

**PROJECT DOCUMENT**  
**OF**  
**THE ASIAN INFRASTRUCTURE INVESTMENT BANK**

**Republic of Indonesia**  
**Strategic Irrigation Modernization and Urgent**  
**Rehabilitation Project**

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## CURRENCY EQUIVALENTS

(As of April 30, 2018)

Currency Unit	-	Indonesian Rupiah (IDR)
IDR1.00	=	USD0.000072
IDR 13,912.00	=	USD1.00

## FISCAL YEAR

January 1 – December 31

## ABBREVIATIONS AND ACRONYMS

AIIB	Asian Infrastructure Investment Bank	KOMIR	Komisi Irigasi (Irrigation Commission)
APBN	State Budget (Anggaran Pendapatan dan Belanja Negara)	MPWH	Ministry of Public Works and Housing
ASEAN	Association of South East Asian Nations	NCB	National Competitive Bidding
BBWS	River Basin Organization (Balai Besar Wilayah Sungai)	NPV	Net Present Value
CPIU	Central Project Implementation Unit	O&M	Operations and Maintenance
CPMU	Central Project Management Unit	PIU	Project Implementation Unit
CSA	Climate Smart Agriculture	PJT	Bulk Water Supply Corporation (Perum Jasa Tirta)
DA	Designated Account	PPSD	Project Procurement Strategy for Development
DG-Bangda	Directorate General of Regional Development	RBO	River Basin Organization
DGWR	Directorate General Water Resources	RPJMN	National Medium-term Development Plan (Rencana Pembangunan Jangka Menengah Nasional)
Dinas PU	Public Works Service (Dinas Pekerjaan Umum)	SCADA	Supervisory Control and Data Acquisition
EIRR	Economic Internal Rate of Return	SDG	Sustainable Development Goal
ENPV	Economic Net Present Value	SORT	Systematic Operations Risk Rating Tool
ESMF	Environmental and Social Management Framework	TA	Technical Assistance
ESSP	Environmental and Social Safeguard Policies	WA	Withdrawal Application
GDP	Gross Domestic Product	WB	World Bank
GHG	Greenhouse Gas	WISMP	Water Resources and Irrigation Sector Management Program
GRM	Grievance Redress Mechanism	WUA	Water User Association
JIS	Jatiluhur Irrigation Scheme	WUAF	Water User Association Federation
IBRD	International Bank for Reconstruction and Development		
IDA	International Development Association		

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## 1. PROJECT SUMMARY SHEET

### Republic of Indonesia Strategic Irrigation Modernization and Urgent Rehabilitation Project

Project No.	000060
Client / Borrower(s) Project Implementing Agency	Republic of Indonesia Ministry of Public Works, Directorate General of Water Resources
Sector(s) Subsector(s)	Water Irrigation
Project Objectives / Brief Project Description	The project objective is to improve irrigation services and strengthen accountability of irrigation schemes management in selected areas. This will be achieved through rehabilitation, revitalization and modernization of water resources and irrigation systems; institutional strengthening and improved management; and operation and maintenance of these systems.
Project Implementation Period (Start Date and End Date)	Start Date: July 1, 2018 End Date: December 31, 2023
Expected Loan Closing Date	June 30, 2024
Project Cost and Financing Plan	Total Project Cost: USD578 million Financing Plan: AIIB: USD250 million WB: USD250 million GoI: USD78 million
AIIB Loan (Size and Terms)	USD250 million 16-year term: annuity repayments, including a grace period of 8 years, in accordance with the Bank's standard pricing.
Co-financing (If any) (Co-financier(s), Size and Terms)	WB: USD250 million 16-year term; annuity repayments, including a grace period of 8 years.
Environmental and Social Category	B
Project Risk (Low/Medium/High)	Medium
Conditions for Effectiveness and Disbursement (If any)	1. Cross-Effectiveness of IBRD Loan Agreement
Key Covenants	1. The Borrower shall provide the CPMU, the CPIU and PIUs each with adequate funds and other resources, and qualified and experienced personnel. 2. The Borrower shall prepare and furnish, by September 30 of each year, beginning in CY-2018, an Annual Work Plan and Budget

	<p>(AWPB) for the following FY; adopt the Plan approved by the WB; and ensure that the Project is executed in accordance with the approved AWPB.</p> <p>3. The Borrower shall ensure that all activities under the Project is carried out in accordance with (i) the Project Operations Manual; (ii) the WB’s Safeguard Policy and Procedures (particularly the Safeguards Instruments); and (iii) the Bank’s policy on Prohibited Practices and the WB’s Anti-Corruption Guidelines.</p> <p>4. The Borrower shall retain a qualified independent expert to oversee the implementation of safety measures for the dams (existing or under construction) that are situated upstream of irrigation schemes.</p>
Policy Assurance	The Vice President, Policy and Strategy confirms an overall assurance that the Bank is in compliance with the policies applicable to the Project.

<b>President</b>	Jin Liquan
<b>Vice-President, CIO</b>	D. J. Pandian
<b>Director General, Investment Operations</b>	Supee Teravaninthorn
<b>Manager, Investment Operations</b>	Ke Fang
<b>Project Team Leader</b>	Ghufran Shafi, Senior Investment Operations Specialist
<b>Project Team Members</b>	<p>Alexander I. Ugut, Principal Risk Specialist</p> <p>Bin Wang, Senior Policy &amp; Strategy Officer</p> <p>Chongwu Sun, Senior Environmental Specialist</p> <p>David Ginting, Young Professional</p> <p>Kishor Uprety, Senior Counsel</p> <p>Michaela Bergman, Principal Social Development Specialist</p> <p>Xiaowei Guo, Senior Procurement Specialist</p> <p>Zacharias Ziegelhöfer, Infrastructure Sector Economist</p> <p>Yige Zhang, Project Assistant</p>

## 2. STRATEGIC CONTEXT

### A. Country Context

1. With 261 million people, the Republic of Indonesia is the largest country in the Association of South East Asian Nations (ASEAN) in terms of population. Its gross domestic product (GDP) is USD932 billion, making it ASEAN's biggest economy as well. Indonesia is the largest archipelago in the world, consisting of more than 17,000 islands with a total land area of about 190 million hectares (ha). About 30 percent (55 million ha) of the total land is agricultural and most of the rest is forest. Indonesia shares land borders with Papua New Guinea, Timor-Leste, and Malaysia, and maritime borders with Singapore, the Philippines, and Australia. Over half of the country's population lives in the Java-Bali region, while the rest is spread across Sumatra, Sulawesi, Kalimantan, Nusa Tenggara and Maluku, Papua, and about 6,000 other smaller inhabited islands. Economic activity is mostly focused in the Java-Bali region. The country's island geography makes transportation and service provision challenging in outlying provinces.

2. Driven by political stability, an educated workforce and technological advancements, the Indonesian economy has registered impressive growth since the Asian financial crisis, with gross national per capita income rising from USD2,200 in 2000 to USD3,603 in 2016. This sustained economic growth has helped in lowering poverty levels, accelerating infrastructure development and improving the performance of social sectors. Despite this, the economy is facing multiple challenges. The gains from economic growth have not been distributed evenly, with a large percentage of the population still living very close to the poverty line. Additionally, poverty reduction has begun to stagnate and the present national poverty rate of approximately 11 percent has shown little decline in recent years.

3. Poverty in Indonesia remains a predominantly rural phenomenon. It is estimated that 60 percent of those earning less than USD1.25 per day rely on the agricultural sector. Despite its decline as a share of GDP over the past 50 years, currently accounting for approximately 14 percent of GDP, the agricultural sector continues to play a vital role in the Indonesian economy. Agriculture is the main source of employment in the rural areas, with more than 33 percent of the labor force involved in the sector. Irrigated agriculture is the main driver of food production. However, rice yields have stagnated due to deteriorating infrastructure, lack of innovation and low levels of technology uptake. Rehabilitation and modernization are central to sustaining production and it is estimated that a 7 percent per annum increase in smallholder productivity could result in a USD50 billion increase in agricultural revenues by 2030.

4. The Government's 2015-2019 Mid-Term Development Plan (RPJMN) reflects its strategy to meet its development challenges by focusing on human and community development, narrowing the income gap through increased productivity and poverty reduction measures, and increasing development without environmental degradation. The Plan also focuses on infrastructure development for sustainable economic growth and social assistance programs related to education and health.

## B. Sectoral and Institutional Context

5. A combination of abundant rainfall and fertile soils naturally makes Indonesia very conducive for farming and agriculture. The agricultural environment is divided largely by geography and altitude, with intensive food crop production occurring on the southern islands (Java, Bali, Lombok, and Madura), and less intensive perennial cropping systems predominant on the islands of Sumatera, Kalimantan Sulawesi, and Papua. Of the 55 million agricultural ha, 24 million consist of arable land, 20 million are under permanent crops, and 11 million consist of meadows and pastures. Irrigation is central to the Government's development objectives, and some 7.4 million ha, roughly 30 percent of the total arable land, is equipped with irrigation infrastructure.

6. Indonesia began introducing regulatory, institutional and administrative reforms in the water resources and irrigation sector in the 1990s, through the assistance of multilateral donors. Institutional arrangements for the management and development of water resources and irrigation are divided in accordance with a government hierarchy that follows existing law, i.e., Law no.23/2014, and several ministerial regulations: (i) irrigation schemes above 3,000 ha, or below 3,000 ha but which cross provincial boundaries, are under the responsibility of the central government; (ii) schemes below 1,000 ha are under the responsibility of the district (kabupaten) government; and (iii) schemes between 1,000 and 3,000 ha, or below 1,000 ha but which cross district (kabupaten) boundaries, are under the responsibility of the provincial government.

7. The percentage of irrigated land in the three categories is as follows: (i) national schemes account for around 33 percent (about 2.44 million ha); (ii) provincial-level schemes account for 16 percent of the total (about 1.18 million ha); and (iii) smaller district-level schemes account for 51 percent (about 3.78 million ha). Farmers are fully responsible for the tertiary units through their Water User Associations (WUAs) and Water User Association Federations (WUAFs), which are composed of several WUAs; they are also partners in Operations and Maintenance (O&M) of the primary and secondary canals of the central, provincial, and district schemes. The vast majority (83 percent) of the irrigated areas are located on Java, Bali, Sumatra and Sulawesi, with Java and Bali accounting for nearly half of the total irrigated area.

8. The level of irrigation development varies from traditional systems to modern irrigation schemes. It is estimated that about 50 percent of the 7.4 million ha of irrigated area in Indonesia require some form of rehabilitation. Of this, 16 percent are considered heavily damaged, just under 20 percent are considered to have medium levels of damage and 15 percent considered lightly damaged. Most of these schemes are run-of-the-river systems, with only about 11 percent of the total command area served by reservoirs. The reservoir-served areas are national and classified by the Government as premium schemes that have been prioritized for rehabilitation and modernization. All irrigation schemes proposed under the project are above 3,000 ha and under the responsibility of the central government.

9. The *Jatiluhur Irrigation Scheme (JIS)*, with a command area of 240,000 ha, is the largest contiguous irrigation system in Indonesia, located mainly within West Java. The JIS covers the basin area of the Citarum River and other rivers that were linked by in the 1970s by the East, North and West Tarum canals and are now served by the Juanda Reservoir. The system supports the supply of approximately 40 percent of the rice needs for West Java and 9.4 percent for the country. The East Tarum Canal (ETC), 90,230 ha, and the West Tarum Canal (WTC), 52,626 ha, are

supplied by low-lift hydraulic pumps at the headworks, whereas the North Tarum Canal (NTC), 85,945 ha, is supplied by the large Welahar barrage. WTC also functions as the main conveyance canal for the domestic, municipal and industrial water supply for the urban and industrialized areas along the canal and for Jakarta. The system has come under increasing pressure in recent years due to expanding population, economic development, deteriorating infrastructure and increased conveyance losses.

10. New irrigation management approaches are needed to deliver well-defined, reliable and responsive services to mitigate farmers' increasing risks. The challenge is to ensure rehabilitation of existing infrastructure and provide a platform for modernization that can develop resilient, reliable and sustainable irrigation management institutions and infrastructure; enhance productivity of land, water and the human resource base; improve farmers' livelihoods and minimize risks related to climate variability and price volatility. Some of the specific measures include assessing the current level of spending; increasing the coverage of water systems; reversing the deterioration of the water network; and setting incentives to invest in service delivery.

11. Water resource management in Indonesia is based on a national system of river basin management that combines many independent river basins into larger administrative "river territories" or Wilayah Sungai(s). Implementation of activities within irrigation schemes is the responsibility of the respective River Basin Organization (RBO) or Balai Besar Wilayah Sungai (BBWS). These public RBOs fill both regulatory and management functions, as well as undertake construction, operation, and maintenance of river infrastructure and irrigation systems.

### **3. THE PROJECT**

#### **A. Rationale**

12. *Strategic fit.* The project fits into and supports the sectoral plans for irrigation and water resources of the Ministry of Public Works and Housing (MPWH), which have a strong focus on modernization and rehabilitation. Various dimensions of development that relate to achievement of Sustainable Development Goals (SDGs) have been internalized in the RPJMN. The themes of poverty eradication and improved prosperity related to SDG 1 – No Poverty – and food security and sustainable agriculture related to SDG 2 – Zero Hunger – have been translated into policy measures and priority investments over a five-year period in the RPJMN. These are aimed at achieving water and food security and improving the economic conditions of farmers.

13. Development of the agricultural sector through rehabilitation and modernization of the irrigation sector is central to the Government's strategy. Highlighting two distinct roles of the agricultural sector, namely increasing rice production for food security and developing higher value cropping to improve rural livelihoods, the RPJMN promotes: (i) the rehabilitation of 3.2 million ha of irrigated land; (ii) the development of one million ha of new irrigation systems; (iii) the adoption of sustainable approaches to farming on rehabilitated upland areas; (iv) the development of farm roads; and (iv) increased adoption of environmentally friendly technologies for food crops. Meeting these targets and realizing the contribution of the irrigation sector to poverty alleviation require a dual approach focused on the rehabilitation of existing infrastructure and increased productivity and efficiency through irrigation modernization. The cost of the measures outlined in the strategic plan is estimated to be around USD24.68 billion, including

investments for improved irrigation systems and their management. Support from multilateral development agencies is needed to mobilize the huge amount of required resources.

14. The project is well aligned with the Bank's mandate to promote social and economic development in Asia through investment in infrastructure. By investing in Indonesia's irrigation infrastructure, the project will contribute to the twin goals enshrined in the Bank's Articles of Agreement, namely (i) fostering sustainable economic development, and (ii) addressing development challenges through collaboration with other development institutions. The project contributes to the former through improvement and upgrading of existing water resource and irrigation infrastructure, which is the backbone of Indonesia's staple food supply and directly contributes to inclusive and sustainable socio-economic growth in the country, and to the latter through its co-financing of the Project with the World Bank (WB), which has a long and established history of working in Indonesia in water resources management and irrigation modernization.

15. The *Bank's value addition* involves mobilizing sufficient financial resources to fill the investment gap in a project that is vital for the country's socio-economic growth. Besides providing technical inputs to the development of the project's results framework, procurement strategy and financial arrangements, the Bank team also performed a fiscal review of the historic operations and maintenance (O&M) allocations and expenditures of the irrigation sector that can provide a platform for policy dialogue with the Government on current practices of revenue generation from water charges. The joint implementation of the project with the WB demonstrates that the Bank is a reliable and strong partner, while also increasing the capacity of Bank staff through sharing of expertise and knowledge in the water resource and irrigation sector.

## **B. Objective**

16. The project objective is to improve irrigation services and strengthen accountability of irrigation scheme management in selected areas. Objective-level indicators include a combination of those reflected in the Government's irrigation modernization program under the RPJMN and the WB core indicators. Achievement of the objective will be measured through two sub-sets of indicators as noted below:

- i. Improvement of irrigation services, to be measured through:
  - Area provided with new/improved irrigation or drainage services (ha)
  - Increase in crop intensity (paddy) (percent)
- ii. Strengthened management of irrigation schemes through improved accountability, transparency and sustainability, to be measured through:
  - Number of irrigation service agreements with clear allocation of responsibilities implemented (number)
  - Number of asset management systems with transparent budget allocation operational (number).

17. *Project Beneficiaries.* The main project beneficiaries are farmer households, both male- and female-headed, which directly benefit from more reliable, climate-resilient, and efficient irrigation water supply and distribution; and increased agricultural productivity through improved irrigation water management and Climate Smart Agricultural (CSA) interventions. This includes

300,000 farmer households and 100,000 ha under Component A and 587,000 farmer households and 176,000 ha in the JIS under Component B. Another group of beneficiaries includes the national, provincial, and district water resources and irrigation management agencies, irrigation commissions, WUAs and WUAFs.

### **C. Project Description and Components**

18. The project is designed around the five pillars of irrigation management modernization of the Directorate General of Water Resources (DGWR), and require enhancement of participatory development, improved levels of service, and more efficient, effective and sustainable management while adjusting to future scenarios of environmental, social and agricultural change. The five pillars are intended to support the Government's efforts to address the infrastructure, institutions, information, and technical issues required to enhance irrigation efficiency through a coherent participatory approach focused on efficient and effective delivery of water. The five pillars include: (i) improvement of water security and availability; (ii) rehabilitation and upgrading of infrastructure; (iii) improvement of management systems; (iv) strengthening of institutions; and (v) strengthening of human resources. These five pillars are implemented through an integrated approach that is intended to respond to the very system-specific needs of the individual schemes. An approach with 40 steps to this modernization process is described in the policy document on Basics of Irrigation Modernization (MPWH-DGWR-DIS, September 2015) and summarized in Annex 3: Government Policy on Modernization of Irrigation Management.

19. The project will affect the management of just over two-thirds of all the national irrigation systems. As the project will work in nine RBOs and eight provinces, its institutional innovations will affect approximately 1.5 million ha managed by the provinces, which is 67 percent of the area covered by the national irrigation service area. The capacity building of RBOs and provincial irrigation service providers through improved knowledge, information, tools, and management processes will directly improve service delivery for 276,000 ha or 11.2 percent of the total national irrigation service area. At the same time, schemes that are not directly covered under the project will indirectly benefit through the improved institutions and management.

20. Project activities focus on increased accountability, transparency and cost effectiveness in achieving reliable and sustainable delivery of irrigation and drainage services and include: (i) establishment of service agreements between different management tiers in the irrigation systems; (ii) introduction of a benchmarking system of irrigation service providers to be eventually linked to annual budget allocations; (iii) introduction of asset management planning; (iv) publication of service delivery plans and performance reports; (v) introduction of client feedback through user surveys and audits; (vi) development of management information systems (MIS); (vii) upgrading and modernization of hydraulic infrastructure for irrigation; and (viii) capacity development of the irrigation management and water user institutions. These activities, to be undertaken for the selected national schemes under the project, will have a potential demonstration effect in the sector.

21. **Component A: Urgent Rehabilitation of Irrigation and Drainage System (USD225.4 million).** This component will support institutional strengthening and rehabilitation and revitalization of about 100,000 ha of irrigated command area. The Government identified a list of 41 irrigation schemes, spread across 12 RBOs in 11 provinces, which was prioritized to select 14 schemes spread across nine RBOs in eight provinces. This includes 84,000 ha of upland

gravity irrigation schemes located on South Sulawesi, Java, West Nusa Tenggara, North Sumatra and South Sulawesi, along with 16,000 ha of tidal lowland schemes on South Sumatra and Central Kalimantan. Five schemes accounting for roughly 33,000 ha have been prioritized for the first phase of implementation.

22. The criteria for selection of the priority schemes include: (i) reliability of water supply; (ii) condition of existing infrastructure; (iii) current irrigation management and O&M arrangements; (iv) existence and level of organization of the WUAs and WUAFs and Irrigation Commission; (v) limited potential adverse environmental and social impacts; and (vi) level of competition for water among water users for different purposes. The schemes have then been grouped into three types: premium schemes with reservoirs being planned or under implementation; run-of-the-river systems in urgent need of rehabilitation; and systems located in tidal lowlands. The result was the selection of two premium schemes, ten run-of-the-river schemes and two lowland systems.

23. The component will also include the modernization and strengthening of irrigation management systems and institutions in the project area through activities such as: (i) preparation of management plans and service agreements, accountability mechanisms and asset management systems; (ii) improvement of hydrological and meteorological data collection and transmittal systems for planning and monitoring of service delivery; (iii) development of a decision support system on water entitlements and allocation, distribution and delivery; (iv) provision of training to irrigation management institutions; and (v) supporting the development and implementation of CSA pilots for rice and non-rice crops in irrigation systems.

24. **Component B: Strategic Modernization of Irrigation and Drainage System (USD333.6 million).** The objective of this component is to increase the serviceability of premium irrigation systems through modernization of existing management and infrastructure by introducing a higher level of technology. The initial focus is on selected areas within the 240,000-ha JIS, where the capital investments and assets are the responsibility of the BBWS Citarum. This component will support increased serviceability and management of 176,000 ha of main, secondary and tertiary networks in the East Tarum Canal (ETC), 90,230 ha, and North Tarum Canal (NTC), 85,945 ha, along with two pilot projects on irrigation management modernization principles in the Binong and Patrol sections of the ETC command area.

25. The component will also introduce service agreements between different tiers of management; asset management systems, planning, surveys and designs for physical and non-physical measures; rehabilitation and modernization of the main, secondary and tertiary irrigation and drainage systems; monitoring and evaluation of irrigation service delivery performance; installation of an advanced information and control system; and carrying out of a CSA pilot. These activities will be accompanied by an institutional strengthening and capacity development process for the existing RBOs and irrigation management institutions.

26. **Component C: Project Management (USD19 million).** This component will provide support to overall Project management and implementation through: (i) the Central Project Management Unit (CPMU) within the DGWR of the MPWH, and Project Implementation Units (PIU) at the RBOs to provide the necessary support services for timely and effective project implementation, including monitoring and evaluation, procurement, financial management, and

safeguard compliance and monitoring; (ii) technical assistance (TA) for the RBOs and other implementing entities to ensure timely and effective implementation; (iii) support to the National Steering Committee for Water Resources; and (iv) the incremental operating costs of the CPMU and the PIUs for activities related to project implementation.

#### **D. Cost and Financing**

27. The project is expected to cost approximately USD578 million, to be financed as follows: (i) a sovereign-backed loan of USD250 million from the Bank with a 16-year term, including a grace period of 8 years, made on standard terms for sovereign-backed loans, (ii) a sovereign-backed loan of USD250 million from the WB with a 16-year term, including a grace period of 8 years; and (iii) USD78 million counterpart financing by the GoI. A project investment plan showing the cost estimates is given below in Table 1.

**Table 1: Project Cost and Financing Plan**  
(USD million)

<b>Project Components</b>	<b>Cost</b>	<b>Financing</b>		
		<b>AIB</b>	<b>IBRD</b>	<b>GoI</b>
<b>Component A:</b> Urgent Rehabilitation of Irrigation and Drainage System	<b>225.4</b>	98.6	98.6	28.2
<b>Component B:</b> Strategic Modernization of Irrigation and Drainage System	<b>333.6</b>	143.0	143.0	47.6
<b>Component C:</b> Project Management	<b>19.0</b>	8.4	8.4	2.2
<b>Total Cost</b>	<b>578.0</b>	<b>250.0</b>	<b>250.0</b>	<b>78.0</b>

28. The Bank and the WB will jointly co-finance the project, with the WB taking the lead. The co-financing arrangements for the project between the Bank and the WB will follow the Co-financing Framework Agreement signed by the respective Presidents of the two institutions in April 2016 (as amended in April 2018). In essence, the WB's policies and procedures on safeguards, procurement, disbursement, financial management, project monitoring and reporting will be used for the project activities to be financed in whole or in part out of the loan proceeds (including activities to be financed by the Bank).

#### **E. Implementation Arrangement**

29. MPWH - the Project Implementing Agency - will implement the project through the DGWR. A CPMU will be established within the DGWR and ensure coordination and joint implementation across many different Directorates, including the Directorate of Irrigation and Lowlands, Directorate of Water Resources Infrastructure Development, Directorate of Operation and Maintenance and Directorate of Water Resources Management, among others. The CPMU will be assisted in management of the project by dedicated TA.

30. Implementation of the activities within each of the irrigation schemes will be the responsibility of the respective RBOs. A Central Project Implementation Unit (CPIU) will also be

established under the DGWR to coordinate the local government irrigation program and project implementation in fields. A PIU will be established in each of the eight RBOs responsible for Component A activities for rehabilitation and revitalization of irrigation schemes. In addition, a PIU will also be established in the RBO Citarum, which is responsible for the activities for Component B associated with the modernization of the JIS. The PIUs will be supported in implementation through the TA that is centrally located within the CPIU, with regional sub-teams established in each RBO to provide guidance and supervision during implementation. During the preparation and implementation of the project, regular meetings among all PIUs under the leadership of the CPMU/CPIU will be held to share experiences, coordinate project planning and implementation, and to share lessons learned. Regular reporting of the monitoring results and benchmarking of Project implementation will further complement the coordination meetings.

31. The planning and design of improvement works for the primary to tertiary canals, and the construction of primary and secondary canal works will be implemented by the respective RBOs. The construction of tertiary canal works will be done by WUAs and WUAFs, guided by a district irrigation agency (Dinas PU). The Irrigation Commission (KOMIR) in each province and district will be responsible for coordinating and endorsing all irrigation programs in their respective areas. Knowledge exchange among farmers will be facilitated by peer comparison visits.

32. The Directorate General of Regional Development (DG-Bangda) of the Ministry of Home Affairs will ensure coordination and synchronization with the local government irrigation program. In coordination with the DGWR, the DG-Bangda will carry out institutional strengthening and provide training to the provincial and district Dinas PU and the WUAs/WUAFs. The budget for the institutional strengthening and training will be provided through the state budget (Anggaran Pendapatan dan Belanja Negara, or APBN).

33. The Agency for Agricultural Extension and Human Resources Development of Ministry of Agriculture will be involved to implement the sub-components activities related to agriculture. It will carry out agricultural training programs in modernization and climate smart agriculture in coordination with provincial and district Dinas agriculture offices and with WUAs and WUAFs.

34. Management of the JIS is governed by Government Regulation PP7/20 which assigns the management to the bulk water supply corporation (Perum Jasa Tirta II, PJT2), while capital investments and the assets are the responsibility of the BBWS Citarum. DGWR through the CPIU will oversee the procurement process for the modernization of the system until the contracts have been executed. Thereafter, the implementation of the works will be the responsibility of the PIU within the BBWS Citarum.

35. The CPMU and the Monitoring and Evaluation Unit of the National Steering Committee of Water Resources in the National Development Planning Ministry will be responsible for monitoring the activities and impacts and measuring the results. The lessons learned under the project will be shared among the RBOs in their efforts to modernize the management of irrigation services nationwide.

36. As the lead co-financier, the WB will supervise the project and administer the Bank's loan on behalf of the Bank, in accordance with the WB's applicable policies and procedures, and a

Project Co-Lenders' Agreement, to be signed between the Bank and WB, in accordance with the Co-financing Framework Agreement.

37. *Procurement.* The procurement activities under Components A and B, to be respectively carried out by each participating RBO, will consist of civil works and goods for rehabilitation and upgrading of irrigation infrastructure. Based on the preliminary estimates, the civil works and goods under both components are mainly expected to be procured following National Competitive Bidding (NCB) procedures. The Government's procurement regulations may be used to the extent they do not conflict with the WB's Procurement Guidelines. Component C (Project Management) includes procurement of consulting services to support the CPMU and PIUs in the project implementation, TA and capacity building. The consulting services will be procured mostly through the quality- and cost-based selection procedure but the services below USD 300,000 can be procured following the Consultants' qualifications selection method.

38. *Funds Flow.* A pooled Designated Account (DA) denominated in US dollars will be opened by the Director General of the Ministry of Finance in the Bank Indonesia (central bank) specifically for the project. Access to DA funds follows the Government's treasury system. The CPIU/PIU will review the invoices from consultants and contractors and upon verification submit payment requests to the treasury office for payments. The CPIU/PIU will furnish to the CPMU all payment-related information to develop Withdrawal Applications (WA). The CPMU will submit to the WB through the Ministry of Finance a consolidated WA to record the expenditures and request additional funds from the loans of the Bank and the WB on 50:50 basis. The Project Operations Manual will reflect the detailed documentation and process required.

39. *Disbursements.* The applicable disbursement method will be: (i) advance, (ii) direct payment, and (iii) reimbursement. Advances from the WB and the Bank will be credited to the DA and solely used to finance eligible expenditures. The ceiling for an advance to the DA will be variable, and advances will be made available based on six-month projected expenditures. The reporting of use of the DA funds will be based on the quarterly Interim Financial Report, which will be submitted to the WB no later than 45 days after the end of each quarter.

## **4. PROJECT ASSESSMENT**

### **A. Technical**

40. Technologies, approaches and designs to be adopted for the project are expected to be similar to those deployed under the previous WB projects in the Indonesian water resources and irrigation sector, including the ongoing Water Resources and Irrigation Sector Management Program (WISMP). Therefore, the project design has not only been informed by a long history of WB engagement in the irrigation sector in Indonesia but has also taken into consideration good practices in irrigation rehabilitation and modernization in other countries. Major physical activities, such as canal lining, design of flow control arrangements and introduction of a Supervisory Control and Data Acquisition (SCADA) system on critical canals, have been reviewed in the context of regional experience, so as to avoid large-scale and ambitious technological interventions that might not be germane to all system operators. For example, lessons learned from similar regions have shown that the use of supervisory controls (a component in SCADA) can only

be fully operationalized after the basic information and management systems have been established.

41. Technical appraisal has been conducted based on preparatory works of the MPWH, which were supported by WISMP TA to complete technical studies and designs for all components of this project (including JIS). Inception Reports were prepared, which provide the basis for detailed assessments of activities in each component as well as preparation of engineering designs, environmental and social assessments and implementation plans. Detailed engineering designs have been prepared for the physical works totaling USD26 million for six schemes for Component A and USD23 million for Component B. The engineering designs for the remaining activities under each component will be finalized during implementation. The WISMP also assisted in preparation of the terms of reference for various consultancy services and other related documents up to its closure in May 2018. The appraisal concluded that the Project is technically sound and ready for implementation.

42. Modernization principles for management are aimed at supporting the overall objective of water availability, food security and farmer prosperity; they integrate different discrete but correlated aspects including water management, institutional development and infrastructure modernization. The approach focuses on integrated system planning for Component A schemes as well as the JIS. The activities for the latter, JIS, focus on improvement of the main canals (ETC and NTC); modernization of the secondary irrigation and drainage systems; and improvement of tertiary units. The design of the secondary systems is based on servicing the tertiary units and takes into consideration the canals' capacity, location of control structures and design of water levels to increase optimization and efficiency of the overall system.

## **B. Economic and Financial**

43. An economic analysis was conducted by the WB with inputs from the Bank's team. The analysis and results are summarized below and presented in detail in Annex 4: Economic Analysis.

44. The range of considered Project benefits include: (i) increased income from agricultural production due to improvements in crop yield, cropping intensity, increases in net area irrigated, and changes in cropping patterns; and (ii) reduced O&M and replacement costs due to rehabilitation, modernization, and sediment control interventions. The economic analysis was conducted for Components A and B separately considering their respective costs. Component A schemes were categorized into those affected by tide (lowland schemes) and other schemes. Financial and economic gross margin analysis was performed for these groups separately because they exhibit differences in biophysical and socioeconomic contexts. Similarly, Component B scheme was differentiated into four sub-categories based on current drainage and irrigation performance situations. To assess the returns to the overall project, the results of the analyses by group were aggregated. The general analytical approach adopted involves incremental benefits based on with- and without-project scenarios. The financial costs were converted to economic costs using a standard conversion factor.

45. While the Project is not supporting the change in cropping pattern, an analysis was carried out covering different crops. The overall results of the economic analysis indicated that the Project is economically viable, with an Economic Internal Rate of Return (EIRR) of 20.5 percent with

corresponding Net Present Value (NPV) of USD1.5 billion based on the current cropping patterns of the project area (87 percent rice, 7 percent Palawija<sup>1</sup> and 6 percent vegetable), assuming a 6 percent discount rate. Sensitivity analysis was performed with respect to implementation delay, discount rate assumptions, changing cropping patterns and O&M cost assumptions. The sensitivity analysis shows that the EIRR is sensitive to implementation delays, cropping patterns and the O&M cost assumptions, but stays above 10 percent in all scenarios.

46. *Financial Analysis.* Indonesia's Water Law does not allow for water charges for smallholder irrigation and non-commercial users. The sustainability of national water infrastructure hence depends on timely allocation of sufficient O&M funds from government budgets. No conventional financial analysis was performed given that there is no direct revenue stream from the project. Instead, the Bank team assessed the level and trend of the Government's budget allocation for O&M, which is crucial for the financial sustainability of the Project. The detailed analysis is presented in Annex 4: Financial Analysis.

47. Historically, O&M expenditures for Indonesia's irrigation systems have fallen short of the required O&M needs. As part of the efforts to stop deterioration, minimize future expenditure on rehabilitation and extend infrastructure life, the central government has shown an increased commitment to provide sufficient financial resources for O&M for the national irrigation schemes. This is reflected in recent trends of a narrowing expenditure gap for O&M.

48. The average O&M expenditure gap was halved from 64 percent for the period 2011-2014 to 33 percent for the period 2015-2017. For 2017, the gap was estimated at 19 percent and is expected to further narrow in 2018 due to a 12 percent increase in the DGWR budget. However, actual O&M expenditures are expected to fall short of the allocated amount in 2018 due to the limited budget absorption capacity in DGWR. Therefore, modernization of information systems and strengthening of institutional capacities, a key focus of the project, is important to further improve performance and utilization of future available funds, and to strengthen the overall sustainability of irrigation infrastructure.

### **C. Fiduciary and Governance**

49. The financial management arrangements follow the government system, including budgeting, internal control, accounting and reporting, flow of funds, and the auditing mechanism. A financial management assessment was carried out to assess the adequacy of the financial management system of the implementing agencies. The assessment confirmed that the accounting systems for the project expenditures and underlying controls are generally adequate to meet fiduciary objectives and remain in compliance with agreed implementation procedures. Given the risks related to budget delays, financial management specialists placed in the CPMU will also be tasked to assist all PIUs on ensuring timely availability of funds. The DGWR has allocated budget code for both the Bank and the WB loans for 2018 – start of implementation year – which will be made effective upon signing of the loans.

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<sup>1</sup> Palawija are second crops after rice, usually consisting of coarse grains, pulses, roots and tubers.

50. *Anti-corruption.* The Bank is committed to preventing fraud and corruption in the projects that it finances. It places the highest priority on ensuring that projects that it finances are implemented in strict compliance with the Bank's Policy on Prohibited Practices or PPP (2016). The Bank will monitor the work related to tender document preparation and tender/proposal evaluation and award under Bank financing. Implementation will also be monitored rigorously and regularly by Bank staff. The Bank reserves the right to investigate, directly or indirectly through its agents, any alleged Prohibited Practices relating to the project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. To the extent that the WB's Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants," dated July 1, 2016 (Anti-Corruption Guidelines) are similar to the Bank's PPP, the WB's Anti-Corruption Guidelines will apply to the project activities financed in whole or in part by the proceeds of the proposed Bank and WB Loans. Detailed requirements are specified in the Loan Agreement, and will also be included in the Co-Lenders' Agreement and the project tender documents.

51. Procurement for this project will be carried out in accordance with the WB's "Guidelines: Procurement under IBRD Loans and IDA Credits," dated January 2011 (revised July 2014);<sup>2</sup> "Guidelines: Selection and Employment of Consultants by WB Borrowers," dated January 2011 (revised July 2014); and the provisions stipulated in the Loan Agreement. A Project Procurement Strategy of Development (PPSD) has been developed by the MPWH and accepted by both the WB and the Bank as part of Project preparation. The PPSD includes a market analysis to arrive at recommended procurement packages, method of procurement, assessment of procurement capacity of CPMU/PIUs and the risks and risk mitigation measures for smooth and efficient procurement under the Project. Based on the PPSD, the MPWH has prepared the Procurement Plan for the first 18 months, which include a brief description of works, goods, consulting and non-consulting services with estimated cost, method of procurement and the WB's prior review requirement based on the procurement risk.

52. Based on the risk assessment of the WB, the Bank agrees that the fiduciary risks, including procurement risks, are high. Specific mitigation measures have been proposed, including entrusting the CPIU in DGWR with responsibility for procurement for the JIS through contract execution; stipulation of procurement thresholds and procurement methods in the PPSD; training of procurement staff on identification and prevention of red flags; random procurement audits of at least 15 percent of the contracts; strengthening of the payment verification system; and involving the inspectorate general of MPWH for internal audits, with the Supreme Audit Institution, BPK, as external auditor.

53. *Supervision.* The WB, as lead co-financier, will take the lead role on procurement, disbursements, environmental and social aspects, and project monitoring and reporting. It will supervise the project and administer the Bank's loan on behalf of the Bank, in accordance with the WB's applicable policies and procedures and a Project Co-Lenders' Agreement, to be concluded between the Bank and the WB, in accordance with the Co-financing Framework Agreement. The Bank has reviewed the WB's Procurement and Consultant Guidelines (2014) and the WB's

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<sup>2</sup> WB uses its Procurement Guidelines dated January 2011 (revised July 2014) for Projects for which a Project Concept Note was approved before July 2016.

sanctions policies and procedures, including its Anti-Corruption Guidelines. It has found them satisfactory for application to the project in accordance with the Bank's Procurement Policy<sup>3</sup> and the Bank's Policy on Prohibited Practices.<sup>4</sup> In addition, the Bank also reviewed the WB's environmental and social safeguard policies that are applicable to the project. As detailed in Section 4.D, Environmental and Social, the Bank found them in accordance with the Bank's Environmental and Social Policy (ESP).<sup>5</sup> The Bank will accordingly rely on the WB's determination of compliance with the above WB policies and procedures applicable to the project. Project monitoring and reporting, as well as financial management, will also be carried out in accordance with the WB's requirements. This approach will ensure that one set of policies applies to the entire project; it will also provide a single point of contact for the GoI and therefore facilitate a more efficient and seamless approach to project implementation.

#### **D. Environmental and Social**

54. The Bank has decided to use the WB's Environmental and Social Safeguard Policies (ESSP) since (i) they are consistent with the Bank's Articles of Agreement and materially consistent with the provisions of the Bank's ESP and relevant Environmental and Social Standards (ESSs 1, 2 and 3); and (ii) the monitoring procedures that the WB has in place to ascertain compliance with its ESSP are appropriate for the project. The proposed Project has been assigned as Category B, taking into consideration that Project activities mainly concern rehabilitation and modernization of the existing irrigation systems. Therefore, the potential environmental and social risks and impacts are expected to be localized and manageable with proper mitigation measures and application of good engineering and housekeeping practices. Seven ESSPs apply to the project, namely OP/BP 4.01, Environmental Assessment; OP/BP 4.04, Natural Habitats; OP/BP 4.09, Pest Management; OP/BP 4.10, Indigenous Peoples; OP/BP 4.11, Physical Cultural Resources; OP/BP 4.12, Involuntary Resettlement; and OP/BP 4.37, Safety of Dams.

55. The implementing agency has prepared an Environmental and Social Management Framework (ESMF) to comply with the policy requirements and mitigate the potential

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<sup>3</sup> Under the Procurement Policy, the Bank may agree on a common procedure framework with other co-financiers for a jointly-co-financed Project, if the Bank has determined that the co-financiers' procurement policies are consistent with the Bank's Core Procurement Principles and Procurement Standards (paragraph 5.11.3). In that case, the lead co-financier is normally responsible for overseeing the procurement process, applying its own procurement policy and internal review and clearance procedures, and determining whether the procurement has been conducted in accordance with its own policy. In all cases, the Bank's eligibility requirement will apply, permitting firms and individuals from all countries to offer goods, works and services for a Bank-financed contract.

<sup>4</sup> Under the Bank's Policy on Prohibited Practices, the Bank may agree to the application of the prohibited practices or similar policy and investigations and sanctions processes of certain co-financiers for a Project (paragraph 12.3). As a precondition, the Bank must be satisfied that the co-financier's policy and processes are consistent with the Bank's Articles of Agreement and materially consistent with the Bank's Policy on Prohibited Practices. In that case, the Bank may agree that the co-financier will be responsible for the investigations and sanctions processes and the Bank may agree to give full force and effect to the co-financier's sanctions decisions with respect to investigations arising from the Project.

<sup>5</sup> Under the ESP, the Bank may agree to the application, in a project, of the environmental and social policies and procedures of co-financiers. As a precondition, the Bank must be satisfied that these policies and procedures are consistent with the Bank's Articles of Agreement and materially consistent with the Bank's ESP and relevant ESSs, and that appropriate monitoring procedures are in place. In that case, the Bank may rely on the co-financier's determination of compliance with the co-financier's policies and procedures.

environmental and social impacts. The ESMF provides guidance for the incorporation of the requirements of the WB safeguard policies into the activities that are proposed to be financed under the project. The ESMF also provides guidance on health and safety standards, labor management, management of workers and community relations, in line with the WBG's Environmental, Health and Safety Guidelines.

56. *Environment.* The overall environmental impacts are expected to be positive because the project supports: (i) water management in the selected river basins, thereby reducing negative impacts on people's health and the environment; and (ii) improved water resources management, enhanced coordination of water management activities, strengthened water use management both at local and basin levels, including the recognition of ecological and in-stream water uses. The project does not involve civil works with a potential to have significant, irreversible or unprecedented adverse environmental impacts. The project will not finance any new construction and is focused on the rehabilitation of existing irrigation infrastructure, including canal lining, water intakes, and control structures. The potential environmental impacts will only occur during the construction phase of sub-projects, and will be temporary in nature (localized erosion, temporary deterioration of water quality, scouring of canal banks, and other minor construction-related impacts). No major indirect or long-term adverse environmental impacts are expected.

57. The activities are also unlikely to affect vulnerable or protected biodiversity sites or affect critical natural habitats. The project will not procure pesticides. However, improvements to irrigation systems may lead to the intensification of farming activities and hence a potential increase in the application of pesticides. The project will support agricultural practices to implement integrated pest management as much as possible, which reduces the possible use of pesticides and other chemicals. The ESMF includes guidance for managing and handling pesticides. The ESMF provides for the use of "Chance Find Procedures" if archaeological, historical and sacred sites are unanticipatedly encountered by sub-projects.

58. *Climate.* The project is expected to generate climate co-benefits because of its climate change mitigation design. Components A and B will respectively rehabilitate and modernize irrigation infrastructure, which are all gravity-based systems, thus improving capacity of these systems to provide irrigation services with zero emissions. Component A also supports measures to improve the soil carbon pool as part of the activities to rehabilitate two lowland tidal irrigation systems, contributing to negative net Greenhouse Gas (GHG) emissions from the improved efficiency of on-farm water delivery to rice farms (decreasing anaerobic conditions and methane releases). Net annual average GHG emissions of the project are estimated to be -439,743 tons of CO<sub>2</sub> equivalent. For climate change adaptation, the infrastructure improvement work under Components A and B will incorporate climate-resilient designs and climate-resilient irrigation management strategies.

59. *Land Acquisition and Indigenous Peoples.* A Land Acquisition and Resettlement Policy Framework and Indigenous Peoples Planning Framework have been prepared to provide guidance for activities that may involve temporary or permanent land acquisition or activities that will take place in the areas where indigenous communities are present. The ESMF also provides guidance for training and other capacity building activities to strengthen implementing agencies at central and regional levels.

60. *Consultation/participation and disclosure.* The project design and implementation will follow a programmatic approach. The selection, preparation and implementation of each sub-project and irrigation scheme will be participatory and designed to include women and those from less represented groups. Similarly, the environmental and social assessment and management action plans will be based on intensive consultation and involvement of concerned stakeholders, as set out in the ESMF. The mitigation/action plans will be disclosed to those affected before the sub-projects are authorized. The draft ESMF has been disclosed on the project's website prior to the public consultation. Public consultation was held during the period of October 31 to November 9, 2017 in six regions: Palembang (South Sumatera), Lombok (West Nusa Tenggara), Purworejo (Central Java), Jember (East Java), Takalar (South Sulawesi), Cirebon (West Java) and Subang (West Java, for the Jatiluhur area) to cover all participating balais (basin) and districts. The consultation was used to seek inputs for the ESMF finalization as well as to consult relevant stakeholders on the sub-projects that will be implemented in the first year. The final ESMF was re-disclosed at the DGWR and on the WB website in March 2018. Hyperlinks to the disclosed documents, which are available in Bahasa and English, have been made available on the WB's website.<sup>6</sup>

61. *Citizen engagement and gender.* The project is designed to maximize participation of stakeholders and beneficiaries at all levels in order to ensure better governance and accountability, and improve the quality of implementation. The management of irrigation in Indonesia is embedded within a participatory approach and the project will place citizen participation at the core of implementation through various instruments, including consultations and discussions, information disclosure, civil-society oversight in monitoring of sub-project outcomes, and a Grievance Redress Mechanism (GRM). The project will continue to support WUAs/WUAFs in developing and implementing citizen engagement strategies as part of their services. This will include capacity-building support for WUAs/WUAFs as well as incorporation of gender responsive and equity considerations in benefit-sharing mechanisms, and addressing unequal access to irrigation within the command area and gender balance in leadership positions. Project activities are designed and directed toward stakeholder participation: for example, (i) surveys and designs for the rehabilitation and modernization of the infrastructure works that will involve extensive community consultations; (ii) incorporation of participatory irrigation in district and provincial level programming and planning, including through use of user satisfaction surveys; and (iii) institutional modernization and empowerment of WUAs on a wide range of governance, technical and financial issues to encourage greater ownership and internal management. In addition, monitoring and reporting formats will require gender-disaggregated information to better understand changes in gender relations and improvements in equality.

62. *Grievance Redress Mechanism.* The MPWH will have a project-level GRM that will be supported by a team that will receive and facilitate resolution of specific concerns of affected communities, including environmental and social issues and also other issues related to infrastructure development. The GRM will aim to resolve concerns promptly, using an impartial, understandable and transparent process tailored to the specific community. The GRM will be

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<sup>6</sup> <http://projects.worldbank.org/P157585/?lang=en&tab=documents&subTab=projectDocuments>  
[http://sda.pu.go.id/pages/agenda\\_index](http://sda.pu.go.id/pages/agenda_index)

available at no cost to complainants and measures will be included to avoid retribution to the complainants. All complainants will be treated equally, regardless of origin, religion, citizenship status, or social and economic background. GRM composition, procedures and functions will be designed early in the physical investment implementation phase and made available to the public. The MPWH will inform the WB of complaints received and report on their resolution status. The MPWH will also inform the public about access to the WB’s corporate-level Grievance Redress Service. Implementation of the GRM will be monitored by the WB in conjunction with the Bank.

**E. Risks and Mitigation Measures**

63. During appraisal, the Bank and the WB team assessed the project-level risks of the various risk categories utilizing the WB’s Systematic Operations Risk Rating Tool (SORT). Five of the individual indicators, namely, sector strategies and policies, technical design, institutional capacity, fiduciary and stakeholders have been categorized as having either substantial or high risks, with WB categorizing the overall risk as “Substantial.” Based on the SORT assessment, and recognizing the fact that the high and substantial risks of all individual categories can be brought down to acceptable level via adequate controls and mitigation measures, the project has been assigned an overall “Medium” risk rating by the Bank.

64. The key institutional, technical and fiduciary risks and proposed mitigation measures are described here. These mitigation measures will be applied through regular support provided by the Bank and the WB teams, which will consist of adequate technical and procurement expertise to ensure execution of the implementation plans. Technical and fiduciary reviews are expected to be carried out every six months during the implementation support missions, with a focus on examining integrity requirements, conducting site visits, and reviewing funds flow and other arrangements.

65. Major risks and their mitigation measures are detailed below:

**Table 2 : Key Risks and Mitigation Measures**

<b>No.</b>	<b>Risk Category</b>	<b>Description</b>	<b>Mitigation Measures</b>
1.	Procurement	Heightened procurement risk due to possible collusive practices and lax oversight	<ul style="list-style-type: none"> <li>- Increased involvement in preparation of PPSD, procurement plan and procurement documents.</li> <li>- CPMU to provide oversight for Component B procurement.</li> </ul>
2.	Implementation capacity	Low capacities for implementation, procurement and financial management that could adversely impact project execution	<ul style="list-style-type: none"> <li>- Capacity building training to CPMU, CPIU and PIUs in key aspects of project management.</li> <li>- Prescriptive details and instructions in Project Operational Manual (POM).</li> <li>- Technical support through TA consultants.</li> </ul>
3.	Financial	Risks related to budgetary delays, funds flow	<ul style="list-style-type: none"> <li>- Financial managers at PIU to be responsible for budgets.</li> </ul>

<b>No.</b>	<b>Risk Category</b>	<b>Description</b>	<b>Mitigation Measures</b>
			- Strengthening of payment verification process and internal and external audits.
4	Technical	Abrupt changes in institutional mechanism that can impact technical design	- Gradual introduction of modern management and decision support systems with concurrent human resource development program.
5.	Environmental and Social	Dispersed project activities with potential for low-level disputes	- Field based environmental and social support through Bank staff and consultants; preparation of ESMP and consultation on each sub-project.

## 5. ANNEXES

### Annex 1: Results Framework

#### Project Development Objective(s)

The Project Development Objective is to improve irrigation services and strengthen accountability of irrigation schemes management in selected areas.

<b>PDO Indicators by Objectives / Outcomes</b>	<b>DLI</b>	<b>CRI</b>	<b>Unit of Measure</b>	<b>Baseline</b>	<b>End Target</b>
<b>Improvement of irrigation services</b>					
Area provided with new/improved irrigation or drainage services		Yes	Hectare(Ha)	0.00	276,000.00
Percentage of crop intensity (paddy)			Percentage	180.00	200.00
<b>Strengthened accountability of irrigation schemes management</b>					
Number of irrigation service agreements with clear allocation of responsibilities implemented.			Number	0.00	9.00
Number of asset management systems with transparent budget allocation operational			Number	0.00	9.00

<b>Intermediate Results Indicators by Components</b>	<b>DLI</b>	<b>CRI</b>	<b>Unit of Measure</b>	<b>Baseline</b>	<b>End Target</b>
<b>Component A: Urgent Rehabilitation of Irrigation and Drainage System</b>					
Annual performance report of irrigation service providers published (Component A)			Number	0.00	8.00
Irrigation Commission (KOMIR) established and operational (Component A)			Number	8.00	20.00
Participatory Irrigation Development and Management (PPISP) included in planning documents (Component A)			Number	9.00	20.00
WUAs with trained members in decision making (Component A)			Number	0.00	270.00
WUAs with trained female members in decision making (Component A)			Percentage	0.00	50.00
Number of WUAFs established and operational (Component A)			Number	0.00	90.00
Establishment and operationalization of grievance mechanism for water users in delivery of irrigation services (Component A)			Number	0.00	6.00
Number of farmer households provided with improved irrigation services (Component A)			Number (Thousand)	0.00	300.00
<b>Component B: Strategic Modernization of Irrigation and Drainage System</b>					
Annual performance report of irrigation service providers published (Component B)			Number	0.00	1.00
Irrigation Commission (KOMIR) established and operational (Component B)			Number	1.00	4.00
Participatory Irrigation Development and Management (PPISP) included in planning documents (Component B)			Number	1.00	4.00

WUAs with trained members in decision making (Component B)		Number	0.00	480.00
WUAs with trained female members in decision making (Component B)		Percentage	0.00	50.00
Number of WUAFs established and operational (Component B)		Number	0.00	160.00
Establishment and operationalization of grievance mechanism for water users in delivery of irrigation services (Component B)		Number	0.00	9.00
Number of farmer households provided with improved irrigation services (Component B)		Number (Thousand)	0.00	587.00

#### Monitoring & Evaluation Plan: PDO Indicators

<b>Indicator Name</b>	Area provided with new/improved irrigation or drainage services
<b>Definition/Description</b>	
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website/Bi-annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU

<b>Indicator Name</b>	Percentage of crop intensity (paddy)
<b>Definition/Description</b>	Annually harvested area divided by the net command area in the modernized area of the entire target area.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website / Field sampling
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU/IME
<b>Indicator Name</b>	Number of irrigation service agreements with clear allocation of responsibilities implemented.
<b>Definition/Description</b>	An irrigation service agreement describes the procedures, rights and obligations of service provider and beneficiary regarding irrigation water entitlements for the beneficiaries, water allocation and water ordering processes, water deliveries and rotations, procedures in case of water shortages, canal closures for maintenance, cleaning and maintaining the canals and operating and securing canals and regulation equipment at the service interface. Total : 9 RBOs. 8 RBOs in Component A and 1 RBO in Component B.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website / annual report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU/IME

<b>Indicator Name</b>	Number of asset management systems with transparent budget allocation operational
<b>Definition/Description</b>	RBOs with Asset Management System established and operational. The system functions include: i) Staff to implementing irrigation infrastructure management; ii) Irrigation Infrastructure Inventory; iii) Priority List of irrigation infra asset management; and v) Rolling Plan. Total : 9 RBOs. 8 RBOs in Component A and 1 RBO in Component B.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website/Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU/IME

<b>Monitoring &amp; Evaluation Plan: Intermediate Results Indicators</b>	
<b>Indicator Name</b>	Annual performance report of irrigation service providers published (Component A)
<b>Definition/Description</b>	Annual performance report published for of irrigation service providers published. Report to include budgets and work plans, service delivery assessments, financial results, and water user assessment reports. Target: 8 RBOs for Component A.
<b>Frequency</b>	Semi-Annual
<b>Data Source</b>	PMIS Website / Annual Report
<b>Methodology for Data Collection</b>	Through reports
<b>Responsibility for Data Collection</b>	CPMU through PMIS Website
<b>Indicator Name</b>	Irrigation Commission (KOMIR) established and operational (Component A)
<b>Definition/Description</b>	(i) Irrigation commission officially established with all members in place; (ii) a functioning and funded secretariat; (iii) irrigation commission endorse O&M plans and schedules. Target: 20 KOMIR for Component A.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website / Annual Report
<b>Methodology for Data Collection</b>	Through reports
<b>Responsibility for Data Collection</b>	CPMU/IME

<b>Indicator Name</b>	Participatory Irrigation Development and Management (PPISP) included in planning documents (Component A)
<b>Definition/Description</b>	PPSIP is explicitly mentioned in the local government mid term development plan (RPJM) and the sector agencies strategic plan (Renstra)' annual work plans (RKP) and budget (APBD) -provinces and districts - provinces and districts. Target: 20 for Component A .
<b>Frequency</b>	Semi-annual
<b>Data Source</b>	PMIS Website / Semi-annual Report
<b>Methodology for Data Collection</b>	Through reports
<b>Responsibility for Data Collection</b>	CPMU/IME
<b>Indicator Name</b>	WUAs with trained members in decision making (Component A)
<b>Definition/Description</b>	Trainings in decision making include tertiary level water management, association management, and stakeholder coordination provided. Target: 270 for Component A.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	PMIS website / Quarterly report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU

<b>Indicator Name</b>	WUAs with trained female members in decision making (Component A)
<b>Definition/Description</b>	Trainings in decision making include tertiary level water management, association management, and stakeholder coordination provided. Target: 50% for Component A.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	OMIS Website / Quarterly report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU
<b>Indicator Name</b>	Number of WUAFs established and operational (Component A)
<b>Definition/Description</b>	Operational WUAF refers to: (i)WUAF officially established and recognized as a legal entity with a board elected by its members (WUAs) and in the possession of a tax number and a bank account in its name; (ii) WUAF and irrigation service provider have role sharing agreement with rights and obligations for both parties; and (iii) O&M plan in place (using participatory design and participatory construction for rehabilitation). Target: 90 for Component A.
<b>Frequency</b>	Semi-annual
<b>Data Source</b>	PMIS Website / Semi-Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU through PMIS Website

<b>Indicator Name</b>	Establishment and operationalization of grievance mechanism for water users in delivery of irrigation services (Component A)
<b>Definition/Description</b>	Grievance mechanism for water users (farmers) in water delivery based on the service agreements, with complaints and comments from water users reported in the Annual Report. Target: 6 for Component A.
<b>Frequency</b>	Annual
<b>Data Source</b>	PMIS Website/Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU/IME
<b>Indicator Name</b>	Number of farmer households provided with improved irrigation services (Component A)
<b>Definition/Description</b>	Number of farmer households provided with irrigation and drainage services (computed from the service area improved and average number of households per area). Target: 300,000 for Component A.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	PMIS website
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU

<b>Indicator Name</b>	Annual performance report of irrigation service providers published (Component B)
<b>Definition/Description</b>	Annual performance report published for of irrigation service providers published. Report to include budgets and work plans, service delivery assessments, financial results, and water user assessment reports. Target: 1 RBO for Component B.
<b>Frequency</b>	Semi-annual
<b>Data Source</b>	PMIS Website/Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU through PMIS Website
<b>Indicator Name</b>	Irrigation Commission (KOMIR) established and operational (Component B)
<b>Definition/Description</b>	(i) Irrigation commission officially established with all members in place; (ii) a functioning and funded secretariat; (iii) irrigation commission endorse O&M plans and schedules. Target: 4 KOMIR for Component B.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website / Annual Report
<b>Methodology for Data Collection</b>	Through reporting
<b>Responsibility for Data Collection</b>	CPMU/IME

<b>Indicator Name</b>	Participatory Irrigation Development and Management (PPISP) included in planning documents (Component B)
<b>Definition/Description</b>	PPSIP is explicitly mentioned in the local government mid term development plan (RPJM) and the sector agencies strategic plan (Renstra)' annual work plans (RKP) and budget (APBD) -provinces and districts - provinces and districts. Target: 4 for Component B.
<b>Frequency</b>	Semi-annual
<b>Data Source</b>	PMIS Website / Semi-annual Report
<b>Methodology for Data Collection</b>	Through reports
<b>Responsibility for Data Collection</b>	CPMU/IME
<b>Indicator Name</b>	WUAs with trained members in decision making (Component B)
<b>Definition/Description</b>	Trainings in decision making include tertiary level water management, association management, and stakeholder coordination provided. Target: 480 WUAs for Component B.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	PMIS website/Quarterly report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU

<b>Indicator Name</b>	WUAs with trained female members in decision making (Component B)
<b>Definition/Description</b>	Trainings in decision making include tertiary level water management, association management, and stakeholder coordination provided. Target: 50% for Component B.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	PMIS website/Quarterly report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU
<b>Indicator Name</b>	Number of WUAFs established and operational (Component B)
<b>Definition/Description</b>	Operational WUAF refers to: (i)WUAF officially established and recognized as a legal entity with a board elected by its members (WUAs) and in the possession of a tax number and a bank account in its name; (ii) WUAF and irrigation service provider have role sharing agreement with rights and obligations for both parties; and (iii) O&M plan in place (using participatory design and participatory construction for rehabilitation). Target: 160 for Component B.
<b>Frequency</b>	Semi-Annual
<b>Data Source</b>	PMIS Website / Semi-Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU through PMIS Website

<b>Indicator Name</b>	Establishment and operationalization of grievance mechanism for water users in delivery of irrigation services (Component B)
<b>Definition/Description</b>	Grievance mechanism for water users (farmers) in water delivery based on the service agreements, with complaints and comments from water users reported in the annual reports. Target: 9 for Component B.
<b>Frequency</b>	Annually
<b>Data Source</b>	PMIS Website/Annual Report
<b>Methodology for Data Collection</b>	Through report
<b>Responsibility for Data Collection</b>	CPMU/IME
<b>Indicator Name</b>	Number of farmer households provided with improved irrigation services (Component B)
<b>Definition/Description</b>	Number of farmer households provided with irrigation and drainage services (computed from the service area improved and average number of households per area). Target: 587,000 for Component B.
<b>Frequency</b>	Quarterly
<b>Data Source</b>	PMIS Website
<b>Methodology for Data Collection</b>	Through Report
<b>Responsibility for Data Collection</b>	CPMU

## Annex 2: Detailed Project Description

1. SIMURP responds to the Government's Mid-Term Development Plan (RPJM 2015-2019) to increase agricultural production and productivity in support of the national food security and rice self-sufficiency agenda. The Project's focus is on management, rehabilitation and modernization of infrastructure of 14 national irrigation systems with a total service area of around 100,000 ha and on strategic modernization of the Jatiluhur Irrigation Scheme (176,000 ha). The rehabilitation and modernization activities are developed to facilitate enhanced irrigation and drainage service delivery that should enable more diversified cropping. It will deal with system assessments, management information and decision support systems, institutional strengthening, human resources development and studies, designs and construction works for rehabilitation and modernization of irrigation, drainage and flood management infrastructure. SIMURP will however accommodate for a future increase in crop diversification and cultivation of higher value crops even within the framework of the present government policy focusing on food security and self-sufficiency in rice. The institutional and technical designs of the management systems and irrigation and drainage infrastructure already need to accommodate for the needed higher degrees of flexibility to accommodate for near future developments but with an emphasis on sustainability.

2. The Government has prepared a Management Plan and an Action Plan for the Modernization of Irrigation Management with the aim to support enhancement of food security and farmer's prosperity. It integrates three main aspects of study: *water management, institutional and human resources development, and infrastructure modernisation*. The plan is based on a *five-pillar framework* that is complemented with "45 steps" as proposed in the modernization guidelines. The approach comprises a move from a rigid supply driven to a flexible demand driven provision of irrigation services, through improved levels of service by enhancement of user participation, more efficient, effective and sustainable management whilst adjusting to future scenarios of environmental, social and agricultural change and new government policies. The project is based on the Government's five-pillar irrigation modernization framework. Moreover, all activities will follow the principles and practice of participatory irrigation development and management (PPSIP) as established under the WISMP1 and WISMP2.

3. **Project Components.** The project has three components that are aligned with the Government's five Pillars for irrigation management modernization as follows:

- *Component A:* Urgent Rehabilitation of Irrigation and Drainage System of 100,000 ha of national irrigation and lowland systems;
- *Component B:* Strategic Modernization of Irrigation and Drainage System of 176,000 ha; and
- *Component C:* Project Management.

4. **Component A: Urgent Rehabilitation of Irrigation and Drainage System (USD225.4 million).** This component will support the rehabilitation and revitalization of about 100,000 ha of irrigated command area which includes about 84,000 ha of gravity irrigation systems and 16,000 ha of tidal irrigation systems. Five schemes, accounting for roughly 30,000 ha have been prioritized for the first phase of implementation. The Government has selected 14 schemes spread across 9 RBOs in 8 provinces out of a long-list of 41 systems following a set of readiness

and performance criteria considering: (i) reliability of water source; (ii) current condition of existing infrastructure; (iii) current irrigation management and O&M arrangements; (iv) level of existence and organization of the water user institutions (WUA, WUAF) and Irrigation Commission; (v) marginal impacts of environmental and social safeguards policies; and (vi) high level of competition for water among water users for different purposes. The schemes have then been grouped into three types: (a) premium schemes with reservoirs being planned or under implementation; (b) run-of the river systems in urgent need for rehabilitation; and (c) systems located in tidal lowlands. The result was the selection of two premium schemes, ten run-of-the-river schemes and two lowland systems. Five schemes accounting for roughly 33,000 ha, including one lowland tidal irrigation scheme, have been prioritized and detailed designs prepared under the ongoing IBRD-financed WISMP-2 program for the first phase of implementation starting immediately after loan effectiveness.

**Table 3: List of Schemes under Component A**

Province	BBWS	Scheme	Kabupaten
<b>Premium Schemes</b>			
South Sulawesi	BBWS Pompengan Jeneberang	<b>Pamakulu (6,133 ha)</b>	Takalar
<b>Urgent Run-of-the-River Schemes</b>			
West Java	BBWS Citarum BBWS Cimanuk Cisanggrahan	Cipancuh (6,318 ha) <b>Cikeusik (6,924 ha)</b>	Indramayu
Central Java	BBWS Serayu Opak (Serayu)	<b>Kedung Putri (4,341 ha)</b> Banjarcahyana (5,001 ha)	Purworejo Banjarnegara & Purbalingga
East Java	BBWS Brantas	<b>Talang (8,844 ha)</b> Pondok Waluh (7,263 ha)	Jember
West Nusa Tenggara	BWS NT I (Babak)	<b>Jurang Batu (3,467 ha)</b> Jurang Sate Hilir (6,294 ha)	Central Lombok
North Sumatera	BWS Sumatra II (Padang)	Sei Ular (18,500 ha)	Deli Serdang, Serdang Berdagai
South Sulawesi	BBWS Pompengan Jeneberang	Tabo-Tabo (7,013 ha) San Rego (6,432 ha)	
<b>Tidal Lowland Schemes</b>			
South Sumatera	BBWS Sumatra VIII	Karang Agung Hilir (6,350 ha)	Musi Banyuasin
Central Kalimantan	BWS Kalimantan II	Katingan (6,055 ha)	Katingan

\*Project names in bold indicates the selected five phase-one schemes.

5. Activities to be financed under this component include: (i) water resource and system performance assessments, including potential changes due to climate change; (ii) surveys, investigations and designs; (iii) infrastructure rehabilitation and upgrading, where relevant, including irrigation and drainage canals, river and canal flow control structures, along with storage facilities; (iv) construction, rehabilitation and upgrading of measurement devices; (v) construction, rehabilitation and upgrading supporting infrastructure, such as service roads, offices, training

centers; as well as (vi) support to development and improvement of tertiary systems. All these activities will apply the principles of Participatory Irrigation Development and Management (PPSIP) and consider climate-resilient management strategies for groundwater and surface water, improve resilience of infrastructure to flood risks, change irrigation management strategies to reduce climate vulnerabilities (e.g. irrigation schedules) and improve water efficiency by rehabilitation works of existing gravity-flow irrigation systems. The activities will be implemented under five sub-components that are aligned with the Government's five Pillars of modernization.

**6. Sub-component A.1: Rehabilitation and Improvement of National Irrigation Systems (USD202.4 million).** This subcomponent will finance assessments of water resources and system performance assessment of 14 national irrigation systems comprising of: (i) water availability, including potential changes in the hydrological cycle due to climate change and water needs under various management and service delivery scenarios; (ii) management practices and service delivery performance; (iii) water shortage risks and physical and non-physical options for mitigation; (iv) desired levels of irrigation and drainage services; (v) options/scenarios for physical and non-physical measures to enable delivery of desired services. (vi) identification of sediment management to maintain canal conveyance capacities through the survey, feasibility assessment, design and construction of erosion control measures in the catchments and siltation basins and flushing facilities at the entrance of the canal systems. For the 2 lowland systems serving 16,000 ha additional studies and surveys will be carried out for the assessment of water availability, quality and circulation in tidal irrigation systems, and the identification of occurrence and options for improvement of acid sulphate soils and conservation of peat and peat soils.

7. This sub-component will also support rehabilitation and upgrading of 74,000 ha existing gravity run-of-the-river irrigation and drainage systems, 16,000 ha of existing lowland systems and modernization of 10,000 ha of existing irrigation systems to be supplied from new reservoirs. Activities include (i) assessment of condition and functionality of existing system and feasibility analysis of infrastructural needs under to be developed management, service delivery and flood risk mitigation scenarios; (ii) surveys, investigations, detailed engineering design and preparation safeguard and tender documents. (iii) civil and electromechanical construction works; (iv) tertiary unit development using the principles of participatory design and construction, and (v) preparation for up-scaling of management modernization for remaining Nationals systems in participating provinces. Investigation for the lowland systems will include measures for management of acidity leaching processes and effectiveness of tidal irrigation systems.

**8. Sub-Component A.2: Irrigation Management Modernization (USD16.4 million).** Modernization of irrigation system management is continuous iterative process matching service requirements, availability of water resources, capacity of infrastructure, access to technology, and presence and capacity of human resources. The management modernization strategy under SIMURP aims towards the provision of irrigation services that are responsive to the present and near future needs of water users to facilitate the achievement of sustainable CSA, increases in productivity, farm incomes, and food and nutrition security. Activities financed under this sub-Component focus on creation of more accountability, transparency and sustainability and include: (i) establishment of water accounting systems, formulation of service delivery standards, and establishment of service agreements between the bulk water supplier and Irrigation system management and Irrigation system management and WUA(F); (ii) the development, installation and operationalization of a hydro-meteorological and water distribution and service delivery

monitoring network; and (iii) the design, preparation, installation and operationalization of Instruments and tools for management information and decision support systems for water and asset management and management performance monitoring and reporting; (iv) the establishment of a benchmarking system of service delivery performance assessment of the participating irrigation systems; (v) installation of SCADA on pilot basis and associated Decision Support Systems.

9. *Climate smart agriculture (CSA) pilots.* Improvement in irrigation service delivery needs to be linked to agriculture-related inputs and climate-smart agriculture knowledge to result in higher production, higher yields, lower risk of crop failure, and higher and year-round farm and non-farm employment. Beside reducing GHG emissions, CSA also enables smallholder farmers, including women, to adopt more diversified cropping patterns and to switch from low-value subsistence production to high-value market-oriented production. Climate smarting the agricultural and irrigation sectors in Indonesia will involve a combination of farming practice adjustments and investments in infrastructure and management, such as more controlled irrigation and drainage avoiding water saturation when rice is not grown and shortening and introduction of alternate wet and dry (AWD) management technology for rice to reduce emissions and save water. These Pilots for Rice and Non-rice crops will be carried out in each of the participating irrigation systems and include the strengthening of CSA knowledge at the regional extension agencies; and the Training of WUAF and farmer groups in smart agricultural practices.

10. **Sub-Component A.3: Irrigation Management Institutions (USD1.2 million)** supports the modernization of irrigation management institutions and associated human resources towards transparent, accountable and service oriented irrigation and drainage agencies, including strengthening and empowerment of coordination platforms and water user associations and their federations in the systems covered under components A. Activities financed under this sub component will focus on the Modernization of irrigation management institutional arrangements, and their coordination platforms and the associated regulatory frameworks. Activities financed under this component include: (i) Institutional reviews to assess current management arrangements and inform future institutional options for development towards service orientated, transparent and accountable irrigation management institutions; (ii) Improvement of Inter Agency Coordination and Support to Stakeholder Involvement; (iii) Support for enhancement of the legal and regulatory framework on national and local level to synchronize, harmonize and coordinate tasks and responsibilities among irrigation management institutions and coordination platforms; (iv) ensure for participatory irrigation management to be incorporated in programming, planning and budgeting for investments and O&M in the regional planning documents (RPJMD); (v) conduct investigations and piloting of possibilities for outsourcing of irrigation management tasks through maintenance contracts, management contracts or partnerships with WUAF/WUAA; (vi) conduct studies to the possibilities of reducing the O&M budget Gap by reducing O&M cost through more cost effective O&M practices while increasing resources for O&M through revenue generating activities and intensified cooperation with WUAFs.

11. **Sub-Component A.4 Human Resources Development (USD5.4 million).** This sub-component focuses on resolving shortage of staff in the national irrigation service institutions by directing the development of staff capability gains towards optimal utilization of the potential of modernized management processes and technology enhancement generated by the project. Activities under the sub-Component intends to incentivize these staff in the institutions by

provision of training to introduce and acquire knowledge and operational methods of irrigation modernization technologies introduced under the Project. This subcomponent finances (i) socialization and training of participatory irrigation management and irrigation management modernization for government agencies and WUAFs in the 14 selected systems and provinces; (ii) Training needs assessments, training program development and implementation for all irrigation management institutions in the context of service orientation, transparency, accountability and modernization; (iii) Establishment, revitalization and strengthening of WUAs, WUAFs their Apex bodies (WUAA) as management partners of the irrigation agency; (iv) Gender assessments to inform the design of WUA formation and WUA trainings, including with active encouragement for female participation. Implementation of these activities will be done under the sub-components. (v) Strengthening of existing river basin and irrigation management institutions like the BBWS, Basin Management Platforms (TKPSDA), Irrigation Commissions (KOMIR); (vi) Updating of guidelines for institutional strengthening to also include gender sensitivity and mainstreaming.

**12. Component B: Strategic Modernization of Irrigation and Drainage System (USD333.6 million).** The JIS is the country's premium system and the most critical candidate for modernization given the complexity of issues and institutional arrangements relating to the transitional challenges in Indonesia. The Jatiluhur service area is located in the West Java province in four districts: Bekasi, Karawang, Subang and Indramayu and is a key rice production area. It provides approximately 40 percent of the rice needs for West Java Province and 9.4 percent for the country.

13. JIS consists of three main blocks that are served by the West Tarum Canal (WTC - 55,551 ha); East Tarum Canal (ETC - 92,187 ha) and; North Tarum Canal (NTC - 86,423 ha). The West and East Canals are supplied by low lift hydraulic pumps at the headworks (Curug), but North Tarum is supplied by a large barrage (Welahar) built in 1927. The Bugis Main Canal, at the tail of East Tarum Canal is a self-contained system (36,000ha) supplied from the Salam Darma weir, built in 1923. The West Tarum Canal also functions as the main conveyance canal for the domestic, municipal and industrial water supply for the urbanizing and industrializing area along the canal and for Jakarta. Considering the budget proposed and condition of the areas it was agreed that the project will cover the last two blocks i.e. North and East Tarum. A Strategic Environmental Assessment carried out during preparation to evaluate the relation of external and internal conditions and processes affecting water management development informs these activities.

14. This component will support the increase of serviceability of the Jatiluhur Irrigation Scheme through modernization of existing management and 176,000 ha of infrastructure. Activities under this component will focus on improvement of the East (ETC - 90,230 ha) and North (NTC - 85,945 ha) Tarum Canals along with pilot projects in the Binong and Patrol sections of the East Tarum Canal command area. Specific activities will include: (i) water resource assessments, sharing and optimization; (ii) diagnostic scheme reviews; (iii) surveys, investigations and designs with modernization principles in PPSIP; (iv) upgrading and modernizing of river infrastructure, where relevant, including irrigation and drainage canals, and storage facilities, incorporating climate-resilient (such as enhanced reservoir, slope protection, etc.) and water-efficient features; (v) flow control structures; (vi) measurement devices; (vii) supporting infrastructure, such as service roads; as well as (viii) support to development and improvement of tertiary systems to facilitate introduction of CSA.

15. **Sub-component B.1: Detailed Planning, Design and Implementation (USD309.6 million).** For JIS, hydrological assessments on water availability have been carried out under the preparatory studies. This sub-component will finance studies and investigations concerning: (i) water availability and water needs under various management and service delivery scenarios of the Jatiluhur Bulk System and Secondary Systems; (ii) Assessment of present management practices and service delivery performance; (iii) Assessment of water shortage risks and physical and non-physical options for mitigation; (iv) definition of desired levels of irrigation and drainage services at bulk delivery and secondary systems; (v) options/scenarios for physical and non-physical measures to enable delivery of desired services. (vi) Sediment management measures to maintain canal conveyance capacities through the survey, feasibility assessment, design and construction of erosion control measures in the catchments and siltation basins and flushing facilities at the entrance of and within the canal systems

16. This sub-component also includes rehabilitation and modernization of the bulk water system, which includes (i) the East and North Tarum Canal, the Curug and Welahar Headworks Canal flow regulation and measurement systems, sediment management provisions and inspection/maintenance roads; (ii) Detailed Planning, Design and Implementation of the secondary systems in the Jatiluhur service area; and (iii) Participatory Planning, Design and Improvement of tertiary units, which will support the participatory planning, design and construction process of the tertiary irrigation and drainage systems that are managed by legalized WUAs.

17. **Sub-Component B.2: Modernization of Irrigation Management in Jatiluhur Irrigation Scheme (USD17.3 million).** The JIS falls under the management responsibility of the PJT2 while capital investments and the assets are the responsibility of the BBWS Citarum. The PJT2 needs to secure bulk water supply for irrigation and other water users and operate the secondary irrigation systems. In particular, their responsibility includes the bulk entitlements and allocations for irrigation, the adequacy of the hydrological monitoring network and information management, river flow regulation and main and secondary offtake structures, and erosion and sedimentation management works. Activities financed under this sub-Component include: (i) the preparation, introduction and operationalization of a system management plan including hydrological data gathering; (ii) establishment of asset management systems; (iii) evaluation of irrigation systems performance; (iv) development of irrigation management cooperation; (v) installation of advanced information system, telemetry and tele-control irrigation system; (vi) modernization of water irrigation allocation and distribution and (v) climate smart agriculture and pilot of agriculture process management.

18. **Sub-Component B.3: Irrigation Management Institutions (USD2.8 million).** Activities financed under this sub component will focus on modernization of irrigation management institutional arrangements to enhance effectiveness of service delivery options in the context of the PP7/2010 concerning the mandate of PJT2, and their coordination platforms towards transparent, accountable and service oriented irrigation and drainage agencies. The establishment of service contracts between BBWS and secondary water users will be introduced under the JIS, to pilot the activities to improve the accountability for the bulk water supplier distribution system. Therefore, activities financed under this component include (i) Institutional reviews to assess current management arrangements and inform future institutional options in the context of outsourced management to PJT2; (ii) Support for enhancement of the legal and regulatory framework on national and local level for Jatiluhur irrigation management; (iii) Investigation and

piloting of possibilities for outsourcing of irrigation management tasks through maintenance contracts, management contracts or partnerships with WUAF/WUAA; (iv) Strengthening of existing river basin and irrigation management institutions like the B/BWS, Basin Management Platforms (TKPSDA), and District-level Irrigation Commissions (KOMIR) and establishment of a Jatiluhur-specific KOMIR; (v) Establishment and strengthening of the Modernized Irrigation Management Units (UPIM) and rapid O&M Taskforces (UPKM) for the JIS under the PJT2 for the Bulk water supply system and under the BBWS Citarum for the secondary systems; and (vi) Development of a modified strategy for organization of water users in the Jatiluhur Area to accommodate the transition in land ownership, tenure and agriculture practice. Establishment and gender sensitive strengthening of modified Water Users Associations and their federations (WUA, WUAF)

19. **Sub-Component B.4: Human Resources Development (USD3.9 million).** This subcomponent finances (i) establishment and strengthening of Water User Associations (WUA) and WUA Federations (WUAF); (ii) establishment and strengthening of the Irrigation Commissions (KOMIR); (iii) strengthening of Citarum river basin organizations (BBWS) and PJT2; (iv) Development and implementation of training programs for irrigation service development and irrigation system modernization for Government Agencies , Basin Organizations and Water User Federations leadership; (v) Training in modernized irrigation service delivery for KOMIR and Basin Technical Coordination Committee (TKPSDA) in Jatiluhur; (vi) Training implementation serving the introduction of CSA and irrigation management to WUA and WUAFs; (vii) Gender analyses and assessments to better inform approaches, and training programs that will be implemented under these sub-components.

20. **Component C: Project Management (USD19.0 million).** This component will provide support to overall project management and implementation through: (i) the CPMU and CPIU within Ministry and PIUs at RBOs to provide the necessary support services for timely and effective project implementation, including monitoring & evaluation, procurement, financial management, safeguard compliance and monitoring, etc.; (ii) Technical Assistance for the RBOs and other implementing entities to ensure timely and effective implementation; (iii) support to the National Steering Committee for Water Resources; and, (iv) the incremental operating costs of the CPMU and the PIUs for activities related to project implementation.

### **Annex 3: Government Policy on Modernization of Irrigation Management**

1. The Government has formulated an irrigation management modernization concept built around five pillars to move towards the desired service oriented management. This approach is adopted to enhance transparency, participation and accountability, and built on accurate information that increasingly utilizes digital information technology. The Government's five pillars include: (i) improving water security and availability; (ii) rehabilitation and upgrading of infrastructure; (iii) improvement of management system; (iv) strengthening of institutions; and (v) strengthening of human resources. These five pillars are implemented through an integrated approach that is intended to respond to the very system specific needs of the individual schemes. An approach with 40 steps to this modernization process is described in the policy document on Basics of Irrigation Modernization (MPWH-DGWR-DIS, September 2015).

2. Pillar 1: Water Availability for Water Security. Securing the availability of water resources is one of the essential conditions for enhancing productivity and ensuring investments in new technology. Efforts to improve water security are needed on basin and irrigation system level to increase the level of water security for the targeted irrigation systems: (i) Water Assessments to enhance the knowledge of water availability and use and estimates of minimum, maximum and dependable flow; (ii) Water Conservation by increase rates of retention and infiltration and development of storage facilities in the catchment areas and in the irrigation system; (iii) Resource Protection through erosion control, sediment management measures, pollution prevention and control, water quality and ecosystem management in basin and irrigation system levels; (iv) Water Allocation processes at basin level for irrigation purposes based on needs a clear definition of water rights and entitlements including for other water using sectors, and well informed planning and monitoring processes; (v) Water Service Delivery standards for bulk water supply for irrigation systems and for other purposes; and (vi) Flood Risk Mitigation through physical measures such as retention areas, flood embankments, combined with non-physical measures such as early warning systems, flood proofing and flood damage mitigation measures and appropriate reservoir management.

3. Pillar 2: Functional Irrigation Infrastructure. The reliable provision of irrigation services requires rehabilitation, upgrading or modernization of infrastructure to ensure the fulfillment of new service requirements and the optimization of available water, financial and human resources. Much of the infrastructure is at the end of its economic life. Secondly, inadequate funding for operations and maintenance and sub-optimal construction practices result in even higher maintenance requirements. Basically, developing functional infrastructure: Ensuring a functioning infrastructure to facilitate the delivery of bulk water and the provision of irrigation and drainage services requires the development of infrastructure solutions (rehabilitation, upgrading and/or modernization of main secondary and tertiary conveyance and flow control systems, storage solutions, groundwater conjunctive use and recharge solutions, system monitoring and water accounting solutions). These solutions need to ensure delivery at agreed-upon levels of service that: (i) meet the needs and capacity of the customers; (ii) match the capacity of the service provider; (iii) minimize the associated cost of service provision; and (iv) comply with social and environmental standards.

4. Pillar 3: System Management. Issues currently detracting from the quality of system management are: (i) the inadequacy of management funding; (ii) the prevalent development and

construction culture in the management agencies; (iii) inadequate human resources in terms of both quality and quantity; and (iv) the inconsistent implementation of water management plans and rules, resulting in a loss of confidence and acceptance by users. To achieve and sustain functionality over time and under changing service requirements and conditions, regularly updated and accurate information regarding the functioning and condition of the existing infrastructure is necessary and should be tested against new required functions. Asset management programs provide for such an approach. However, to be useful, these programs need to be accompanied by a system of medium term (multi-year) planning and budgeting.

5. The following actions may provide a basis for renewed engagement with the users to enhance service delivery and management performance: (i) establishment of Water use rights and processes to manage and administer these rights at both the river basin and irrigation system level; (ii) Establishment of service agreements between basin manager and irrigation system manager and between the irrigation system manager and the water user association federation (WUAF); (iii) Sustainable systems for the funding of irrigation management and cost recovery (IPAIR); (iv) introduction of asset management systems as a basis for multi-year, needs-based budget plans and allocations; (v) Establishment of a water management information and decision support system covering water availability, water demands, water distribution and delivery accessible by WUAF, irrigation managers and basin managers, accompanied by a monitoring system; and (vi) Introduction of Benchmarking of service delivery performance.

6. Pillar 4: Irrigation Management Institutions: Institutions with responsibilities for river basin, and irrigation management include the national, provincial and district river basin and irrigation agencies, the water users associations and their federations, and the irrigation commissions. For them to become more capable, accountable and responsive the following measures are recommended: (i) Separation of the Management of Bulk Water and Irrigation System Distribution Systems to be applied for systems with large infrastructure, complex hydro-mechanical equipment and systems fed by multiple sources through interconnected basins and through river runs or reservoir-fed systems exceeding areas of say 10,000 ha; (ii) A service orientation will be developed within agencies through the development of client services, service standards, and service agreements, and through the development of platforms for interaction and negotiations between the various stakeholders; (iii) Functional, informed and empowered stakeholder platforms like the irrigation commission (KOMIR) and Basin Commission (TKPSDA) to be strengthened; (iv) Transparent budgeting and financing mechanisms on the basis of multi-year asset management plans. Budgets and work plans, service delivery assessments and financial results should will be made publicly available through annual reports; (v) Strengthening of accountability mechanisms by empowering the irrigation commissions and basin commissions; and (vi) Development of accessible information monitoring and evaluation systems, while plans, rights and obligations, data and results are to be made publicly available.

7. Pillar 5: Human Resources. The appropriate number of staff at the agencies and the competencies they hold depends very much on choices related to the technologies deployed for management, operations and maintenance. Given the considerable shortage of staff at the present time, especially of field staff, the opportunity exists to redirect the human resources development to staffing gains to balance management processes and technology enhancement with more effective use of the WUAFs' competencies, and a higher level of engagement of private sector operators on a management contract basis.

## Annex 4: Economic Analysis

1. **Background:** Indonesia is one of the world's top five rice producers. However, it still imports around three million tons of rice almost every year to keep its reserves at safe levels. It is staple food particularly for poor families. Poorer households spend over half of their total expenditure on food items. The per capita rice consumption is about 150 kg per annum, which is considered one of the highest worldwide. Thus, any price hike in rice may significantly exacerbate poverty and food insecurity in Indonesia.
2. Consequently, the Government of Indonesia places top priority on reaching self-sufficiency in rice production. The strategies designed to achieve this goal include provision of subsidies for strategic rice production inputs such as fertilizers, ensuring minimum guaranteed producer price, and investing in water resources and irrigation infrastructure to ensure adequate and sustainable water delivery to irrigated farms.
3. Despite the commitment of the Indonesian Government, the irrigation sector faces numerous challenges. Much of the infrastructure is at the end of its economic life. To rectify this situation, the Government has formulated mid-term water resources and irrigation infrastructure rehabilitation, revitalization, modernization, and development plan. The plan promotes: rehabilitation of three million ha of irrigation area, development of one million ha of new irrigation, and development of 65 new dams and reservoirs. To meet these targets an overall investment of USD24.68 billion is required nationwide.
4. The Strategic Irrigation Modernization and Urgent Rehabilitation Project (SIMURP) is expected to contribute to this overall national plan. The objective of the project is to improve irrigation services and strengthen management of irrigation schemes in selected areas through rehabilitation and modernization of irrigation systems; institutional strengthening and improved management, operation and maintenance of these systems.
5. The economic analysis of SIMRUP was performed: (i) to evaluate if the benefits generated by the project significantly outweigh the resources committed from the point of view of the Indonesian society, and (ii) to assess if the project provides adequate financial benefits or incentives for participating farmers.

### Methodology

6. **General Approach:** The economic analysis was done for Component A and Component B separately considering their respective costs. Component A schemes were categorized into schemes affected by tide (low laying schemes) and other schemes and an economic gross margin analysis was performed for these groups separately because these groups of schemes have differences in biophysical and socioeconomic contexts. Similarly, Component B scheme was differentiated into four sub-categories based on the current drainage and irrigation performance situations. These are: areas with relatively better drainage and irrigation conditions (about 105,910ha), areas with bad drainage conditions (37,630ha), areas with bad irrigation systems (7,150ha), and areas with bad drainage and irrigation systems (18,520ha). For Component B, separate economic gross margin analysis was performed for these groups of areas because they differ in many important aspects such as potential improvements in yield and cropping intensities

and possibilities for crop diversification. To assess the returns to the overall project, the results of the component by component analysis were aggregated. The general analytical approach adopted involves incremental cash flow analysis based on the with and without project scenarios.

7. *Data and data sources:* The required data to enable the economic gross margin analysis were obtained from: (i) the socioeconomic baseline surveys; and (ii) secondary data gathered from variety of sources.

8. *Key assumptions:* In performing cost benefit analysis the following key assumptions were made:

- Standard Conversion Factor was assumed to be 0.9
- Shadow Wage rate conversion factor is 0.6
- Project duration is assumed to be 30 years
- Project implementation period is assumed to be six years. The target project areas (in both Component A and B) benefit from project interventions incrementally over the six years.
- The discount rate is 6 percent
- O&M costs without project was assumed to be USD234 per hectare per annum<sup>7</sup>
- O&M costs with project was assumed to be USD30 Per hectare per annum
- The key assumptions regarding yield and cropping intensity differentiated by project component, cropping system, and with and without project scenarios are summarized in Table 4 to Table 6 below.

**Table 4: Crop yield assumptions for component A for with and without project scenarios**

Farming System	Tidal Schemes		Other Schemes	
	Without (t/ha)	With (t/ha)	Without (t/ha)	With (t/ha)
Double Rice				
Rendeng Rice	4.27	5.90	4.97	5.90
Gadu Rice	2.04	5.80	4.62	5.70
Five Two system				
Rendeng Rice	4.27	5.90	4.97	5.90
Gadu Rice 1	2.04	5.80	4.62	5.72
Gadu Rice 2	3.50	5.80	3.50	3.50
Rice Rice Palawija				
Rendeng Rice	4.27	5.90	4.97	5.90
Gadu Rice	2.04	5.80	4.62	5.72
Mungbean	1.30	1.30	1.30	1.30
Rice Rice Vegetables				
Rendeng	4.27	5.90	4.97	5.90
Badu	2.04	5.80	4.62	5.72
Long bean	13.12	13.12	13.12	13.12

<sup>7</sup> Real expenditure data form Indonesia for the last five years shows that it costs: US\$2700 per ha for new irrigation system, US\$530 per ha for rehabilitation and US\$30 per ha for O&M. In Indonesia, 44 percent of the irrigation systems is broken and in need of rehabilitation. Therefore, the national average rehabilitation cost per ha is US\$ 234 (i.e. 530\$/ha x 0.44). Rehabilitation in this case is nothing but a deferred maintenance and deficiencies in the irrigation infrastructure.

**Table 5: Crop yield assumptions for component B for with and without project scenarios**

Cropping system	Normal schemes		Bad Drainage		Bad irrigation		Bad drainage & irrigation	
	Without (t/ha)	With (t/ha)	Without (t/ha)	With (t/ha)	Without (t/ha)	With (t/ha)	Without (t/ha)	With (t/ha)
Double Rice								
Rendeng (Wet season) Rice	5.4	6.7	5.42	6.3	4.8	6.3	3.2	5.5
Gadu Rice	5.9	6.3	5.8	6.3	4.4	6.3	2.8	5.5
Five Two system								
Rendeng Rice	5.1	6.7	5.42	6.3	4.8	6.3	3.2	5.5
Gadu (Dry season) Rice 1	5.5	6.3	5.8	6.3	4.4	6.3	2.8	5.5
Gadu Rice 2	3.5	5.5	3.5	5.5	3.5	5.5	2.8	5.5
Rice Rice Palawija								
Rendeng Rice	5.1	6.7	5.42	6.3	4.8	6.3	3.2	5.5
Gadu Rice	5.5	6.3	5.80	6.3	4.4	6.3	2.8	5.5
Mungbean	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Rice Rice Vegetables								
Rendeng Rice	5.1	6.7	5.42	6.3	4.8	6.3	3.2	5.5
Gadu Rice	5.5	6.3	5.8	6.3	4.4	6.3	2.8	5.5
Long bean	13.2	13.12	13.12	13.12	13.2	13.12	13.12	13.12

**Table 6 : Cropping Intensities with and without the project**

Project Components	Double Rice		Five Two System		Rice Rice Palawija		Rice Rice Vegetables	
	Without	With	Without	With	Without	With	Without	With
<b>Component A</b>								
Tidal	1.75	2.0	1.75	2.48	1.75	2.48	1.75	2.48
Other	2.0	2.0	2.0	2.76	2.49	2.76	2.49	2.76
<b>Component B</b>								
Normal	2.05	2.0	2.05	2.15	2.05	2.15	2.05	2.15
Bad Drainage	1.70	2.0	1.70	2.16	1.70	2.16	1.70	2.16
Bad Irrigation	0.95	2.0	0.95	2.15	0.95	2.16	0.95	2.16
Bad irrigation & drainage	0.90	2.0	0.9	2.17	0.9	2.17	0.9	2.17

11. Project Benefits: The range of expected project derived benefits include: (i) Increased income from agricultural production due to improvements in crop yield, cropping intensity, increases in net irrigated area, and changes in cropping pattern, and (ii) reduced O&M and costly replacement costs due to rehabilitation, modernization, and sediment control interventions. Other possible benefits not quantified and valued in this analysis are: increased revenues from bulk water sales to water supply company, increased income from fish farming, benefits from improved navigability of irrigation canals and economic multiplier effects.

12. **Project Costs:** The total financial cost of the project is USD578 million of which USD250 million is from IBRD, USD250 is from AIIB, and USD78 million is contributions from Government of Indonesia. The direct cost of component A is USD225.4 million, while that of Component B is USD333.6 million. In addition to these direct costs, additional non-specific costs (i.e. project management and consultancy service costs) totaling USD19.0 million is added to Components A and B in proportion to the respective irrigation areas affected in Components A and B.

13. **Economic Analysis:** Gross margin financial analysis was done for four cropping patterns, namely Rice Rice Double Cropping, Five Two cropping system, Rice Rice Palawija system, and Rice Rice Vegetable systems. For Component A gross margin analysis was performed for tidal and other schemes separately. Likewise, gross margin analysis was performed for normal, poor drainage, poor irrigation, and poor drainage and irrigation areas of Component B. The analysis was done using the market prices of crops and inputs gathered during the baseline socio-economic survey. The results of gross margin financial analysis were converted to economic gross margins by adjusting input and output prices to reflect their true economic values. The inputs and outputs of the project were valued using their border parity prices. The economic gross margins were used to calculate Economic Net Present Value (ENPV), and Economic Internal Rate of Return (EIRR).

14. **Sensitivity Analysis:** Sensitivity Analysis was performed taking into consideration some variables expected to have significant impacts on the returns to irrigation rehabilitation and modernization investments. The variables chosen are: (i) delays in implementation or realization of benefit stream by one year, (ii) discount rate assumptions, and (iii) changes in cropping pattern, and (iv) O&M baseline cost assumptions.

## Results of Economic Analysis

15. The results of economic cost benefit analysis are summarized in Table 7. The overall results indicate the project is economically viable, with EIRR of 20.5 percent with corresponding NPV of USD1.5 billion for the most typical cropping pattern of rice (87 percent rice, 7 percent Palawija and 6 percent vegetable), assuming a 6 percent discount rate. The analysis considered the likely changes in crop production and irrigation management costs due to the project.

**Table 7: Economic Returns on Investments**

Project components	Rice Rice Double	Five Two Systems	Rice Rice Palawija	Rice Rice-Vegetables
<b>Component A</b>				
ENPV (USD)	291,854,653.1	491,684,146.5	937,612,309.8	\$3,451,944,741.1
EIRR (%)	18.58%	24.05%	34.29%	57.64%
<b>Component B</b>				
ENPV (USD)	707,213,305.1	1,014,883,634.8	1,963,528,362.8	2,365,951,153.7
EIRR (%)	15.63%	20.74%	30.08%	33.76%
<b>Overall Project</b>				
NPV (USD)	999,132,535.6	1,506,632,358.8	2,901,205,250.1	5,817,960,472.2
EIRR (%)	16.41%	21.82%	31.61%	47.39%

## Profitability and Farm Income

16. The gross margin analysis performed to demonstrate whether the project sufficiently benefits the farmers and provides incentives for participation in the project. Table 8 presents the results for the different cropping systems and scheme types of Component A. The percentage increase in farm income from tidal schemes is quite significant. As expected, farmers obtain significant income cropping systems that incorporate vegetables and Palawija crops.

**Table 8: The effect of the project on farmer's income: Component A**

Cropping Systems	Tidal schemes			Other schemes		
	Without project (USD/ha)	With project (USD/ha)	% increase	Without project (USD/ha)	With Project (USD/ha)	% increase
Rice-Rice-Double	1147.6	3249.2	183.1%	1469.4	3249.2	121.2%
Five Two system	1664.0	4353.0	161.6%	1899.9	4353.0	129.1%
Rice Rice Palawija	1027.9	3927.7	282.1%	2541.3	3533.5	39.0%
Rice Rice Vegetables	1027.9	8356.6	713.0%	6970.1	9426.5	35.2%

17. The results of gross margin analysis for Component B is summarized in Table 9 below. The results indicate that the project has significant effect on participating farmers' income.

**Table 9: The effect of the project on farmer's income: Component B**

Type of schemes or Cropping System	Without Project (USD/ha)	With Project (USD/ha)	% increase
Relatively Good Drainage and Good Irrigation areas			
Rice-Rice-Double	3110.7	3761.6	20.9%
Five Two System	3140.8	4723.9	50.4%
Rice Rice Palawija	6009.4	8082.1	34.5%
Rice Rice Vegetables	7958.6	10700.4	34.4%
Bad Drainage Areas			
Rice Rice-Double	3064.9	3605.3	17.6%
Five Two System	3366.3	4573.4	35.9%
Rice Rice Palawija	6229.9	7931.8	27.3%
Rice Rice Vegetables	8179.1	10550.1	29.0%
Bad Irrigation Areas			
Rice-Rice-Double	2276.8	3605.3	58.3%
Five Two System	2661.1	4573.6	71.9%
Rice Rice Palawija	5524.7	7931.8	43.6%
Rice Rice Vegetables	7473.9	10500.1	41.2%
Bad Drainage and Irrigation Areas			
Rice Rice-Double	1026.5	2980.1	90.3%
Five Two System	1271.7	4002.5	214.7%
Rice Rice Palawija	4382.6	7360.7	68.0%
Rice Rice Vegetables	6331.8	9979.0	57.6%

18. **Results of Sensitivity Analysis:** The summary results of sensitivity analysis are presented in Table 10 below. The project still remains economically viable if the implementation period is

delayed by one year. When the project is re-evaluated using 10 percent and 12 percent discount rates, the NPVs decrease significantly but the project remains economically viable. Allocating significant proportion of irrigated land to high value crops such as Palawija and vegetables expectedly improves the economic returns to investment. Similarly, the economic returns to the project is quite sensitive to the without project O&M cost assumptions, but the EIRR stays above 12 percent in all scenarios.

**Table 10: Summary Results of Sensitivity Analysis**

Scenarios	ENPV (USD)		EIRR (%)	
	Base value	Revised	Base value	Revised
Delay in implementation by one year				
Double Rice	999,132,535.6	595,309,248.2	16.41%	10.80%
Five Two System	1,506,632,358.8	1,059,595,702.6	21.82%	14.30%
Rice Rice Palawija	2,901,205,250.1	2,321,425,627.3	31.61%	20.91%
Rice Rice Vegetables	5,817,960,472.2	4,890,091,552.3	47.39%	29.64%
Discount rate assumption: 10%				
Double Rice	999,132,535.6	394,886,263.8	16.41%	16.41%
Five Two System	1,506,632,358.8	717,222,004.2	21.82%	21.82%
Rice Rice Palawija	2,901,205,250.1	1,545,168,257.3	31.61%	31.61%
Rice Rice Vegetables	5,817,960,472.2	3,324,844,162.0	47.39%	47.39%
Discount Rate Assumption: 12%				
Double Rice	999,132,535.6	222,830,897.9	16.41%	16.41%
Five Two System	1,506,632,358.8	487,474,462.0	21.82%	21.82%
Rice Rice Palawija	2,901,205,250.1	1,143,020,554.8	31.61%	31.61%
Rice Rice Vegetables	5,817,960,472.2	2,571,842,128.6	47.39%	47.39%
Changes in cropping pattern				
85% rice and 15% Palawija & Vegetables	NA	1,579,325,057.9	NA	22%
70% Rice and 30% Palawija & Vegetables	NA	2,083,392,606.8	NA	26%
Changes in cropping pattern				
85% Rice and 15% Palawija & Vegetables	1,456,932,289.5 <sup>8</sup>	1,579,325,057.9	20.52%	22%
70% Rice and 30% Palawija & Vegetables	1,456,932,289.5	2,083,392,606.8	20.52%	26%
93% Rice and 7% Palawija and Vegetables	1,456,932,289.5	1,235,005,277	20.52%	18.55%
Without Project O&M Expenditure Assumptions				
50% Reduction in base O&M cost (USD117/ha)	1,456,932,289.5 <sup>9</sup>	1,038,346,560.14	20.52%	15.45%
75% Reduction in base O&M cost (USD58.5/ha)	1,456,932,289.5	829,053,695.5	20.52%	13.3%

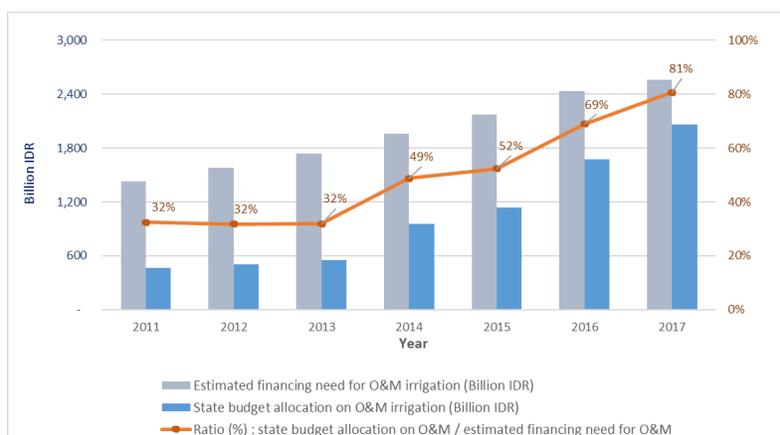
<sup>8</sup> The baseline NPV is based on a cropping pattern of 87% rice and 13% Palawija and vegetable crops.

<sup>9</sup> The baseline assumes an O&M cost of \$234 per ha for without project case.

## Financial Analysis

19. Historically, O&M expenditures for Indonesia’s irrigation systems have fallen short of the required O&M needs. Except for the bulk water supply for commercial use and services from the reservoirs for which the management has been delegated to PJTs, the national Water Law does not allow water charges for irrigation. The sustainability of irrigation infrastructure is dependent on the timely and sufficient allocation of O&M funds from central, provincial and district government budgets.

20. The average O&M expenditure gap<sup>10</sup> was estimated to be IDR 1 trillion from 2011 to 2014 or approximately 64 percent of the total O&M requirements. However, the central government in recent years has shown an increased commitment toward maintenance of irrigation infrastructure by continually increasing O&M allocations and expenditures. A review of the APBN shows that the financial gap between O&M allocation and requirement has been narrowing, and in 2017, the sector was allocated approximately IDR 2,000 billion versus a total need of IDR 2,500 billion. As a result, technical survey by DGWR indicates that the proportion of the damaged national schemes has also reduced due to successful implementation of rehabilitation programs in the recent years. This notwithstanding, a significant portion of the schemes is still in poor condition due to below par O&M and insufficient rehabilitation efforts.<sup>11</sup>



**Figure 1: Financing need and budget allocation on O&M of irrigation infrastructure**

21. As part of the efforts to stop deterioration, minimize the future expenditure on rehabilitation and extend the infrastructure life, the government has shown an increased commitment to provide sufficient financial resources for O&M for irrigation schemes. This is reflected by the steady increase of APBN allocation for irrigation O&M in the recent years (Figure 1). The average O&M expenditure gap of 64 percent (2011 through 2014) has been halved to an average of 33 percent (2015 through 2017). This gap is expected to further narrow with the

<sup>10</sup> Data and figures represent non-salary O&M costs

<sup>11</sup> Strategic Plan: Directorate General of Water Resources 2015-2019 (Original title: Rencana Strategis Direktorat Jendral Sumber Daya Air 2015-2019). Jakarta. Ministry of Public Works and Housing.

proposed 12 percent increase in overall DGWR budget in 2018 APBN.<sup>12</sup> Despite the promising trend, actual O&M expenditures are expected to be less than the allocations due to limited budget absorption capacity in DGWR. Therefore, modernization of human resource and information systems and strengthening of institutional capacities, a key focus of SIMURP, will contribute to improved performance, utilization of available funds and overall sustainability of irrigation infrastructure.

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<sup>12</sup> Annual Development Progress of United Indonesia Cabinet - Directorate General of Water Resources (Original title: Capaian Pembangunan Per Tahun KIB II Ditjen SDA). Jakarta. Ministry of Public Works and Housing.

## Annex 5: Sovereign Credit Fact Sheet

### A. Recent Economic Development

Indonesia is a low-middle-income country. The economy grew by 5.1 percent in 2017, driven mainly by domestic demand and supported by a recovery in exports. Inflation increased to 3.6 percent in 2017 from 3 percent in 2016, due mainly to adjustments in administered prices (electricity and fuel), but remained below the government's expectations of 4.3 percent. The current account deficit was relatively stable at 1.7 percent of GDP in 2017 (compared to a deficit of 1.8 percent in 2016), as higher exports balanced the rising imports of oil and gas. The fiscal deficit stood at 2.7 percent of GDP in 2017, below the government's expectations of 2.9 percent and the legal cap of 3 percent. Public debt remained low at 29 percent of GDP. The currency and interest rate remained broadly unchanged in 2017.

### B. Economic Indicators

**Selected Macroeconomic Economic indicators (2015-2019)**

Economic Indicators	2015	2016	2017*	2018*	2019*
National income and prices (change %)					
Real GDP Growth	4.9	5.0	5.1	5.3	5.5
CPI Inflation (change %, end of period)	3.4	3.0	3.6	3.5	3.6
Central government operations (% of GDP)					
Central government balance	-2.6	-2.5	-2.7	-2.5	--
Total external debt (% of GDP)	36.1	34.2	34.0	32.8	31.4
Gross external financing need (% of GDP)	8.9	7.8	7.0	7.0	6.7
Nominal gross public debt (% of GDP)	27.4	28.3	29.0	29.5	29.9
Public gross financing needs (% of GDP)	4.3	4.2	4.8	4.8	4.5
Money and credit					
Broad money (M2, % annual change)	9.0	6.9	10.1	--	--
Net FDI inflows (% of GDP)	1.2	1.7	2.0	--	--
Gross reserves (months imports)	8.0	7.9	8.0	7.9	7.8
Current account balance (% of GDP)	-2.0	-1.8	-1.7	-1.9	-1.9
Exchange rate (IDR/USD end period)	13788	13473	13579	--	--

Note: \* denotes projected figures. Source: IMF Country Report No. 17/37, Feb. 2017 and WB Indonesia Economic Quarterly, June 2017.

### C. Economic Outlook and Risks

Looking ahead, economic growth is expected to increase to 5.3 percent in 2018 and 5.5 percent in 2019, supported by higher investment and higher commodity prices. Nevertheless, risk remain tilted to the downside due to external factors, including uncertainties in global trade and a possible reversal of capital inflows arising from rising global interest rates and/or global financial volatility. Adverse impact from such shocks could be further amplified by the public and corporate sectors' heavy reliance on non-resident financing. Domestically, downside risks could also emanate from shortfalls in tax revenue, larger fiscal financing needs due to higher interest rates, and political uncertainties in the run-up to the 2019 presidential elections.

On indebtedness, Indonesia's external debt remains moderate at 34 percent of GDP in 2017 and is projected to be sustainable over the medium-term, supported by robust real GDP growth and high

non-debt generating capital inflows. Although public debt is projected to increase modestly over the medium term, it remains low and is expected to be sustainable<sup>13</sup>.

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<sup>13</sup> International Monetary Fund (IMF), 2018. Country Report No. 18/32– 2017 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Indonesia, February 2018.