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R2017-0024/1

February 7, 2017

Closing Date: Monday, February 27, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

Indonesia – Dam Operational Improvement and Safety Project (DOISP) Phase II

Restructuring and Additional Financing

Project Paper

Attached is the Project Paper regarding a proposed restructuring and additional loan to Indonesia for a Dam Operational Improvement and Safety Project (DOISP) Phase II (R2017-0024), which is being processed on an absence-of-objection basis.

Distribution:
Executive Directors and Alternates
President
Bank Group Senior Management
Vice Presidents, Bank, IFC and MIGA
Directors and Department Heads, Bank, IFC and MIGA

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The World Bank

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Report No: PAD2105

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT PAPER

ON A

PROPOSED RESTRUCTURING AND ADDITIONAL LOAN

IN THE AMOUNT OF US$ 125 MILLION

TO THE

REPUBLIC OF INDONESIA

FOR A

DAM OPERATIONAL IMPROVEMENT AND SAFETY PROJECT PHASE II (ADDITIONAL FINANCING FOR DAM OPERATIONAL IMPROVEMENT AND SAFETY PROJECT)

February 02, 2017

Water Global Practice
EAST ASIA AND PACIFIC

CURRENCY EQUIVALENTS

(Exchange Rate Effective JANUARY 26, 2017)
Currency Unit = Indonesian Rupiah (IDR)
IDR 13,325 = US$ 1

FISCAL YEAR
January 01 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
AIIB	Asian Infrastructure Investment Bank
AKNOP	Maintenance Operations Real Analysis (*Analisa Kebutuhan Nyata Operasi Pemeliharaan*)
BAPPENAS	National Development Planning Agency
BBWS	River Basin/Territory Organization (*Balai Besar Wilayah Sungai*)
BDSF	Basic Dam Safety Facility
BP	Bank Policy
BPBD	Local Disaster Management Agencies (*Bedan Penanggulangan Bencana Daerah*)
BWS	River Basin/Territory Organization (*Balai Wilayah Sungai*)
CDMU	Central Dam Monitoring Unit
CP	Community Participation
CPF	Country Partnership Framework
CPIU	Central Project Implementation Unit
CPMU	Central Project Management Unit
DA	Designated Account
DGWR	Directorate General of Water Resources
DIPA	Budget Authorization (*Dokumen Isian Pelaksanaan Anggaran)*
DMU	Dam Management Unit
DOISP	Dam Operational Improvement and Safety Project
DSP	Dam Safety Project
DSU	Dam Safety Unit
EA	Environmental Assessment
EAP	Emergency Action Plan
EPP	Emergency Preparedness Plan
ERR	Economic Rate of Return
ESMF	Environmental and Social Management Framework
FY	Fiscal Year
GDP	Gross Domestic Product
GoI	Government of Indonesia
GRS	Grievance Redress Service
GW	Gigawatt
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
ICOLD	International Committee on Large Dams
ICR	Implementation Completion and Results Report
SMEC	Snowy Mountains Engineering Corporation Ltd
SMM	Quality System Management (*Sistem Management Mutu*)
SP2D	Remittance orders
SPM	Payment orders
TA	Technical Assistance
ID	Indonesia
IDA	International Development Association
IFR	Interim Financial Report
INACOLD	Indonesia International Committee on Large Dams
IP	Indigenous People
IPPF	Indigenous Peoples Planning Framework
IRR	Internal Rate of Return
KUD	Village Cooperatives (Koperasi Unit Desa)
LARAP	Land Acquisition and Resettlement Action Plan
LARPF	Land Acquisition and Resettlement Policy Framework
MDG	Millennium Development Goals
MEAV	Modern Equivalent Asset Value
MOF	Ministry of Finance
MPWH	Ministry of Public Works and Housing
NCB	National Competitive Bidding
NPV	Net-Present Value
NSCWR	National Steering Committee for Water Resources
NTB	West Nusa Tenggara (*Nusa Tenggara Barat*)
NTT	East Nusa Tenggara (*Nusa Tenggara Timur*)
O&M	Operation and Maintenance
OED	Operations Evaluation Department
OP	Operational Policy
PBMC	Performance-Based Management Contracts
PDO	Project Development Objective
PIU	Project Implementation Units
PJT	State-owned Enterprise (*Perum Jasa Tirta*)
PMF	Probable Maximum Flood
PMM	Project Management Manual
PMU	Project Management Unit
PoE	Panel of Experts
QA	Quality Assurance
QCBS	Quality and Cost-Based Selection
RBO	River Basin Organizations
RCWR	Research Center of Water Resources
RPJMN	National Mid-term Development Plan (*Rencana Pembangunan Jangka Menengah Nasional*)
Satker	Working Unit (*Satuan kerja*)
SEOP	Spillway Emergency Operation Plans
SID	Surveys, Investigations and Designs
SMC	Service Management Contracts
TKPSDA	Basin Water Resources Council (*Tim Koordinasi Pengelolaan Sumber Daya Air*)
ULP	Procurement Service Unit
WB	World Bank
WBG	World Bank Group

Vice President:	Victoria Kwakwa
Country Director:	Rodrigo A. Chaves
Senior Global Practice Director:	Guang Zhe Chen
Practice Manager/Manager:	Sudipto Sarkar
Task Team Leader:	Marcus Wishart, Ximing Zhang

INDONESIA
ADDITIONAL FINANCING FOR
THE DAM OPERATIONAL IMPROVEMENT AND SAFETY PROJECT PHASE 2

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Indonesia

Dam Operational Improvement and Safety Project Phase II (P161514)
(Additional financing for Dam Operational Improvement and Safety Project)

EAST ASIA AND PACIFIC

GWA02

Basic Information – Parent			
Parent Project ID:	P096532	Original EA Category:	B
Current Closing Date:	30-Jun-2017		

Basic Information – Additional Financing (AF)			
Project ID:	P161514	Additional Financing Type (from AUS):	Scale Up
Regional Vice President:	Victoria Kwakwa	Proposed EA Category:	B
Country Director:	Rodrigo A. Chaves	Expected Effectiveness Date:	16-June-2017
Senior Global Practice Director:	Guang Zhe Chen	Expected Closing Date:	30-Jun-2023
Practice Manager/Manager:	Sudipto Sarkar	Report No:	PAD2105
Team Leader(s):	Marcus J. Wishart, Ximing Zhang		

Borrower

Organization Name	Contact	Title	Telephone	Email
Ministry of Finance	Ayu Sukorini		+ 62 21 345 8289	ayusukorini.mof@gmail.com
Ministry of Public Works and Housing (DG Water Resources)	Lolly Matina Martief	Director of Operations and Maintenance	+	subdit_op_bendungan@yahoo.co.id

Project Financing Data - Parent (Dam Operational Improvement and Safety-P096532) (in US$ Million)

Key Dates

Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date

P096532	IBRD-76690	Effectiv e	19-Mar-2009	27-Mar-2009	08-Jun-2009	31-Dec-2013	30-Jun-2017

Disbursements

Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Undisbu rsed	% Disbursed
P096532	IBRD-76690	Effective	US$	50.00	50.00	0.00	47.02	2.98	94.04

Project Financing Data - Additional Financing Dam Operational Improvement and Safety Project Phase 2 (P161514)(in US$ Million)

[X] Loan [ ] Grant [ ] IDA Grant
[ ] Credit [ ] Guarantee [ ] Other

Total Project Cost: 300.00 Total Bank Financing: 125.00

Financing Gap: 0.00

Financing Source – Additional Financing (AF)	Amount
Borrower	50.00
International Bank for Reconstruction and Development	125.00
Asian Infrastructure Investment Bank	125.00
Total	300.00

Policy Waivers

Does the project depart from the CAS in content or in other significant respects?	No
Explanation	
Does the project require any policy waiver(s)?	No
Explanation	

Team Composition

Bank Staff

Name	Role	Title	Unit
Marcus J. Wishart	Team Leader (ADM Responsible)	Sr Water Resources Mgmt. Spec.	GWA02
Ximing Zhang	Team Leader	Sr Water Resources Spec.	GWA02
Angelia Budi Nurwihapsari	Procurement Specialist (ADM Responsible)	Procurement Analyst	GGO08

I Gusti Ngurah Wijaya Kusuma	Financial Management Specialist	Financial Management Specialist	GGO20
Chau-Ching Shen	Team Member	Senior Finance Officer	WFALN
Evarist F. Baimu	Counsel	Senior Counsel	LEGES
Ilham Abla	Team Member	Consultant	GWA02
Isabel Duarte A. Junior	Team Member	Program Assistant	GWA02
Jana Halida Uno	Team Member	Senior Operations Officer	EACIF
Joop Stoutjesdijk	Peer Reviewer	Lead Irrigation Engineer	GWA02
Kian Siong	Environmental Specialist	Environmental Specialist	GEN2A
Marcos T. Abicalil	Peer Reviewer	Sr Water & Sanitation Spec.	GWA04
Martin Benedikt Albrecht	Team Member	Water & Sanitation Specialist	GWA02
Nina Herawati	Team Member	Program Assistant	EACIF
Ninin K. Dewi	Safeguards Specialist	Consultant	GSUID
Paula Pedreira de Freitas de Oliveir	Peer Reviewer	Sr Water Resources Spec.	GWA04
Regassa Ensermu Namara	Team Member	Sr Water Resources Econ.	GWA08
Satoru Ueda	Team Member	Lead Dam Specialist	GWASO
Vica Rosario Bogaerts	Team Member	Disaster Risk Management Specialist	GSU09
Virza S. Sasmitawidjaja	Safeguards Specialist	Consultant	GEN2A
Xiaokai Li	Peer Reviewer	Lead Water Resource Management Specialist	GWA01

Extended Team

Name	Title	Location

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Indonesia	Daerah Istimewa Aceh	Sumatera 1 River Territories.			
Indonesia	Riau Kepulauan	Sumatera 4 River Territories			
Indonesia	Lampung	Mesuji-Sekampung River Territories			
Indonesia	West Java	-Citarum River Basin			
Indonesia	West Java	-Cimanuk-Cisanggarung River Territories			

Indonesia	Central Java	Bengawan Solo-River Territories			
Indonesia	Central Java	Pemali-Juana River Territories			
Indonesia	Yogyakarta	Serayu-Opak River Teritories			
Indonesia	East Java	Brantas River Territories			
Indonesia	Bali	Bali-Penida River Territories			
Indonesia	Nusa Tenggara Barat	NT1 River Territories			
Indonesia	Nusa Tenggara Timur	NT2 River Territories			
Indonesia	Kalimantan Timur	Kalimantan3 River Territories			
Indonesia	South Sulawesi	Pompengan-Jeneberang River Territories			

Institutional Data

Parent (Dam Operational Improvement and Safety-P096532)

Practice Area (Lead)

Water

Contributing Practice Areas

Additional Financing Dam Operational Improvement and Safety Project Phase 2 (P161514)

Practice Area (Lead)

Water

Contributing Practice Areas

Consultants (Will be disclosed in the Monthly Operational Summary)

Consultants Required ? Consultants will be required

I. INTRODUCTION

1. This Project Paper seeks the approval of the Executive Directors to provide an additional loan in an amount of US$ 125 million to the Republic of Indonesia for the Dam Operational Improvement and Safety Project (P096532, Loan No. 7669-ID). Accompanying the additional financing is a proposed level one restructuring of the Project to simplify the Project Development Objective (PDO) and to extend the safeguard policies triggered.

2. The proposed additional loan would help finance the costs associated with scaled-up activities to enhance the impact of a well-performing project. The major changes being proposed through this level one project restructuring accompanying additional financing include: (i) simplification of the PDO and streamlining of indicators; (ii) the rehabilitation of an additional 20 dams that were identified at the time of appraisal for the parent project but not included due to lack of available financing; (iii) introduction of a framework approach for screening and prioritization of dams under the Ministry of Public Works and Housing to create a platform that will allow for potential rehabilitation of an estimated 120 additional dams during implementation; (iv) updating of the environmental and social management framework to provide a more comprehensive set of tools to support the portfolio approach, including triggering operational policies on Indigenous Peoples, Involuntary Resettlement, Natural Habitats and Pest Management, which were not triggered under the original project; and (v) provisions for innovative measures to improve sediment management and land-care practices.

3. The activities to be supported with additional financing are expected to result in enhanced outcomes that will contribute to improved dam safety. In accordance with paragraph 58 of BP 10.00, an Implementation Completion and Results (ICR) Report for the parent project was prepared prior to management's decision on appraisal and negotiations of the additional loan given that the approval of the additional financing is expected to result in an overall Project implementation period exceeding ten years (Report ICR00003347). Given the high relevance of the PDO, the substantial relevance of the design and implementation, the substantial achievement of the PDO to date and the planned activities throughout the final year of implementation, and given the moderate efficiency, the overall project outcome has been rated as *moderately satisfactory*. A number of key lessons related to assessment of dam safety risks, monitoring and evaluation, sedimentation management and the overall quality of supervision have been incorporated into the design and restructuring of the additional financing.

4. The project restructuring and additional financing will involve introduction of new partnership arrangements with the Asian Infrastructure Investment Bank (AIIB) through joint co-financing on an equal basis with IBRD financing. This is to be implemented in accordance with the Co-Financing Framework Agreement entered into between AIIB and IBRD on April 13, 2016.

II. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING IN THE AMOUNT OF US$ 125 MILLION

5. **COUNTRY CONTEXT.** Water insecurity has the potential to undermine Indonesia's economic gains and development outcomes. The world's fourth most populous nation has shown solid growth over the past decade to emerge as a confident middle-income country and one of Asia Pacific's most vibrant democracies. Total Gross Domestic Product (GDP) has almost doubled and Gross National Income per capita has risen steadily from US$ 2,200 in the year 2000 to US$ 3,524 in 2014 such that Indonesia is the world's 10th largest economy in terms of purchasing power parity. This growth has halved the poverty rate since 1999 to 11.3 percent in 2014. Despite sustained economic growth and impressive gains in reducing poverty, considerable challenges remain in achieving Indonesia's goals. Inequality is increasing, with the income gap between rich and poor as measured by the Gini coefficient increased by almost 12 percentage points between 2000 and 2013, and vulnerability to poverty remains a major concern. Indonesia still has a large poor population, with 30 million people living below the national poverty line (which is just below Purchasing Power Parity US$ 1.25 a day). An additional 65 million people live above the poverty line but are highly vulnerable to falling back into poverty. Together they make up 38 percent of Indonesia's population. Geographic disparities also exist, with poverty rates higher in rural areas, and in Eastern Indonesia, especially Papua. The pace of poverty reduction is also slowing and many households existing just above the poverty line remain vulnerable to economic and environmental shocks that can send them back into poverty. Going into the next decade, Indonesia aspires to become more prosperous, equitable and sustainable nation.

6. **SECTOR CONTEXT.** Indonesia's limited water storage capacity coupled with the country's unique geography constrain the country's economic development and contribute to water insecurity. Three-quarters of the country's 131 water basins reportedly exhibit stress conditions, with demand dangerously close or exceeding supply, particularly in those high population density areas. Despite a long history of water resources development, Indonesia still ranks very low in storage capacity per capita when compared with its international peers. The country has developed an extensive network of more than 2,200 dams, with 213 classified as large. The majority of these (183 as of 2016) are owned by the Ministry of Public Works and Housing and used primarily for irrigation, with 30 owned by various corporations, including six tailing dams, six water supply dams and another 18 hydroelectric dams with an installed capacity of 5,545 MW. Seven of these are under private operation and another 11 under the national power utility. More than 40 percent of the countries of dams are located in Java with most used to support some 750,000 hectares of irrigated agriculture, representing 11 percent of the total irrigated area. These are all governed by *Ministerial Regulation Number 27/PRT/M/2015* and required to be certified by the Dam Safety Commission as well as develop a range of instruments such as Emergency Action Plans (EAPs) and Emergency Prepared Plans (EPPs).

7. To address the nexus of water, food and energy security the Government has launched an ambitious program to increase storage capacity through development of 65 proposed new dams at an estimated cost of IDR 66.4 trillion (roughly US$ 5 billion). While these are not financed under the project, the Government is continuing efforts to improve on the operation, maintenance and safety of existing dams and reservoirs. The risks associated with these dams are growing due to increasing population density and economic activity in the service areas, increased flooding risks due to higher climate variability and rainfall intensities, rapid catchment degradation and natural conditions, such as volcanic activity. In addition to physical and economic losses, severe soil

erosion is reducing the regulating capacity and available storage due to sedimentation. In turn, this erosion reduces the lifetime of storage reservoirs, increases the rate of occurrence of floods and landslides, and reduces the availability of water in the dry season. Rehabilitation and upgrading of dam facilities and improvement of dam operation and safety management are essential to enhance water security, reduce risks and increase the productive use of the limited water resources.

8. **RATIONALE.** The proposed project is aligned to the Country Partnership Framework (CPF) for FY16-20 (Report 99172) and contributes directly to the twin goals by supporting the Government of Indonesia (GoI) to eliminate extreme poverty, generate prosperity and share this more widely amongst all its people. Improved dam safety will disproportionately benefit the poor, and in particular women, who are the most vulnerable to downstream flooding and dam failure. Improved physical safety of irrigation dams will secure food production systems, improve the climate resilience of the hydraulic infrastructure network including dams and reduce the risk of inundation downstream due to dam failure. The pathways to the twin goals and priorities of government outlined in the CPF are organized around six engagement areas which are supported by two beams[1]. The current project and proposed additional financing contributes to and is included under Engagement Area 1: Infrastructure Platforms at the National Level. This is part of the CPF contribution to the Government's ambitious goals under the National Mid-term Development Plan (RPJMN - Rencana Pembangunan Jangka Menengah Nasional) for toward realization of a self-reliant nation that maintains its unique national characteristics whilst existing in mutual cooperation and respect within the global community. This contributes to the outcomes envisaged in the broader, longer term Master Plan for "Acceleration and Expansion of Indonesia's Economic Development 2011-2025" that seeks to accelerate development through a pro-growth, pro-jobs, pro-poor and pro-green strategy.

9. The proposed additional financing represents the next phase in a continued commitment to strengthening water resources institutions and asset management in Indonesia and the third in a series of specific investments aimed at improving dam safety. This is intended to support the Government's long-term programmatic approach to developing a portfolio management approach across its dam and reservoir sector. This is aimed at improving the aggregate levels of performance and safety of its reservoirs, starting to improve their financial sustainability, carry out the investigations, designs and actual works, and starting to address the erosion from the upper river catchments. This represents a commitment to a systematic process directed toward progressive improvements. Preparation and implementation of the Dam Safety Project (DSP: 1994-2003) was the first in a series of projects envisaged at supporting the Governments efforts and was followed by the Dam Operational Improvement and Safety Project (DOISP: 2009-2016). The overall aims of DOISP were: (i) to increase the safety and the functionality of the 63 short-listed prioritized large dams/reservoirs, and (ii) to develop and mainstream the regulatory and administrative arrangements for dam and reservoir management and safety that are more sustainable from a technical, environmental and financial perspective. It was recognized at the time that the rehabilitation and improvement of several dams would require more extensive surveys, investigations and designs under DOISP to allow implementation of the works under an envisaged

[1] Engagement Areas include: (i) Infrastructure Platforms at the National Level; (ii) Maritime Economy and Connectivity; (iii) Delivery of Local Services and Infrastructure; (iv) Delivery of Local Services and Infrastructure; (v) Sustainable Landscape Management; (vi) Collecting More and Spending Better; and Beams: (i) Leveraging the Private Sector and (ii) Shared Prosperity, Equality and Inclusion

second phase (DOISP2). The longer-term time frame was also considered more feasible to realize the objectives of the institutional reforms. Both the DSP and DOISP were rated in the satisfactory range[2] and have included structural and non-structural interventions to improve safety and operational standards, enhancing sustainable catchment management practices, strengthening newly established dam safety institutions along with supporting adaptions to climate change, enabling more reliable supplies. The proposed additional financing represents the second phase of support envisaged at the time of approval in 2009. Additional financing has been selected as the preferred option to ensure continuity in the program and simplify the process requirements.

10. The World Bank Group's support builds on the global experience with dam rehabilitation and safety projects in support of the Government's effort to enhance public sector performance. Global experience with dam safety and rehabilitation programs highlight the need for an appropriate balance of structural and non-structural interventions within an objective prioritization framework to ensure sound institutions, secure infrastructure and sustainable revenues. The additional financing draws on lessons learned from a number of related World Bank projects, including similar dam safety programs in Armenia, China, India, Indonesia and Sri Lanka as well as through reimbursable technical assistance in countries like Brazil. Drawing on this experience is helping to inform the appropriate mechanisms and innovations, such as the piloting of performance management contracts to stimulate private sector participation; conceptualizing incentive based mechanisms, such as payments for environmental services, to improve watershed management and sediment management; and helping design a comprehensive asset management system to direct the flow of limited funds.

11. Building on the existing foundations of the Government's program, the projects have supported a combination of structural and non-structural measures to assist in the formulation and execution of a comprehensive program to address the systemic issues associated with dam safety. Coupling the funds required for the physical rehabilitation with the global experience will help increase the project's development impact and address the underlying systemic issues in ways that go beyond what can be realized by exclusive reliance on the Government's own resources. Vertical integration of the basic elements of dam safety across different areas of Government is aimed at creating a virtuous cycle that will: (i) secure the structural integrity of the dam, (ii) implement the required operational and management measures, and (iii) enhance the capacity and re-enforce the regulatory mechanisms to implement a portfolio approach that assures an organization level of safety with accompanying certification. The project also builds on the lessons learned from a number of related World Bank projects that advocate for an integrated, holistic approach to dam safety and operations within the context of the river basin and to ensure the adequacy of the supporting institutional environment.

12. **THE ORIGINAL PROJECT.** The original DOISP was a US$ 50 million IBRD loan approved on March 19, 2009. The loan was signed on March 27, 2009 and became effective on June 08, 2009. The project was restructured three times. The first restructuring was carried out in October 2013 with a request for extension of the closing date from December 31, 2013 to July 01, 2015. This was to accommodate the slow start of the project and reorganization of the executing agency. The second restructuring was carried out in June 2015 with a request for extension of the closing date from July 01, 2015 to December 31, 2016 to provide adequate time to achieve the Project

[2] OED Review of the DSP concluded the outcome was moderately unsatisfactory due to the level of risk of dam failure remaining significantly higher than internationally acceptable, among other shortcomings.

Development Objective. This included motivations to complete on-going works and to use the loan savings to facilitate screening of 140 dams under the portfolio and prepare the engineering designs and tender documents for the dams proposed under the proposed additional financing. The third restructuring was approved in November 2016 to allow for an extension of the closing date by 6 months to allow for completion of the processing of the proposed additional financing.

13. The original project development objectives were to: (i) increase the safety and the functionality with respect to bulk water supply of large Ministry of Public Works-owned reservoirs; and (ii) strengthen the safety and operational management policies, regulations and administrative capacity of Ministry of Public Works. There were no revisions to the PDO during implementation.

14. The outcomes expected at the time of appraisal were: (a) restored safety, operational performance, and economic life of approximately 34 large dams including reduction of spillway flood risk to downstream population, (b) sedimentation impact reduced on three dams owned by the Ministry of Public Works and Housing; and (c) strengthened national dam safety institutions. An implicit aim of the project was that the enhanced functionality of the reservoirs would in effect reduce or delay the urgency to build costly new reservoirs. The primary beneficiaries were urban communities and over 2.5 million farm households who depend on these reservoirs for their water supply and livelihood, as well as all downstream communities who could be placed at physical and/or environmental risk if the safety of the dams were to be compromised.

15. The **Key Indicators** were not revised during implementation but the targets associated with some of the intermediate outcome indicators were slightly revised to account for government investments in some of the key activities. The key indicators included the following.

16. Part (i) of the PDO was aimed at increasing the safety and the functionality with respect to bulk water supply of large MPW-owned reservoirs and included the following key indicators:

(a) Reduction in dam failure risk of about 34 rehabilitated dams using an appropriate Risk Assessment Method & achieving operational Spillway Emergency Operation Plans for these dams. This included
- ‘Extreme’ Hazard dams reduced from 3% to 0%;
- ‘High’ Hazard dams reduce from 81% to 15%;
- ‘Moderate’ Hazard dams increased from 0% to >95%.
- Overall Hazard of the 34 dams reduced by > 30% on Risk Score.

(b) DGWR Dam Portfolio management improved by established: Annual Dam O&M Funding Program, Dam HR Development Program, Dam Hydrology Program, Dam QA system and a functional CDMU.
(c) DSU has completed > 75% of its priority dam inspection & certification load (including 2-3 large mine tailings dams).

17. Part (ii) of the PDO was aimed at strengthening the safety and operational management policies, regulations and administrative capacity of MPW and included the following key indicators:

(a) Government Regulation on Dams and Ministerial Decrees issued.
(b) Administrative procedures and capacity enhanced.

18. **PROJECT PERFORMANCE.** The project has performed satisfactorily in regard to meeting its expected Development Objectives and related outcomes. Progress toward achievement of the PDO and Overall Implementation Progress have been consistently rated Moderately Satisfactory or above.

19. The ICR completed for the parent project acknowledges that the PDO and the design remain highly relevant and arguably even more so given the Governments new construction program and increase in the overall portfolio. Disbursements under the parent project are currently at 94 percent with the ICR assessed the project as *moderately satisfactory*. The Outcome Indicator results show that the project has successfully addressed the failure risk of all 'extreme hazard' dams to 'high'; the failure risk of 21 out of 33 dams from 'high' to 'moderate'; and the overall hazard of dams under the project by 25 percent. Spillway Emergency Operating Plans (SEOP) have been prepared for 56 dams and Portfolio Management of dams under the DGWR has been improved by increased funding for O&M, preparing O&M manuals, providing training to dam operators, establishing a Central Dam Monitoring Unit, along with numerous improvements in the development of regulations, guidelines and administrative capacity through a Government Regulation on Dams (PP 37/2013) and several approved guidelines and manuals.

20. Through the ICR and reflecting on implementation to date a number of key lessons have been identified relating to the assessment of dam safety risks, monitoring and evaluation, sedimentation management and the overall quality of supervision. Specific provisions have been incorporated into the design and restructuring of the additional financing. These include integrated technical assistance with decentralized regional teams to support implementation, along with reformulation of the PDO and indicators to take into account those factors the project can influence and more disaggregated targets that are not aiming at a lower category of risk but a certain reduction in the total score for each dam.

21. The project is in substantial compliance with all key loan covenants. The covenant related to the Dam Safety Panel is "partially complied with". The panel was required to be established and retained during implementation to review and oversee large and or complex dams. Given that the works have largely been minor rehabilitation the panel was not retained throughout implementation and will be reconstituted under the additional financing on a demand driven as need basis. This will be triggered upon recommendation by the Dam Safety Commission or at the request of the IBRD to ensure compliance with international best practice and the provision of the applicable IBRD operational policy.

22. **ADDITIONAL FINANCING.** The rationale for the borrower to request the additional loan is to enable a scale-up of activities to enhance development impact. This is based on the project performance to date and the assumptions at the time of appraisal. The specific activities are summarized below and detailed in Annex 2, including: (i) scaling up opportunities from successful implementation; (ii) a greater than anticipated demand/absorptive capacity of eligible project beneficiaries; and (iii) an improved project design. While the design includes scaling up of activities, it also repositions the support to help Government address new challenges within a rapidly changing a complex environment.

23. The scope of the original project design was structured around five components. These were not restructured during implementation. It is proposed that the original components be retained and additional financing be allocated to each of the components to support a scale up of activities (see Table below).

	Cost Estimate (US$)		Financing Source					
			GoI		IBRD		AIIB	
	Original	AF	Original	AF	Original	AF	Original	AF
Component 1	36.85	161.96	7.12	27.00	29.73	67.48	N/A	67.48
Component 2	18.84	23.08	9.29	3.84	9.55	9.62	N/A	9.62
Component 3	6.86	55.07	3.07	9.17	3.79	22.95	N/A	22.95
Component 4	3.38	24.82	0.23	4.14	3.15	10.34	N/A	10.34
Component 5	4.5	35.07	0.72	5.85	3.78	14.61	N/A	14.61
Total	70.55	300	20.55	50.00	50.00	125.00	N/A	125.00

24. **Component 1: Dam Operational Improvement and Safety Works and Studies**. The objective of the original parent project was to restore dam performance and safety by providing for: (i) design and construction of *minor* and localized rehabilitation and remedial works on each of about 34 prioritized large dam/reservoir sites ("sub-projects") to restore operational performance and/or safety (including spillway equipment repair and/or minor upgrading); (ii) four sub-projects for implementation in the first year; (iii) Surveys, Investigations and Designs (SID) - including social and environmental management plans - for *medium to major* works (sub-projects) to restore and/or improve operational performance and safety for approximately 22 dams/reservoirs to be implemented in the successor project, including the second-phase additional works on about 14 dams/reservoirs that were subject of first improvement in DOISP; (iv) Basic Dam Safety Facility (BDSF) repair and/or upgrading to improve safety monitoring, and preparedness systems for spillway emergency discharge for about 34 dams; (v) establishing a river inflow and sediment monitoring system to improve the operational hydrology for about 63 dams, and review flood flow data, estimated flood discharge frequency, and Probable Maximum Flood (PMF) or "Flood Envelope Curves" related to watershed area; and (vi) assessment of spillway capacity and downstream flooding risks for approximately 34 dams (including surveys, models and feasibility studies regarding downstream effects to determine the viability of any spillway modification or operational change, to be undertaken in the successor project).

25. The additional financing will finance the physical rehabilitation of an estimated 140 major dams in the portfolio to restore dam performance and safety in accordance with acceptable international and national design standards. This includes 20 major dams prioritized and prepared under DOISP, along with priority investments from the remaining 120 major dams in the portfolio that are to be prioritized based on the objective criteria for identification and assessment. Support would include: (i) specialized studies, including hydrological assessments to review flood flow data, estimate flood discharge frequency and review spillway capacity and downstream flooding risks; (ii) Surveys, Investigations and Designs (SIDs), supervision and quality control of rehabilitation works; (iii) rehabilitation and safety remedial works on existing dams and their

associated structures, including civil and hydro-mechanical works; (iv) installation, rehabilitation or upgrading of Basic Dam Safety Facilities (BDSF) to improve safety monitoring, flood forecasting and preparedness systems; and (v) installation, rehabilitation or upgrading of instrumentation for operational hydro-meteorological monitoring. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. These activities are not intended to exceed the original schemes, change their nature, or so alter or expand the scope and extent as to make them appear as new or different schemes.

26. **Component 2: Operations and Maintenance Improvement and Capacity Building**. The objective of the original parent project was to support improved operations and maintenance and to strengthen capacity building of the dam agency through: (i) preparation of Operation and Maintenance (O&M) plans, Standard Operation Procedures (including rule curves and reservoir water balance) and manuals and undertaking needs based budgeting and O&M activities for about 34 dams and reservoirs, and for 29 dam sites to be rehabilitated under the successor project; (ii) preparation of dam and reservoir management plans and emergency spillway operation plans for about 34 dams; (iii) O&M staff training for dam safety monitoring, maintenance and operations, (iv) participatory programs on reservoir and dam management with local communities living near the reservoir, in approximately 20 reservoirs; and (v) provision of incremental operating costs for O&M of dams and reservoirs (borne by GoI).

27. The additional financing will finance improvements in the operational elements required for securing dam safety and improved utilization. This would include: (i) conducting strategic studies, including those for establishing asset management systems and needs based budgeting for operation and maintenance and piloting of performance-based contracts; (ii) Operation and Maintenance Plans; (iii) Instrumentation Plans and setting the service standards; (iv) preparing Emergency Preparedness Plans, including dam break analyses, downstream flood mapping and benchmarking; (v) conducting Community Participation Programs in reservoir maintenance, income-generating activities related to reservoir maintenance and related skills training with local communities; and (vi) human resource development and capacity building of dam safety institutions.

28. **Component 3: Reservoir Sedimentation Mitigation**. The objective of the original parent project was to provide for measures to mitigate the risk of sedimentation of selected reservoirs and for sustained performance and safety through: (i) bathymetric surveys to determine the available total storage and water level-area-volume relations of approximately 30 of the 63 reservoirs known to be affected by accelerated sedimentation; (ii) feasibility studies, designs and any necessary safeguards plans for "within-reservoir" activities and interventions to be taken in the medium-term (e.g., dredging, hydro-suction, etc.) that can be funded in DOISP or the successor project; (iii) preparation for a sample study for decommissioning of a severely silted reservoir to be financed under the successor project; and (iv) piloting of institutional models and plans for treatment of upstream rivers and (sub-)catchments with construction of sediment retaining and river bank protection structures, mostly through community participation and incentive programs.

29. The additional financing will support the scale-up of a comprehensive Sedimentation Management Program. This will include: (i) studies and surveys related to reservoir sedimentation; (ii) Corrective Measures, such as (a) dredging; (b) flushing and diversion works; (c) check dams; etc. and, (iii) Preventative Measures, such as (a) community watershed management, including community participation programs; and (b) piloting of incentive mechanisms, such as Payment for Environmental Services.

30. **Component 4: Dam Safety Institutional Improvement**. The objective of the original parent project was to further strengthen and consolidate the regulatory framework and national dam safety institution and strengthen MPWH's capacity for portfolio management and regulation in order to sustain rehabilitation works and reservoir life. This was achieved through: (i) the preparation of the Government and Ministerial regulatory documents and Concept/Academic Papers, including the consultations; (ii) a public awareness campaign about dams and reservoirs, and dissemination to all public and private dam owners of the regulations and guidelines regarding dams and reservoirs; (iii) strengthening and development of the DSU better fulfill its regulatory roles for about 63 dams under MPWH's program, and of other public and mines tailings dams through staff recruitment and training (with outsourcing of work to consultants and RCWR); (iv) provision of a fully furnished and equipped DSU office capable of housing about 30 engineers; (v) preparation of new or updated DSC Guidelines; (vi) establishing and supporting a National Dam Safety Panel to review site investigations and designs; (vii) establishing a dam engineer and technician training and certification system in cooperation with INACOLD; and (viii) incremental costs of the structural CDMU in DGWR to operate as the focal point for dam safety monitoring, review and archiving

31. The additional financing will continue to support Government's institutional evolution and further innovations in building water resources institutions in Indonesia. The institutional activities include: (i) strengthening the capacity of the MPWH to manage its dam portfolio better and regulate large dams in the country, and (ii) improving the sustainability of the rehabilitation works and the reservoir life. This will include support for the following: (i) institutional assessments, benchmarking and enhanced coordination mechanism among line agencies; (ii) regulatory support and instruments, standards and guidelines, including national dam policy on registration, inspection, safety compliance and penalties; (iii) a National Dam Safety Management System; (iv) enhancing dam safety through improved surveillance and protection measures; and (v) supporting development of a dam technology center.

32. **Component 5: Project Management**. The objective of the original parent project was to provide for overall Project Management including provision of: (i) the principal Project Management TA Consultant; (ii) the incremental operating costs of the Central Project Management Unit's (CPMU) and Project Implementation Units (PIUs) activities for coordinating all project interventions; and (iii) all TA support to prepare for the successor project.

33. The additional financing will support continued implementation and the overall project management through: (i) the Project Management Unit (PMU) within Ministry to provide the necessary support services for timely and effective project implementation, including monitoring & evaluation, procurement, financial management, safeguard monitoring, etc.; (ii) Technical Assistance for the Dam Safety Unit to ensure oversight and effective implementation; (iii) Technical Assistance for the river basin organizations to ensure timely and effective implementation; (iv) Environmental and Social Service Provider/s; (v) an international Dam Safety Panel of Experts; (vi) a National Dam Safety Review Panel; (vii) the National Steering Committee for Water Resources; and, (viii) the incremental operating costs of the Central Project Management Unit's (CPMU) and the Project Implementation Units (PIUs) for activities related to project implementation.

III. PROPOSED CHANGES

Summary of Proposed Changes	
The proposed changes are intended to allow for the provision of additional financing, in collaboration with the Asian Infrastructure Investment Bank, to enable a scale-up of activities. This includes an extension of the project closing date, changes to the project development objective, extending the safeguard policies triggered and amendment to the results framework.	
Change in Implementing Agency	Yes [ ] No [X]
Change in Project's Development Objectives	Yes [X] No [ ]
Change in Results Framework	Yes [X] No [ ]
Change in Safeguard Policies Triggered	Yes [X] No [ ]
Change of EA category	Yes [ ] No [X]
Other Changes to Safeguards	Yes [X] No [ ]
Change in Legal Covenants	Yes [ ] No [X]
Change in Loan Closing Date(s)	Yes [X] No [ ]
Cancellations Proposed	Yes [ ] No [X]
Change in Disbursement Arrangements	Yes [X] No [ ]
Reallocation between Disbursement Categories	Yes [ ] No [X]
Change in Disbursement Estimates	Yes [X] No [ ]
Change to Components and Cost	Yes [X] No [ ]
Change in Institutional Arrangements	Yes [ ] No [X]
Change in Financial Management	Yes [ ] No [X]
Change in Procurement	Yes [ ] No [X]
Change in Implementation Schedule	Yes [X] No [ ]
Other Change(s)	Yes [ ] No [X]
Development Objective/Results	
Project's Development Objectives	
Original PDO	
The objectives of the Project are to (i) increase the safety and the functionality with respect to bulk water supply of large Ministry of Public Works-owned reservoirs; and (ii) strengthen the safety and operational management policies, regulations and administrative capacity of Ministry of Public Works.	
Change in Project's Development Objectives	
Explanation:	

The proposed changes to the PDO are intended to increase the focus on outcomes for which the project can reasonably be held accountable.

Proposed New PDO - Additional Financing (AF)

The new Project Development Objective is proposed to increase the safety and functionality of dams in selected locations and strengthen the operation and management capacity for dam safety.

Change in Results Framework

Explanation:

To align with the proposed changes in the PDO and establish new targets to account for the additional financing and scale up of activities.

Compliance

Change in Safeguard Policies Triggered

Explanation:

The safeguard policies triggered have been increased to allow for a more flexible framework during implementation. This includes inclusion of a Resettlement Policy Framework in the event that there is a need for resettlement during implementation. An Indigenous Peoples Policy Framework has also been included in the safeguard instruments to provide greater flexibility to address issues of dam safety within the portfolio during implementation. Similarly, Pest Management has been triggered to provide a framework in the event that increase in farming activities as the result of the optimal supply of water from the irrigated dams. Revisions have been introduced into the provisions for establishment of the Dam Safety Panel of Experts based on experience in implementation of the parent project. Given that the works are largely minor rehabilitation the panel will be established as needed upon recommendation by the Dam Safety Commission or at the request of the IBRD to ensure compliance with international best practice and the provision of the applicable IBRD operational policy.

Current and Proposed Safeguard Policies Triggered:	**Current (from Current Parent ISDS)**	**Proposed (from Additional Financing ISDS)**
Environmental Assessment (OP) (BP 4.01)	Yes	Yes
Natural Habitats (OP) (BP 4.04)	No	Yes
Forests (OP) (BP 4.36)	No	No
Pest Management (OP 4.09)	No	Yes
Physical Cultural Resources (OP) (BP 4.11)	No	No
Indigenous Peoples (OP) (BP 4.10)	No	Yes
Involuntary Resettlement (OP) (BP 4.12)	No	Yes
Safety of Dams (OP) (BP 4.37)	Yes	Yes
Projects on International Waterways (OP) (BP 7.50)	No	No
Projects in Disputed Areas (OP) (BP 7.60)	No	No

Other Changes to Safeguards

Explanation:

The safeguard instruments have been updated to reflect the additional policies that have been triggered under the Additional Financing.

Select Non-Standard Covenants - Additional Financing
(Dam Operational Improvement and Safety Project Phase 2 - P161514)

Source of Funds	Finance Agreement Reference	Description of Covenants	Date Due	Recurrent	Frequency	Action
				☐		

Non-Standard Conditions

Source Of Fund	Name	Type
IBRD	Article IV, 4.01 of the Loan Agreement	Effectiveness

Description of Condition

The Co-financing Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Borrower to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section I A 3	Recurrent

Description of Condition

The Borrower shall: (a) ensure that each PIU shall prepare monitoring reports on each Sub-project under its responsibility on a quarterly basis, which reports shall be consolidated on a semi-annual basis by the CPMU; (b) commencing October 1, 2017, a report reviewing performance of the Annual Work Program of the year to date.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section I A 4	Recurrent

Description of Condition

The Borrower shall no later than March 31 in each year of Project implementation, commencing on March 31, 2017, send to the Bank a report on O&M budget containing the information required as set out in the Project Management Manual, including: (a) the O&M budget allocation in the immediately preceding Fiscal Year; and (b) the percentage thereof that was spent in accordance with the Project Management Manual.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section I A 5	Recurrent

Description of Condition
The Borrower shall adopt, and thereafter implement, the O&M plans, standard operation procedures and manuals prepared under Part 2 of the Project on a schedule acceptable to the Borrower and the Bank.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section I D 3 (a)	Recurrent

Description of Condition
If requested by the Bank, or upon recommendation by the DSC, establish and thereafter retain for the period as agreed with the Bank, an International Dam Safety Panel of Experts with composition, qualifications and terms of reference acceptable to the Borrower and the Bank.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section I D 3 (b)	Dated

Description of Condition
By December 31, 2017, establish and thereafter retain throughout the Project, a National Dam Safety Review Panel with composition, qualifications and terms of reference acceptable to the Borrower and the Bank.

Source Of Fund	Name	Type
IBRD	Schedule 2 Section II A 2 (a)	Dated

Description of Condition
The Borrower shall prepare, under terms of reference agreed between the Borrower and the Bank and furnish to the Bank by June 30, 2020, or such later date as the Bank may otherwise agree, a mid-term review report of the progress made in carrying out the Project during the period preceding the date of such report, and setting out the measures recommended to ensure the efficient carrying out of the Project and the achievement of the objectives thereof during the period following such date.

Risk	
Risk Category	**Rating (H, S, M, L)**
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Substantial

9. Other	
OVERALL	Substantial

Finance

Loan Closing Date - Additional Financing
(Dam Operational Improvement and Safety Project Phase 2 - P161514)

Source of Funds	Proposed Additional Financing Loan Closing Date
Asian Infrastructure Investment Bank	30-Jun-2023
Borrower	30-Jun-2023
International Bank for Reconstruction and Development	30-Jun-2023

Loan Closing Date(s) - Parent (Dam Operational Improvement and Safety - P096532)

Explanation:

The closing date of the loan is extended to June 30, 2023 to allow time for the activities under the additional finance to be completed.

Ln/Cr/TF	Status	Original Closing Date	Current Closing Date	Proposed Closing Date	Previous Closing Date(s)
IBRD-76690	Effective	31-Dec-2013	30-Jun-2017	30-Jun-2023	01-Jul-2015, 31-Dec-2016, 30-Jun-2017

Change in Disbursement Arrangements

Explanation:

The additional financing is joint co-financing with the Asian Infrastructure Investment Bank. Each will be governed by separate loan agreements but jointly co-finance all contracts on an equal basis. The review and clearance of withdrawal applications will be made by the World Bank and an instruction issued to the AIIB requesting disbursement to the project's special account. The Government will contribute counterpart funding in parallel.

Change in Disbursement Estimates (including all sources of Financing)

Explanation:

Change in expected disbursements to account for the additional financing and the time required to implement this.

Expected Disbursements (in US$ Million)(including all Sources of Financing)

Fiscal Year	2017	2018	2019	2020	2021	2022	2023
Annual	5.00	25.00	60.00	80.00	45.00	30.00	5.00
Cumulative	5.00	30.00	90.00	170.00	215.00	245.00	300.00

Allocations - Additional Financing
(Dam Operational Improvement and Safety Project Phase 2 - P161514)

Source of Fund	Currency	Category of Expenditure	Allocation	Disbursement % (Type Total)
			Proposed	Proposed
IBRD	US$	Goods, works, non-consulting services, Training and Workshops, Incremental Operating Costs and consultants services	125,000,000.00	50.00
		Total:	125,000,000.00	
AIIB	US$	Goods, works, non-consulting services, Training and Workshops, Incremental Operating Costs and consultants services	125,000,000.00	50.00
		Total:	125,000,000.00	

Components

Change to Components and Cost

Explanation:

There are no proposed changes to the components other than to increase the cost allocation to accommodate the additional financing and enable scaling up of activities.

Current Component Name	Proposed Component Name	Current Cost (US$ M)	Proposed Cost (US$ M)	Action
Dam Operational Improvement and Safety Works and Studies	Dam Operational Improvement and Safety Works and Studies	31.48	161.96	Revised
Operation and Maintenance Improvement and Capacity Building	Operation and Maintenance Improvement and Capacity Building	13.24	23.08	Revised
Reservoir Sedimentation Mitigation	Reservoir Sedimentation Mitigation	13.12	55.07	Revised

Dam Safety Institutional Improvement	Dam Safety Institutional Improvement	2.14	24.83	Revised
Project Management	Project Management	4.36	35.07	Revised
	Total:	64.34	300.00	

Other Change(s)

Implementing Agency Name	Type	Action

Change in Implementation Schedule

Explanation:

The implementation schedule is amended to allow time for activities to be carried out under the additional financing.

Appraisal Summary

Economic and Financial Analysis

Explanation:

The expected combined outcomes of these activities are improvements in the dam safety or reduction in the probabilities of dam failure, restoration of the operational performance of dams and reservoirs, and increased longevity of dam life. The achievement of these outcomes is expected to increase the safety of existing dams and their operational performance thereby: (i) avoiding loss of human life, (ii) avoiding irrigation benefit loss, (iii) avoiding hydropower benefit loss, (iv) avoiding household property losses, and (vi) avoiding emergency response costs.

The cost benefit analysis methodology adopted for this project follows the probabilistic approach to dealing with the effects of dam safety improvement interventions. Successful implementation of this approach requires proper risk evaluation and risk measurement. It requires precise estimates of annualized risk of dam failure and its consequences or associated hazards. The annualized risk to local economy, human life, and the environment is the interplay of the probability of dam failure and the expected consequences or hazards. These consequences should be of most concern to the decision makers and dam safety analysts, not the collapse of the dam per se. Thus, meaningful quantification of dam failure risk depends on credible estimates of the damages that would result from each significant failure scenario.

Dam safety is unique in that it represents an extreme situation characteristic of low probability event and high consequence or hazard. Thus, conventional rules of economic analysis are difficult to extrapolate and extend to such events. For instance, human life is generally accepted as the most important consequence and often dominates dam safety decisions. Unfortunately, the confidence with which life loss can be estimated is low and so has not been included in the calculations. Application of cost benefit analysis is still relevant as there are insufficient financial resources to

improve the safety of every dam without limit. It is particularly useful for setting priority or determining the order in which dam safety rehabilitation projects are implemented within a portfolio of dams eligible for intervention. The extremely low probabilities of dam failure masks the risks. However, when the failure actually happens due to neglect or lack of necessary measures, the consequences are usually very costly, as evidenced by the recent two dam failure events in Indonesia itself.

The overall results of the cost benefit analysis carried out for the 23 priority dams for which special studies were completed under the parent project show very high economic returns with Net Present Value (NPV) of 522.9 million and Internal Rate of Return (IRR) of 60.3 percent (see Appendix 5 for details). Despite the overall highly satisfactory returns to the project, further scrutiny of the analysis done for each of the dams reveals mixed results. The IRR ranged from 0.5 to 145 percent, while B/C ratio ranged from 0.5 to 32.4. Three dams had negative NPV and IRR less than the cut-off value of 6% due to small irrigation area and low population residing downstream of these dams. These are retained as the criteria for inclusion is primarily based on the risk assessment and need to ensure dam safety with a zero tolerance for loss of life. Five dams recoded IRR higher than 80 percent due mainly to high density of human population residing downstream of the dam and availability of hydropower plant.

The ICR included an assessment of the economic and financial analysis prepared at the time of appraisal for the original parent project. This used the same methodology and was based on certain assumptions of dam failure probabilities, financial data on public expenditures and currency exchange rates at that time. The results of the economic analysis indicate a positive Net-Present Value of US$ 56.3 million as well as Internal Rate of Return of 28.7 percent at a 6 percent discount rate. This is less than assumed at appraisal (NPV US$ 108.2 million, IRR 32.8 percent), due to a smaller overall reduced risk score achieved than originally targeted.

Financial Analysis is required to assess the financial capacity of central and provincial governments to cover the O&M requirements of dams and reservoirs. The results of the financial analysis carried out for the original project are valid for the present contexts because no changes and regulations have been effected with regard to O&M issues. For instance, no regulations exist to require collection of water fees from the main water users, specifically for irrigation which represents an estimated 99.7 percent of the users from the reservoirs. Only a small portion of the bulk water is supplied to hydropower, and industrial and domestic users. The annual O&M expenditures for dam and irrigation facilities are fully financed from the central and provincial governments budgets in the ratio of 20:80. The PJT I and II collect fees for water supplied for hydropower, urban and industrial uses.

The actual O&M expenditures are often lower than the total needs, although budget allocations are generally increasing. The planned investments within the framework of DOISP2 AF would be expected to reduce the required annual O&M requirements by comprehensively addressing the rehabilitation requirements and reducing the need for annual O&M. However, the incremental O&M budget needs to be provided through firm commitments to providing resources on a needs basis or allowing the users to partially share or fully cover the financing requirements through new regulatory provisions.

Technical Analysis

Explanation:

The proposed additional financing is intended to finance a scale up of activities. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. This includes the rehabilitation of 20 major dams prioritized and prepared under DOISP, along with priority investments from the more than 120 remaining major dams in the portfolio that are to be prioritized based on the objective criteria for identification and assessment during implementation.

At the time of appraisal, the DOISP was envisaged as the first in a series of projects under the proposed programmatic support. The overall aims of the program were: (i) to increase the safety and the functionality of the 63 short-listed prioritized large dams/reservoirs, and (ii) develop and mainstream the regulatory and administrative arrangements for dam and reservoir management and safety that are more sustainable from a technical, environmental and financial perspective.

It was recognized at the time of appraisal of the parent project that the rehabilitation and improvement for a group of 29 dams would require more in-depth Special Studies, including extensive surveys, investigations and designs under DOISP to allow implementation of the works under an envisaged second phase (DOISP2). As a result the parent project focused on the rehabilitation works for 34 dams and the Special Studies to inform the rehabilitation works for 29 dams that were expected to be carried out during the second phase. This also allowed sufficient time to realize the objectives of the institutional reforms.

In the interim six of these dams in East Nusa Tenggara Province have been addressed by Government or removed from the prioritized list due to effectiveness and efficiency reason. The Special Studies for the remaining 23 major dams have been completed under the parent project (DOISP). These have determined the root causes of their reduced safety and are used to inform the detailed design of risk-reducing remedial works, along with the necessary environmental and social safeguard requirements.

The 23 priority dams are distribution among nine river basin organizations, ranging in height from 7 to 129 meters with an average height of 39m and with an average storage capacity of 164 Mm3 ranging from high risk dams with a low capacity of only 0.13 Mm3 to larger reservoirs such as Juanda which has a storage capacity of 2,556 Mm3. Only six of the 23 priority dams identified have been built in the past 25 years, with the average age of over 50 years and the oldest constructed 100 years ago in 1916 with the Tempuran Dam in BBWS Pemali Juana. The Modern Equivalent Asset Value of these 23 dams is estimated at IDR 12 trillion (roughly US$ 980m equivalent).

The recommendations of the special studies for three dams were implemented under the parent project, leaving left 20 dams to be included under the additional financing. Detailed designs and safeguard requirements have been advanced for six of these 20 dams, with and the tender dossier are expected to be prepared in time to accelerate their implementation in early 2017. The total investment cost for these six phase 1 investments is estimated at US$ 17m. Five of the first six phase 1 sub-projects are focused on relatively smaller dams within the portfolio, ranging from 08 to 23m, with a focus on rehabilitation of the main wall and dikes, hydro-mechanical works and

sediment removal. The sixth includes replacement of concrete arches in the spillway of the Ubrug Dam with two radial gates. The Ubrug Dam is one of three saddledams within the Jatiluhur system under the BBWS Citarum. At the time of construction the four outlet bays were blocked with solid concrete arches with the intention that these would be breached through blasting with dynamite during a high flood event. The installation of the radial gates will improve operational capacity and allow for the BBWS to manage the system to balance the risk during flood events.

Further additional rehabilitation works and remedial measures would be carried out for prioritized dams in the portfolio of 120 dams under the MPWH. These will be assessed as part of an update to inform the risk assessment based on the modified ICOLD method. This method has been developed, reviewed, assessed and applied under the DOISP to provide a portfolio approach to management of dam safety by the MPWH CDMU. Based on experience under the parent project, there is expected to be an overall risk reduction of more than 20 percent. Under the parent project the average reduction achieved was estimated to be 25.3 percent. The baseline of four percent in the results framework is calculated by taking each individual risk reduction score of the 24 dams under the parent project that are also part of second phase under the additional financing and averaging it with the remaining 116 dams so that the total denominator of the average calculation is 140 dams, with an initial zero percent risk reduction for each dam that has not yet been rehabilitated. As a result, this indicator will show a steady increase in percentage with each dam that has been rehabilitated, contributing to the overall risk reduction average score.

Institutional support would continue to build on the foundations provided under the DSP and the first phase of DOISP. This is increasingly important given the ambitious development program launched by the Government with the construction of 65 dams over the five year period from 2014-19. This has important implications and presents a number of challenges on the institutional capacity. The support under the project will focus on a range of legal and institutional capacity building and enhancement measures within the Directorate of Operation and Maintenance under the Director General for Water Resources in the Ministry of Public Works and Housing, the Central Dam Monitoring Unit, the Dam Safety Units within the basin organizations, and the Research Center for Water Resources within the MPWH. This support would include formal training and certification, on-the-job training, mentoring and peer to peer exchanges, research and technology innovations, as well as the formulation of additional regulations to enhance the enabling environment for sustained dam safety and improved operations.

Sediment management and mitigation measures are to be scaled up based on the experience of the community participation program under the current DOISP. This will include corrective mitigation measures, such as dredging, sediment traps, check dams, stabilization works and reservoir flushing, along with preventative management measures, such as catchment interventions to address sediment at the sources. This will include a focus on participatory approaches, piloting of incentive based mechanisms such as payments for environmental services, all aimed at continuing to provide cost effective options to improve the operational efficiency and sustainability of reservoirs.

Social Analysis

Explanation:

The overall social and environmental impacts are expected to be positive. The parent project did not trigger any of the social safeguards. However, as a precautionary approach and to provide greater flexibility during implementation the additional financing has triggered the Indigenous Peoples and Involuntary Resettlement safeguard policies.

The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. As with the original DOISP, physical rehabilitation will be carried out in situ and mainly limited to improving operation. There will be no major alterations in the existing land use patterns. None of the subprojects under the on-going DOISP have involved land acquisition. However, to give more flexibility during project implementation of the DOISP2 AF, a Land Acquisition and Resettlement Policy Framework (LARPF) have been developed to provide for any proposed activity may require additional land, temporarily or permanently. The project will ensure that only small-scale land acquisition will take place, which will not have any significant impact on the owners. The LARPF will also provide guidance on the voluntary land donation procedure, to anticipate any land donation from the community. Land donation for community-level facilities took place at several sites in the on-going DOISP under the Community Participation Program.

As with the Community Participation (CP) Program under the on-going DOISP, the scaled-up program in the DOISP2 AF will give more direct social and economic benefits to the communities around the reservoir and catchment area. The CP Program of the on-going DOISP, though still in limited scale, has been benefitting the communities participating in the program who have received incentives in the forms of livelihood programs as well as public facilities provided by the program. While in the same time, they are involved in maintaining the reservoirs and preserving the catchment areas.

Although the project does not have a specific poverty or gender focus, the Additional Finance provides an opportunity to develop a clearer understanding of the role of surrounding agricultural communities in contributing to project objectives so as to increase the potential benefits at the household and community level. Further, increased consideration of how women can contribute to elements of the project will be explored through the development of emergency preparedness plans and environmental services to help strengthen watershed management. A challenge for the project will be to develop a monitoring system that recognizes and values the important role women play in farming and accurately records the benefits that result from their ownership and efforts. This is important for the project so that all the benefits and impacts can be identified. It is also important from the perspective of promoting gender equality to challenge perceptions and norms, and make visible the value of contributions by women to agricultural productivity.

There are no indigenous peoples in any of the 20 sites identified and the on-going project did not trigger the policy. While the 20 dam sites for the first phase financing and some other sites for the following years have been identified, there is a possibility that during the project implementation new dams are proposed for rehabilitation. An Indigenous Peoples Planning Framework (IPPF) has been developed to provide flexibility in the approach should any IPs be identified in any of the estimated 120 dams remaining within the portfolio identified as requiring rehabilitation. Experience from the on-going DOISP shows that the activities are localized in the existing schemes and even in the event that IPs present there will be no significant adverse impacts. If IPs are identified then

the IPPF provides the necessary steps to be carried out to ensure compliance with the provisions of the policy.

The LARPF and the IPPF have been disclosed as an integral part of the ESMF on the MPWH website (http://sda.pu.go.id) as well as through the Infoshop on January 10, 2017.

Environmental Analysis

Explanation:

The environmental impacts are expected to be positive. The parent project triggered the Environmental Assessment policy. As a precautionary approach and to provide greater flexibility during implementation the additional financing has also triggered the Natural Habitats and the Pest Management policy as it is possible that the rehabilitation of some irrigation dams may result in agriculture intensification which could cause increased usage of pesticides, even if not directly procured under the project.

The project will not finance any new dam construction and the rehabilitation works will include in situ rehabilitation of existing infrastructure. The potential environmental impacts will be during the construction phase that will be localized on site and properly mitigated as necessary by implementing the best management practices. Implementation of the environmental safeguards under DOISP is considered sufficient and rated satisfactory. No cumulative environmental impacts are anticipated as the result of the project activities. The Environmental and Social Management Framework (ESMF) used to guide the current DOISP has been update to include the necessary framework instruments for the new policy that has been triggered. The updates to the ESMF have been completed and disclosed in country on the MPWH website (http://sda.pu.go.id) as well as through the Infoshop on January 10, 2017.

The 6 first phase sub-projects have prepared the safeguard instruments based on the DOISP ESMF and additional measures required under the revised ESMF for the DOISP2 AF. For additional rehabilitation works and remedial measures to be carried out for prioritized dams in the portfolio of 140 major dams under the Ministry, the ESMF adapted from the existing DOISP instruments give direction to the detail preparation of sub-project assessments during implementation.

Risk

Explanation:

The overall risk is considered Substantial during preparation and implementation. The project is supporting implementation of measures to improve the structural integrity and safety of dams along with non-structural measures to management the potential impacts associated with potential failure. The risk reflects the probability of failure and the impacts associated with such an event. The structural measures will help to address the probability of failure while the non-structural measures will help to mitigate the potential negative impacts through improved monitoring, oversight and forecasting, as well as preparedness. However, many of the potential impacts are beyond the control of the project, such as the population and assets downstream that are at risk. Within this context the key risks to achieving the PDO, and mitigation measures, include:

The Sector Strategies and Policies risk is considered substantial. While Indonesia has a comprehensive framework for dam safety management there is a complex legal framework and an evolving institutional context. The Water Law 7/2004 has been revoked and operations now continue under a recently issued Ministerial decree pending revision and resubmission of the Act.

Adequate financing for operation and maintenance remains a challenge under the current revenue framework and could present a significant risk to long-term sustainability. The Government has been exploring institutional models to optimize revenue mechanisms and develop sustainable revenue streams. These have been implemented in the more profitable river basins and the project will help develop institutional benchmarks to identify key constraints, along with asset management systems to assess the specific O&M requirements, guide budget decisions and strengthen institutions.

The Technical Design of Project or Program risk is considered substantial. The ongoing DOISP has provide an objective, internationally benchmarked framework for assessing risk and prioritizing specific interventions. The methodology has been developed, applied and refined during implementation and is broadly accepted. However, high or unseasonal flows during the rehabilitation works could negatively impact the schedule of works or cause downstream flooding. The PMF for each dam will be recalculated and the rule curve adjusted as needed. A number of measures would be taken to control the risks during rehabilitation of each dam and would be detailed in the contract documents. For example; operational measures such as lowering water levels prior to commencing civil works, phasing works during periods of low flood risk, ongoing monitoring before during and after work is completed and setting up a dam safety panel of independent experts.

There is a risk of Dam Failure during implementation. The project is aimed at financing the rehabilitation of dams identified to be at risk where the risk of failure is high and the potential downstream impacts significant. The risk index based on a modification of the ICOLD method has prioritized the rehabilitation of the most at risk dams during DOISP without major incidence. Further, the prioritization process means that the project will be undertaking high risk rehabilitation works.

The Institutional Capacity for Implementation and Sustainability risk is considered moderate. The implementation arrangements involve a large number of different entities within different level of local, provincial and national Government. Both the Directorate for O&M and the B(B)WSs report directly to the Directorate General of Water Resources and a lack of appropriate incentives, coupled with an ambitious parallel program of new dam construction, may create delays in implementation within the basin organizations. The long period of underinvestment in dams and reservoir management has also led to a very limited capacity in both government and private sector in terms of knowledge, experience and management of dam operations and safety. An important part of the resources need to be devoted to support capacity development of dam management units, consultants and contractors to ensure quality and quality control. This will be supported through decentralized regional technical assistance that will also help with enhanced monitoring and evaluation during implementation.

The Fiduciary Risk is considered substantial. While the implementing agency of the project has extensive experience in implementing Bank financed projects there have been challenges with coordination among the implementing agencies at different levels and across the country. Specific weaknesses have also been identified in the procurement, management and implementation of contracts during implementation of projects in the water and irrigation sector. These will be addressed through enhanced support from the decentralized regional technical assistance during implementation.

The Environment and Social risk is considered substantial. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures. The rehabilitation works are to be carried out in-situ and the experience of the ongoing DOSIP indicates that there are not expected to be any major social or environmental issues. However, the rehabilitation of existing dams may raise historical issues associated with the original construction and relating to the environmental and social context at the time. In accordance with good practice, the identification process will include screening criteria to identify any historical issues, such as those associated with any original resettlement. The project documents will include provisions to ensure that if any such issues are identified, appropriate interventions will be incorporated to address them as required. The risks are considered to be manageable with the implementation of the best environmental and social management and its mitigation measures.

The Stakeholders risk is considered substantial. There is considered public awareness through regular reporting in the popular media, with dam failures such as that of the Situ Gintung dam in 2009 receiving widespread local and international attention. A communications strategy is envisaged and public consultation will be carried out during preparation and implementation. Specific provisions will also be included to ensure corporate requirements relating to citizen engagement and gender are adequately addressed.

V. WORLD BANK GRIEVANCE REDRESS

34. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

ANNEXES

ANNEX 1: RESULTS FRAMEWORK

Project Name:	Dam Operational Improvement and Safety Project Phase 2 (P161514)			Project Stage: Additional Financing	Status:
Team Leader(s):	Marcus J. Wishart, Ximing Zhang	Requesting Unit:	EACIF	Created by:	Marcus J. Wishart on 25-Aug-2016
Product Line:	IBRD/IDA	Responsible Unit:	GWA02	Modified by:	Marcus J. Wishart on 29-Jan-2017
Country:	Indonesia	Approval FY:	2017		
Region:	EAST ASIA AND PACIFIC	Lending Instrument:	Investment Project Financing		
Parent Project ID:	P096532	Parent Project Name:	Dam Operational Improvement and Safety (P096532)		

Project Development Objectives

Original Project Development Objective - Parent:

The objectives of the Project are to (i) increase the safety and the functionality with respect to bulk water supply of large Ministry of Public Works-owned reservoirs; and (ii) strengthen the safety and operational management policies, regulations and administrative capacity of Ministry of Public Works.

Results

Core sector indicators are considered: Yes

Results reporting level: Project Level

Project Development Objective Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
New	Direct project beneficiaries	☒	Number	Value	2.30		11200000.00
				Date	23-Nov-2016		30-Jun-2023
				Comment			
New	Female beneficiaries	☒	Percentage Sub Type Supplemental	Value	0.00		50.00

New	Overall risk reduction of all dams under project	☐		Value	4.00		20.00
				Date	23-Nov-2016		30-Jun-2023
				Comment			
New	Number of dams with individual hazard reduced by > 20% of risk score.	☐	Percentage	Value	16.00		98.00
				Date	23-Nov-2016		30-Jun-2023
				Comment			
New	Dams returned to improved operation	☐	Percentage	Value	0.00		74.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	River Basin Organizations (Balai) with need based O&M budget and plan operationalized within a national dam asset management system	☐	Number	Value	0.00	0.00	13.00
				Date	23-Nov-2016		30-Jun-2023
				Comment			
New	Issuance of regulation on dam safety (incl. Government/PP, Minister and/or DG Decree on dam safety assurance)	☐	Text	Value	0		3
				Date	26-Oct-2016	11-Nov-2016	30-Jun-2023
				Comment	n/a	One PDO indicator consist of sub indicators that caused difficulty to conclude the achievement of PDO indicator. The O&M sub indicator is modified and used as PDO indicator. Other sub-indicators are	

						moved as intermediate indicators.	
Marked for Deletion	Dam portfolio risk assessments	☐	Number	Value	0.00	22.00	22.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			
Marked for Deletion	DGWR Dam Portfolio Management Program established	☐	Number	Value	0.00	56.00	56.00
				Date	01-May-2009	02-Jun-2016	31-Dec-2016
				Comment			
Marked for Deletion	DOISP Referable Dam Works and Field Inspection and Certification per DSU Priority Plan	☐	Percentage	Value	0.00	94.00	75.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			

Intermediate Results Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
Revised	Number of dams rehabilitated	☐	Number	Value	0.00	29.00	140.00
				Date	01-May-2009	02-Jun-2016	30-Jun-2023
				Comment			
No Change	Special studies for dams completed	☐	Number	Value	0.00	23.00	23.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			
New	Number of dams with BDSF operational	☐	Number	Value	10.00		140.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	Dams with emergency action plans updated and disseminated	☐	Number	Value	56.00		140.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			

Revised	Dam operational staff receiving annual training	☐	Percentage	Value	0.00	100.00	90.00
				Date	01-May-2009	02-Jun-2016	30-Jun-2023
				Comment			
Revised	O&M Manuals (including related training) for Dams completed.	☐	Number	Value	0.00	51.00	140.00
				Date	01-May-2009	02-Jun-2016	30-Jun-2023
				Comment			
Revised	Community-Dam Operator MOUs signed on Greenbelt Management	☐	Number	Value	0.00	3.00	30.00
				Date	01-May-2009	23-Nov-2016	30-Jun-2023
				Comment			
New	Land area under sustainable landscape management practices	☐	Hectare(Ha)	Value	10.00		300.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	Communities joining catchment management activities (% of which female)**	☐	Percentage	Value	37.00		50.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	Dams implementing at least 70% of catchment management activities	☐	Number	Value	0.00		60.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	Dams providing real time data	☐	Number	Value	30.00		80.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	Dam Technology Center established and operationalized	☐	Number	Value	0.00		1.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
New	CDMU staff trained		Number	Value	0.00		5.00

		☐		Date	16-Dec-2016		30-Jun-2023
				Comment			
New	DSU staff trained	☐	Number	Value	0.00		15.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
Marked for Deletion	INACOLD certification of Dam Professional	☐	Percentage	Value	0.00	100.00	80.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			
New	INACOLD certification of dam professionals	☐	Number	Value	40.00		200.00
				Date	16-Dec-2016		30-Jun-2023
				Comment			
No Change	Operating staff training took place for 63 dam.	☐	Number	Value	0.00	64.00	63.00
				Date	01-May-2009	02-Jun-2016	31-Dec-2016
				Comment			
No Change	DOISP Reservoir Survey completed	☐	Number	Value	0.00	31.00	30.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			
No Change	Number of 34 priority dams with SEOP operational	☐	Percentage	Value	0.00	56.00	50.00
				Date	01-May-2009	02-Jun-2016	01-Jul-2015
				Comment			
No Change	Household joining catchment management activities	☐	Percentage	Value	0.00	37.00	25.00
				Date	01-May-2009	02-Jun-2016	30-Dec-2016
				Comment			

Proposed Project Results Framework

PDO Indicators	Core	UOM	Progress To Date (Sept 26, 2016)	Target Values (CY)						Frequency	Data Source/ Methodology	Responsibility for Data Collection	Notes
				2017	2018	2019	2020	2021	2022				
The new Project Development Objective is to increase the safety and functionality of dams in selected locations and strengthen the operation and management capacity for dam safety.													
Overall risk reduction of all dams under project.	☐	Percentage	4	4	6	9	12	15	20	Quarterly	TA team & CPIU / Secondary data	TA team & CPMU - DMU	The share of dams rehabilitated under the project that demonstrate reduction in all the risk categories under modified ICOLD method.
Number of dams with individual hazard reduced by > 20% of risk score.	☐	Number	16	16					98	Quarterly	TA team & CPIU / Secondary data	TA team & CPMU - DMU	The share of dams rehabilitated under the project that demonstrate reduction in all the risk categories under modified ICOLD method
River Basin Organizations (Balai) with need based O&M budget and plan operationalized within a national dam asset management system.	☐	Number	0	0	2	5	7	10	13	Quarterly	TA team & CPIU / field visit	TA team & CPMU - DMU	
Issuance of regulation on dam safety (incl. Government/PP, Minister and/or DG Decree on dam safety assurance)	☐	Number	2	2	2	3	3	3	3	Quarterly	TA team & DSU / Secondary data	TA team & CPMU - DMU	

Beneficiaries													
Project beneficiaries	X	Number (million)	2.3	2.3	3.4	4.5	7.6	9.9	11.2	Quarterly	TA team & CPIU / field visit	TA team & CPMU - DMU	Only estimates those directly dependent on irrigation services. Population estimates at risk from failure will be determined through the EAPs during implementation.
Of which female (beneficiaries)	X	percentage	50	50	50	50	50	50	50	Quarterly	TA team & CPIU / field visit	TA team & CPMU - DMU	Female who get benefit from improved service and reduced risk of the dams

Intermediate Results Indicators	Core	UOM	Progress To Date (Sept 26, 2016)	Target Values (CY)						Frequency	Data Source/ Methodology	Responsibility for Data Collection	Notes
				2017	2018	2019	2020	2021	2022				
Intermediate Result 1: DAM OPERATIONAL AND SAFETY IMPROVEMENT WORKS													
Number of dams rehabilitated	☐	Number	35	20	60	90	105	120	140	Quarterly	Site Visit / Primary data	TA team & CPIU/ DSU/ Dam Safety Panel	
Number of dams with BDSF operational	☐	Dams	10	15	25	65	95	124	140	Quarterly	Site Visit / Primary data	TA team & CPIU/CPMU/ DMU	
Number of dams where emergency action plans updated and disseminated	☐	Dams	56	60	70	78	98	120	140	Quarterly	TA team & CPIU / Secondary data	CPIU/CPMU/ DMU	
Intermediate Result 2: O&M IMPROVEMENT AND CAPACITY BUILDING													
Dam operational staff receiving annual training	☐	Percentage	0	50	90	90	90	90	90	Quarterly	TA team & CPIU/DSU / Secondary data	CPMU / DMU	
O&M Manuals (including related training) for Dams completed.	☐	Number	51	70	85	100	110	125	140	Quarterly	TA team & CPIU/DSU / Secondary data	CPMU/DMU	
Community-Dam Management MOUs signed on Greenbelt Management	☐	Number	03	08	10	15	20	25	30	Quarterly	Community /Primary data	Facilitators / TA team & CPIU	
Intermediate Result 3: RESERVOIR SEDIMENTATION MITIGATION COMPONENT													

Intermediate Results Indicators	Core	UOM	Progress To Date (Sept 26, 2016)	Target Values (CY)						Frequency	Data Source/ Methodology	Responsibility for Data Collection	Notes
				2017	2018	2019	2020	2021	2022				
Land area under sustainable landscape management practices	☐	Hectare	10	50	100	150	200	250	300	Quarterly	TA team & CPIU/DSU/ Secondary data	CPMU/DMU	The land area for which sustainable landscape management practices have been introduced
Communities joining catchment management activities (% of which female)**	☐	Percentage	37	40	40	40	50	50	50	Quarterly	Community /PIUs/ /Primary data	Facilitators / TA team &CPIU	
Dams implementing at least 70% of catchment management activities	☐	Number	0	5	10	10	10	10	60	Quarterly	Community /PIUs/ /Primary data	Facilitators / TA team &CPIU	
Intermediate Result 4: DAM SAFETY ASSURANCE INSTITUTIONAL IMPROVEMENT													
Dams providing real time data	☐	Number	30	45	55	65	75	80	80	Quarterly	TA team & CPIU / Secondary data	CPMU/DMU	
Dam Technology Center established and operationalized	☐	Number	0	0	0	0	1	1	1	Quarterly	RCWR / Secondary data	CPMU	
CDMU staff trained	☐	Persons	5	5	5	5	5	5	5	Quarterly	CPMU / Secondary data	CPMU	
DSU staff trained	☐	Persons	15	25	25	25	25	25	25	Quarterly	CPMU / Secondary data	CPMU	

Intermediate Results Indicators	Core	UOM	Progress To Date (Sept 26, 2016)	Target Values (CY)						Frequency	Data Source/ Methodology	Responsibility for Data Collection	Notes
				2017	2018	2019	2020	2021	2022				
INACOLD certification of Dam Professional	☐	Persons	40	40	80	100	120	160	200	Quarterly	/ Secondary data	CPMU	

** Citizen engagement indicators

*** Dam center, sub directorate of Dam O&M, DSU, Research center of WR (including river basin org surrounding in Indonesia)

ANNEX 2: COUNTRY AND SECTOR CONTEXT

1. Indonesia has shown solid growth over the past decade to become one of Asia Pacific's most vibrant democracies. Having maintained political stability, the world's fourth most populous nation has emerged as a confident middle-income country with the gross national income per capita having risen steadily from US$ 2,200 in the year 2000 to US$ 3,524 in 2014. Prudent economic management has resulted in low budget deficits, a much reduced public debt-to-GDP ratio, and manageable inflation. Total GDP almost doubled from 2001 to 2012 such that today Indonesia is the world's 10th largest economy in terms of purchasing power parity and has made enormous gains in poverty reduction. Despite this, around 50 percent of the country's population live in rural areas and depend mainly or exclusively on the agricultural sector for their livelihood.

2. Indonesia's economic planning follows a 20-year development plan, spanning from 2005 to 2025 segmented into 5-year medium-term plans, each with different development priorities. The current medium-term development plan is the third phase of the long-term plan and runs from 2015 to 2020 with a focus, amongst others, on infrastructure development and improving social assistance programs in education and health-care. Such shifts in public spending have been enabled by a reform of long-standing energy subsidies, allowing for more investments in programs that directly impact the poor and near-poor. Going into the next decade, Indonesia aspires to become a more prosperous and equitable nation founded on more sustainable resource utilization.

3. Despite sustained economic growth and poverty reduction, considerable challenges remain in achieving Indonesia's goals. The poverty rate has more than halved since 1999 to 11.3 percent in 2014, but despite impressive gains in reducing poverty, inequality is increasing and vulnerability to poverty remains a major concern. The income gap between rich and poor as measured by the Gini coefficient increased by almost 12 percentage points between 2000 and 2013. Indonesia still has a large poor population, with 30 million people living below the national poverty line (which is just below PPP$1.25 a day) and the pace of poverty reduction is slowing. An additional 65 million people live above the poverty line but are highly vulnerable to falling back into poverty. Together they make up 38 percent of Indonesia's population. Geographic disparities also exist, with poverty rates higher in rural areas, and in Eastern Indonesia, especially Papua. While overall poverty rates have declined, many households hover just above the poverty line and remain vulnerable to economic and environmental shocks that can send them back into poverty.

4. Public services remain inadequate by middle income standards and institution building to enhance public sector performance is a keystone of the current administration. The achievements in strengthening public financial management over the relatively short reform period have been remarkable. However, public service delivery needs to be strengthened through improved coordination and greater transparency. Indonesia is also struggling in a number of health and infrastructure related indicators. For example, despite recent progress, access to improved sanitation facilities currently stands at 68 percent of the population, significantly short of the MDG target of 86 percent. The investment climate, though generally positive, faces continued regulatory uncertainties, shortcomings in infrastructure provision, and adjustments in minimum wages. The Government has achieved important improvements in water resources management through the decentralization to basin and provincial levels, improved data collection and information management, hydrology, water quality monitoring and pilot of water allocation. Nevertheless, more intensive efforts are required to optimize the role and functions of institutions at the central and provincial/regency and internalize the processes such as data collection and processing, quality

assurance, asset management, monitoring and evaluation into the routine activities of the government to improve the operation and service.

5. Indonesia's water security is subject to important spatial and seasonal variations that are likely to severely constrain the country's economic development and food security. Although abundant in aggregate, water resources are unevenly distributed across an archipelago of more than 17,000 islands that extends across 5,000 kilometers in length. Pronounced wet and dry periods lead to seasonal water shortages in parts of the country, especially on the densely populated islands of Java and Bali, and the relative dry zones of West Nusa Tenggara (NTB: Nusa Tenggara Barat) and East Nusa Tenggara (NTT: Nusa Tenggara Timur). Population growth, urbanization, economic development, and the impacts of climate change are further increasing pressure on water resources, resulting in increased vulnerability to water-related hazards such as floods and droughts and increasing shortages. This is particularly acute in Java, which has nearly 60 percent of the population and less than 5 percent of the national water resources, where approximately 20,000 ha/year of prime irrigated paddy fields are being converted to other uses as a result of the process of urbanization. These shortages are further aggravated by the dry spells caused by the El Nino effect.

6. Lack of water storage coupled with the unique geographic constraints are likely to further constrain the country's economic development and food security. Since most of the river basins are small with steep gradients and relative small retention capacity, improved retention through dam development and regulating capacity of existing reservoirs becomes increasingly important for water security. Three-quarters of the country's 131 water basins reportedly exhibit stress conditions, with demand close to or higher than supply, particularly in those high population density areas. At the same time the risk associated with these dams is growing due to increasing population density and economic activity in the service areas, increased flood risks due to higher climate variability and rainfall intensities. These are compounded by rapid catchment degradation, and natural conditions such as volcanic activity, which cause severe soil erosion in addition to physical and economic losses, reducing the regulating capacity through sedimentation. In turn, this reduces the lifetime of storage reservoirs, increases the rate of occurrence of floods and landslides, and reduces the availability of water in the dry season. Rehabilitation and upgrading of dam facilities and improvement of dam operation and safety management are essential to enhance water security, reduce risks and increase the productive use of the limited water resources.

7. Despite a long history of dam construction, Indonesia still ranks very low in storage capacity per capita when compared with its international peers. Since the construction of the Nglangon Dam, the first large dam in 1914, the country has developed an extensive network of more than 2,200 dams. Of these 213 are classified as large dams. The majority of these (183 as of 2016) are owned by the Ministry of Public Works and Housing and used primarily for irrigation, with 137 subject to special regulations in the interest of public safety as spelled out in Government Regulation 37/2010. More than 40 percent of these are located in Java and most of these dams are used to support some 750,000 hectares of irrigated agriculture which is only 11 percent of the total irrigated area. With a present storage capacity of 52 m3/capita Indonesia ranks very low in the international ratings when compared with Brazil (3,386 m3/ capita), China (2,486 m3/ capita), India (2,000m3/ capita) and Thailand (1,277 m3/ capita). It is the Governments ambition to increase the water security by increasing the storage capacity to 100 m3/ capita through development of 69 proposed new dams.

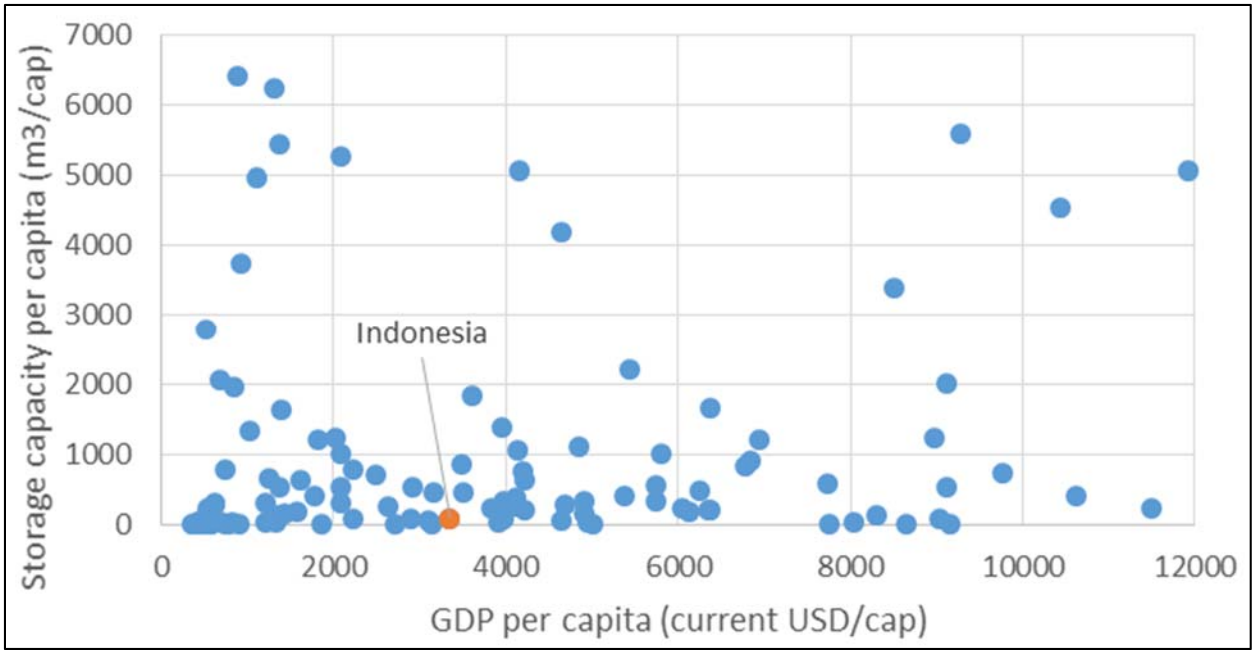


Figure A2.1. Storage capacity for countries of different levels of GDP per capita.

8. The management of Indonesia's water resources sector faces increasingly complex long term investment and management challenges. The development of water resources has played a critical role in stimulating rapid growth and reducing widespread poverty. While irrigation continues to be the largest user of water resources, the installed hydropower capacity is expected to more than double in the next decade. There are currently 37 large hydropower stations, with 130 small schemes less than 10 MW with an installed capacity estimated in excess of 3,867 MW. However, the Hydropower Master Plan Study (2011) has identified 89 new sites with an estimated capacity of almost 13 GW of which some 5.7 GW is planned to be developed before 2020. Roughly 1.5 GW is currently under construction, with another 1.8 GW in the purchase process and an additional 2.1 GW under study or design. This increasing pressure on the available water resources will require enhanced legal, regulatory and institutional measures in addition to the underlying infrastructure to meet the competing demands.

9. Indonesia’s water resources sector is going through a transformation following the enactment of the decentralization laws in 2003. With a three-tier unitary government structure comprised of 34 provinces and 491 autonomous district and city units spread over more than 17,000 islands containing more than 300 ethnic groups, Indonesia has a centralized fiscal system. The transition from a centralized development and investment system towards a decentralized system of service delivery in which more efficient use of resources and service quality are emphasized has helped improve service quality, particularly in education and health. However, data suggests that significant progress has yet to be seen in the development of local infrastructure, public transportation, and water and sanitation. Further, sub-national government spending is dominated by spending on administration over productive sectors and on personnel over maintenance and capital spending. Moreover, poor sector outcomes are greatly influenced by inefficiency in spending. Within this context, the key development issues in the water resources are: (i) strengthening national and local sector governance and management; (ii) improving the fiscal framework and sustainability; (iii) upgrading of water resources infrastructure and safety; and (iv) increasing agricultural water productivity.

10. Government's strategy toward decentralization was translated in the Law 7/2004 on Water Resources. This adopted a basin-based integrated water resources management approach; improvement of governance for accountability; effective service delivery of bulk water supply, irrigation, flood management and other services. Under the revised law, all river basins were required to have long term strategic plans (Pola) and sustainability-focused water resources master plans (Rencana) which outline key actions for water resources conservation in terms of quantity and quality, for water resource use to deliver high quality water services, for managing and reducing risks associated with water, and for increasing the capacity of water management institutions to implement these plans under a multi-stakeholder governance umbrella. However, Law 7/2004 on Water Resources has been suspended, along with all of the related Government Regulations, and dam construction and management is governed through Ministerial Regulation No. 27/2015.

11. The framework for decentralized water resources management provided for under the law is based on river territories. These include sets of river basins managed by the Provincial Water Resources Services (Balai PSDA), while cross-province and strategically important territories are managed by National River Basin Organizations (RBOs or Balai (Besar) Wilayah Sungai-BBWS) under the authority of the Ministry of Public Works and Housing. The River Basin Organizations are given the responsibility for basin planning, development and management of river infrastructure development and O&M including reservoirs and dams (strengthening of selected RBOs has been one of the items of WISMP Project). A total of 133 river territories (Wilayah Sungai (WS)) have been defined through ministerial regulation No. 11a/PRT/M/2006 issued by Minister of Public Works. Of these, 13 WS are fully located within an individual district (District WS) and 51 are fully located within a single province (Provincial WSs). Among the remaining 69 basin territories, five are considered international rivers basin, shared between two countries (with Malaysia, Timor Leste and Papua New Guinea), 27 are located within two or more Provinces and 37 are considered to be of strategic national importance. These national basin territories (National WSs) have been placed under the management authority of the central government. To enable participation, transparency and accountability, multi-stakeholder governance platforms are being established at national level (National Water Council – Dewan Nasional Sumber Daya Air), provincial level (Provincial Water Council – Dewan Sumber Daya Air Provinsi) and basin level levels (Basin Water Resources Council – Tim Koordinasi Pengelolaan Sumber Daya Air - TKPSDA). These platforms are required to discuss and endorse water allocation plans, including reservoir operation rules.

12. The process of institutional reforms has led to a more cohesive and transparent framework for dam safety and management as described in Government Regulation 37/2010 on Dams (see attached organogram of the Ministry of Public Works and Housing). The National Dam Safety Commission (DSC) is responsible for certification of dams during construction and special events during operation and reports to the Secretary General in the Ministry of Public Works and Housing. This Commission is supported by the Dam Safety Unit in carrying out inspections, evaluation of requests for licenses and certificates, provision of guidelines for operation, maintenance, safety procedures and equipment, and inspection (using the guidelines prepared under DOISP). The DSU sits under the Secretary General and acts as a Secretariat to the Commission. The Directorate General of Water Resources is responsible for dam construction, through the Center for Dam Construction, for maintenance and operations through the Directorate of Operations and Maintenance, and for the management of water resources through decentralized basin organizations. Oversight of the portfolio of existing dams under the responsibility of the Ministry

of Public Works and Housing is executed by the Central Dam Monitoring Unit (CDMU), which was established in the Directorate of Operations and Maintenance in 2015 with support from DOISP, while the day to day management of individual dams is the responsibility of the Dam Management Units (DMU) within the river basin organizations. These DMUs were also established with support from DOISP. All large dams are considered strategic and fall under the responsibility of the National River Basin Organizations.

13. Non-liner evolution of the institutional reforms has resulted in differentiated capacities among those agencies responsible for the operation and safety of dams in Indonesia. While recognizing the significant progress made since 2003/04 on water resources policies and regulations, the roles and responsibilities for joint implementation of water resources management and the associated financing mechanisms need to be further developed. Many of the organizations are still in their infancy and few have the complete set of tools required to enable integrated development and management of water resources. As a result, not all of the river basin organizations or line agencies are at the same level and there is a need for an integrating framework at the central level to consolidate the regulatory environment and enable the decentralized structures to deliver on their mandates. These challenges are further complicated by the suspension of Law 7/2004 on Water Resources. Many of the required measures agreeing being managed through Ministerial Decree, creating a complex environment that has the potential to undermine the continued institutional evolution and achievements to date.

14. The fiscal framework for river and irrigation infrastructure is constrained by inadequate financing, particularly for operations and maintenance. Law 7/2004 on Water Resources only permits the imposition of water charges for commercial water services and not for smallholder irrigation. The sustainability of water infrastructure is therefore dependent on the timely allocation of sufficient funding for operations and maintenance through allocations from central, provincial and district government budgets. Each level of government is responsible for the operations and maintenance of the network under its authority. This creates a complex framework within which the MPWH, through the Directorate-General for Water Resources, is largely responsible for capital investment and the operations and maintenance of national river territories and irrigation systems. At the central level Government finances operations and maintenance through the national budget and utilizes transfers to the provincial irrigation services, which often delegate implementation to district level agencies. At the provincial level, the water resources irrigation agencies fund operations and maintenance of the systems under its management through the provincial budget, with budget funds deriving from their own revenues and from the general purpose transfers. While these general purpose transfer mechanisms have been established for irrigation systems, similar arrangements have yet to be developed for river infrastructure. At the district level, funding for operations and maintenance comes from the district budget.

15. Irrigation spending is still focused on construction and rehabilitation, with relatively low allocations for operation and maintenance. The MPWH's allocation for operations and maintenance stood at around 16 percent of its total expenditure on irrigation in 2012. The Ministry estimates that the funds needed for operations and maintenance amount to approximately IDR 250,000/ha on average for the national irrigation system. However, in 2012, the actual budget allocated for this purpose was only IDR 180,000/ha, increasing to IDR 200,000/ha in 2013. As part of its endeavors to improve cost recovery and to ensure the fiscal sustainability of river basin management systems, the Indonesian government has established two self-financing state enterprises, or River Basin Corporations, (PJT I Brantas and PJT II Jatiluhur) under the Ministry of State Enterprises. These entities are to be responsible for the operation and maintenance of river

and bulk water supply infrastructure, with funding derived from sales of raw water, hydropower, water quality laboratory fees, and recreation fees, etc. However, all infrastructure development and rehabilitation investments continue to be funded through the national budget under MPWH.

16. Notwithstanding the significant achievements in the institutional evolution there are a number of persistent challenges and emerging issues related to dam safety in Indonesia. The fiscal constraints and complex framework creates perverse incentives resulting in deferred maintenance and preferred resource allocations toward the construction of new infrastructure. This undermines the operational efficiency of existing infrastructure and often necessitates premature rehabilitation. These challenges are further compounded by the lack of a comprehensive needs based budgeting system and integrated asset management framework. The prospects of increasing hydro-climatic variability, coupled with aging infrastructure, rapid urbanization, persistent catchment degradation and a paucity of real time data transmission and information networks, further undermines operational efficiencies and dam safety. When considered within the non-liner evolution of the institutional framework and the unique geography that defines Indonesia, this context creates a complex operating environment that has the potential to undermine economic growth and poverty reduction prospects. The Government's program of dam development and enhanced operational safety and performance is part of the broader efforts to enhance water security and ensure its continued contribution to the national development agenda. The proposed project represents the next phase in the World Bank's continued assistance to help address these challenges. This support will help consolidate an integrated approach at the national level to establish systems for securing improved management and efficiency at the local operational level with a continued focus on the evolution of institutions to respond to the changing dynamics related to dam safety in Indonesia.

ANNEX 3: COMPONENT DESCRIPTION

1. The proposed additional financing represents the next phase in a continued commitment to strengthening water resources institutions and asset management in Indonesia. The DOISP was envisaged as the first stage of a longer-term programmatic approach by Government to develop a portfolio management approach across its dam and reservoir sector and builds on the foundations provided by the Dam Safety Project (DSP: 1994-2003). The overall aims of the program were to provide a platform to improve the aggregate levels of performance and safety of its reservoirs, starting to improve financial sustainability, carry out investigations, designs and actual works, and to start to address the issues associated with erosion from within the upper catchments. The specific objectives under DOISP were to: (i) to increase the safety and the functionality of the 63 short-listed prioritized large dams/reservoirs, and (ii) develop and mainstream the regulatory and administrative arrangements for dam and reservoir management and safety that are more sustainable from a technical, environmental and financial perspective. It was recognized at the time of appraisal for the first phase of DOISP that the rehabilitation and improvement of several dams would require more extensive surveys, investigations and designs under DOISP to allow implementation of the works under an envisaged second phase (DOISP2). The longer-term time frame was also considered more feasible to realize the objectives of the institutional reforms.

2. The proposed additional financing represents the second phase of DOISP envisaged at the time of approval in 2009 and will upscale the portfolio approach developed under the first phase of DOISP to further enhance the institutional and regulatory arrangements for dam management and safety. The project is focused on core elements of the portfolio approach to dam safety, specifically: i) institutional, regulatory, human, and financial capacity for dam safety to ensure implementation and improve compliance; ii) physical rehabilitation to ensure structural integrity and enhance safety; iii) operational measures to ensure dam safety. Vertical integration of these three elements within each of the basin territories is aimed at creating a virtuous cycle that will secure the structural integrity of the dam, implement the required operational and management measures, enhance the capacity and re-enforce the regulatory mechanisms to implement a portfolio approach that assures an organization level of safety with accompanying certification.

3. The project builds on the lessons learned from a number of related World Bank projects that advocate for an integrated, holistic approach to dam safety and operations within the context of the river basin and to ensure the adequacy of the supporting institutional environment. These include similar dam safety programs in Armenia, China, India, Indonesia, Sri Lanka and Vietnam as well as through reimbursable technical assistance in countries like Brazil. Common to all approaches is the need to invest in long-term institutional support to provide a sustainable operating environment and a strong, national cadre of professionals and training institutions. This was demonstrated in Brazil where a strong focus on institutionalized training enhanced national capacity and established international professional networks through dedicated training exchange programs. Experiences from similar project support in India highlights the need for strong implementing agencies to ensure effective implementation. These arrangements are better served when embedded within centralized national apex institutions that can provide the necessary environment on regulatory, technical assistance support as well as overseeing implementation. Performance in all instances was facilitated by ensuring a sound, transparent and objective framework for the identification, screening and prioritization of dams within a national framework. The long World Bank engagement on dam safety projects in Indonesia further highlights the importance of a *priori* agreement on these mechanisms and the use of internationally benchmarked assessment tools to set verifiable targets.

4. The project is to be jointly co-financed on an equal basis with the Asian Infrastructure Investment Bank. The joint co-financing is be implemented in accordance with the Co-Financing Framework Agreement signed between AIIB and IBRD/IDA on April 13, 2016. In accordance with the provisions of the agreement, all contracts will be jointly financed in agreed proportions. The current cost estimates for each of the components are shown below.

	Cost Estimate (US$)		**Financing Source**					
			GoI		**IBRD**		**AIIB**	
	Original	**AF**	**Original**	**AF**	**Original**	**AF**	**Original**	**AF**
Component 1	36.85	161.96	7.12	27.00	29.73	67.48	N/A	67.48
Component 2	18.84	23.08	9.29	3.84	9.55	9.62	N/A	9.62
Component 3	6.86	55.07	3.07	9.17	3.79	22.95	N/A	22.95
Component 4	3.38	24.82	0.23	4.14	3.15	10.34	N/A	10.34
Component 5	4.5	35.07	0.72	5.85	3.78	14.61	N/A	14.61
Total	70.55	300	20.55	50.00	50.00	125.00	N/A	125.00

COMPONENT 1: DAM OPERATIONAL IMPROVEMENT AND SAFETY WORKS AND STUDIES

	Cost Estimate		GoI		IBRD		AIIB	
	US$	%	US$	%	US$	%	US$	%
DOISP1	36.85	100	7.12	19.32	29.73	80.68	N/A	N/A
DOISP2 AF	161.96	100	27.00	17	67.48	42	67.48	42

35. The original objective was to restore dam performance and safety by providing for: (i) design and construction of *minor* and localized rehabilitation and remedial works on each of about 34 prioritized large dam/reservoir sites ("sub-projects") to restore operational performance and/or safety (including spillway equipment repair and/or minor upgrading); (ii) four sub-projects for implementation in the first year; (iii) Surveys, Investigations and Designs (SID) - including social and environmental management plans - for *medium to major* works (sub-projects) to restore and/or improve operational performance and safety for approximately 22 dams/reservoirs to be implemented in the successor project, including the second-phase additional works on about 14 dams/reservoirs that were subject of first improvement in DOISP; (iv) Basic Dam Safety Facility (BDSF) repair and/or upgrading to improve safety monitoring, and preparedness systems for spillway emergency discharge for about 34 dams; (v) establishing a river inflow and sediment monitoring system to improve the operational hydrology for about 63 dams, and review flood flow data, estimated flood discharge frequency, and PMF or "Flood Envelope Curves" related to watershed area; and (vi) assessment of spillway capacity and downstream flooding risks for approximately 34 dams (including surveys, models and feasibility studies regarding downstream effects to determine the viability of any spillway modification or operational change, to be undertaken in the successor project).

36. The additional financing will finance the physical rehabilitation of an estimated 140 dams to restore dam performance and safety in accordance with acceptable international and national

design standards. This includes 20 major dams prioritized and prepared under DOISP, along with priority investments from the remaining 120 major dams in the portfolio that are to be prioritized based on the objective criteria for identification and assessment. Support would include: (i) specialized studies, including hydrological assessments to review flood flow data, estimate flood discharge frequency and review spillway capacity and downstream flooding risks; (ii) Surveys, Investigations and Designs (SIDs), supervision and quality control of rehabilitation works; (iii) rehabilitation and safety remedial works on existing dams and their associated structures, including civil and hydro-mechanical works; (iv) installation, rehabilitation or upgrading of Basic Dam Safety Facilities (BDSF) to improve safety monitoring, flood forecasting and preparedness systems; and (v) installation, rehabilitation or upgrading of instrumentation for operational hydro-meteorological monitoring. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. These activities are not intended to exceed the original schemes, change their nature, or so alter or expand the scope and extent as to make them appear as new or different schemes.

37. Within the portfolio of proposed dams to be supported under the DOISP2 AF, the Dam Safety Assessment have been carried out for 20 major dams through Special Studies under the parent project. These Special Studies include Dam Safety Assessments to: (a) inspect and evaluate the safety status of the dams, their appurtenances, and performance history; (b) review and evaluate the operation and maintenance procedures; and (c) provide a written report on the findings and recommendations. These findings are used to inform the detailed design of the remedial works and safety-related measures necessary to improve the overall performance to an acceptable standard of safety, along with the necessary environmental and social safeguard requirements. From these 20 dams, six sub-projects have been prepared through detailed designs and are ready for implementation in the first phase in 2017 with an estimated cost in excess of US$ 17m. Two additional sites, the Gonggang and Pacal dams, have also been prioritized for early stage intervention. The six investments for the first phase include the following:

a. Ubrug Dam in BBWS Citarum is one of three saddledams at Jatiluhur. The Special Study found that a fully control gate in the exiting auxiliary spillway is needed to reduce risk of overspill in the morning glory. At the time of construction, the four outlets in the auxiliary spillway were blocked with solid concrete arches. These would be breached through blasting with dynamite during a high flood event. To improve operational capacity, it is now proposed to complete the original design by replacing the concrete arches with two radial gates. This is estimated to cost US$ 7m.

b. Ketro Dam in BBWS Bengawan Solo is a 15m high, earthfill dam with a central clay core built in 1984. The Special Study found that piping in the downstream slope need permanent solution. The section of main dike in 0+180 also found to be unsafe with safety factor (SF) below minimum of 1.2 and 1.3 with and without earthquake. Based on the findings of the Special Study, the scope of work under the additional financing includes Rehabilitation of main dike, minor replacement of hydro-mechanical and dredging of sediment. The total cost is estimated at IDR 26 billion.

c. Penjalin Dam in BBWS Pemali Juana is a 23m high, homogenous earthfill dam built in 1934. The Special Study found that the safety main dike to the earthquake is below minimum level, piping in the downstream slope is also observed. Based on the findings of the Special Study, the scope of work under the additional financing includes

rehabilitation of the main dike, using diaphragm wall, minor replacement of hydro-mechanical and dredging of sediment. The total cost is estimated at IDR 19 billion.

d. Greneng Dam in BBWS Pemali Juana is a 13m high, homogenous earthfill dam built in 1918. The Special Study found similar case like in Penjalin dam. Based on the findings of the Special Study, the scope of work under the additional financing includes replacement of material along the dike, improved compaction and stability along with dredging of sediment. The total cost is estimated at IDR 26 billion.

e. Tempuran Dam in BBWS Pemali Juana is an 18m high, homogenous earthfill dam built in 1916. The Special Study found frequent piping in a spot where a big tree was removed. Sliding and crack in the crest level also happened. Based on the findings of the Special Study, the scope of work under the additional financing includes replacement of material along the dike, improved compaction and stability along with dredging of sediment. The total cost is estimated at IDR 22 billion.

f. Mrancang Dam in BWS Kalimantan III is a 08m high, homogenous earthfill dam built in 1995. The Special Study found that due to consolidation and crack the existing crest level is about 1.8 meter below design level. The existing spillway might not be enough to cope with flood, the dam is not safe. Based on the findings of the Special Study, the scope of work under the additional financing includes and levelling of undulating main dike, and repair spillway, minor replacement of hydro-mechanical and dredging of sediment. The total cost is estimated at IDR 49 billion.

38. Further additional rehabilitation works and remedial measures would be carried out for prioritized dams in the portfolio of 140 major dams under the Ministry. This framework provides a flexible mechanism that can respond to the changing risk profile of the portfolio during implementation and the availability of financing. It should be noted that the cost of the individual rehabilitation depends on the nature of the works required. From the 20 dams for which the special studies have been completed, the costs range from under US$ 1 million to more than US$ 15 million. The dams in the portfolio will be assessed during the first year of implementation as part of an update to inform the risk assessment based on the modified ICOLD method. This method has been developed, reviewed, assessed and applied under the DOISP to provide a portfolio approach to management of dam safety by the Ministry based on level of hazards and a rapid risk assessment.

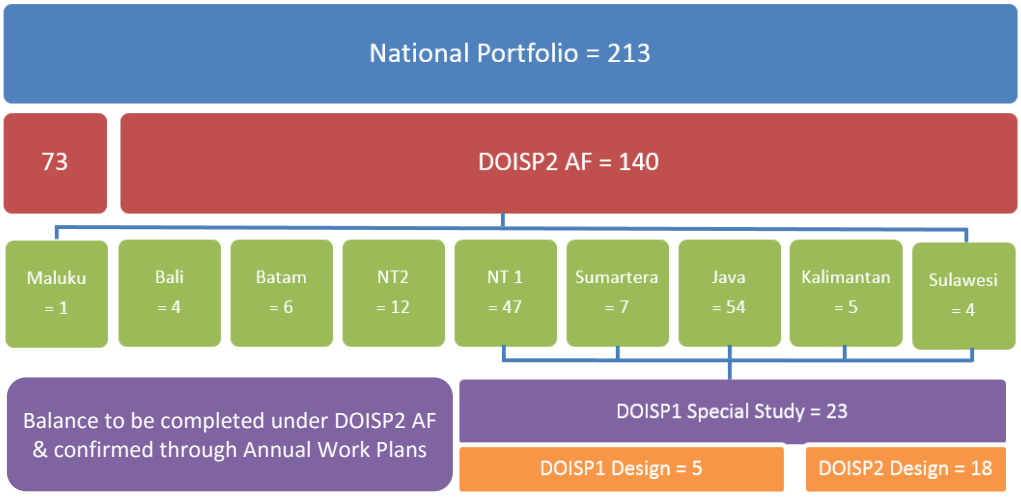


Figure A3.1. Summary of the proposed portfolio approach under the DOISP2 Additional Financing.

39. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. These activities are not intended to exceed the original schemes, change their nature, or so alter or expand the scope and extent as to make them appear as new or different schemes.

40. The quality of construction work on the dam will be achieved as planned if the system of quality control is done correctly, consistently and in line with guidelines related with quality control. The Ministry of Public Works and Housing has issued regulations to maintain the quality of construction work that is contain in the *Peraturan Menteri Pekerjaan Umum No.: 04/PRT/M/2009 tentang Sistem Manajemen Mutu (SMM) Departemen Pekerjaan Umum* (Quality System Management) as guidelines for contractor and consultant. The Government's dam development program means that there is a shortage of experienced consultants available within the country that could pose a risk to the quality of supervision and support during implementation. The quality of the designs and supervision was identified as one of the key issues under implementation of the parent project and is acknowledged as a substantial risk. The implementation arrangements have drawn on the lessons of the parent project and will include regional units within the technical assistance to provide support during implementation along with a pre-identified long list of potential expertise to be used thorough an on-call just-in-time basis during implementation.

41. **Basic Dam Safety Facilities (BDSF)** are considered an essential requirement to improve the basic safety at dams and appurtenant structures with the DGWR portfolio. Based on an assessment carried out during preparation and feedback from operation and maintenance staff, there is a recognized that there is a major lack or shortage of the following:

a. day to day access and mobility at sites
b. communication facilities
c. basic equipment need for surveillance and monitoring
d. safety equipment for inspections and emergency repair works
e. standby power supply
f. water borne transportation
g. lighting etc.

42. The additional financing will continue to extend the provision and installation of BDSFs. In general, the supply and/or installation of the elements list below are recommended as the minimum package of BDSF. The experience with procurement and installation of BDSF during the parent project points to a number of important lessons. The approach to be adopted under the additional financing will explore service contract provisions to sustain the provision of basic spares and maintenance measures, as well as sustained capacity building and support during the project period. This will be provided on a decreasing basis to correspond with increasing capacity to assume longer term sustainable operations.

43. Technological advances will be engaged to draw on digital systems where appropriate. This will build on existing platforms, such as those employed within BBWS Bengawan Solo that enables monitoring data at several dams to be sent real time using mobile phones from the dam location to the headquarters in BBWS Bengawan Solo.

INSTRUMENTATION	FACILITIES AND RELATED	SURVEY AND OTHER
V-Notch Weirs	CCTV Cameras	Monument Surveys
Water Level	Toe lead-away drains	Settlement Surveys
Seismographs	Stand by Generators	Dip Meters
Piezometers		Pressure Gauges
Inclinometers		Readout Units
Extensometers		

44. **Flood Forecasting and Preparedness System.** The operation of a flood forecasting / warning and preparedness for response system is the most effective method for reducing the risk of loss of life and economic losses. The additional financing will support a comprehensive program to enhance capacity with respect to flood forecasting including the following basic elements. This will include telemetry to facilitate real time data for each dam and a relay station to the office on site, the central dam safety unit within the basin organization and the central dam safety management unit.

RISK KNOWLEDGE	MONITORING AND WARNING	DISSEMINATION AND COMMUNICATION	RESPONSE CAPABILITY
- Hazard - Element of risk	- Rainfall - River Level - Water Reservoir - Dam Condition	- Radio - Telephone - Household Warning	- Evacuation Center - Search and Rescue

COMPONENT 2: OPERATIONS AND MAINTENANCE IMPROVEMENT AND CAPACITY BUILDING

	Total		GoI		IBRD		AIIB	
	US$	%	US$	%	US$	%	US$	%
DOISP1	18.84	100	9.29	49.31	9.55	50.69	N/A	N/A
DOISP2 AF	23.08	100	3.84	17	9.62	42	9.62	42

45. The original objective was to support improved operations and maintenance and to strengthen capacity building of the dam agency through: (i) preparation of O&M Plans, Standard Operation Procedures (including rule curves and reservoir water balance) and manuals and undertaking needs based budgeting and O&M activities for about 34 dams and reservoirs, and for

29 dam sites to be rehabilitated under the successor project; (ii) preparation of dam and reservoir management plans and emergency spillway operation plans for about 34 dams; (iii) O&M staff training for dam safety monitoring, maintenance and operations, (iv) participatory programs on reservoir and dam management with local communities living near the reservoir, in approximately 20 reservoirs; and (v) provision of incremental operating costs for O&M of dams and reservoirs (borne by GoI).

46. The additional financing will finance improvements in the operational elements required for securing dam safety and improved utilization. This would include: (i) conducting strategic studies, including those for establishing asset management systems and needs based budgeting for operation and maintenance and piloting of performance-based contracts; (ii) Operation and Maintenance Plans; (iii) Instrumentation Plans and setting the service standards; (iv) preparing Emergency Preparedness Plans, including dam break analyses, downstream flood mapping and benchmarking; (v) conducting Community Participation Programs in reservoir maintenance, income-generating activities related to reservoir maintenance and related skills training with local communities; and (vi) human resource development and capacity building of dam safety institutions.

47. **Operation and Maintenance Plans, Instrumentation Plans, Standard Operating Procedures and Service Standards.** The parent project has developed a number of standard guidelines and plans that will be operationalized under the additional financing. Under the first phase parent project budget requirements have been derived based on the Modern Equivalent Asset Value (MEAV) which is based the 0.2 percent times the present value to build dam. Although there are requirements for the provision of O&M budgets, these are limited.

48. **Emergency Action Plans and Emergency Preparedness Plans, including dam break analyses, downstream flood mapping and benchmarking.** Recognizing the need to complement policies and procedures for dam design, construction, and operation and maintenance, Indonesia has made progress in developing emergency action plans. With the passage of Government Regulation No. 37 on Dams in 2010,[3] the development of emergency action plans became mandatory for large dams. To date, the Directorate General of Water Resources (DGWR) of the Ministry of Public Works and Housing (MPWH) and the River Basin Organizations (RBOs) have developed emergency action plans for about 80 dams, of which 56 have been financed by DOISP. During preparation, the downstream communities that would be affected by dam failure and the provincial and local authorities responsible for early warning, evacuation, and post-flood assistance, are required to be consulted.

49. An emergency action plan is an operational tool to reduce the likelihood of dam failure and potential impacts caused by dam failure. With support of DOISP, DGWR has developed formal guidelines which provide a basic structure for the development of plans. Examples of items covered in the plans include, *inter alia*, preventive actions to be undertaken to avoid failure; a flowchart which lists all authorities to be involved in the notification process ranging from the dam operator to local emergency authorities; and inundation maps which delineate the area that would be flooded in the event of dam failure and identify evacuation zones. A review of a selected number of plans indicates that the level of detail and the quality of plans varies widely. Moreover, there appears to be limited experience with reinforcing and testing the effectiveness of the plans.

[3] Since the 2004 Water Law was repealed in 2015, Government Regulation No.37 is temporarily replaced by Ministerial Regulation No.27 (clause 53-61).

50. There is an opportunity to further improve the operationalization of emergency action plans. An effective emergency action plan is a living document to be revised and updated as new information about the reservoir and downstream area becomes available or the people involved in the notification process change. Continuous coordination between the RBOs, local government, and emergency management authorities, as well as simulation exercises to test the plans, would provide the necessary input to keep the emergency action plans up-to-date and benefit the execution in the event of dam failure. Another area which requires attention are the emergency actions plans for dams located in river basins with multiple dams. Currently, these plans do not take account for the failure of any of the other dams in the basin. Moving forward, it would be worth exploring how these plans can be updated to facilitate the execution of a collective response to cascade failures. Finally, it would be important to understand and evaluate how the operationalization of the emergency action plans compares across RBOs. In this context, a benchmarking exercise could provide insights into current practices and provide direction on how to continue to improve the operationalization of the plans.

51. The additional financing is intended to build on the guidelines and experience under the parent project to improve the operationalization of the emergency preparedness plans. This will include the review of the Indonesian Hazard Classification Guidelines prepared under the original DSP and approved by the Indonesian Dam Safety Committee in 1999, along with the Emergency Action Plan (EAP) Guidelines prepared under the current DOISP. The Additional Financing will support the development of Emergency Action Plans for all dams under the project where there is the potential for loss of life in the event of dam failure. Emergency Operation Plans will also be prepared for gated spillways (and controlled outlets).

Box A3.1. Examples of Emergency Action/Preparedness Planning in Indonesia.

Case Study I: Situ Gintung

The 10-meter high Situ Gintung dam was built in 1933 during the Dutch colonial era. It was located on a tributary of the Pesanggrahan near the village of Cirendeu in the Banten province which has become part of suburban Jakarta. The dam was initially used for the irrigation of rice paddies, but these paddies were replaced over time by residential development and the size of the reservoir was reduced. A number of residential dwellings located downstream of the dam may have been illegal and in violation with Spatial Laws No.24/1992 and No. 26/2007.

On March 27, 2009, the Situ Gintung dam failed. Heavy rains increased the water level of the reservoir causing overtopping and erosion of the dam surface. This resulted in a breach around 2 a.m. in the morning. The uncontrolled released of nearly 1 million cubic meters of water created a flash flood which inundated more than 400 residential dwellings, displaced 170 people, and claimed the lives of about 100 people. There had been no early warning system in place to provide timely warning to avoid the loss of life. One year prior to the event, there has been reports about the vulnerability of the dam, but no action was taken to reduce the risk of dam failure.

Case Study II: Way Ela

On July 13, 2012, a 5.6-magnitude earthquake hit central Maluku and triggered a landslide that blocked the flow of the Way Ela River. This event resulted in the creation of natural dam of 215 meters in height and 300 meters in width with a reservoir capacity of 19.8 million cubic meters. Recognizing the potential risk to the 4,777 residents of Negeri Lima village which was located 2.5 kilometers downstream of the dam, DGWR carried out a survey in the immediate aftermath of the event to assess the condition of the dam. The survey results indicated that demolishment of the dam would likely trigger additional landslides. In this context, the government decided to take action to protect the dam and to conduct preparedness activities with the community to maintain public safety in the event of dam failure.

Upstream preparedness efforts of the Maluku RBO focused primarily on the conservation of the natural dam and continuous on-site monitoring. Activities included the installment of water pumps; the construction of a toe drain to collect seepage; and the construction of an emergency spillway to provide controlled release from the dam. In addition, the RBO was involved in the monitoring of the dam, mostly the water level and the amount of seepage discharge; the establishment of an early warning system; and the development of an emergency action plan. The early warning system consisted of various sensors to measure the water level, rainfall intensity, and the level of debris, and to provide an early alert of potential dam failure. In the event of dam failure, the system would automatically activate sirens to warn the downstream community. At the same time, downstream efforts focused on avoiding the loss of life in the event of dam failure. While the Maluku RBO took responsibility to conduct a community awareness campaign related to the emergency action plan, the provincial emergency authorities (BPBD) focused on the preparation of the evacuation routes and signs and the organization of different types of simulation exercises with the community to test the standard operating procedures and logistics.

During July 18 and 25, 2013, the efforts to reduce the water level of the reservoir failed and the condition of the dam became critical. Following the procedures of the emergency action plan, the head of the Maluku RBO notified the Governor of Maluku, the Regent of Maluku Tengah, and BPBD to start the evacuation. When the dam eventually collapsed within a period of 12 hours on July 25, 2013, nearly all residents of Negeri Lima had moved to the designated evacuation zones. In the end, the timely and effective public alert had saved almost 5,000 lives.

52. **Operation and Maintenance Budget Systems.** Sustained operations and maintenance is one of the key challenges associated with dam safety and the additional financing will support further development of instruments aimed at ensuring sufficient timely resources are made available to sustain the portfolio of dams within DGWR. The guidelines for preparation of O&M Manuals will be reviewed and updated to provide an integrated national framework for timely, accurate, and easier calculation of needs based budgets. These are based on the Guidelines for Needs Based Analysis of Operations and Maintenance (AKNOP - Analisa Kebutuhan Nyata Operasi Pemeliharaan).

53. **Asset Management System.** The O&M system will be linked to further development of asset management plans. To maximize the productivity of the infrastructure assets that have the conditions and optimal performance requires a sound management system for the owner or manager of the dam assets. Therefore, the dam manager must conduct an inventory of its assets and shall maintain the inventory and update asset data in accordance with the development of the situation as part of the asset management dam.

54. Asset Management is defined as the process of managing procurement, acquisition, operation, maintenance, rehabilitation, and elimination of the assets of an organization in order to provide a certain service levels are sustained in the long term cost effective manner. Asset management is an approach that can provide all of the information and analytical tools needed to manage existing assets more effectively and can meet the needs of today and the future. The goal of the asset management system is ensuring: i) the realization of administrative conduct asset dam; ii) creating efficiency and effectiveness of the use of assets dam; iii) security of the assets; and, iv) availability of data / information that is accurate on the number of assets for decision making Implementation of an asset management system for the portfolio of dams under DGWR will include the following activities:

a. Inventory of dam assets
b. Planning of the dam asset management
c. Implementation of dam asset management
d. Evaluation of the implementation of asset management
e. Update the inventory of dams

55. **Piloting Performance-Based and Service Management Contracts.** With an increasing portfolio of large dams, challenges with available capacity with growing maintenance needs in the face of a downsized or fixed maintenance work force and pressure on the operating budget expenditures the MPWH is exploring options for different contracting methods. These include Performance-Based Management Contracts (PBMC) and Service Management Contracts (SMC) that can provide incentives and/or dis-incentives to achieve desired outcomes or results and allow for innovation. Such contracts are often based on long-term, fixed ceiling or lump sum contracts with predictable payment schedules that improve budget predictability. Other benefits include but are not necessarily limited to the following:

a. Potential increases in the level of service
b. Improved budget predictability and potential cost reductions
c. Shift from an input-output focus to performance based outcomes
d. Improved risk distribution among owners and contractors
e. Knowledge transfer and skills development through effective partnering

f. Fostering innovation by focusing on outcomes and allowing flexibility in meeting performance specifications rather than method specifications
g. Reduction in contract administration and management

56. There are a number of different potential entry points for PBMC/SMCs. All of these require strong government commitment and leadership to be successful. They can include simple instrumentation operation, monitoring and regular reporting; dam operations and maintenance measures; dam safety monitoring and reporting as well as rehabilitation works to meet standard requirements. Any such contract requires a clearly defined set of activities with corresponding outcome metrics framed within the national legal requirements relating to dam safety. PBM/SM Contracts rely on identifying performance measures, establishing desired performance standards or targets, and the levels of service to be achieved. These would be detailed in the Operation and Maintenance Plans, Instrumentation and Monitoring Plans, Emergency Action Plan and Standard Operating Procedures. Each would provide details on the appropriate Service Standards.

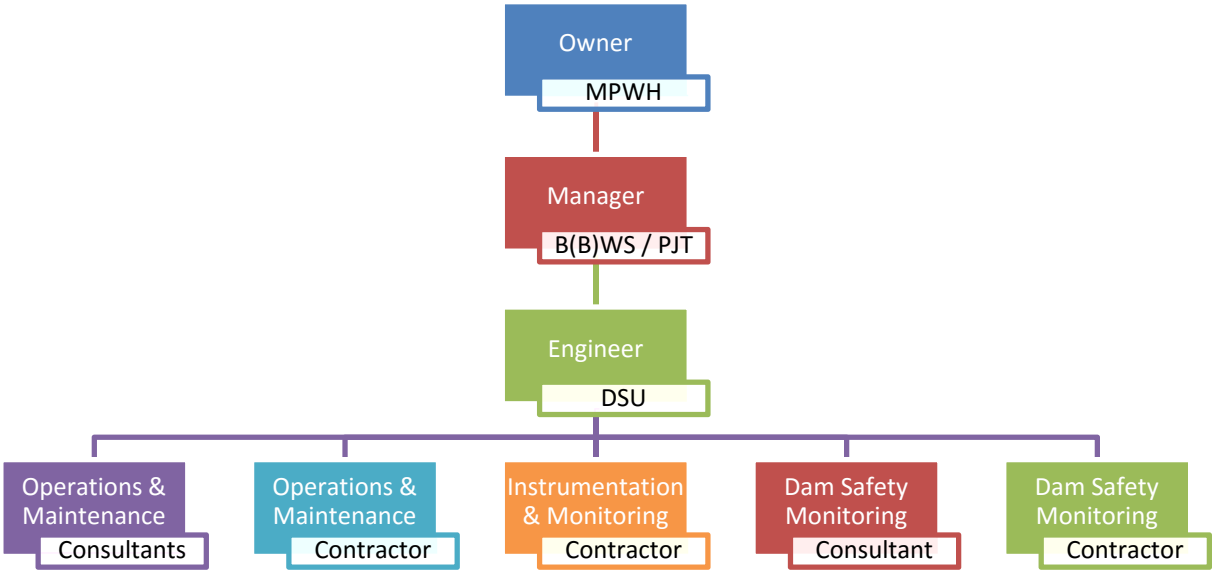


Figure A3.2. Schematic illustration of a framework for Performance Based Service Contracts

57. An Operation and Maintenance Contract may, for example, may be used to operate a dam in accordance with the Standing Operating Procedures and maintain the dam infrastructure in accordance with the Operation and Maintenance Manuals. This would typically include a requirement for the Contractor to prepare, in conjunction with the Owner, an Annual Report on Planned Maintenance each year during the period of the Contract. The Report would identify observations of deteriorating condition for each dam or performance of various components or scope for enhancements to improve efficiency, economy or safety of operations along with the staffing, technical expertise, and training required. Such report would covers all aspects including civil works, electrical and mechanical works such as painting, plant refurbishment, plant replacement, automation or upgrades and instrumentation and make recommendations for planned maintenance activities in the coming year. The report would include cost estimates together with proposed methods of implementing the work including details of any proposed sub-contracts and an indicative implementation plan for carrying out such work.

58. An Instrumentation and Monitoring Contract may, for example, be used to operate and maintain a dams instrumentation in accordance with the Instrumentation Plan and Standing Operating Procedures. This would typically include requirements for assessing the existing instrumentation network, upgrading as necessary, providing a sustained period of service to maintain the instrumentation, and provide regular monitoring reports on the dam behavior and related hydro-meteorological, structural, and seismic factors. Regular reporting, on a monthly and or annual basis, should confirm the status of the instrumentation and outline any remedial measures required to bring it in compliance with international best practice and national requirements, provide a short- and long-term summary of hydro-meteorological, structural, and seismic factors, forecast short- and long-term hydro-meteorological, structural, and seismic trends and identify any potential areas of concern requiring changes in operations or investment. The reports would include cost estimates together with proposed methods of implementing the work including details of any proposed sub-contracts and an indicative implementation plan for carrying out such work.

59. A Dam Safety and Assurance Contract may, for example, be used to ensure the safety of a dam in accordance with national safety regulations, international best practice and the Standing Operating Procedures. This would typically include regular dam safety reviews, routine inspections and surveillance, along with specific inspections as required, to confirm the satisfactory behaviour of the dam and identify any deficiencies. The reports would include cost estimates together with proposed methods of implementing any required works, including details of any proposed sub-contracts, and an indicative implementation plan for carrying out such work.

60. There are a number of basic elements required to initiate PBM/SM Contracts. These include an effective contractor acquisition strategy, prequalification processes, clearly defined criteria for selecting a contractor, and clearly defined criteria for assessing contractor performance with payment linked indicators. Contractual provisions such as payment methods, including incentives and disincentives, need to be identified.

COMPONENT 3: RESERVOIR SEDIMENTATION MITIGATION

	Cost Estimate		GoI		IBRD		AIIB	
	US$	%	US$	%	US$	%	US$	%
DOISP1	6.86	100	3.07	44.75	3.79	55.25	N/A	N/A
DOISP2 AF	55.07	100	9.17	17	22.95	42	22.95	42

61. The original objective was to provide for measures to mitigate the risk of sedimentation of selected reservoirs and for sustained performance and safety through: (i) bathymetric surveys to determine the available total storage and water level-area-volume relations of approximately 30 of the 63 reservoirs known to be affected by accelerated sedimentation; (ii) feasibility studies, designs and any necessary safeguards plans for "within-reservoir" activities and interventions to be taken in the medium-term (e.g., dredging, hydro-suction, etc.) that can be funded in DOISP or the successor project; (iii) preparation for a sample study for decommissioning of a severely silted reservoir to be financed under the successor project; and (iv) piloting of institutional models and plans for treatment of upstream rivers and (sub-)catchments with construction of sediment

retaining and river bank protection structures, mostly through community participation and incentive programs..

62. The additional financing will support the scale-up of a comprehensive Sedimentation Management Program. This will include: (i) studies and surveys related to reservoir sedimentation; (ii) Corrective Measures, such as (a) dredging; (b) flushing and diversion works; (c) check dams; etc. and, (iii) Preventative Measures, such as (a) community watershed management, including community participation programs; and (b) piloting of incentive mechanisms, such as Payment for Environmental Services.

63. Catchment Conservation consists of structural and non-structural interventions. Structural interventions typically comprise of civil work, such as the construction of Check Dams, Sand Traps, Gully Plugs, etc. While the non-structural interventions to mitigate sedimentation rates can be achieved through the participation of communities living in the catchment area. This can include results based financing mechanisms and other market based mechanisms to provide incentives for improved land care management and agricultural practices, along with replanting and revegetation of degraded areas through a range of different mechanisms.

64. These non-structural measures will require development of coordination mechanisms among various line agencies and Ministries at different levels of Government given the distribution of responsibilities relating to land and water management within the catchment areas. In the past, such efforts have been limited to the buffer zone around the reservoirs which are under the direct authority of the Ministry of Public Works and Housing.

65. Selective reservoir dredging, either on a large scale to support extensive reclaiming of reservoir storage, or on a relatively small scale in the vicinity of the outlet works to facilitate operation of the intake gates and spillway gates, is expensive and often not economically. Dredging should be accomplished using the most technically satisfactory, environmentally compatible, and economically feasible dredging and dredged material disposal procedures. Long- term objectives concern the management and operation of disposal areas to ensure their environmentally sustainable long-term use. To achieve these objectives, the following activities are carried out prior to any determination:

a. Analyze dredging location and quantities to be dredged, considering future needs.
b. Determine the physical and chemical characteristics of the sediments.
c. Evaluate potential disposal alternatives.
d. Identify relevant social, environmental, and institutional factors.
e. Assess necessary actions for environmental and social effects mitigation
f. Evaluate dredge plant requirements

COMPONENT 4: DAM SAFETY INSTITUTIONAL IMPROVEMENT

	Cost Estimate		GoI		IBRD		AIIB	
	US$	%	US$	%	US$	%	US$	%
DOISP1	3.38	100	0.23	6.80	3.15	93.20	N/A	N/A
DOISP2 AF	24.83	100	4.14	17	10.34	42	10.34	42

66. The objective of the original project was to further strengthen and consolidate the regulatory framework and national dam safety institution and strengthen MPWH's capacity for portfolio management and regulation in order to sustain rehabilitation works and reservoir life. This was achieved through: (i) the preparation of the Government and Ministerial regulatory documents and Concept/Academic Papers, including the consultations; (ii) a public awareness campaign about dams and reservoirs, and dissemination to all public and private dam owners of the regulations and guidelines regarding dams and reservoirs; (iii) strengthening and development of the DSU better fulfill its regulatory roles for about 63 dams under MPW's program, and of other public and mines tailings dams through staff recruitment and training (with outsourcing of work to consultants and RCWR); (iv) provision of a fully furnished and equipped DSU office capable of housing about 30 engineers; (v) preparation of new or updated DSC Guidelines; (vi) establishing and supporting a National Dam Safety Panel to review site investigations and designs; (vii) establishing a dam engineer and technician training and certification system in cooperation with INACOLD; and (viii) incremental costs of the structural CDMU in DGWR to operate as the focal point for dam safety monitoring, review and archiving

67. The additional financing represents a substantial increase over the parent project and will be used to continue to support Government's institutional evolution and further innovations in building water resources institutions in Indonesia. The institutional activities include: (i) strengthening the capacity of the MPWH to manage its dam portfolio better and regulate large dams in the country, and (ii) improving the sustainability of the rehabilitation works and the reservoir life. This will include support for the following: (i) institutional assessments, benchmarking and enhanced coordination mechanism among line agencies; (ii) regulatory support and instruments, standards and guidelines, including national dam policy on registration, inspection, safety compliance and penalties; (iii) a National Dam Safety Management System; (iv) enhancing dam safety through improved surveillance and protection measures; and (v) supporting development of a dam technology center.

68. There are a number of agencies under the Directorate General of Water Resources related to the dam safety. These include the Dam Centre, Directorate of O&M, Directorate of River and Coast, Research Center for Water Resources, and the Dam Safety Unit. The Dam Safety Units within the basin organizations are central to fulfilling the requirements for dam safety management and in the day-to-day operation and maintenance of dams and appurtenant structures. These organizations were established during the original Dam Safety Project. Coordination mechanisms among these agencies is important, along with enhanced capacity, to prevent or to mitigate the potential risks associated with dam safety. Enhancing coordination among these agencies requires appropriate platforms to ensure the highest standards relating to dam safety.

69. Strengthening the dam safety agencies can be achieved if the appropriate regulatory framework is in place and applied. The regulatory support for the tasks required for dam safety

consist of instruments, standard and guidelines, including national dam policy registration, inspection, safety compliance and penalties. Although a variety of guidelines and standards have been developed under the earlier phases, there is a need to review, revise and update these considering new technologies and approaches.

70. The Directorate General of Water Resources, MPWH, have responsibility for performance all of the existing dam owned by government of Indonesia, in the implementation works have best coordination and communication with others institution related to the existing dam performance. To carry out the task of responsibilities, the Directorate General of Water Resources shall prepare various rules and regulations in accordance with the needs of existing dams that include instrumentation, standards, guidelines, including registration policy, inspection, security, and penalty or sanctions.

71. The Researched Center of Water Resources (RCWR - Pusat Penelitian dan Pengembangan Sumber Daya Air) was established in 1936 and is part of the MPWH. The RCWR has been assigned to implement applied research, development, science and technology in the water resources field. It is proposed to support the establishment of a dedicated Dam Technology Center within RCWR. The current research focus is toward geological, hydrological, and environmental research and development. The current role of the RCWR in Water Resources Development based in the MPWH regulation, consists of:

a. Implemented Research, Development, including applied Science and New Technology in the field of Water Resources

b. Preparation of technical policies, plans and strategies for research, development and application of science and technology, as well as the investigation and assessment in the field of water resources.

c. Implementation of research, development, implementation, and service of science and technology, as well as the investigation and assessment in the field of water resources.

d. Preparation, formulation, and evaluation standards, guidelines, and manuals in the field of water resources.

e. Monitoring, evaluation, and reporting tasks of research, development and application of science and technology, as well as the investigation and assessment in the field of water resources.

72. **Training and Career Development for Dam Safety.** To ensure the long-term effectiveness of dam safety rehabilitation works implemented under DOISP2 AF, it is essential that the CDMU, DMU and PDMU staff are given adequate training in the use of the dam safety assurance monitoring guidelines, evaluation of monitoring results and in the adoption of good O&M practices as set out in the O&M manuals of the Dam Safety Commission. The Dam Safety Training program will be divided into three types of training: i) Formal Training; ii) On Job Training; and, iii) Dissemination and Application of Guidelines. A National Master Trainer in the Technical Assistance Team will provide guidance and continuity in training. It may also be appropriate to second staff from the DGWR to various projects being developed under the Ministry and or by PLN for hydropower generation.

73. **Dissemination and Application of Dam Guidelines.** The objective of Dissemination and Application of Dam Guidelines is to improve Engineers who have background, often in charge of

dam work especially in the field of dam design which includes design of new dams, rehabilitation and improvement of the function of the dam, the composing of the whole inspection (Inspeksi Besar), and preparation of dam Emergency Action Plan. A number of guidelines and standards were developed under DOISP1 and these will be reviewed, revised as needed and operationalized through enhanced dissemination etc.. Additionally, the government policy that will be built almost 60 new dam unit for the next 5 year, automatically, the DSU coordination with Dam Safety Commission (DSC) as the "back bone" of new dam construction recommendation to the MPWH for Dam Construction Certification, more necessary to get technical assistance for DSU tasks. The Dissemination and Application of Dam Guidelines would include not only government employees but professionals / engineers working in the field of dam development and safety, such as Consultants and Contractors, Academics, Suppliers etc..

COMPONENT 5: PROJECT MANAGEMENT

	Cost Estimate		GoI		IBRD		AIIB	
	US$	%	US$	%	US$	%	US$	%
DOISP1	4.50	100	0.72	16.00	3.78	3.78	N/A	N/A
DOISP2 AF	35.07	100	5.85	17	14.61	42	14.61	42

74. The original objective of this component was to provide for overall Project Management including provision of: (i) the principal Project Management TA Consultant; (ii) the incremental operating costs of the Central Project Management Unit's (CPMU) and Project Implementation Units (PIUs) activities for coordinating all project interventions; and (iii) all TA support to prepare for the successor project.

75. The additional financing will support continued implementation and the overall project management through: (i) Technical Assistance for the Central Project Management Unit (CPMU) and Central Project Implementation Unit (CPIU) within Ministry to provide the necessary support services for timely and effective project implementation, including monitoring & evaluation, procurement, financial management, safeguard monitoring, etc.; (ii) Technical Assistance for the Dam Safety Unit to ensure oversight and effective implementation; (iii) Technical Assistance for the river basin organizations to ensure timely and effective implementation; (iv) Environmental and Social Service Provider/s; (v) an international Dam Safety Panel of Experts; (vi) a National Dam Safety Review Panel; and, (vii) the incremental operating costs of the Central Project Management Unit's (CPMU) and the Project Implementation Units (PIUs) for activities related to project implementation.

ANNEX 4: INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS

1. The institutional arrangements for dam safety in Indonesia are facing increasing challenges. The Government has launched an ambitious development program that will see the construction of 60 dams within the next five years. This will require a large number of experienced dam experts to examine and certify the designs and construction works in accordance with national regulations but also require a significant increase in the number of staff available for operations and maintenance. Experience also suggests that improved incentives and structures will be required within the basin organizations to improve the continued operation and maintenance.

2. The institutional arrangements with responsibility for dam safety and operations includes a range of different stakeholders. Overall oversight will be provided by the National Steering Committee for Water Resources in the National Development Planning Agency (BAPPENAS). Drawing on the lessons from earlier projects technical assistance to support implementation and improve the quality of designs, supervision etc. will be provided through regional teams under the overall guidance of the central ministry. This on the ground presence is intended to provide a stronger framework for implementation. The organizations and agencies currently involved in dam safety, along with their responsibilities, include the following.

Directorate General of Water Resources

3. The roles and responsibilities of the Directorate General of Water Resources are outlined in "*Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat nomor 15/PRT/M/2015 tanggal 21 April 2015* and include the following:

(i) Formulation of policies in the field of conservation of water resources, water resources utilization and control of water damage on surface water sources, and utilization of groundwater in accordance with the provisions of the legislation;
(ii) Implementation of policies in the field of water resources management integrated and sustainable in accordance with laws and regulations;
(iii) Preparation of norms, standards, procedures, and criteria in the field of management Water resources;
(iv) Providing technical guidance and supervision in the field of water resources management;
(v) Evaluating and reporting in the field of water resources management;
(vi) The administration of the Directorate General of Water Resources; and
(vii) Implementation of other functions provided by the Minister.

Dam Center (Pusat Bendungan)

4. The roles and responsibilities of the Dams Center are outlined in the *Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat nomor 15/PRT/M/2015 tanggal21 April 2015* and include the following:

(i) Preparation and implementation guidance norms, standards, procedures, and criteria for dams, lakes, water, and ponds, as well as the physical conservation of water resources;
(ii) Readiness assessment execution of activities in dams, lakes, water, and ponds, as well as the physical conservation of water resources;
(iii) Planning arrangement dams, lakes, water, and ponds, as well as the physical conservation of water resources;

(iv) Coaching the management of dams, lakes, water, and ponds, as well as the physical conservation of water resources; and
(v) Implementation of administrative affairs Centre.

Dam Safety Unit

5. The roles and responsibilities of the Dam Safety Units are outlined in *Peraturan Menteri PU No. 25 / PRT / M / 200*6 on Organization; Task of Dam Safety Unit is 'Implementing the provision of technical support assessment and preparation of technical advice and monitoring the behavior of the dam to the "dam safety commission'. The Dam Safety Unit has the following functions:

(i) Collection and processing of data and programming
(ii) Dam safety assessment for approval
(iii) Periodic inspections and exceptional
(iv) Implementation of behavioral analysis dam
(v) Preparation of technical advice to dam safety
(vi) Implementation of the cooperation with the institutions concerned and the owner of the dam
(vii) Dissemination and giving guidance to dam safety
(viii) The drafting of regulations, guidelines, technical instructions dam safety
(ix) Inventory, registration and classification of danger of dam
(x) Implementation of administrative affairs and household

Research Center for Water Resources (RCWR)

6. The roles and responsibilities of the RCWR Unit is outlined in the *Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat nomor15/PRT/M/2015 tanggal21 April 2015*, and includes the following:

(i) Preparation of technical policies, plans and strategies for research, development and application of science and technology, as well as the investigation and assessment in the field of water resources.
(ii) Implementation of research, development, implementation, and service of science and technology, as well as the investigation and assessment in the field of water resources.
(iii) Preparation, formulation, and evaluation standards, guidelines, and manuals in the field of water resources.
(iv) Monitoring, evaluation, and reporting tasks of research, development and application of science and technology, as well as the investigation and assessment in the field of water resources.

BBWS/BWS

7. The roles and responsibilities of the River Region Bureau (*Balai Wilayah Sungai*) has the tasks of water resources management including planning, construction, operation and maintenance in the context of the conservation of water resources, water resources development, and utilization of water resources and control of water resources in the river basin. In carrying out the tasks of Region River the following functions:

(i) Preparation of patterns and plan for water resources management in the basin;
(ii) Planning and implementation of protected area management of water resources in the basin;
(iii) Water resources management which includes the conservation of water resources, water resources development, utilization of water resources and control of water resources in the basin;
(iv) Preparation of technical recommendations in the granting of licenses for the provision, allocation, use and exploitation of water resources in the basin;
(v) Operation and maintenance of water resources in the basin;
(vi) Management of hydrological systems;
(vii) Organizing data and information on water resources;
(viii) Facilitation of Coordination Team of Water Resources Management in the basin;
(ix) Empowerment of communities in the management of water resources;
(x) The implementation of the Central River Region administration.

8. The proposed implementation arrangements for the project draw on the lessons learned from the Dam Safety Project and the Dam Operation Improvement Safety Project. The Project will build upon and reinforce the existing institutions as a continuity of these previous efforts. These adopted different approaches to implementation with DSP starting with a centralized model. Changes in the Government organizational structure and lessons from the DSP resulted in a more decentralized approach during DOISP. Both present challenges and these lessons inform a more balanced arrangement that is intended to ensure clear lines of report, delineation of responsibilities and re-enforce the most recent changes in the institutional arrangements for dam safety.

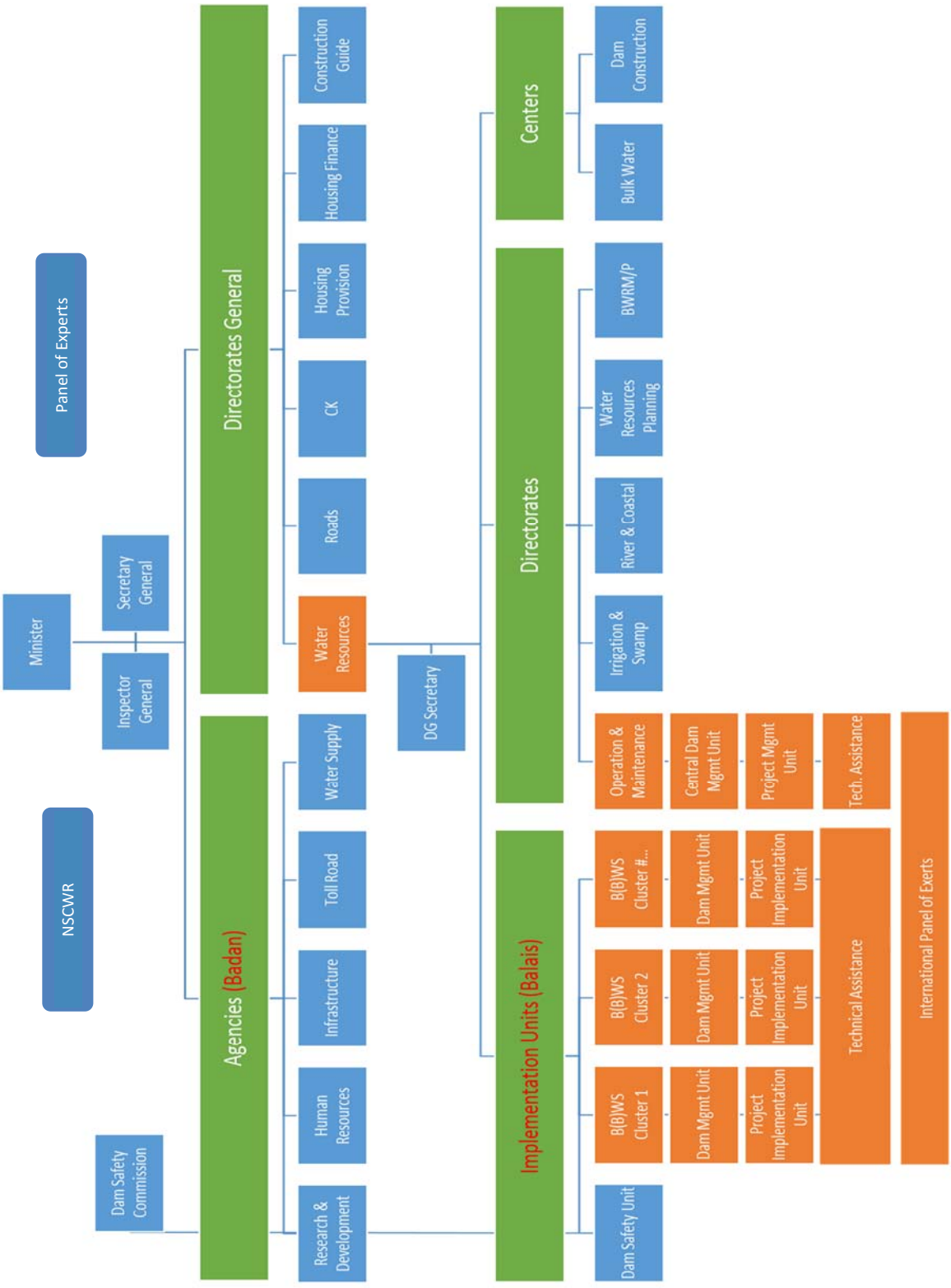


Figure A4.1. Organogram of the MPWH and proposed implementation arrangements.

9. The project will be implemented under the Ministry of Public Works and Housing by the Directorate General of Water Resources (DGWR) through the Directorate of Operation and Maintenance (O&M). An overview and organogram of the Ministry and the relevant agencies is attached for reference. A Central Project Management Unit (CPMU) would be established within the Central Dam Monitoring Unit (CDMU). The CDMU will be responsible for technical assurance, with the CPMU assisting with implementation oversight, project management, financial management and procurement, safeguards compliance, training and capacity building. The CDMU CPMU will be supported with Technical Assistance to support implementation. The Strategic Assistance will help re-enforce the capacity of the CDMU CPMU to ensure quality implementation.

10. The 16 regional Balai Besar/ Balai WS Offices (River (Regional) Basin Organizations) under the MPWHs that are responsible for dam operation and management will be responsible for implementation of the works. Project Implementation Units (PIU) will be established within each of the Dam Management Units (DMU) of the participating BBWS. These PIUs will be clustered based on the number and nature of the support, considering the amount of civil works, the number of studies, equipment and capacity required. This will be informed through a transparent, objective assessment based on the initial screening carried out during preparation and reviewed annually during implementation. Technical Assistance to support the PIUs will be provided across a number of clusters. This is proposed to capitalize on the economies of scale afforded by such clusters, maximize the economic efficiency, and ensure consistency in the approach and quality in support being provided. The CDMU CPMU and the Technical Assistance will provide assistance and support during implementation.

11. The budget will be provided to the PIUs through the sectoral APBN budget. The RCWR, a semi-autonomous unit of MPWH, will be assigned study, survey and technical review tasks, specifically those relating to hydrology and hydraulics. The training and institution strengthening will be implemented through the CDMU and include not only central government staff but also local government staff responsible for dam safety and management. This arrangement draws on the satisfactory performance of the other Bank-assisted projects with the same counterpart.

12. Overall policy oversight will be provided by the National Steering Committee for Water Resources (NSCWR) in Bappenas. The NSCWR was established 2004 and has been providing oversight for the other Bank-funded projects in the sector. The NSCWR will be supported through an Independent Monitoring and Evaluation Consultant during implementation.

13. A National Dam Safety Review Panel and an International Dam Safety Panel of Experts would be established under the project to provide support during implementation. The independent Panel of Experts (PoE) would comprise several individual consultants, each with considerable experience in dam rehabilitation programs. The independent PoE would be expected to visit at least twice a year for a period of two weeks, at minimum, to review, assess and advise Government on the program. The International PoE is not envisaged under the Government's own regulation and proved difficult to mobilize effectively under the parent project. Given the portfolio approach the PoE should be mobilized to address those highly speciliazed technical issues and projects with a high risk. This advocates for the development of a portfolio approach to properly assess and identify the risks within the portfolio so that the PoE can be deployed effectively. Aligning the International PoE with the National PoE can help facilitate the exchange of knowledge and experience and enhance the technical functioning and inputs of both panels.

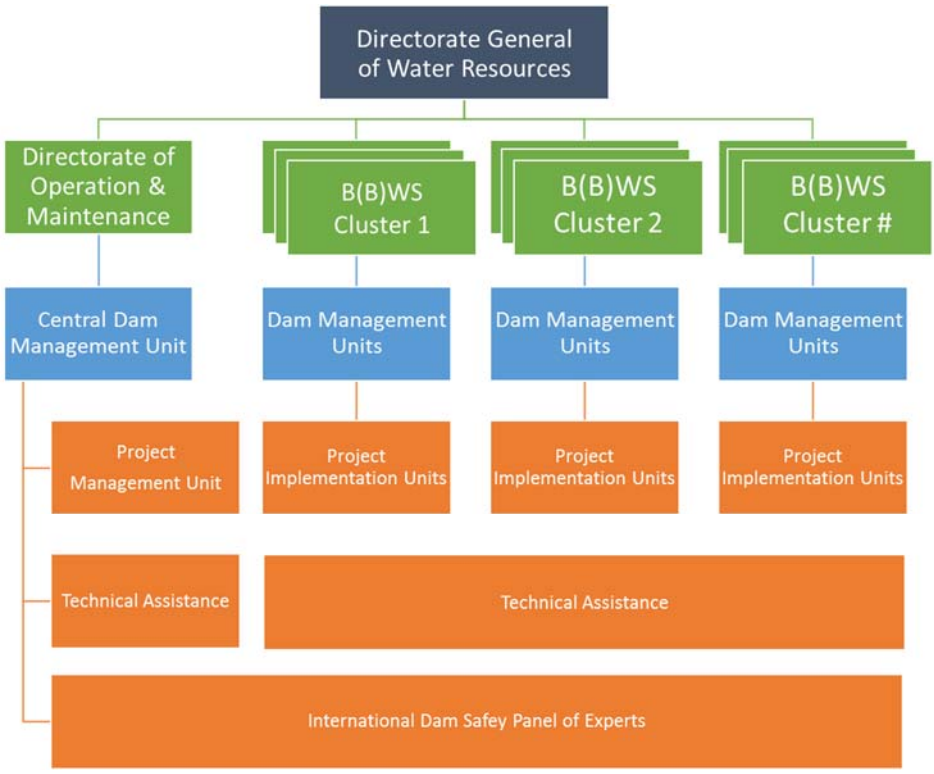


Figure A4.2. Proposed implementation arrangements for the DOIS2 Additional Financing.

14. A Project Management Manual has been prepared under the parent project to guide implementation and updated to reflect the proposed changes under the restructuring. The PMM provides details of: (i) the institutional arrangements for implementation; (ii) the list of proposed dams, eligibility requirements, and the preparation, appraisal, selection and implementation procedures; (iii) the requirements for preparing and processing Annual Work Plans; (iv) arrangements for Community Participation Programs, including identification of eligible activities and the criteria for selection of recipients; (v) procurement procedures and standard procurement documentation; (vi) reporting requirements, financial management procedures and audit procedures; (vii) project performance indicators; (viii) arrangements and procedures for environment and social safeguard management; and (ix) the Anti-corruption Guidelines and the Governance and Accountability Strategy.

15. The PMM is made available to all those involved in the project, including but not limited to the CPMU, the CPIU, all PIUs, Community Recipients and all consultants and contractors. The individual PIUs under the project prepare annual work plans that are submitted to the CPMU, including a detailed description of the sub-projects proposed to be undertaken in the following year and the related budget requirements along with all relevant information regarding proposed activities, such as the proposed budget (including Counterpart Funds), social and environmental safeguard (including compliance with the Safeguard Instruments), procurement plans and financial management information. The preparation, appraisal, selection and implementation procedures for sub-projects includes: (A) the list of sub-project sites selected for remedial, rehabilitation or reconstruction works activities under the project, as the same may be updated from time to time

with the agreement of the Bank; (B) arrangements for, and the carrying out of, timely public and stakeholder consultations; (C) technical standards, design criteria and Dam safety Commission safety inspection requirements; (D) the mitigation and dam safety measures.

ANNEX 5: ECONOMIC AND FINANCIAL ANALYSIS

1. The additional financing project maintains the five components of the original project and scales-up the original activities into additional dams already prioritized within the framework of the technical assistance activities conducted in the original project and those yet to be identified and prioritized during the implementation of the additional financing project. These components are:

- Component 1: Dam Operational Improvement and Safety Works and Studies;
- Component 2: Operation and Maintenance Improvement and Capacity Building;
- Component 3: Reservoir Sedimentation Mitigation;
- Component 4: Dam Safety Institutional Improvement, and,
- Component 5: Project Management.

2. The expected combined outcomes of these activities are improvements in the dam safety or reduction in the probabilities of dam failure, restoration of the operational performance of dams and reservoirs, and increased longevity of dam life. The achievement of these outcomes is expected to increase the safety of existing dams and their operational performance thereby: (i) avoiding loss of human life, (ii) avoiding irrigation benefit loss, (iii) avoiding hydropower benefit loss, (iv) avoiding household property losses, and (v) avoiding emergency response costs.

Methodology

3. The cost benefit analysis follows the probabilistic approach to dealing with the effects of dam safety improvement interventions. Successful implementation of this approach requires proper risk evaluation and risk measurement. It requires precise estimates of annualized risk of dam failure with and without the project and the associated consequences or hazards. The annualized risk to local economy, human life, and the environment is the interplay of the probability of dam failure and the expected consequences or hazards given the dam failure probability as depicted in the equation 1 below.

$$AR = PDF * EH \quad \ldots\ldots 1$$

Where,
AR is the annualized risk measured in monetary values
PDF is the probability of dam failure, and
EH is expected consequences or hazards given the dam failure event

4. The consequences could be direct or indirect. The direct consequences could be human life loss, loss of fishery or livestock, economic losses, loss of environmental amenities and expenditures for environmental restoration, onsite and downstream property damage etc.. The indirect economic consequences refer to changes in business output and employment in linked economic sectors, which may represent a large portion of the economic consequences from a dam failure scenario. Development of dams often induce huge multiplier effects in various sectors of the economy[4]. These direct and indirect consequences should be of most concern to the decision makers and dam safety analysts, not the collapse of the dam per se. Thus, meaningful quantification

[4] However these effects are not considered in this analysis due to complexity of quantifying these consequences

of dam failure risk depends on credible estimates of the damages that would result from each significant failure scenario.

5. Dam safety is unique in that it represent an extreme situation characteristic of low probability event and high consequence or hazard. Thus, conventional rules of economic analysis are difficult to extrapolate and extend to such events. For instance, human life is generally accepted as the most important consequence and often dominates dam safety decisions. Unfortunately, the confidence with which life loss can be estimated is low, which is a hindrance to credibility and value of dam safety risk assessment results. However, application of cost benefit analysis is still relevant as there are insufficient disposable financial resources to improve the safety of every dam without limit. The analysis is particularly useful for setting priority or determining the order in which dam safety rehabilitation projects should be approached within a portfolio of dams.

Box A5.1. The consequences of recent two dam failure events in Indonesia.

The Situ Gintung dam tragedy of 2009

Situ Gintung dam was built in 1933. There are different opinions regarding the cause for the collapse but failure to implement appropriate structural and non-structural dam safety measures is considered as a major reason. The losses associated with the failure this dam are the following:

- 100 people died
- 190 people injured
- 420 homes damaged
- 1600 people displaced
- About 10 Billion Rupiah worth of material lost

The collapse of Way Ela natural dam in 2013

The Wayela natural dam was created in 2012 due to hill landslide that closed the flow of a river. Alarmed by Situ Gintung dam tragedy of 2009, the Indonesian government in cooperation with NGOs took some structural and non-structural dam safety measures, informed by results of solid technical analysis. Emergency disaster-risk management measures including early warning systems, awareness creation and capacity building of communities, and preparation of evacuation strategies were implemented. As a result, the consequences of the Wayela natural dam failure, particularly regarding human life loss, was significantly reduced in contrast to the case of the Situ Gintung situation. This is remarkable given the fact that the storage volume of Wayela natural dam is 41 times bigger than that of Situ Gintung dam. The losses encountered were:

- No death of human being recorded
- 3 people missed
- 3 people slightly injured
- 5233 people displaced
- 470 units of houses damaged
- 5 units of schools damaged
- 2 units of praying rooms damaged
- 1 bridge damaged
- 1 unit of KUD was damaged
- 1 unit of community health center damaged
- Two clean water facilities damaged
- 1 telecom tower damaged

6. The extremely low probabilities of dam failure masks the risks. However, when the failure actually happens due to neglect or lack of necessary measures, the consequences are usually very costly, as evidenced by the recent two dam failure events in Indonesia itself (see Box A5).

7. On the top of the property and human life losses described above, the GoI and communities incur significant additional costs for post disaster rehabilitation and reconstruction operations.

8. The cost benefit analysis was done in two steps. First, the analysis was done for each of the priority dams identified for intervention. Secondly, the analysis was carried for a cluster of priority dams to demonstrate the overall economic returns of the project.

9. Estimates of annualized dam failure probabilities and estimates of economic, property, and emergency response costs for with and without project scenarios were employed to determine the incremental benefit streams as shown in the equations 2 to 4 below.

$$IB = AR_{WOP} - AR_{WP} \quad \ldots\ldots 2$$

$$AR_{WOP} = PDF_{WOP} * EH \quad \ldots\ldots 3$$

$$AR_{WP} = PDF_{WP} * EH \quad \ldots\ldots 4$$

Where:
IB= incremental benefit stream attributable to the project
AR_{WOP} =Annualized risk without the project valued in monetary terms
AR_{WP} =Annualized risk with project valued in monetary terms
PDF_{WOP} = Probability of dam failure without the project
PDF_{WP} =Probability of dam failure with project
EH= Expected consequences or hazards valued in monetary terms

10. **Portfolio of Dams**: There are more than 140 dams eligible for consideration in this project. These dams are at different stages of readiness for implementation. Thus, the project shall follow a framework approach in which the dams are first studied, prioritized using risk assessment scores, and readied for implementation in batches during the course of project. Out of the more than 140 dams, 23 were studied under the original parent project and prioritized for implementation under the additional financing. The cost benefit analysis was done for the 23 dams for which the studies were carried out under the parent project in order to demonstrate the economic returns of the project. The results will vary depending of the distribution of the balance of the 140 dams to be carried out under the DOISP2 AF and the nature of the rehabilitation required.

11. **Dam Failure Probability Assumptions**: In the absence of a large number of historical data for portfolio of dams, it is difficult to estimate the probability of failure of any given dam. Therefore, it is a good practice to make an overall assessment of probability of dam failure reduction, and then carry out sensitivity analysis. Following the original project, the rate of dam failure have been assumed at 13 percent in a period of 20 years in the without project scenario. Existing historical records indicate that the failure risk of large dams in Indonesia is about 3.8 percent per year, which is very high[5]. Thus, the 13 percent failure probability assumption in 20 years period is conservative. International experience suggests that a comprehensive dam safety measures can reduce the probability of dam failure by, at least, one order of magnitude from the

[5] DOISP Project Appraisal Document

existing conditions for moderately intensive repairs and rehabilitations and up to two orders of magnitude for deep rehabilitation and replacement of large components of the structure and equipment. In this analysis, the rate of dam failure have been assumed to be reduced to 1.3 percent (i.e., 90 percent reduction) in the 'with project' scenario. The risk score assessments for pre and post project implementation made by SMEC and others is provided in figure 5. The results indicate that the percentage reduction in the dam risk assessment scores for 22 of the 23 dams from an initial pre-project condition to post-project implementation condition ranges between 2 and 65 percent.

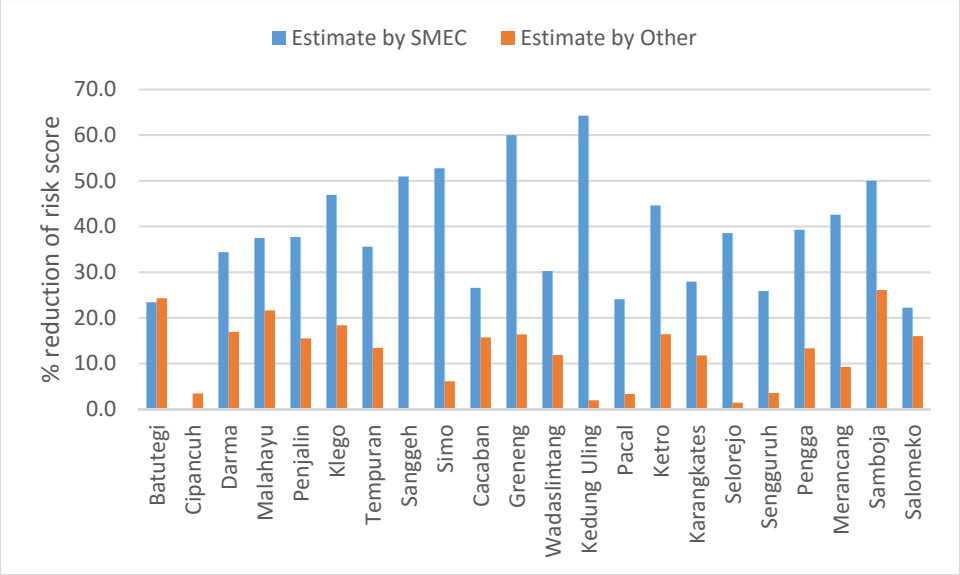


Figure A5.1 Summary of Dam Risk Assessment score with and without the project
Source: DOISP project progress report

Benefits

12. There are two main categories of benefits that arise from improving dam safety. These are averted benefit losses and remediation costs. The potential averted benefit losses include irrigation water supply benefits, industrial and municipal water supply benefits, hydropower benefits, recreation or tourism benefits, fishing or aquaculture benefits, indirect economic benefits, averted loss of human life. The potential remediation cost benefits include property damage costs, environmental restoration costs, and emergency response costs. Due to paucity of data and/or difficulty in quantification and valuation (e.g., loss of human life, indirect economic benefits) only the following averted benefit loss and remediation costs were considered in this analysis. These are: (i) irrigation benefits, (ii) hydropower benefits, (iii) avoided household property losses; (iv) avoided dam replacement or rehabilitation cost, and (v) avoided emergency response costs.

13. **Avoided irrigation benefit loss**: irrigation benefit loss is estimated based on data on net area irrigated at each of the 23 dam sites, representative crop budget[6], and cropping intensity values[7]. The average gross margin per hectare is US$ 350.5. The cropping intensity ranged from

[6] Statistics Indonesia 2014
[7] Statistics Indonesia 2013

0.8 to 2.9. It is assumed that only 30 percent of the total irrigation benefits from any given dam would be lost if dam failure occurs.

14. **Hydropower benefits:** Hydropower benefit loss was estimated using hydropower capacity at each dam site and energy price from hydropower plant, which ranges from US$ 8 to 9 cents per KWh[8]. It was assumed that in the event of dam failure, only 30 percent of the hydropower benefits would be lost.

15. **Avoided household property loss:** Household property or infrastructure was estimated at US$ 2, 887.2 per unit. It was assumed that in the event of dam failure, only 10 percent of the household property value would be affected.

16. **Dam Replacement or rehabilitation cost:** the cost was estimated by using Modern Equivalent Asset Valuation (MEAV) method as a proxy for total value. MEAV is the notional total cost of replacing at the same location, the same type and size of structure at today's price. It is assumed that if dam failure happens only 30 percent of this value is required to reinstate the dam to its normal condition.

17. **Emergency Response Cost:** This cost was estimated based on the basic needs of affected people such as tent, food, water, etc. as indicated in the Evacuation Action Plan of Dam published by Ministry of Public Works and Housing. The population at risk at any given dam is assumed to be 30 percent.

18. The total potential avoidable benefit loss due to improvements in safety of the 23 dams is estimated to be about one billion US Dollar (table A5.1). The highest benefit is expected from the protection of household property and assets followed by averted dam replacement or rehabilitation expenditure. Avoided irrigation benefit loss constitutes only about 10 percent of the project benefits despite the fact that the primary function of the dam is agricultural water supply, reflecting the low dollar value of water use in agriculture.

Table A5.1 Potential averted benefit loss due to the project

No	Category	Avoided benefit loss (US$)	Proportion of total benefit loss (%)
1	Irrigation benefits	98,101,854	9.8
2	Hydropower benefits	30,723,561	3.0
3	Household property and assets	463,550,024	46.1
4	Dam replacement or rehabilitation expenditure	281,112,376	28.0
5	Emergency response cost	131,255,043	13.1
	Total	1,004,742,859	

Costs

19. The estimated total cost required to enhance the safety of the 23 priority dams is US Dollar 69.2 million (table A5.2). This sum is required to finance:

- Physical rehabilitation of the dams to restore their performance and safety in accordance with acceptable international and national design standards;

[8] Energy and Mineral resources Ministerial Decree no 03/2015.

- Support improved maintenance and to strengthen capacity building of the dam agency or finance improvements in the operational elements required for securing dam safety and improved utilization;
- Mitigate the risk of sedimentation of selected reservoirs; and
- Further strengthen and consolidate the regulatory framework and national dam safety institutions.

Table A5.2. Estimated costs of improving the safety of the 23 dams

No	Project components	Costs (US$)
1	Component 1	5, 067,863
2	Component 2	50,453,350
3	Component 3	9,619,373
4	Component 4	4,088,889
	Total	69,229,476

Results of Economic Analysis

20. Assuming dam failure probability of 13 percent and reduction of this probability by 90 percent because of project interventions, the overall economic return of the project is very high. The NPV is US$ 522.9 million with IRR of 60.3 percent (table A5.3).

21. Despite the overall highly satisfactory returns to the project, scrutiny of the analysis done for each of the 23 dams reveals mixed results. The IRR ranged from 0.5 to 145 percent, while the B/C ratio ranged from 0.5 to 32.4. Three dams, namely Greneng, Sanggeh, and Tempuran had negative NPV and IRR less that the cut-off value of 6 percent. The reasons behind unsatisfactory rate return for these dams are the relative small number of affected human population downstream of the dams and the small size of irrigated area served by the dams.

22. Five dams, namely Cengklik, Karangkates, Wlingi, Wonorejo, and Wadaslintang recorded IRR higher than 80 percent. This is mainly due to high density of human population residing downstream of -the dam. These dams also generate hydropower in addition to supplying irrigation water.

Sensitivity Analysis

23. The economic viability to the project largely depends on the dam failure probability and reductions in dam failure probability (following project interventions) assumptions among other factors. Therefore, the sensitivity of returns to the project to these variables was analyzed and the results are depicted in table A5.4. The results indicate that the returns to the project are quite robust. The project is viable under most of the plausible dam failure probabilities and failure probabilities reduction assumptions. Unfavorable result is recorded only for dam failure probability of 3.8 percent over 20 year's period and 25 percent reduction in this probability following project intervention. This assumption is too optimistic. Since 1960, Indonesia recorded 15 incidents of major dam structural failures. Based on this existing historical records, the failure risk of large dams in Indonesia was estimated 3.8 percent per year, which is above international average and realistic figures for regulated and well maintained dam structures (about 0.5 percent)[9].

[9] DOISP

Table A5.3. Summary Results of Economic Analysis

No	Name	NPV (US$)	B/C Ratio	ERR (%)
1	Cengklik	65,267,851	32.4	145.8
2	Kedung Uling	13,004,782	7.3	37.6
3	Ketro	8,536,729	4.3	25.2
4	Plumbon	6,778,881	4.3	25.2
5	Karangkates	83,813,995	28.9	127.7
6	Sampean Baru	32,591,751	16.7	73.8
7	Selorejo	14,266,426	7.9	40.0
8	Wlingi	37,526,247	19.1	83.4
9	Wonorejo	43,991,409	22.2	96.5
10	Darma	10,458,716	5.0	28.3
11	Malahayu	10,893,805	7.6	38.7
12	Cipancuh	85,188	1.1	6.5
13	Juanda	111,490,071	8.3	41.7
14	Merancang	6,070,515	2.7	17.7
15	Tiu Kulit	10,736,569	6.2	33.2
16	Cacaban	11,472,444	7.4	38.1
17	Greneng	-914,214	0.7	2.1
18	Penjalin	12,138,266	5.6	31.1
19	Sanggeh	-965,086	0.5	0.5
20	Simo	1,274,715	1.7	11.7
21	Tempuran	-466,598	0.8	4.2
22	Salomeko	2,101,316	1.8	12.6
23	Wadaslintang	48541813	21.2	92.2
	Overall	**522,918,622**	**9.7**	**60.3**

Table A5.4. Sensitivity of the viability of the project to some key variables

Indicators	Probability of dam failure	Dam failure probability reduction			
		90%	75%	50%	25%
NPV (Million US$)	13%	522.9	425.8	263.9	101.9
	10%	388.4	313.7	189.1	64.6
	5%	164.2	126.9	64.6	2.3
	3.8%	110.4	82.0	34.7	-12.6
IRR (%)	13%	60.3	50.8	35.6	19.6
	10%	47.3	40.2	28.5	15.3
	5%	26.0	22.3	15.3	6.4
	3.8%	20.5	17.4	11.5	3.5
B/C	13%	9.7	8.1	5.4	2.7
	10%	7.5	6.2	4.2	2.1
	5%	3.7	3.1	2.1	1.0
	3.8%	2.8	2.4	1.6	0.8

24. The sensitivity of the viability of the project (as indicated by IRR) for each of the 23 dams is summarized in table A5.5. It is estimated that 30.4 percent the dams would have unfavorable IRR for the unlikely scenario of 3.8 percent dam failure probability over 20 years period (which is very optimistic given the dam failure history of Indonesia) and only 25 percent reduction in failure probability following project intervention (which is considered pessimistic for a comprehensive dam safety program such as DOISP2 AF). Under this unlikely scenario, the project is economically viable for 69.6 percent of the dams.

25. The major conclusion of this finding is that if there is financial constraint cover all of the dams, the dams with economic returns (69.6 percent) need to be prioritized. However, this does not imply that the remaining 30.45 percent of the dams should not be considered. Interventions in these dams could as well make economic sense if all benefits of avoiding dam failure are identified, valued, and considered in the analysis.

Financial Analysis

26. Financial analysis is required to assess the financial capacity of central and provincial governments to cover the O&M requirements of dams and reservoirs. Currently, expenditure review is under way to assess levels of efficacy of O&M. The expenditure review determines the Modern Equivalent Asset Value of portfolio of dams; assess budget allocations for O&M over the past 10 years. The expenditure review is expected to shade light on the fiscal impact of incremental O&M expenditures for dam owners, operators and water users. The results would enable the GoI to formulate policies and regulations that are needed to ensure the availability of adequate financial resources for maintaining and operating the dams and related infrastructure to ensure the sustainability of services for water users.

Table A5.5. Summary results of the sensitivity analysis for each of 23 dams

Probability of dam failure	IRR(%)	%Reduction in dam failure probability or number of dams			
		90%	75%	50%	25%
13%	<0%	0	0	0	3
	0%-10%	3	3	3	4
	10%-50%	9	10	13	13
	50%-90%	5	4	3	3
	>90%	6	6	4	0
10%	<0%	0	0	2	3
	0%-10%	3	3	3	4
	10%-50%	10	12	12	16
	50%-90%	4	2	6	0
	>90%	6	6	0	0
5%	<0%	2	3	3	7
	0%-10%	4	4	4	6
	10%-50%	11	11	16	10
	50%-90%	6	5	0	0
	>90%	0	0	0	0
3.8%	<0%	3	3	4	7
	0%-10%	4	4	7	9
	10%-50%	12	14	12	7
	50%-90%	4	2	0	0
	>90%	0	0	0	0

27. The results of the financial analysis done for the original project are valid for the present contexts because no changes and regulations have been effected with regard to O&M issues. For instance, still no regulations exist to require collection of water fees from the main water users, viz. irrigators (representing about 99.7 percent of the users from the reservoir). Only a small portion of the bulk water is supplied to hydropower, and industrial and domestic users. The annual O&M expenditures for dam and irrigation facilities are fully financed from the central and provincial government's budgets in the ratio of 20:80. The PJT I and II collect fees for water supplied for hydropower, urban and industrial uses.

28. The actual O&M expenditures are often lower than the total needs, although budget allocations is generally on increasing trend. The planned investments within the framework of DOISP2 AF would undoubtedly increase the O&M budget requirements for both the central and provincial governments. The incremental O&M budget need to be provided through firmly committing resources or allowing the users to share the burden partially or fully through making new regulations[10].

[10] Note that the 2004 Water Law specifically exempts individual small farmers from water charges.

ANNEX 6: ENVIRONMENTAL AND SOCIAL SAFEGUARDS

1. **Environment.** The potential environmental impacts of the project predicted to be non-irreversible, localized and manageable by the implementation of the best environmental management practices. The implementation of environmental safeguards of the current DOISP shows that the related parties involve in the project are aware and comply with the Bank's and GoI's requirements of environmental documentations, mitigation measures, and reporting. The environmental safeguards of DOISP is rated satisfactory.

2. The DOISP2 AF will have the same implementing agency and those who involve in the implementation of DOISP, as well as the environmental safeguards function in the project that will remain available, where an environmental specialist will be hired along the period of the project to oversee and ensure the implementation of all environmental related requirements by the sub-projects' contractor, as well as to provide the reporting and other documentation.

3. No issues or grievances have been reported and filed with regard to environmental issues during implementation of the parent project.

Social Safeguards

4. *Land Acquisition.* The objectives of the Project are to (i) increase the safety and the functionality with respect to bulk water supply of large Ministry of Public Works-owned reservoirs; and (ii) strengthen the safety and operational management policies, regulations and administrative capacity of Ministry of Public Works and Housing. As in the existing DOISP, physical rehabilitation will be carried out in situ and mainly limited to improving operation there will be no major alterations in the existing land use patterns. The project will not finance any new dam construction and is focused on the rehabilitation of existing dams and their associated structures, along with improved safety measures. Further, the works under the project are typically minor, in situ rehabilitation works that do not have any land acquisition and are typically implemented during the off-season. As such, there have not been any situations requiring extended draw down periods that have impacted agricultural production. Should such impacts be identified during the screening process, assistance will be provided through a livelihoods support program, including preferential waged employment opportunities associated with the construction, maintenance of the irrigation schemes, etc.

5. None of the subprojects under the on-going DOISP have involved land acquisition. However, to give more flexibility during project implementation of the DOISP2 AF where some proposed activities may require additional land, temporarily or permanently, a Land Acquisition and Resettlement Policy Framework (LARPF) has been developed. The project will ensure that only small-scale land acquisition will take place, which will not have any significant impact on the owners.

6. The LARPF of this project is prepared based on the harmonization of the World Bank's OP/BP4.12 and the GoI's laws and degrees on land acquisition, resettlement and compensation. The basic objective of the LARPF is to ensure that all project affected persons will be compensated at replacement cost and assisted with restoration measures to help them improve or at least maintain the living conditions and the capacity to make income before the project. This LARPF presents the basis for preparation, review and approval of Land Acquisition and Resettlement Action Plan (LARAP) for later sub-projects of the project. Subproject-specific LARAPs will be prepared in accordance with the LARPF. The LARPF also includes among others: resettlement principles, policies, procedures and requirements, assessment for linked projects, eligibility for

compensation and assistance, entitlements, applicable laws and regulations, organizational arrangements and funding, grievance redress mechanism, and monitoring and evaluation. The LARPF will also provide guidance on the voluntary land donation procedure, to anticipate any land donation from the community. Land donation for community-level facilities took place at several sites in the on-going DOISP under the Community participation program. This LARPF has been disclosed in country on the project website and through the InfoShop on January 10, 2017.

7. *Indigenous Peoples*. In the 1st year, the DOISP2 AF will finance the physical works in the 23 dams already identified and studied in the on-going DOISP. It is confirmed that there are no indigenous peoples in the 23 site. While the 23 dam sites for the first year financing and some other sites for the following years have been identified, there is a possibility that during the project implementation new dams are proposed for rehabilitation. An Indigenous Peoples Planning Framework (IPPF) has been developed prior to project appraisal to anticipate the presence of indigenous community in the new proposed sites. An Indigenous Peoples Plan (IPP) will be prepared during the project implementation (after the screening, verification and confirmation stage) in the likely event that IPs will be affected by subproject activities. The Bank requires the project involves indigenous peoples to design and implement projects in a way that fosters full respect to Indigenous People's dignity, human rights, and cultural uniqueness and so that they: (a) receive culturally compatible social and economic benefits; and b) do not suffer adverse effects during the development process. Experience from the on-going DOISP shows that the activities are localized in the existing schemes and even in the event that IPs present there will be no significant adverse impacts.

ANNEX 7: PROCUREMENT

1. Procurement under the proposed Additional Financing project will be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated January 2011 (revised July 2014), and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011 (revised July 2014); and the provisions stipulated in the Legal Agreements.

2. The procurement under the project is expected to include selection of consulting firms for Technical Assistance to support the CPMU in project implementation, Technical Assistance to support the PIU, design and supervision of dam rehabilitation, and individual consultants for the Panel of Experts. Civil works will include contracts for dam rehabilitation, and there will also be contracts for supply and installation of hydro-mechanical equipment and Basic Dam Safety Facilities. Given the nature and value of the various procurement packages under the project, it is expected that there will be sufficient number of consultants, contractors and suppliers in the market to solicit participation in the competitive procurement processes that are expected to be carried out primarily under QCBS, NCB and ICB procedures as appropriate. The Procurement plan will provide the basis for use of the procurement methods and the Bank's review requirements for each contract package which will be consistent with the Bank's suggested standard thresholds based on the project procurement risk. The procurement plan for the first 18 months was reviewed during Appraisal and recorded in the Bank's STEP system which shall be used for exchange, tracking and documentation of all procurement records under the Project. 3. The existing CPMU under the DG of Water Resources will continue to be responsible for project implementation under the Additional Financing, and procurement will also continue to be carried out by the current Procurement Service Unit (ULP).

3. Notwithstanding the prior experience gained by CPMU under the parent project, the procurement risk under the proposed project is considered to be High as it is evident from the performance experience of several contract packages under the previous project that CPMU will require additional support for building procurement and contract management capacity as well as strengthening oversight to ensure compliance with the applicable procedures and monitoring performance and outcomes. For example, in the selection process of TA consultants for implementation management and supervision (TA CPIU) and TA consultants for the Project Management Unit (TA CPMU), the Bank had to be extensively engaged with CPMU to ensure that the correct selection approach was followed. Similarly, during implementation of the contract for supply of dredgers, the Bank had to advise CPMU on taking a prudent approach to avoid a significant potential loss that would have resulted from a major contract amendment proposed by the supplier; nevertheless implementation of the contract was extensively delayed. The risk mitigation measures will be discussed and agreed with CPMU by Appraisal and it is expected that this will also include provision of the required support through the TA consultants and also enhanced oversight and monitoring by MPWH and external auditors.

4. In Addition to the Bank's prior review of strategically important, large value or complex contracts, and the hands-on procurement support by the Bank during project implementation, it is proposed that procurement supervision in the field will be conducted at least twice per year, including ex-post reviews of not less than 20 percent of the contracts subject to the Bank's post review.

ANNEX 8: FINANCIAL MANAGEMENT

1. The proposed additional financing will be implemented with a generally similar financial management arrangement with those of the original project. It includes budgeting, fund flow, accounting and reporting, and auditing. Some adjustment in the budgeting and disbursement mechanism will take effect due to the co-financing with AIIB. CPMU would continue within Central Dam Monitoring Unit under Directorate of Operation and Maintenance (DO&M) with support from financial management consultants. Project Implementation Units (PIU) will be established within each of the Dam Management Units (DMU) of the participating BBWS.

2. The CPMU is experience on handling financial management aspect of WB financed activities. The financial management performance of the original project is in general satisfactory. The latest Financial Management rating for the project is Moderately Satisfactory. The project's financial statements also received unqualified opinion with timely follow up of audit findings. Risk that remains substantial from the original project is continuous delay of budget effectiveness that delay the project implementation. Risk also still noted in the payment verification function as noted in some audit findings related to overpayment to consultant firms and contractors. The risk related to budget delays will be mitigated through separation of contracts financed by loan and counterpart fund, close coordination between CPMU, PIUs, and the planning bureau of the ministry, and having a financial management consultant that fully understand the budgeting processes. The strengthening of payment verification functions effort within the CPMU and PIUs will also be maintained during the implementation of the additional financing.

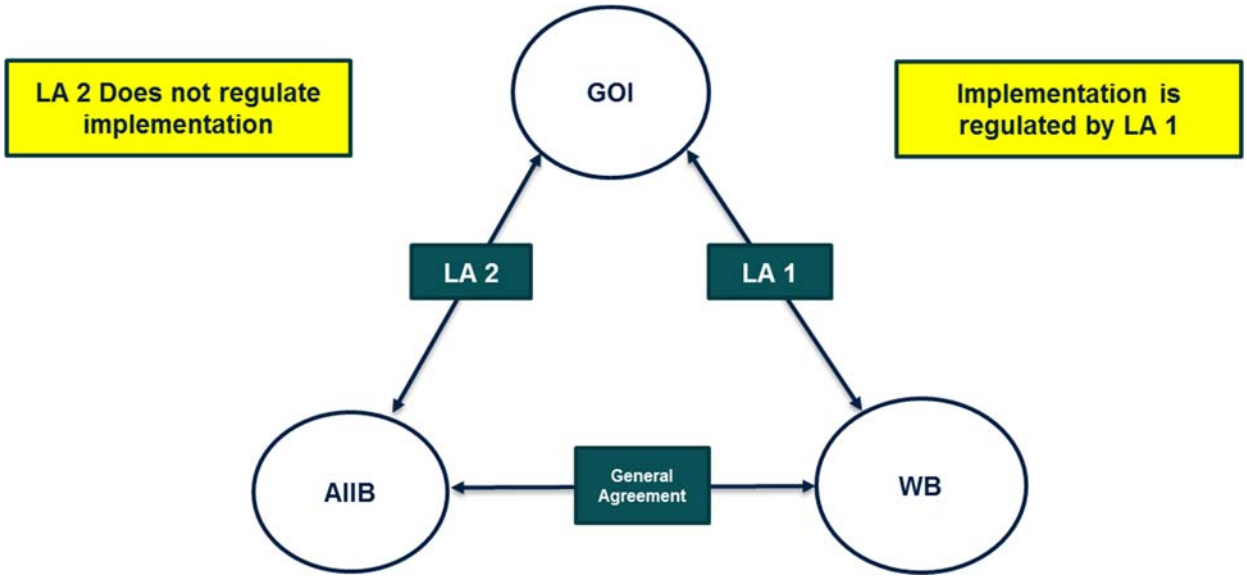
3. The proposed additional financing is joint co-financing with the Asian Infrastructure Investment Bank (AIIB). Each will be governed by separate loan agreements but jointly co-finance all contracts and activities on an equal 50:50 basis. The review and clearance of withdrawal applications will be made by the World Bank and an instruction issued to the AIIB requesting disbursement to the project's special account. The same financial management arrangements will apply to project components financed by AIIB.

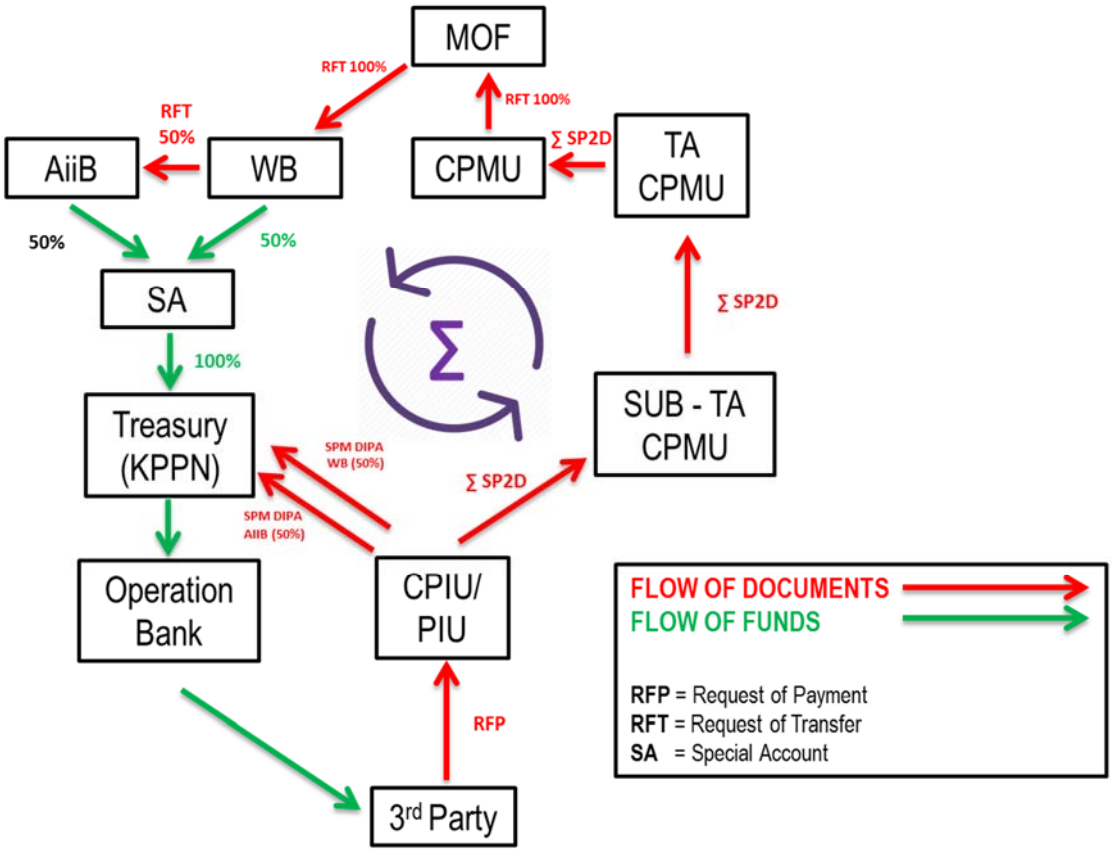
Budgeting

4. The budgeting system follows the existing government procedures. The project budget will be included in the annual government budget and line ministry budget document (DIPA). Budget register will be made separately for activities financed using WB and AIIB fund and are detailed in DIPA on an equal 50-50 basis and strictly followed. Some activities that might be implemented by the provincial satker, if any, will be budgeted through *Tugas Perbantuan* Mechanism.

5. Accounting and Reporting. CPMU and PIUs will maintain separate accounting records for all payment orders (SPM) and remittance orders (SP2D) on a cash basis. All payment of contracts and activities that financed by loan will be using an equal 50:50 basis for WB and AIIB. Separate SPM and SP2Ds will be issued for transactions of each financing sources. All financial transactions will be recorded in the government accounting system and included in government accountability reports. All PIUs will keep original remittance payment records (SP2Ds) and maintain files for audit purposes. The CPMU will prepare a set of consolidated financial reports (interim Financial Reports) that are suitable for project monitoring purposes. The CPMU will be responsible for submitting the reports to the Bank on a quarterly basis not later than 45 days after the end of each quarter. A financial statement for this project will also be prepared annually for audit purposes.

6. Fund Flow. One pooled Designated Account (DA) for funds from WB and AIIB denominated in US dollars will be opened by DG Treasury (MOF) in the Bank Indonesia (Central Bank) specifically for the project. Access to fund in the DA follows government's treasury system.





7. Internal Controls. For payments at the CPMU and PIU level, in addition to the existing verification procedures, the PMU/PIU will assign staff within CPMU/PIU to conduct detailed verification of the contractors and consultants' invoices prior to issuance of payment requests. This control measurement can be further improved through the provision of verification guidelines, and through improving the accountability of the verification team, such as official appointment of the team.

8. Disbursement Arrangement. The applicable disbursement method will be (1) "Advance", (2) "Direct Payment", (3) "Reimbursement", and (iv) Special Committment. One pooled Designated Account (DA) for funds from WB and AIIB denominated in US dollars will be opened by DG Treasury (MOF) in the Bank Indonesia (Central Bank). Advances from WB and AIIB will be deposit to this DA and will be solely used to finance eligible expenditures. The ceiling of the advance to DA will be variable, and the advance(s) will be made on the basis of the six month projected expenditures. The reporting of use of the DA funds will be based on the quarterly Interim Financial Report (IFR), which should be submitted to the Bank no later than 45 days after the end of each quarter. Applications for an advance to the DA will be submitted together with the reporting on use of DA funds, which will consist of: (a) IFRs and a list of payments; (b) projected expenditures for six months; and (c) the DA reconciliation statement.

9. The Application for Withdrawal submitted by the Borrower for the Bank's review and processing will cover the financing of both WB and AIIB; i.e. the same Application for Withdrawal will be used for processing for both WB and AIIB parts and separate Application for Withdrawal for the AIIB part is not required. The CPMU will be responsible for reconciling the DAs and preparing applications for the withdrawal of reimbursements and advances, duly approved by the DG Treasury, before their submission to the Bank. Copies of DA bank statements will be provided to the PMU by DG Treasury, MOF. For each withdrawal application received by the Bank against advances or eligible expenditures, WB will pay its share of co-financing to the DA and simultaneously instruct AIIB to remit payment of their share of co-financing to the DA.

10. The proceeds of both Bank loan and AIIB loan would be disbursed against eligible expenditures (taxes inclusive) as in the table below. Parallel counterpart funds of US$ 50 million will finance items such as minor rehabilitation works, studies, inspections, taxes, contingencies, and incremental operating expenses. Retroactive financing of up to US$ 25 million will be available under this additional financing for payments made for eligible expenditures made not more than twelve months prior to the date of the legal agreement, provided that the relevant Bank procurement guidelines are followed.

Category	**Amount of the Loan Allocated (expressed in US$)**	**Percentage of Expenditures to be financed (inclusive of Taxes)**
(1) Goods, works, non-consulting services, Training and Workshops, Incremental Operating Costs and consultants' services for the Project	125,000,000	100% of Bank Share of Total Lending
TOTAL AMOUNT	125,000,000	

11. Audit Arrangement. The project will be subject to external audit by the BPKP. Each audit will cover a period of one fiscal year of the recipient. The audits will be conducted based on TOR approved by the Bank. Audit reports and audited financial statements will be furnished to the Bank by not later than six months after the end of the fiscal year concerned and shall be made available to the public. The audit will go beyond merely providing an opinion on the financial statements, but would also include opinions on internal control frameworks and compliance with the loan covenants and related regulations. There are no outstanding audit reports under the original project.