

PROGRAM SOUNDNESS ASSESSMENT

A. Program Description

1. The program will support the implementation of Indonesia's irrigation improvement program (IIP), which advances the overarching agenda of food security and rural poverty reduction through increased agricultural water productivity. The IIP aims to (i) rehabilitate, upgrade, and modernize irrigation schemes that serve 3.2 million hectares (ha); (ii) promote participatory irrigation management; (iii) strengthen water users association (WUA) participation; (iv) improve the service delivery of river basin organizations and water resources agencies; and (v) improve operation and maintenance (O&M) through asset management and needs-based budgeting.

2. Successful implementation of the IIP will contribute to achieving food and water security, in accordance with the Long-Term National Development Plan (RPJPN), 2005–2025¹ and the National Medium-Term Development Plan (RPJMN), 2015–2019.² Implementation of the IIP is estimated to cost \$9.935 billion from 2015 to 2025. The proposed program will provide \$600 million to support selected subprograms under the IIP in 74 districts across 16 provinces.³ The International Fund for Agricultural Development (IFAD) will provide parallel financing of \$100 million to address extension services, access to farmer credits, and farm or market inefficiencies that limit rural income growth. The scope of the IIP and the program are in Table 1.

Table 1: Program Scope

Item	Broader Government Program	Results-Based Lending Program
Outcome	Sustainable and more productive irrigated agriculture in Indonesia	Sustainable and more productive irrigated agriculture in 74 districts
Key outputs	Rehabilitated or upgraded irrigation infrastructure; appropriate operation and maintenance; improved farmers' participation; and strengthened institutions.	Same elements as the broader government program, organized into three outputs: (i) systems and institutional capacity for sustainable irrigated agriculture strengthened; (ii) irrigation operation, maintenance, and management improved; and (iii) irrigation infrastructure improved.
Activity types	Rehabilitation or upgrading of irrigation infrastructure; improved asset management and needs-based budgeting; establishment of water users associations; and institutional strengthening of water resources agencies and irrigation commissions.	Upgrading of engineering guidelines; operationalization of irrigation commissions; improved asset management and needs-based budgeting through use of information system; operationalization of water users associations; institutional strengthening of water resources agencies; water accounting; and rehabilitation or upgrading of irrigation infrastructure.
Program expenditure	\$9.94 billion	\$1,679 million
Main financiers and the respective financing amounts	Government of Indonesia: \$7.24 billion Development institutions: \$2.70 billion	\$1,051 million: Government of Indonesia (62.60%) \$600 million: ADB (35.73%) ^a \$28 million: World Bank (1.67%) ^b
Geographic coverage	National	74 districts ^c
Implementation period	2015–2025	2017–2021

ADB = Asian Development Bank, ASEAN = Association of Southeast Asian Nations.

^a Including \$100 million from the ASEAN Infrastructure Fund.

^b Parallel financing provided under the ongoing Water Resources and Irrigation Sector Management Program (Phase II).

¹ Government of Indonesia. 2005. *Long-term Development Plan: RPJPN 2005-2025*. Jakarta.

² Government of Indonesia. 2015. *Medium-term Development Plan: RPJMN 2015-2019*. Jakarta.

³ Conditional on the performance of the program, lending for an additional \$400 million is planned for 2019.

^c The program is proposed to cover 74 districts across 16 provinces (Banten, Central Java, Central Sulawesi, East Java, East Nusa Tenggara, Lampung, Nanggroe Aceh Darussalam, North Sulawesi, North Sumatra, West Nusa Tenggara, South Kalimantan, South Sulawesi, South Sumatra, West Java, West Kalimantan, and West Sumatra). Source: Asian Development Bank estimates.

3. The key results areas and outputs summarized below are in keeping with the IIP:

- (i) **Output 1: Systems and institutional capacity for sustainable irrigated agriculture strengthened.** Output 1 includes support for institutional measures that will strengthen the planning, management, and delivery of irrigation systems; and improve the linkage between irrigation service delivery and agricultural development support. Output 1 will support the upgrading of (i) engineering guidelines for irrigation infrastructure to improve water efficiency and climate resilience; and (ii) planning guidelines to ensure that irrigation and agriculture development are integrated and coherent (disbursement-linked indicator [DLI] 2). DLI 3 measures the operationalization of irrigation commissions, which will improve subnational institutional capacities for integrating and coordinating agriculture and infrastructure. Capitalizing on these strengthened institutions, this output will support the process to incorporate irrigation plans into regional plans as captured by DLI4.⁴ The capacity of river basin organizations, water resources agencies, and subnational planning agencies will be strengthened to address weaknesses in implementing government safeguards, procurement, financial management, gender mainstreaming, engineering, and irrigation O&M and management processes. A capacity development framework will be prepared, implemented, and monitored (program action plan).⁵ Output 1 will also promote climate resilient practices and provide training to farmers in water management, and quantitative water measurement and allocation.⁶ Establishing a competency certification system for field facilitators will further strengthen institutional capacity. Monitoring and evaluation (M&E) systems will be enhanced to improve support for operations, monitor progress, track results, and provide feedback to policy and planning.
- (ii) **Output 2: Irrigation operation, maintenance, and management improved.** Output 2 focuses on measures aimed at enhancing irrigation sustainability and resilience at the scheme level. Having a better understanding of the condition of the irrigation network is critical to this effort. Toward that end, the program will upgrade and update the irrigation asset management information system (IAMIS) registry to cover 2.5 million ha of irrigated area, using aerial surveys of assets and remote sensing technologies (DLI 5). This will enable better linkages between asset management, sector budgeting, and planning. The participation of beneficiaries is central in improving asset management and water service delivery. Output 2 will enhance the role and participation of WUAs—including women and poor farmers in the planning, design and construction, and operation of irrigation infrastructure to improve maintenance and management (DLI 6). Output 2 will also promote climate-resilient practices and provide training to

⁴ The district irrigation development management plan is formally approved, with appropriate budget allocations, by the district or province parliament. It then becomes part of the development policy and plan for that district or province.

⁵ Program Action Plan (accessible from the list of linked documents in Appendix 2).

⁶ IFAD will also promote climate resilient practices and provide training to farmers in production, soil and crop management, improved planting methods, and improved pest and harvest management.

farmers in water management.⁷ It will ensure convergence between irrigation, livelihood, and agriculture interventions in the technical, socioeconomic, and institutional profiling of irrigation schemes as a basis for investments (DLI7).

- (iii) **Output 3: Irrigation infrastructure improved.** The program will support infrastructure rehabilitation and/or upgrading in ways that combine community participation, local knowledge, and advanced technology. Rehabilitation will address design shortcomings, restore effective water service delivery, and improve water efficiency and climate resilience (DLI 8). To ensure the technical soundness of infrastructure investments, the program will confirm the reliability of water sources through water accounting that draws on the results of data generated using satellite technology.⁸ The combination of participatory approaches and high technology methods will lead to rehabilitated and upgraded irrigation systems with improved efficiency that better serve the small farm community.

B. Program Soundness

1. Relevance and Justification

4. From 2006 to 2014, agriculture consistently contributed to 13.0%–15.2% of Indonesia's gross domestic product. Although the share of the working population in agriculture has decreased from 42.0% to 34.3% over the same period, this sector still provides employment to some 24 million farm households. The national poverty rate has been reduced from 17.8% in 2006 to 10.7% in 2016, but poverty incidence falls disproportionately on the rural population, which still registers a poverty rate of 14.0%.

5. Poverty reduction is recognized as a development priority in the government's RPJMN, which targets slashing the national poverty rate to 6%–8% by 2019. Food security is another development priority in the RPJMN.⁹ The government plans to improve food security through a number of strategies, including increasing rice production and promoting productive irrigation infrastructure and its sustainable management. By supporting the IIP, the program contributes directly to the government's development goals.

6. The program is highly relevant to promoting agricultural income growth and poverty reduction. Many of the rural irrigation systems are in need of rehabilitation and modernization. In 2014, only 55% of the 7.2 million ha of Indonesia's irrigated area were fully functioning. Some 70% of the systems are under the responsibility of provincial and district governments, whose resources are constrained. Some systems have deteriorated from their original design states, while many have fallen into disrepair owing to inadequate O&M planning and management. The program will first rehabilitate, upgrade, and modernize the existing irrigation systems in program areas. During this process, participatory rural assessment and water accounting exercises will be conducted to improve engineering design, water use efficiency, and the reliability of water

⁷ IFAD will also promote climate-resilient practices and provide training to farmers in production, soil and crop management, improved planting methods, and improved pest and harvest management.

⁸ A Climate Risk Vulnerability Assessment (accessible from the list of supplementary documents in Appendix 2) prepared under technical assistance for Enabling Climate Change Responses in Asia and the Pacific: Supporting Investments in Water and Climate Change (TA-7581 REG) provides potential climate associated risks for the program as well as guidance for climate change adaptation and climate proofing of infrastructure.

⁹ Indonesia is one of the biggest importers of cereals in Asia and the Pacific. From 2006 to 2013, on average slightly over 1 million tons of rice were imported each year, and the average import value was \$486.4 million.

delivery. Irrigation water availability increases productivity yield and cropping intensity, while improved water reliability encourages diversification to high-value crops.

7. Many past irrigation programs suffered a cycle of rehabilitation, neglect, deterioration, and rehabilitation. A major challenge is to ensure sustainable irrigation infrastructure management. To this end, the program will support (i) the establishment, reorganization, and strengthening of WUAs for irrigation systems management; (ii) strengthening relevant government agencies for the implementation and monitoring of irrigation development management plans (RP2I); (iii) improving coordination between different levels of governments and agencies; and (iv) upgrading the IAMIS.

8. An upgraded IAMIS is particularly important to sustainable irrigation budget planning and management. It will ease the government's efforts to monitor the conditions of irrigation systems, which will reduce administration costs. Furthermore, the IAMIS allows for early detection of repair needs, which brings multiple benefits. First, by directing routine O&M activities to sections of the irrigation systems where repair is most needed, the IAMIS improves budget allocation efficiency. More can be accomplished with the same amount of funding. Secondly, needs-based budgeting makes it possible to forecast maintenance expenditures for medium- and long-term (5–10 years) budget planning. Projections for the maintenance requirement will help formulate the RP2I at provincial and district levels. The program will support relevant agencies at these levels to secure intra-governmental funding for scheduled maintenance. By 2021, the IAMIS will cover the full program area of 2.5 million ha of farmland. Total cost savings for the government will be substantial.¹⁰

9. Early detection, regular maintenance, and timely repair of irrigation systems are critical to agricultural production because of the seasonality of the growing cycle. A time lag in detection leads to a time lag in response, often compounded by a time lag in funding provision between budget cycles. While unchecked irrigation infrastructure deterioration causes disruptions to agricultural production, its prevention will benefit farming households.¹¹

10. **Beneficiaries.** The primary beneficiaries of the program are farming households in the program areas. The program is designed to improve not only agricultural productivity but also irrigation service reliability and sustainability. To maximize the potential gain for farmers, IFAD will provide additional support to address farm and market constraints, such as (i) lack or untimely supply of agricultural inputs, (ii) poor access to extension services and credit, (iii) inadequate post-harvest services, and (iv) poor access to output markets. The improved IAMIS and improved institutional capacity activities will also bring about substantial cost savings in O&M expenditures for the government.

11. **Stakeholder support.** The program will involve WUAs in design, construction, and rehabilitation works, as well as participatory canal maintenance. Social mapping and participatory planning will be integrated into agriculture and irrigation planning from the outset to ensure that the risks, vulnerabilities, and capacities of the beneficiaries are taken into account.

¹⁰ According to the IIP program expenditure framework, at least \$2.469 billion will be spent on O&M from 2015 to 2025, and \$6.395 billion on irrigation rehabilitation and modernization. If the IAMIS can bring about O&M cost savings of 10%, that amounts to \$247 million. The IAMIS contributes to regular and timely repair that prevents periodic major rehabilitation works. If 5% of planned rehabilitation work can be spared, this may yield another \$319 million of cost savings.

¹¹ Burton, Martin. 2010. *Irrigation Management: Principles and Practices*. CABI Publishing, Wallingford, United Kingdom. Burton estimates that, in Madhya Pradesh, India, the lost agricultural production caused by the decline in the irrigation system performance is 35 times greater than the required maintenance costs.

Stakeholder consultation will continue to be a key part of the design during program implementation.

12. **Gender impact.** Direct targeting activities will ensure the inclusion of women. Gender analysis of the program has been conducted to promote the effectiveness of the program and ensure that its benefits accrue equitably to women and men. The program will ensure the following objectives: (i) men and women have full awareness of the program; (ii) livelihood, participation, decision making, and development opportunities in agriculture for women are reinforced; (iii) women's participation in all program-related implementation activities is strengthened; and (iv) women's participation in program management is ensured.

13. **Poverty reduction.** In 2010, over 60% of Indonesians earning less than \$1.25 per day worked in the agriculture sector. The program covers 74 districts across 16 provinces, with rural poverty rates as high as 22.2%.¹² IFAD's participation will secure farmers' access to extension services, affordable credits, and agricultural inputs and output markets—maximizing the potential benefits from the increased availability and reliability of the water supply. In a previous irrigation project financed by the Asian Development Bank (ADB), the Participatory Irrigation Sector Project, the poverty rate plummeted from 24.4% in 2008 to 6.8% by 2012.¹³ While factors outside the program also contribute to poverty reduction, extensive studies and reviews show that improved irrigation is a major influence in poverty reduction.¹⁴ It is expected that this program will also be a major contributor to poverty reduction.

2. Adequacy

14. The program builds on the work of the government and other international development partners. Whereas the financing of infrastructure is usually prioritized, the program will implement complementary measures as outlined in para. 7 to ensure sustainable irrigation management—often the aspect of program design that debilitates many irrigation programs. The IAMIS in particular will cover the entire 2.5 million ha of the program area farmland. It will bring about substantial cost savings in O&M expenditures. Other program activities will facilitate coordination between different levels of government to ensure timely budget allocations for irrigation repair and maintenance.

15. The program will employ intervention mapping to identify service gaps and select appropriate interventions from a menu of plausible interventions. IFAD is engaged to provide supporting services in agricultural production and the marketing of agricultural produce. Multilateral coordination can create synergies to maximize program benefits.

16. In the Participatory Irrigation Sector Project, farming households experienced an average increase in income of 129.5%, from Rp10.2 million to Rp23.4 million, over a 5-year period. The poverty rate fell by 17.6 percentage points from the 24.4% baseline. Annual rice yield also increased by about 18%. By and large, the project either met or exceeded the initial targets in other performance areas, including rehabilitation, strengthening irrigation management capacity, and strengthening WUAs. The actual project was \$127.5 million, against the \$126.0 million projection. The risk of significant cost overrun was minimal. The project was jointly implemented by the Ministry of Home Affairs (MOHA) and the Ministry of Public Works

¹² Statistics Indonesia (BPS). *2014 Data*. Jakarta. Eleven out of the 16 program provinces have rural poverty rates higher than the national rural poverty rate of 14.2%.

¹³ ADB. 2014. *Completion Report: Participatory Irrigation Sector Project in Indonesia*. Manila.

¹⁴ I. Hussain, and M.A. Hanjra. 2004. Irrigation and Poverty Alleviation: Review of the Empirical Evidence. *Irrigation and Drainage*. 53. pp. 1–15.

and Housing (MPWH), the same implementing agencies as the proposed program. Drawing on the previous successful experience, it is expected that the current program can deliver the intended results in promoting agricultural growth, poverty reduction, and sustainable irrigation management. The financial analysis conducted from the perspectives of farmers and government also indicates that the program is sustainable after the program implementation phase.

3. Financial and Economic Analysis

17. The government is committed to investing in irrigation in the agriculture sector. The RBL program calls for a total investment of about \$1,679 million from 2017 to 2021, \$600 million of which will be financed by the ADB.

18. The economic internal rate of return (EIRR) was calculated based on the following assumptions:

- (i) The time horizon is taken to be 25 years, including 5 years of implementation between 2017 and 2021.
- (ii) The program area will rehabilitate or modernize irrigation schemes in 74 districts across 16 provinces. The total investment cost is \$1,679 million, including 1,019 million capital expenditures and \$408 million recurrent O&M costs. At program completion (Year 6), annual O&M costs are estimated to be \$44.9 million.
- (iii) Financial costs and revenues are based on prevailing prices in 2015; the economic prices of the main tradable commodities are based on the World Bank's commodity price forecasts after adjusting border prices to farm gate prices. Economic values of investments and non-traded agricultural inputs are converted from their financial values using appropriate conversion factors.
- (iv) Economic costs and benefits are valued in rupiah (Rp) using the domestic price numeraire.
- (v) The analysis limits the program benefits to (a) improved agricultural income for farming households from increasing the yield and cropping intensity of rice cultivation; and (b) cost savings in O&M expenditures for the government.
- (vi) Cropping intensity is expected to increase from the baseline (without the program) 177% to 195% in the with-program scenario, and rice yield from 4.9 to 5.4 ton/ha.¹⁵
- (vii) The rice crop budgets for the wet and dry seasons are taken from Statistics Indonesia (BPS).¹⁶ In the with-program scenario, all variable costs in farming, including imputed labor inputs, are increased proportionally to the expected increase in yield.
- (viii) Additional benefits include (a) diversification to high-value crops, made possible by the increased availability and reliability of water supply; (b) capacity building for WUAs and government agencies that will improve water resourced management; and (c) synergy by building on the work of other development partners. However, these are not included in the economic analysis.

¹⁵ The baseline (without-program) scenario is data taken are extracted from 2015 2013 provincial level agriculture statistics, provided by individual provincial statistics offices. The statistics are accessible through the offices' individual websites. To access the websites, search for "X bps" using web search engine, where "X" is the name of the province. Central Bureau of SStatistics Indonesia (Badan Pusat Statistik).

¹⁶ Statistics Indonesia (Badan Pusat Statistik). Paddy Cultivation Household Survey (*Hasil Pencacahan Survei Rumah Tangga Usaha Tanaman Padi*) Cultivation. <https://www.bps.go.id/linkTabelStatis/view/id/1855>

- (ix) Economic costs and benefits for non-tradable agricultural inputs and agricultural outputs are derived by excluding taxes (namely valued added tax, at 10%). Economic prices of subproject costs are estimated by removing taxes and then adjusting the tradable component by the SERF of 1.15, unskilled labor costs by the shadow wage rate factor (SWRF) of 0.8. The shadow exchange rate factor is 1.15; the shadow wage rate factor is 0.80; and the economic discount rate is 12%.

19. Based on these considerations, the program generates an EIRR of 14.0%. Sensitivity analyses are conducted on (i) a 10% investment cost overrun; (ii) a 10% reduction in yield improvement; and (iii) a 10% reduction in dry season cultivation area. When the risks are considered individually, the EIRR remains above the 12% threshold for all scenarios.

20. This analysis was conducted at the program level. Three core subproject areas were selected for detailed analyses: (i) Karowa in North Sulawesi, (ii) Mon Sukon in Aceh, and (iii) Lembor in Nusa Tenggara Timur. The EIRRs are 26.3% for the Mon Sukon subproject and 23.8% for the Lembor subproject. In Karowa, the EIRR is estimated to be 13.2% since its irrigation system—especially the main weir—has deteriorated to such an extent that it requires reconstruction, which adds to investment costs. Karowa’s EIRR is substantially below the other EIRRs, highlighting the importance of a running maintenance framework, to which the program will contribute by sponsoring the IAMIS and other capacity-strengthening activities that harmonize irrigation maintenance and budgeting across different levels of government. Without this program, unchecked deterioration would call for periodic major rehabilitation, which is costlier.

Table 2: Economic Internal Rate of Returns of the Overall Program and Three Core Subprojects

Sensitivity Test	<u>National</u>		<u>Karowa</u>		<u>Mon Sukon</u>		<u>Lembor</u>	
	EIRR	SI ^a	EIRR	SI ^a	EIRR	SI ^a	EIRR	SI ^a
Base Case	14.0%		13.3%		26.3%		23.8%	
1. +10% investment cost	12.5%	1.1	12.1%	9.15	24.5%	0.67	22.1%	0.85
2. -10% yield improvement	12.2%	-1.3	12.6%	-5.86	24.0%	-1.93	21.5%	-2.23
3. -10% dry-season cultivation area	13.8%	-0.1	13.1%	1.57	26.0%	0.26	23.4%	0.38
4. 1-year benefit delay			11.7%		22.4%		20.4%	

() = negative, EIRR = economic internal rate of return, SI = switching indicator.

^a The percentage change in the EIRR caused by a one percentage change in the variable.

Source: Asian Development Bank estimates

21. **Sustainability.** Financial analysis conducted from the perspective of farmers indicates that they have a sufficiently strong financial incentive to contribute labor inputs voluntarily to the improved irrigation scheme’s routine maintenance.

22. On the government side, budget allocation on O&M has increased steady since 2011. To ensure the long-term sustainability of the program, the government has agreed to allocate adequate funds for O&M costs of the irrigation schemes rehabilitated under the program. In addition, the IAMIS will bring about substantial O&M cost savings and budget allocation efficiency for the government. Consequently, the government will be able to deliver better or more extensive irrigation maintenance services, even with the same budget provision as set under the IIP. The program is considered sustainable since the stakeholders’ financial incentives are aligned with the program objectives.

4. Implementation Arrangements

23. The executing agency will be the Directorate General of Water Resources (DGWR), MPWH. National, provincial, and district water resources agencies will deliver infrastructure investment and irrigation services at scheme level. Under the overall guidance and responsibility of the MOHA (as implementing agency), provincial and district planning agencies will ensure institutional strengthening, planning, and internalization of O&M into midterm and annual plans. The National Steering Committee for Water Resources—supported by the National Agency for Planning as implementing agency—will provide strategic and policy guidance. Coordination, integration, and communication will be enhanced through the operationalization of the irrigation commissions, which include members from water resources, agriculture, and planning agencies, and representatives from WUAs. The program will also support the development of water resources knowledge management centers at subnational level to capture and disseminate best practices, providing a platform for farmers to access knowledge.

C. Managing Risks and Improving Capacity

24. The program is subject to a number of risks. First, agriculture productivity is heavily dependent on climate, watershed and water resources management, farm gate prices, market demand and access, farm wages, cost of agricultural inputs, technologies, extension services, and other factors outside the control of the program. Second, the interventions by IFAD, the government, and other partners may not be on track, which poses a risk to outcome achievement. Third, institutional capacities may be weaker than envisaged, which may lead to lack of proper implementation. Fourth, insufficient local capacities, motivation, and commitment could derail the participatory approach for improvements, and thereby undermine sustainability. Finally, political factors also pose risks: province or district parliamentarians may not approve the incorporation of the RP2I into their budgets and plans. Political issues could impede the establishment and functioning of the irrigation commissions and WUAs.

25. The main government counterparts—the DGWR at the MPWH and the MOHA—are well aware of these risks. ADB is supporting the risk management process during program preparation, including the planning of various scenarios. One strength of the program is that it builds on the accumulated knowledge and experience of similar irrigation programs. The program is applying lessons learned from past projects, such as further support needed for subnational water authorities and WUAs, greater focus on the sustainability of asset management, and realistic budget allocations (footnote 13). Furthermore, the program's flexible menu approach addresses the recommendation by the Independent Evaluation Department to move away from a fixed and narrow scope toward programs that have a broader and more flexible menu of activities.¹⁷ The program also addresses other evaluation recommendations, such as mainstreaming the role of the irrigation commissions, continuing staff training in irrigation, and strengthening the legal basis for irrigation reforms.

26. Convergent and coordinated planning between the government, ADB, and IFAD will reduce the risks associated with agricultural inputs and services. Risks linked to climate change and attendant impacts will be managed by incorporating disaster preparedness and resilience measures in assessments, guidelines, trainings, and planning sessions.

¹⁷ ADB. 2015. *Performance Evaluation Report: Participatory Irrigation Sector Project in Indonesia*. Manila.