheme)  <input checked="" type="checkbox"/> Not significant (Other schemes)  <input type="checkbox"/> None	<p>Not significant, except for Mahanadi Chitropala Island irrigation scheme where branch and minor canal systems will be expanded to complete the original scope of the investment project and a full resettlement plan is being prepared. For other schemes, the project aims at improving the operational sustainability of existing major and medium-scale irrigation schemes. All renovation works can be completed within the existing right of way. A resettlement framework has been prepared to provide a basis to address resettlement impacts under the present and future subprojects.</p>	<input checked="" type="checkbox"/> Full  <input type="checkbox"/> Short  <input type="checkbox"/> None
<b>Affordability</b>	<input type="checkbox"/> Significant  <input checked="" type="checkbox"/> Not significant  <input type="checkbox"/> None	<p>The project envisages beneficiary contribution of 5% of the investment costs for minor canal systems, 10% for command area development, and 20% for community-based minor lift irrigation, along with the cost of O&amp;M. The affordability assessment suggests that the required contribution is well within the incremental income brought about by the project interventions.</p>	<input type="checkbox"/> Yes  <input checked="" type="checkbox"/> No
<b>Labor</b>	<input type="checkbox"/> Significant  <input checked="" type="checkbox"/> Not significant  <input type="checkbox"/> None	<p>Project will not result in lay-offs, so no specific retrenchment plan is required. Labor-intensive irrigation O&amp;M and rehabilitation activities will create local employment opportunities. The initial construction repair phase will provide significant employment opportunities and later in the project, job opportunities will increase due to improvement in cropping intensity and agro based industry</p>	<input type="checkbox"/> Yes  <input checked="" type="checkbox"/> No
<b>Indigenous Peoples</b>	<input type="checkbox"/> Significant  <input checked="" type="checkbox"/> Not significant  <input type="checkbox"/> None	<p>Out of 7 subprojects, 3 subprojects have relatively high share of ST population as project beneficiaries settling in the command area. The ST issues have been addressed through an Indigenous Peoples Specific Actions and a separate indigenous peoples development framework has been prepared to address the issue for future subprojects.</p>	<input type="checkbox"/> Yes  <input checked="" type="checkbox"/> No
<b>Other Risks and/or Vulnerabilities</b>	<input type="checkbox"/> Significant  <input type="checkbox"/> Not significant  <input checked="" type="checkbox"/> None	<p>The project does not envisage any adverse impacts or risks for the beneficiaries. The proposed project will in fact reduce risk and uncertainty vis-à-vis unreliable water supply due to failing public irrigation and drainage system, over dependency on monsoon, frequent crop failure, inefficient O&amp;M due to lack of community awareness and participation thus, gradually changing people's attitudes towards participation and giving more opportunity.</p> <p>Governance concerns will be addressed by the participatory approaches to the project planning and implementation and other specific measures incorporated to improve transparency and accountability. Open meetings, open books, audits, posters, and legal empowerment of WUAs will also prevent corruption and promote accountability.</p> <p>The participatory principle of the project design will develop project ownership among stakeholders and this, in turn, will enhance the project sustainability. The cost-sharing mechanism will relieve the government of significant financial costs in subsidizing O&amp;M, and government financial assistance will be more effectively used for sustaining and further expanding the reforms.</p>	<input type="checkbox"/> Yes  <input checked="" type="checkbox"/> No

## 13. SUMMARY RESETTLEMENT FRAMEWORK

1. **Scope and Impacts.** The Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program) aims to enhance the productivity and sustainability of irrigation systems in the four northern river basins plus a part of the Mahanadi river delta. Following the modality of multi-tranche financing facility (MFF) and envisaging the coverage of five major and nine medium irrigation schemes, and up to 1,400 community-based minor lift irrigation (MLI) schemes, its specific scope includes: (i) participatory planning with strengthening of water user associations (WUAs); (ii) renovation and extension of irrigation and associated infrastructures including field channel systems; (iii) agriculture and allied sector support and livelihood enhancement of the poor; and (iv) monitoring and support for sustainable operation and maintenance (O&M), along with project management and institutional development. All are existing schemes proposed for renovation, except for one scheme (Mahanadi Chitropala Island Irrigation [MCII] project) that will expand its canal systems to about 5,940 ha of new command area to complete its original scope of investment.

2. For the purpose of the first Project under MFF, feasibility studies were undertaken for two major, three medium, and two MIL subprojects including MCII subproject. This resettlement framework (RF) outlines the policy, procedures, and institutional requirements for preparing and implementing resettlement plans (RPs) for the subprojects to be included in the Program.

3. **Resettlement Policy.** Resettlement will be implemented in accordance with the Land Acquisition Act and the National Policy on Resettlement and Rehabilitation 2007 (Government of India), the Orissa Resettlement and Rehabilitation Policy 2006, and the relevant Asian Development Bank (ADB) policies and operations manuals, in particular the *Policy on Involuntary Resettlement* (1995) and Operations Manual F2 on Involuntary Resettlement (2003).

4. **Resettlement Principles, Entitlements, and Procedures.** The RF applies to all involuntary resettlement effects—including displacement of non titled people—arising from land acquisition or conversion, or any other effects that arise from the project works including the effects on people with no title to the land. Those affected will be entitled to maintain at least their standard of living at preproject level, and to receive compensation for all types of losses including land, crops, trees, structures, and any other assets at full replacement value. Affected households will receive: (i) an additional cash grant to match replacement value to supplement the grant provided by the district collector, and (ii) other resettlement assistance such as shifting allowances and compensation for loss of workdays and income due to dislocation. Households belonging to scheduled tribes, if any, will be eligible for further cash assistance for relocation and house reconstruction. People involuntary displaced will receive priority assistance under the Program's livelihood enhancement subcomponent.

5. The types of loss and entitlements will cover: (i) loss of title holders (including agriculture land, homestead land and assets, commercial land and structure, residential tenancy and commercial tenancy); (ii) loss of non title holders (including agriculture land possessed by informal tenants [including sharecroppers], squatters and encroachers, homestead land and/or homestead and commercial structure possessed by informal tenants, squatters and encroachers, shifting business, and kiosks); (iii) loss of livelihoods (loss of wage earnings, incomes from non-perennial and/or perennial crops such as fruit trees); (iv) additional support to vulnerable group including negative impacts on scheduled tribe family; (v) loss of community infrastructure/common property resources; and (vi) any other impacts (temporary impacts during

construction of canals, and any other unforeseen impacts). The specific details of the entitlements are shown in the Resettlement Framework.

6. **Institutional Responsibilities and Procedures.** The project management unit (PMU) has overall planning, financing, and supervisory responsibility for preparing and implementing the RPs, with the support of the consultants, including capacity strengthening and monitoring. PMU will have land acquisition and resettlement manager assigned from among the senior staff of the Resettlement and Rehabilitation (R&R) directorate of the Department of Water Resources (DOWR), and guidance of the project director. The specific works will be carried out by the subproject implementation offices (SIOs), which will have a specialized resettlement unit comprising experienced officers from R&R directorate in case of any subprojects requiring the preparation and implementation of the resettlement plan. The PMU will engage experienced non-government organizations (NGOs) to assist in the process with the support of the consultants. For future subprojects, the PMU with the assistance of the consultants, will undertake assessments on social impacts and resettlement due diligence will be undertaken based on preliminary technical designs, and full or short RPs will be prepared as necessary. The draft RPs as prepared will be submitted to ADB for approval.<sup>1</sup> Affected persons (APs) will be fully compensated before award of the relevant civil works contracts.

7. **Disclosure, Consultation, and Grievances.** The RP will be prepared and implemented in close consultation with the stakeholders and will involve focus group discussions and meetings with the APs, with disclosure of information in the form of brochures written in the local language. Copies of the RF and draft RPs will be distributed among NGOs and community groups prior to finalizing the engineering design. They will also be disclosed on the ADB website. A grievance redress committee (GRC) will be established headed by district collector and comprising representatives of the APs, local governments, and the NGOs to resolve any AP grievances. People's participation will also be ensured by including APs representatives with NGO facilitation in the district compensation advisory committee.

8. **Monitoring and Evaluation.** DOWR, with assistance from the consultant resettlement specialist, will establish a monthly monitoring system involving PMU, SIOs, and implementing NGOs, and prepare progress reports on all aspects of land acquisition and resettlement (covering staff appointment and capacities, planning, scheduling and budgeting; delivery of entitlements; consultation, grievance, and other issues; and resettlement impacts) in the quarterly reports. An annual report stipulating all efforts and outcome will be submitted to ADB. External monitoring will also be assigned to an independent local agency, which will review the progress and performance of RP preparation and implementation and report the findings and recommendations to DOWR and ADB.

9. **Resettlement Cost.** The cost of land acquisition and resettlement is estimated at Rs190 million (\$4.7 million) including NGO services. The Orissa state government will provide the entire fund for land acquisition and resettlement, and will guarantee meeting unforeseen obligations in excess of the budget estimate to meet the resettlement objectives.

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<sup>1</sup> In the event that the RPs are revised with the process of the detailed designs, such revised RPs will also be submitted to ADB for approval.

## 14. SUMMARY INITIAL ENVIRONMENTAL EXAMINATIONS

### A. Introduction

1. In accordance with Asian Development Bank (ADB) guidelines, initial environmental examinations (IEEs) were carried out as part of the project preparatory technical assistance (PPTA) for the Orissa Integrated Irrigated Agriculture and Water Management Investment Program (the Program). The IEEs assessed the environmental implications of the specific loan interventions and identified mitigating measures. In view of the diversity, scale and extent of the project interventions, IEEs for all major and medium scale irrigation subprojects for the first tranche of the multitranche financing facility (MFF Project 1) were prepared, along with the IEEs for sample subprojects for community-based minor lift irrigation subprojects: Gohira (medium irrigation), Taladanda (major irrigation), Mahanadi Chitropala Island (major irrigation), Remal (medium irrigation), Sunei (medium irrigation), Jaldha (minor lift irrigation), and Parimukundapur (minor lift irrigation). The Project 1 has been classified as environmental category B.

2. The Program focuses on planning within the five contiguous basins of the state by adopting a basin management approach to support the State's critical agenda for enhancing the productivity and sustainability of existing underutilized major, medium and minor (lift) irrigation projects. The basins include Brahamani, Baitarni, Buda Bangla and Subernarekha (covering 29% of the State's geographical area and support 33% of the overall population). It also includes part of Mahanadi Delta Stage-I areas. The Program aims to reduce the regional imbalance in infrastructure development and to increase the productivity including remote tribal areas through sustainable water management with participatory irrigation management (PIM) and adopting an integrated water resources management (IWRM) approach.

### B. Environment Conditions for the Program Areas

3. Orissa is rich in surface and ground water resources, and receives approximately 231 billion cubic meters (bcm) of rainfall annually, of which approximately 80% flows to the ocean as surface run off.<sup>76</sup> There are a total of 11 river basins in Orissa as a whole, of which the Mahanadi is the biggest river system. The state covers 155.7 square kilometers of area, and its land utilization comprises cultivated area (45%), forest (37%), non-agricultural land (6%), barren land (5%), and others (7%). The forest area has rich flora and fauna,<sup>77</sup> but is increasingly under pressure due to illegal logging, fuel wood collection, agriculture/pastoral encroachment, forest fires, mining, and other related developmental activities. The natural regeneration in many forests is poor due to forest fire. Intense grazing and other human activities, invasion of exotic species, and loss of endemic flora and fauna are other problems related with forest degradation.

4. While the State's water resources are overall abundant, river flows have high spatial and temporal variation due to high concentration of rainfall within a period of 80 days in a year. As such, the available flow cannot provide irrigation to the full command area of most irrigation systems. In addition, the state has substantial mineral deposits whose exploitation is posing increasing pressure on the environment, in particular on water quality. The ongoing and planned industrial development is adding further pressure and concern. These call for coordinated water use within and among the irrigation and other users in particular for the lean season, and effective monitoring and regulation of water quality within the context of IWRM.

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<sup>76</sup> The average availability of surface and groundwater amounts to 120 bcm and 13 bcm, respectively, amounting to 3,280 cubic meters and 340 cubic meters per capita, respectively, in 2001.

<sup>77</sup> There are six main forest types found in the State of Orissa, namely Tropical Semi-evergreen, Tropical Moist Deciduous, Tropical Dry Deciduous, Subtropical Broad leaved Hill, and scattered Littoral and Mangrove forests.

5. The project strategy of rehabilitating the existing schemes in an effort towards improving the reliability of diversion and efficiency in water use with institutional development will mean that potential environmental impacts will generally be positive. Potential environmental concerns include water use conflicts and quality deterioration in areas of water scarcity, particularly in the dry season. Water and soil quality may also be affected as a result of enhanced agricultural activities in the concerned schemes. Given that subproject works are generally on a small scale and confined to existing agricultural lands, they can be kept minimal with little cumulative impacts, through due environmental consideration to screening, planning, and implementation.

C. Summary of IEEs prepared for Subprojects

6. **Subproject Description.** Key features of the subprojects are summarized as below.

**Table 1: Summary of Scope of Principal Works for examples of the Core Subprojects**

Item	Major: Taladanda and Mahanadi Chitopala Island (MCI)	Medium: Gohira, Remal, and Sunei	Minor Lift: Jaldha and Parimukundapur
Location	Mahanadi delta (stage-I area)	Gohira: Brahmani basin Remal: Baitarani basin Sunei: Budhabalanga basin	Jaldha: Subernarekha basin Parimukundapur: Brahmani basin
Subproject type	Taladanda: Renovation MCI: Extension	Renovation	Renovation
Command area	Taladanda: 32,700ha MCI: 13,300ha (5,940ha new)	Gohira: 8,300ha; Remal: 4,310 ha; Sunei: 10,000ha	Jaldha: 20ha (groundwater) Parimukundapur: 40ha (river)
Nature and scope of headwork/canal network improvements	Taladanda: Canal system renovation (83km main, 115km distributary, and 386km minor), cross regulators, inspection roads and bridges, minor drainage, and command area development (CAD) MCI: Extension of branch (52km) and minor (61km), and ancillary structures (e.g., cross drainage works, canal bridges), CAD	Combined Total: Minor repair of reservoir facilities, canal renovation (96km distributary and 234km minor), ancillary facilities (cross regulators, inspection roads, drop structures, etc.), CAD	Jaldha: Electrical installation, pump house renovation, buried distribution system with distribution box, CAD. Parimukundapur: 2 pump units, electrical installation, distribution systems with distribution box, CAD

Source: Asian Development Bank.

7. The above physical works will be accompanied with necessary support for institutional strengthening including WUA strengthening, agriculture and allied sector support services such as agriculture extension and exposure visits, and livelihood enhancement of the poor to support their capacities for income generation.

8. **Potential Environmental Impacts and Mitigation Measures.** Based on the environmental assessment of the subprojects, the following impacts and mitigation measures have been summarized for the OIIAWMP.

**Table 2: Summary of Potential Environmental Impacts and Mitigation Measures**

Impact	Mitigation Measures
<b>Construction Phase</b>	
<b>Physical Environment</b>	
<u>Stability of the embankments:</u> The slope stability of the embankments may be affected adversely during the construction phase due to adjacent canal excavation work in Taladanda and MCII. There is also a possibility of small scale erosion. To minimize this, the construction methods will control surface erosion as far as is practical.	The construction activities will be strictly carried out employing sound technology. Blasting will not be allowed. Cut and fill mass management methods will be applied. Protective measures such as construction of protection walls, catchments, drains and plantations will be adopted in areas with erosion problems.
<u>Air-borne dust:</u> The construction activities will temporarily increase the level of dust particles in the surrounding area.	Use of masks or dust guards among the labourers will be encouraged, with regular sprinkling of water during the day.

Impact	Mitigation Measures
<u>Water quality:</u> Water in the streams may get polluted due to the construction works. The impact will be direct, low, local and short term during the construction phase only.	The project will design the drainage systems by considering the flow, conveyance, disposal of surface water runoff from the construction works (e.g., with check dams).
Given the limited space on the access roads to the subproject sites for two way vehicular traffic, there is an increased chance for vehicular and other accidents.	To minimize the accidents, proper road safety measures will be adopted. The road safety guidelines and codes by the Department of Road will be followed. This should be clearly communicated to the residents close to the work sites.
<u>Construction debris:</u> The mismanagement of unused construction materials may have long term implications.	After completion of construction activities, the construction debris and excess debris will be reused where possible.
<b>Biological Environment</b>	
<u>Water born pathogens in non-irrigated areas:</u> increased chance of water borne vectors	At present this is a significant problem in non irrigated areas contributing to greater incidence of disease. Farmers will be trained in safer farm practices (including health aspects) which will enable them to help reduce breeding grounds etc.
<u>Vegetation and other resources:</u> Most of the forests along the canal alignment will be government owned land. The impact on these resources is expected to be limited as they are already developed.	Loss of vegetation will be minimized through judicious site clearance and adoption of appropriate protection measures. Temporary loss of vegetation at the work site will be re-vegetated after the completion of the civil work. The directives of the Ministry of Environment and Forests and the Soil Conservation cell of the Department of Water Resources will be strictly followed. During re-vegetation, local species identified during the survey will be used.
<b>Social, Economic and Cultural Environment</b>	
<u>Disruption due to rehabilitation works:</u> The subprojects may partially damage the existing, irrigation canals, local common facilities etc.	Careful planning will be done to avoid any damage to existing infrastructure. Budgets will be allocated to avoid funding problems at a later stage or after work completion.
<u>Occupational safety:</u> Occupational safety issues and public health concerns will be the most important component during the construction phase in the absence of attention to personal accident coverage for construction labourers.	Safety related local orientations to the work force and the field staff will be carried out on a regular fixed basis. A first aid box and medical facilities will be made available at the worksite.
<b>Planning and Operational Phases</b>	
<b>Physical Environment</b>	
<u>Water Balance Requirements:</u> Uneven water flows/ imbalances if not monitored correctly could negatively affect downstream users and habitats.	While the water use pattern of the schemes have been developed within the existing water balance (and the impacts are deemed insignificant with most schemes which are focused on rehabilitation and relatively small extension works), available flows need to be carefully monitored, and water use needs adjusted at times of very low flows through effective communication with WUAs (within the scheme) and between DOWR and different water users (in case of subprojects in the Mahanadi delta stage-I). <sup>78</sup> Infrastructure design and operation will also incorporate proportional offtakes and canal rotations in water shortage periods.
<u>Increased use of Agriculture Chemicals:</u> The rehabilitated infrastructure and subproject programs will enhance agriculture productivity that may cause soil and water contamination due to increased agrochemical use and livestock activities, reduced soil nutrients.	These impacts will be mitigated by including sustainable land use practices in agriculture extension, such as promoting organic-based practices, optimal use of fertilizers with provision of soil testing kits, and extension services on integrated pest management.
<u>Soil Erosion:</u> The proposed rehabilitation works will be designed to strategically minimize soil erosion. There may be several unstable embankments.	A sustainable approach to control soil erosion will be brought into practice. This could be developed through local maintenance groups.
<b>Biological Environment</b>	
<u>Maintenance:</u> Regular maintenance of the canal works and environmental mitigation measures are not routinely carried out during the operation phase which may result in the gradual degradation of the environmental protection measures adopted during the construction phase.	An innovative and sustainable approach to maintenance of the infrastructures, thus created, will have to be brought in to practice. This could be developed through the Water User Associations (WUAs) for whom there are direct incentives involved.

DOWR – Department of Water Resources, WUA – Water User Associations

Source: Asian Development Bank

<sup>78</sup> Overall water balance at Mahanadi is regularly reviewed by DOWR to closely monitor flow utilization by various users, particularly, domestic and industrial users who may have increasing future requirements. Downstream environmental flow of 150m<sup>3</sup> as given in Mahanadi River Basin Plan (2004) will also be examined.

9. **Public Consultation.** Public consultation and disclosure was completed during the PPTA in the subproject areas. Activities consisted of disseminating project information among stakeholders combined with household surveys and focus group discussions. Stakeholders' views of the proposed project and their concerns have been taken into account and incorporated into the project design. Specific details of this are provided in individual IEE reports that have been prepared. Continued public participation from design till operation will be an important aspect of all subproject works, which will be carried out through the WUAs.

#### **D. Institutional Arrangements**

10. At the Department of Water Resources (DOWR) headquarters level, a central project management unit (PMU) will be set up and will be responsible for overall implementation of the project including environmental management plan. The PMU will have an environmental cell comprising a senior environmental engineer having sufficient experience in environmental management of irrigation projects who is engaged from local market, along with designated environmental engineers of Orissa Planning Organization of DOWR. The environmental cell will bear overall responsibility for preparing the IEE/environmental impact assessment (EIA) reports of the further subprojects under the MFF in coordination with the external agencies, obtaining environmental clearances (ECs) as necessary, and implementation of environmental management plans at the subproject level. At each subproject level, subproject implementation office (SIO) will be set up, where an assistant executive engineer will be assigned as chief officer responsible for environmental management. A total budget of \$770,000 has been incorporated to cover the necessary costs for IEE/EIA reports of further subprojects, and staffing including institutional strengthening activities.

11. Based on the IEE and stakeholder consultation and following the ADB guidelines and the Government's environmental requirements,<sup>79</sup> project specific environmental assessment and review framework (EARP) were prepared.<sup>80</sup> Under the EARP, environmental considerations are made fundamental to the OIIAWMP approach and will be introduced from a very early stage of subproject selection and planning.<sup>81</sup> Emphasis will be placed upon incorporating environmental considerations into each stage of the subproject cycle. For example: avoidance of environmental damage as far as possible through proper planning; minimization of the damage risk through environmentally sensitive design and the use of sound technology; and control of potential damage through proper management practices employed during the implementation phase. The proposed environmental planning and mitigation works have been elaborated in detail in the environmental management plan and have been further expanded in the EARF document where efforts have been made to ensure that this work is consistent with the environmental guidelines of the State and National Government.

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<sup>79</sup> Including the Environment (Protection) Act 1986, Environmental Impact Assessment Notification 2006, Water and Air Acts, Forest Act 1980, and Wild Life Act 1972, among others.

<sup>80</sup> In the context of MFF Project 1, DOWR/PMU will be responsible for preparing environmental assessment for about 300 minor lift irrigation schemes envisaged to be identified during the implementation period following the EARF.

<sup>81</sup> The environmental impacts of the proposed subprojects will ultimately depend on type, size, and location. The EARF has incorporated (i) environmental criteria for subproject eligibility, planning, design and implementation; and (ii) individual screening and assessment of each subproject as to the potential impacts on the environment.