ASIAN INFRASTRUCTURE INVESTMENT BANK

Sovereign-backed Financings

Approval Project Document
P000769- Indonesia: Solid Waste Management for Sustainable Urban Development Project

Currency Equivalents
(As at date, June 30th, 2025)
Currency Unit – Indonesia Rupiah (IDR)
USD 1.00 = IDR16,233
USD1.00=EUR0.8529
EUR1.00 = IDR19,033
IDR 1.00 = USD0.0000616

Fiscal Year

January 1 to December 31

Abbreviations

AEPW	Alliance to End Plastic Waste
AIIB	Asian Infrastructure Investment Bank
APBD	Anggaran Pendapatan Belanja Daerah (Local Budget)
APBN	Anggaran Pendapatan Belanja Negara (National Budget)
AWP	Annual Work Plan
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BLUD	Badan Layanan Umum Daerah (Local Public Service entity)
BOD	Biochemical Oxygen Demand
BP2JK	Balai Pelaksana Pemilihan Jasa Konstruksi (Regional Procurement Services Office)
BPBPK	Balai Penataan Bangunan Prasarana dan Kawasan (Regional Unit for Building, Infrastructure, and Area Development)
BPK	Badan Pemeriksa Keuangan (Supreme Audit Institution Indonesia)
BPKP	Badan Pengawasan Keuangan dan Pembangunan (Indonesian State Finance and Development Surveillance)
CAPEX	Capital Expenditure
CLTS	Community Led Total Sanitarian (Sanitasi Total Berbasis Masyarakat, or STBM)
EA	Economic Analysis
FA	Financial Analysis
CPIU	Central Project Implementing Unit
CPMU	Central Project Management Unit
DED	Detailed Engineering Design
DG Binkon	Directorate General Construction Development
DGHS	Directorate General Human Settlements
EA	Executing Agency
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
E&S	Environmental and Social
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

ESMPF	Environmental and Social Management Planning Framework
ESP	Environmental and Social Policy
FM	Financial Management
FS	Feasibility Study
GAP	Gender Action Plan
GBV	Gender-based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOI	Government of Indonesia
HDPE	High Density Polyethylene
ISWTF	Integrated Solid Waste Treatment Facilities
IOCS	International Open Competitive Selection
IRR	Internal Rate of Return
LG/s	Local Government/s
LKPP	Lembaga Kebijakan Pengadaan Barang Jasa Pemerintah (Government Procurement Policy Agency)
LRP	Livelihood Restoration Plan
LTP	Leachate Treatment Plan
JAKSTRANAS	Kebijakan dan Strategi Nasional (National Policy and Strategy)
M&E	Monitoring and Evaluation
MCF	Material Collection Facility
MOE	Ministry of Environment
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MPW	Ministry of Public Works
MRF	Material Recovery Facility
MT	Metric Tons
NCT	National Competitive Tendering
NDCs	Nationally Determined Contributions
NPMC	National Project Management Consultant
NPV	Net Present Value
OPEX	Operations Expenditure
O&M	Operations and Maintenance
POM	Project Operations Manual
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
PPIU	Provincial Project Implementation Unit
PMC	Project Management Consultant
PPM	Project-affected People's Mechanism
Posyandu	Pos Pelayanan Terpadu (Integrated Health Service)
Puskesmas	Pusat Kesehatan Masyarakat (Community Health Centre)
PSW	Project Specific Window
RDF	Refuse-Derived Fuel
RP	Resettlement Plan
RPJMD	Rencana Jangka Menengah Daerah (Medium-Term Local Development Plan)
RPJMN	Rencana Jangka Menengah National (Medium-Term National Development Plan)
QCBS	Quality and Cost Based Selection
SDG	Sustainable Development Goal
SEA/SH	Sexual Exploitation and Abuse/ Sexual Harassment
SEP	Stakeholder Engagement Plan
SPSE	National E-Procurement System
SPD	Standard Procurement Document

SWM	Solid Waste Management
SWM-SUD	Solid Waste Management-Sustainable Urbanization Development
TA	Technical Assistance
TNA	Training Needs Assessment
TPA	Tempat Pemrosesan Akhir (Landfill)
TPD	Tons of waste Per Day
TPS	Tempat Penampungan Sementara (Intermediate Collection Facility)
TPST	Tempat Pengolahan Sampah Terpadu (Integrated Solid Waste Treatment Facilities)
TPS3R	Tempat Pengolahan Sampah - Reduce, Reuse, Recycle (intermediate recycling facility)
TSS	Total Suspended Solid
UASB	Up-flow Anaerobic Sludge Blanket

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Executive Summary

1. Indonesia is a lower middle-income country with a Gross Domestic Product (GDP) per capita of approximately USD 4,357 and a population of 272 million. Its economic resilience is underpinned by more than two decades of prudent macroeconomic management, which has contributed to robust growth, poverty reduction, and greater inclusion. Despite global headwinds, Indonesia's economy grew by 5.0 percent in 2023, driven by resilient private consumption and investment.

2. Indonesia is experiencing rapid urbanization, which will significantly shape its economic prospects but also place increasing pressure on basic services and infrastructure. Infrastructure gaps, particularly in solid waste management, sewerage systems, and other essential services, continue to constrain urban development and economic growth. In 2024, Indonesia generated 35.0 million tons of waste, of which only 1.11% was reduced, 37.66% was handled, and the remaining 61.22% was unmanaged.

3. To address these challenges, Indonesia needs to scale up investment in solid waste management (SWM) infrastructure, strengthen regulatory frameworks, and build technical capacity at the local level. The Solid Waste Management for Sustainable Urban Development Project (the Project) aims to improve integrated SWM services for populations in selected cities and districts by: (i) financing investments in waste management in participating local governments; (ii) strengthening institutional capacity with enhanced community participation; and (iii) supporting SWM and circular economy initiatives. These interventions will contribute to improved environmental conditions, better public health outcomes, and stronger local government service delivery.

4. The Project will directly benefit three main groups: (i) at least 6.2 million residents who will gain improved access to SWM services; (ii) municipal staff, through enhanced institutional capacity for planning, implementation, and financing of SWM systems; and (iii) formal and informal sanitation workers—including waste pickers, women, and other vulnerable groups—who will benefit from improved working conditions and enhanced livelihood opportunities in the SWM sector.

5. AIIB has supported the design and implementation readiness of the Project by mobilizing grant resources from the Alliance to End Plastic Waste (AEPW). AEPW has provided financial support for upstream circularity models and in-kind project preparation services. In addition, the Project will be co-financed by AEPW through a USD 40 million grant to be administered by AIIB under its Project-Specific Window (PSW).

Project No.	P000769
Project Name	Solid Waste Management for Sustainable Urban Development Project (SWM-SUD)
AIIB Member	Indonesia
Borrower	Republic of Indonesia
Guarantor	Not Applicable
Project Implementation Agencies	Ministry of Public Works Ministry of Home Affairs Ministry of Health
Sector Subsector	Urban Integrated waste management
Alignment with AIIB's thematic priorities	Green infrastructure
Project Objective	To improve integrated solid waste management services for populations in selected cities and districts in Indonesia.
Project Description	The Project will finance the construction of integrated solid waste treatment facilities (resource recovery, composting, and refuse derived fuel (RDF) plants), landfill upgrading, and improve waste segregation, collection, recycling, transport services through grants provision to eligible local governments and community groups. It will also support institutional strengthening, including upgrading regulations, institutions, management, and community participation. The Project aims to support the Government of Indonesia (GOI) in achieving the national solid waste management (SWM) targets of 85% waste collection coverage, 38% waste processing, and a reduction of residual waste disposal to landfills to 47%, while contributing to addressing SWM challenges.
Implementation Period	12/01/25 03/31/31
Expected Loan Closing Date	03/31/31
Proposed Amount of AIIB Financing (USD)	USD150 million (EUR127,937,000)
Financing Plan	Project Cost: USD 210 million AIIB: USD150 million Grant: PSW USD40 million grant, sponsored by Alliance to End Plastic Waste (AEPW) GOI: USD20 million
ES Category (or AIIB equivalent, if using another MDB's ES Policy)	A
ES Category Comments	
Risk (Low/Medium/High)	Medium
Conditions of Effectiveness	The Project Operation Manual has been prepared in form and substance satisfactory to the Bank.
Key Covenants	The Borrower: (i) through the Project Executing Agency and the Project Implementing Agencies, shall carry out the Project in accordance with the Project Operation Manual; and (ii) through the Project Executing Agency and the Project Implementing Agencies shall allocate the proceeds of the

	Loan for a Sub-Project only after such Sub-Project has become eligible according to the provisions of the Project Operation Manual.
Conditions for Disbursement	No withdrawal shall be made until the Bank has received payment in full of the Front-end Fee.
Retroactive Financing (Loan % and dates)	NA
Policy Waivers Requested	No
Policy Assurance	The Vice President, Policy, and Strategy, confirms an overall assurance that AIIB is in compliance with the policies applicable to the project
Economic Capital (ECap) Consumption (USDm)	USD14.97 (9.98%)
President	Liqun Jin
Chief Investment Officer	Kim-See Lim
Director General	Rajat Misra
Manager	Toshiaki Keicho
Team Leader	Jana Halida Uno, Senior Investment Officer
Back-up Team Leader	Xiang Xu, Investment Officer
Team Members	Krisnan Isomartana, Senior Environment Specialist Nurul Mutmainnah, Financial Management Associate Rizal Rivai, Procurement Specialist - Consultant Victoriano Macasaquit, Social Development Specialist David Hartcher, Senior Finance Officer Luiz Eduardo Rodrigues, Counsel Edith Zheng, Economics Associate Benno Rahardyan, SWM Specialist - Consultant Sabah Iqbal, Environment Specialist Nicole Faith Blanco, Social and Environment Associate Jiaqi Su, Economic Analyst Bakhtiar Sohag, Economist Yijun Jiang, Climate Specialist Muhammad Halik Rizki, Urban Specialist - Consultant Jinghui Li, Senior Administrative Assistant
Credit Officer	Young Bong Cho, Senior Sovereign Risk Officer

1. Context

1.1 **Country and Macroeconomic Overview.** Indonesia is a lower middle-income country with a Gross Domestic Product (GDP) per capita of around USD 4,357 and a population of 272 million. The economy recovered well from the COVID-19 pandemic, with real GDP accelerating to 5.0% in 2023. Inflation increased from 1.6% in 2021 to a peak of 6.0% in September 2022, mainly driven by the rise in global commodity and energy prices.

1.2 The fiscal deficit has narrowed from a high of 6.1% of GDP in 2020 to 2.2% in 2023, thus successfully returning within the 3.0% of GDP deficit ceiling. The current account further improved, from a deficit of 0.4% of GDP in 2020 to a surplus of 1.0% of GDP in 2022, driven by commodity windfall and strong external demand.

1.3 **Sector Overview.** In 2024, Indonesia generated 35.0 million tons of waste, of which only 1.11% was reduced, 37.66% was handled, and the remaining 61.22% was unmanaged.[1]. Additionally, a significant amount of plastic waste is discarded into the environment, contaminating groundwater, soil, rivers, seas, and oceans[2]. Only around 39% of Indonesia's plastic waste is appropriately managed annually[3]. This leads to an estimated 40 million tons of waste, with 3-4 million tons of plastic waste being burned openly, releasing harmful substances like dioxins, heavy carbon monoxide, and other greenhouse gases.

1.4 The Government of Indonesia (GOI) has set national solid waste management targets under the National Mid-Term Development Plan (RPJMN) 2025-2029, which aim to achieve 85% household waste collection coverage, 38% waste processing, and reducing residual waste disposal to landfills to 47%. In addition, the Government has set a target to reduce plastic waste leakage into the ocean by 70% by 2029. Around 257 cities/districts in 17 provinces are expected to ban single-use plastics[4], while material recovery and reuse are being promoted, with 12 cities planning to establish waste-to-energy plants and 34 cities/districts to build refuse-derived fuel (RDF) plants. Furthermore, the National Development Planning Agency (Bappenas) has recently launched the Indonesia Circular Economy 2025-2045 Roadmap and National Action Plan, which highlights three main directions for advancing the circular economy: reducing resource use, extending product life cycles, and increasing recycling and waste utilization.

1.5 The Solid Waste Management (SWM) sector in Indonesia is governed by the Solid Waste Management Act (Law No. 18/2008), which focuses on municipal SWM and recognizes the urgent need to reduce the reliance on landfills due to their pollution impacts. Regarding plastic waste, the Act also seeks to disincentivize producers who use non-environmentally friendly materials.

[1] Based on SIPSN 2024 data from 321 districts/cities. National Waste Management Information System. 2024. https://sipsn.menlhk.go.id/sipsn/
[2] Systemiq. 2021. Building Robust Governance and Securing Sufficient Funding to Achieve Indonesia's Waste Management Strategies. https://www.systemiq.earth/wp-content/uploads/2021/11/Building-Robust-Waste-System-Governance-and-Securing-Sufficient-Funding_Final-Report_26Nov2021.pdf
[3] Systemiq. 2021. Building Robust Governance and Securing Sufficient Funding to Achieve Indonesia's Waste Management Strategies. https://www.systemiq.earth/wp-content/uploads/2021/11/Building-Robust-Waste-System-Governance-and-Securing-Sufficient-Funding_Final-Report_26Nov2021.pdf
[4] This includes, but not limited to, plastic straws, shopping bags, cutlery, and food packaging.

1.6 According to the Local Government Act (Law No. 23/2014), responsibility for the SWM sector falls under the concurrent government affairs[5]. Local governments hold the primary responsibility for solid waste management, while the national government, including the Ministry of Public Works (MPW), has a role in providing technical advice, promoting pilot projects, and supervising large-scale off-site solid waste facilities. However, limited budgetary and technical capacity at the local level has hindered the achievement of national SWM targets. To address these challenges, the national government, within its capacity, continuously provides support for local governments.

1.7 **Key Development Challenges: Project Contributions.** The SWM sector faces the following challenges in infrastructure provision, financial resources and institutional arrangements:

(i) LGs' municipal SWM service delivery is limited by inadequate budgets[6]. In 2025, the average SWM budget allocation was only 0.53% of the total local budget (APBD)[7]. This issue of insufficient budget has been worsened by the low efficiency of waste management tariff collection[8]. As a result, local governments' expenditure on waste exceeded the revenues generated from service tariffs.

(ii) Lack of community participation in waste segregation, recycling, and reuse is observed, and relatively little waste treatment takes place before the waste enters the landfill. The majority of mixed waste goes into landfills without proper sorting and compacting, consuming additional spaces and further exacerbating the issue of overcapacity[9] [10].

(iii) Most landfills in Indonesia are designed to be sanitary landfills (MPW Regulation No. 3/2013). However, due to inadequate operating costs and maintenance, such as daily cover, they end up being operated with exposure to health and safety issues, odors, and methane gas emissions. Inadequate maintenance has also led to landfills nearing overcapacity, while the availability of lands for new landfills is becoming increasingly limited.

(iv) Inadequate collection and transport services have yet to reach all residents equally, and as a result, some people still dispose of and even burn their trash. This behavior has also caused other environmental issues, such as land contamination and air pollution, a decrease in the lifespan of sanitary facilities, and the large amount of plastic waste that ends up being dumped in riverways and oceans.

(v) The responsibility of SWM is to spread across various government agencies, including the main ministries[11] (MPW, Ministry of Environment (MOE), and Coordinating Ministry of Maritime and Investment Affairs) and the core ministries[12] (MOHA, Bappenas, and MOH). To create an enabling environment that supports synchronization between national-level ministries and their operational branches at the local level, it is essential

[5] Concurrent government affair is a joint responsibility that is shared between national and local governments.
[6] Waste for Change. 2019. The Governance of Solid Waste Institutions in Indonesia: Overview of Solid Waste In Indonesia (Part 2 Regional Government).
[7] Bappenas: Pengelolaan Sampah Tak Optimal karena Alokasi APBD Terlalu Kecil
[8] Among the three LGs assessed by detailed financial analysis, only 4.6% of households, on average, pay tariffs for the waste services they receive.
[9] Waste sorting behavior at the household level in Indonesia is only 9%. Zakianis and and Sabarinah, Int J Waste Resour 2017, 7:4. The Importance of Waste Management Knowledge to Encourage Household Waste-Sorting Behaviour in Indonesia.
[10] The average percentage of the total waste treated by waste banks is between 0.004% to 2.9% from Yogyakarta City Waste Reduction Master Plan 2017.
[11] Main Institution is an institution mandated in the Laws and Government Regulations to be in charge of the waste management, has a structure and budget allocation related to the waste management.
[12] Core Institution is an institution that is not mandated by the regulations but has its own structure in terms of waste management.

to strengthen planning and regulatory frameworks that can mainstream integrated SWM approaches into local mid-term development plans (RPJMD) and local budgets (APBD).[13]

(vi) Local governments often combine the functions of regulator and operator in SWM service delivery. This creates inefficiencies, weakens accountability, and limits opportunities for professionalized service provision through Local Technical Implementation Units (UPTDs), Local Government-Owned Enterprise (BUMDs), or private sector operators. Clear separation of roles is needed to improve oversight, strengthen service standards, and attract investments and partnerships in the sector.

1.8 The Project aims to assist GOI in achieving its SWM national target and in addressing the key SWM challenges faced by the country. Component 1 of the Project aims to improve the SWM infrastructure provision and service delivery through the construction of waste treatment facilities and upgraded landfills. Component 2 aims to improve regulatory, institutional, technical, and financial aspects, as well as community participation, by enhancing the capacity of local governments and community participation in managing solid waste. This will be achieved through enhancing the quality of SWM master plans, provision of technical assistance, strengthening tariff collection regulations, and conducting awareness raising and behavior change initiatives. Component 3 addresses inadequate waste segregation, collection, recycling, and transport services by providing grants for LGs and community groups[14]. Component 4 provides implementation support and project management to support Project activities.

1.9 The Project will support the Government of Indonesia's transition to stop the construction of new landfills by 2030 and shift the focus toward waste segregation and recycling. It will assist eligible local governments (LGs) in moving toward the zero-new-landfill target, thereby setting a standard for other LGs to follow.

1.10 The theory of chain for the Project (figure 1) presents a comprehensive approach to improving SWM performance in Indonesia through provision of solid waste infrastructure, institutional strengthening, and community engagement, aiming to address the existing SWM development challenges.

[13] Waste for Change. 2019. The Governance of Solid Waste Institutions in Indonesia: Overview of Solid Waste In Indonesia (Part 1 Central Government).

[14] Grants refers to the non-monetary assistance in the form of goods and services from central government to local governments and community groups, conditioned to achieving performance and requirements. It can include supplies, equipment, and technical support.

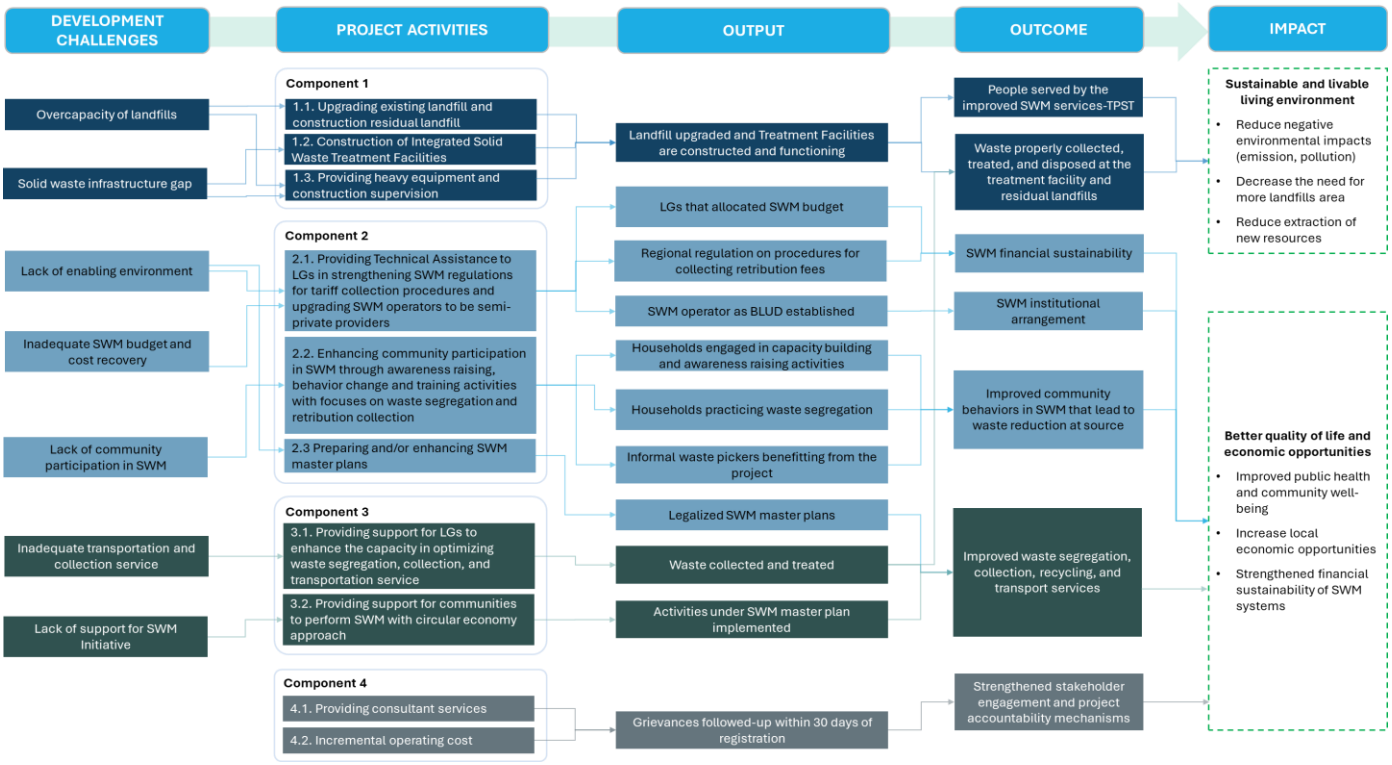


Figure 1. Theory of Change of SWM-SUD Project

2. Rationale

2.1 **Project Objective.** The Project objective is to improve integrated solid waste management services for populations in selected cities and districts in Indonesia.

2.2 **Expected Beneficiaries.** The Project will be implemented in 10 participating locations with a total population of approximately 11 million residents, all of whom are expected to benefit from improved environmental conditions, public health, and enhanced local government service delivery. Three main target groups will directly benefit from the Project: (i) at least 6.2 million residents who will gain increased access to improved SWM services, 50% of whom are female[15]; (ii) municipal staff, through improved institutional capacity for planning, implementing, and financing systems for SWM; and (iii) formal and informal sanitation workers, including waste pickers, women, and other vulnerable groups, through improved working conditions and better livelihood opportunities in the SWM sector.

2.3 **Expected Results.** The Project objective will be evaluated against the following key result indicators: (i) number of people with access to improved SWM services; (ii) waste properly collected at the waste treatment facility; (iii) waste properly treated by improved SWM services and (iv) waste properly disposed of in residual landfills. A detailed results framework containing results indicators, monitoring, and reporting arrangements is provided in Annex 1.

2.4 **Strategic Fit for AIIB.** The Project is consistent with AIIB's mandate and thematic priority to promote green infrastructure. This is because the proposed investments will deliver substantial environmental improvements, with more integrated waste collection and waste treatment facilities and equipment. This will enable better pollution control and contribute to climate mitigation actions by enhancing waste recycling and reducing health, safety, and climate risks from the improper operation of landfill facilities that were initially designed as sanitary landfills but are inadequately maintained. The Project also aligns with the Sustainable Cities Strategy, which aims to promote integrated development, provide basic infrastructure, and improve city resilience. The Project will result in improved access to critical SWM services, expected to bring significant economic benefits with high social value. It is also likely to help improve the efficiency and sustainability of SWM investments by strengthening institutional systems and capacities of the participating cities and districts.

2.5 The Project is aligned with the GOI's priorities for promoting sustainable urban development and SWM. It will directly contribute to national strategic objectives as set out under the RPJMN 2025-2029, which provides the overarching framework for strengthening solid waste management services, advancing circular economy approaches and improving environmental sustainability. It also supports the country's Nationally Determined Contributions (NDCs) on waste management, being consistent with NDC waste sector mitigation actions. These include promoting waste utilization as raw materials or energy and enhancing the adaptive capacity of solid waste facilities to climate risks by integrating climate-resilient designs in infrastructure development and maintenance. The Project supports Sustainable Development Goal (SDG) 3 by improving the health and well-being of the target population, SDG 11 by promoting safe, resilient, and sustainable urban development, and SDG 12 by facilitating sustainable consumption and production.

[15] The source of this data is based on Indonesia Statistic Yearbook published in February 2024.

2.6 **Paris Agreement Alignment (PAA) and Climate Finance.** In line with AIIB methodology for assessing alignment with the mitigation and adaptation goals of the Paris Climate Agreement, the Project is assessed as aligned[16]. Details on the assessment are provided in section E. In line with the joint multilateral development bank (MDB) methodologies for tracking mitigation and adaptation finance, it is estimated that USD 18.6 million is qualified for climate finance with dual benefits contributing to both mitigation and adaptation benefits, while USD119.4 million is qualified for climate mitigation finance. Further details are provided in section E.

2.7 **Value Addition by AIIB.** Beyond the provision of financing for the SWM sector, AIIB's participation has helped improve the design and implementation readiness of the Project by mobilizing grant support from the Alliance to End Plastic Waste (AEPW) and leveraging AIIB's experience from prior SWM projects. The Bank will support enhancing the quality of environmental and social management for the participating local governments. AIIB has assisted local governments in adopting lessons learned from similar projects in Indonesia and other countries and reflecting them in Project design and implementation arrangements. The Project has benefited from knowledge gained from the Bangladesh SWM project by incorporating design features for integrated service delivery and climate resilience. The Bank also encouraged a non-profit, non-governmental organization whose mission is to end plastic waste in the environment, AEPW, to provide financial support for upstream waste circularity models and support this Project with in-kind project preparation services. The Bank has proactively provided the following support: (i) rapid waste sector assessments; (ii) shaping the Project's scope and conceptual design; (iii) adoption of good SWM practices, locally adoptable SWM technologies, and solutions that consider climate impacts; and (iv) knowledge sharing and capacity building support for key Project stakeholders.

2.8 **Value Addition to AIIB.** The Project is AIIB's first integrated SWM project in Indonesia. This engagement will provide a good opportunity for the Bank to gain experience in comprehensive waste management at the regional level, eventually covering other major cities in the country. Waste management is a significant challenge across Southeast Asian cities. This is the first AIIB project that receives a contribution from a non-member through Project Specific Window (PSW). This Project will provide an opportunity to pave the way for building the Bank's presence in the sector and strengthening its partnership with the GOI and development partners.

2.9 **Lessons Learned.** The Project design incorporates the following lessons learned from similar projects both in Indonesia and in other countries:

(i) AIIB's SWM experiences in Bangladesh and India showed that an integrated service delivery approach to improving SWM (collection, transportation, treatment, and safe disposal) is essential[17]. Global experience in the sector also emphasized the importance of an enabling policy, regulatory and institutional framework, and financial sustainability mechanisms for an integrated and efficient SWM system. This Project applies such an integrated SWM approach by enhancing and updating the SWM master plan for each

[16] AIIB. 2023. Methodology for Assessing the Alignment of AIIB Investment Operations with the Paris Agreement. https://www.aiib.org/en/how-we-work/paris-alignment/overview.html

[17] AIIB. 2024. P000387 - Bangladesh Integrated Solid Waste Management Improvement Project, P000453 – India Kerala Solid Waste Management Project.

participating LG, optimizing collection equipment and transportation services through in-kind support, and financing waste treatment plants and landfills.

(ii) Component 3 of the Project has incorporated lessons drawn from projects implemented by other MDBs:

(a) An evaluation conducted by the Independent Evaluation Group (IEG) of the World Bank Group found that waste hierarchy and circular economy approaches to municipal SWM are recognized and need to be advocated [18]. The Project encourages the application of the waste hierarchy[19] and introduces the circular economy principles through the development of a Circular Economy for SWM manual, pilot projects, and grants for circular economy practices in eligible LGs. In the Indonesian context, this involves minimizing waste and maximizing resource use by keeping materials in circulation at the highest value for as long as possible through facilities such as intermediate recycling facilities (TPS3R) and waste banks. It includes reducing, reusing, repairing, recycling, and recovering materials throughout the product lifecycle.

(b) Several World Bank projects in Indonesia have incorporated incentive grants, grants, and in-kind support to incentivize better service delivery, expansion, and scale-up. Examples include (1) the Rural Water Supply Sanitation Project, which provided incentive grants and/or assistance to participating districts and villages to meet project objectives, particularly with respect to scaling-up, replication, and sustainability; and (2) the Urban Water Supply Project (UWSP), which provided grants to incentivize local water utilities to expand and improve their services. The UWSP provided three types of grants: (a) stimulant grants for LGs with relatively low-capacity through provision of capacity building and investments; (b) matching grant for LGs with financially and technically capable water utilities; and (c) grants for LGs whose water utilities achieved key performance indicators in operational efficiency and service improvement (e.g., non-revenue water (NRW) reduction and energy efficiency). This Project provides similar grants and in-kind support to incentivize LGs in applying an integrated SWM approach in its SWM service.

(iii) Relevant lessons incorporated into project preparation for the Project include: (a) waste management at the community level can be strengthened by awareness-raising and behavioral change initiatives. These require a complex process of shifting public perceptions towards waste segregation, recycling, and disposal. Communication campaigns are essential to ensure public ownership and support for climate-smart and disaster-resilient SWM operations; and (b) an enabling regulatory environment, together with strong institutional commitment and mechanisms, is essential for successful operations. Accordingly, the project design and implementation for the Project involve core SWM institutions, including the Ministry of Home Affairs (MOHA), Ministry of Health (MOH), and Bappenas, to strengthen institutions and policies at local level and support community participation. MOHA will lead policy and regulation stock-taking at the LG level, review regulators and operators, and strengthen waste operator capacity. MoH will conduct behavior change initiatives at the community level, involving sanitarians and healthcare volunteers to ensure effectiveness.

[18] The World Bank, 2022, Transitioning to a Circular Economy - An Evaluation of the World Bank Group's Support for Municipal Solid Waste Management (2010–20). https://documents1.worldbank.org/curated/en/473711647523370382/pdf/Transitioning-to-a-Circular-Economy-An-Evaluation-of-the-World-Bank-Group-s-Support-for-Municipal-Solid-Waste-Management-2010-20.pdf

[19] By reducing the wastes sent to landfills, this Project is in line with the waste hierarchy which include the five stages: prevention, reuse, recycle, recovery and disposal.

(iv) Given that operating costs in the SWM sector are high, clear revenue streams must be identified upfront so that operations and maintenance (O&M) are covered, preferably from own revenues (dedicated waste tariffs or municipal taxes) or through budget support and/or subsidies. This lesson is reflected in the Project design, where: (a) one of the selection criteria for LGs is to require the local parliament and head of districts to sign a Memorandum of Understanding (MoU)[20] with the central government committing to provide O&M budgets for Integrated Solid Waste Treatment Facilities (ISWTFs) including RDF plants; (b) MoU between local governments and off-takers (e.g., cement and fertilizer factories) ensure purchase of outputs; (c) technical support is provided to develop cost recovery mechanisms, with a focus on setting fair tariffs that can be implemented locally; and (d) community awareness-raising and behavior change initiatives support timely tariff payment.

[20] This MOU will be followed up by legal agreements between operators and offtakers.

3. Project Description

3.1 **Selection criteria for participant LGs.** The Project will benefit 10 or more participating local governments selected based on the MPW's screening criteria. The selection criteria include, but are not limited to, the following: commitment to operations and maintenance, land availability, completeness of planning documents, and the existence of potential off-takers for waste products such as RDF, recyclables and compost.[21] Following these criteria, the GOI has reaffirmed the inclusion of the following cities and districts, which may also be subject to change: Temanggung, Rembang, Tasikmalaya (first batch); Jepara, Banyuwangi, and Regional Aceh (second batch); and Cirebon, Gunung Kidul, Tabalong, and Regional Magelang (third batch). The first batch was selected considering their progress on technical documents, including feasibility studies, environmental and social (E&S) documents, detailed engineering design (DED), and implementation readiness. The sequencing of batches is flexible: LGs listed in later batches may be advanced to an earlier batch if they demonstrate stronger readiness, while others may be shifted depending on circumstances. Additional LGs may be included in the Project subject to fund availability and the fulfillment of selection criteria. The Project's Steering Committee will assess the eligibility of LGs and approve their participation.

3.2 **Components**

3.2.1 **Component 1. Provision of Solid Waste Infrastructure.** This component will finance priority investments in waste management infrastructure in each participating local governments, including support for better utilization and upgrading existing infrastructure. Priority investments include the construction of Integrated Solid Waste Treatment Facilities (Waste Treatment Facilities) (resource recovery, composting, and RDF plants), and upgrading of existing landfills, and construction of residual landfills. It will also provide heavy equipment to support operations at the Waste Treatment Facilities and residual landfills, as well as supervision consultants to oversee construction works.

3.2.2 **Component 2: Institutional Strengthening and Community Participation**. This component aims to enhance the performance of local governments and community participation in SWM. It will support: (i) strengthening SWM institutional performance, including regulatory, institutional, financial, and technical aspects; (ii) enhancing community participation in SWM through awareness raising, behavior change, and training activities focused on waste segregation and retribution collection; and (iii) preparation and/or enhancement of SWM master plans[22].

3.2.3 **Component 3: Support for SWM and Circular Economy Initiatives**. This component aims to enhance waste management services by supporting local governments

[21] The waste products generated from Waste Treatment Facilities will include 1) RDF that can be used as substitute fuels to reduce the use of fossil fuels in cement kilns; 2) recyclable materials that can be reused and 3) composts that are generated from organic wastes. Potential offtakers for these products have been identified in the 10 participant cities. The selection criteria requested LGs to sign MoUs with offtakers including suppliers for recyclables and composting and cement factories.

[22] Seven participant cities have existing master plans to be updated and enhanced while the other three cities, Rembang, Aceh, Tabalong have existing SWM technical plans which will need further development to become master plans. Among the 10 cities, only Temanggung, Gunungkidul, Bayuwangi have legalized master plans. The law requested master plans should be reviewed and updated every 5 years. The enhancement of masterplans aims to incorporate comprehensive aspects of SWM including technical, institutional, regulatory, financial aspects, community participation, and new initiatives such as digitalization, circular economy, and private sector engagement.

and community efforts toward sustainable waste management. It will provide (i) grants for eligible LGs to enhance capacity in optimizing waste segregation, collection, and transportation services; and (ii) grants for community groups, villages, urban wards, and LGs to implement eligible SWM activities with a circular economy approach. The circular economy approach aims to minimize waste and maximize resource use by keeping materials in circulation at the highest value for as long as possible. It involves reducing, reusing, repairing, recycling, and recovering materials at every stage of the product lifecycle. Rather than following the traditional "take, make, dispose" model, the circular economy seeks to eliminate waste by promoting sustainable product design, extending product life, and ensuring that end-of-life materials are repurposed or reintegrated into the production cycle. This component will only be implemented subject to the finalization of the Project Operations Manual and technical guidelines, which will specify detailed rules including maximum and minimum allocations per LG, eligible activities, and the preparation and appraisal process of sub-projects financed under this component.

3.2.4 **Component 4: Implementation Support**. This component will support project management during implementation, including procurement, financial management, monitoring and evaluation, and environmental and social risk and impact management. It will also support relevant national and local officials for effective implementation through: (i) a national project management consultant under Central Project Management Unit (CPMU); (ii) a national monitoring team for overall solid waste program under Steering Committee; (iii) advisory individual consultants for the CPMU and Central Project Implementation Units (CPIUs); (iv) evaluation and studies consultants; and (v) incremental operating cost. Incremental Operating Costs refer to reasonable project-related expenditures incurred by the Implementing Units to support implementation. These include items such as stationery, local travel per diem and allowances, communication, advertising, translation, interpretation, bank charges, and similar operational costs—excluding civil servant salaries and personal expenses. All costs will be based on periodic budgets acceptable to the Bank and aligned with MDB financial reporting standards. The list of expenditures has been previously shared by MPW with the Bank; any changes related to the proposed items should be communicated to the Bank for approval before they can be included in the Annual Work Plan and Budget. Further technical details of project design and scope are provided in Annex 2.

3.3 Cost and Financing Plan

3.3.1 The estimated Project cost and financing plan of the Project is shown in Table 1. The financing will be inclusive of taxes. The total Project cost is estimated to be USD 210 million per breakdown below.

Table 1. Project Cost and Financing Plan

Item	Project Cost (USD m)	Financing (USD m (%))		
		AIIB	GOI	PSW Grant-AEPW[23]
Component 1. Provision of Solid Waste Infrastructure	137.79	124.09 (90.05%)		13.7 (9.94%)
Component 2. Institutional Strengthening and Community Participation	21.55	10.35 (48.02%)	10.1 (46.86%)	1.1 (5.1&)
Component 3. Support for SWM and Circular Economy Initiatives	35.7	2 (5.6%)	9.5 (26.6%)	24.2 (67.78%)
Component 4. Implementation Support	14.96	13.56 (90.6%)	0.4 (2.67%)	1.0 (6.68%)
Grand Total	210	150 (71.5%)	20 (9.5%)	40 (19%)

3.3.2 The PSW Grant, under the Project cost and financing plan, is still dependent on the Borrower's approval and AEPW's payment of its contribution to the fund. If the PSW Grant does not materialize, the Project cost and financing plan shall be restructured. The GOI funding includes the salary/honoraria for sanitarians, local government contributions for the grant, and other expenditures to support Project implementation.

3.4 Implementation Arrangements and Readiness

3.4.1 **Implementation arrangements.** At the national level, a steering committee consists of Bappenas as the lead and MPW, MOH, MOHA, and MOE, and other SWM relevant ministries as members. The Steering Committee will provide oversight, advisory support, policy, and strategic guidance; monitor the Project's overall implementation targets; and coordinate with all agencies involved in the Project. It will also coordinate with the existing Pokja PPAS/PKP[24] at the national, province and city/district levels, as well as with heads of sub-districts and village/urban wards.

3.4.2 The Executing Agency (EA) is the Directorate General of Human Settlement (DGHS), MPW, which is responsible for coordinating all Project activities and coordinating with AIIB and other ministries. A CPMU, established at MPW and led by the Directorate of Sanitation, will oversee Project implementation, particularly achievement of the Project objective and outputs. The CPMU will undertake comprehensive monitoring, evaluation, and impact assessment activities; carry out field validation and project facilitation in participating cities and districts; maintain an efficient project monitoring and tracking system to ensure timely implementation of activities; and provide technical expertise and inputs to the Steering Committee for policy development, dialogues, and high-level meetings.

[23] AEPW has shared a letter to commit the amount of grant will be USD 40 million. The grant amount will be finalized in the grant agreement.
[24] Pokja PPAS/PKP: Work force and collaboration platform for ministries and/or government offices working in water, sanitation, housing, and settlements

3.4.3 The CPMU will be supported by three CPIUs to implement specific activities, monitor progress, and provide feedback and inputs for policy and project decisions. The CPIUs consist of: (i) MPW (Directorate of Sanitation), (ii) MOHA (Directorates of Synchronization of Local Government [SUPD] 1 and 2); and (iii) MOH (Directorate of Environmental Health).

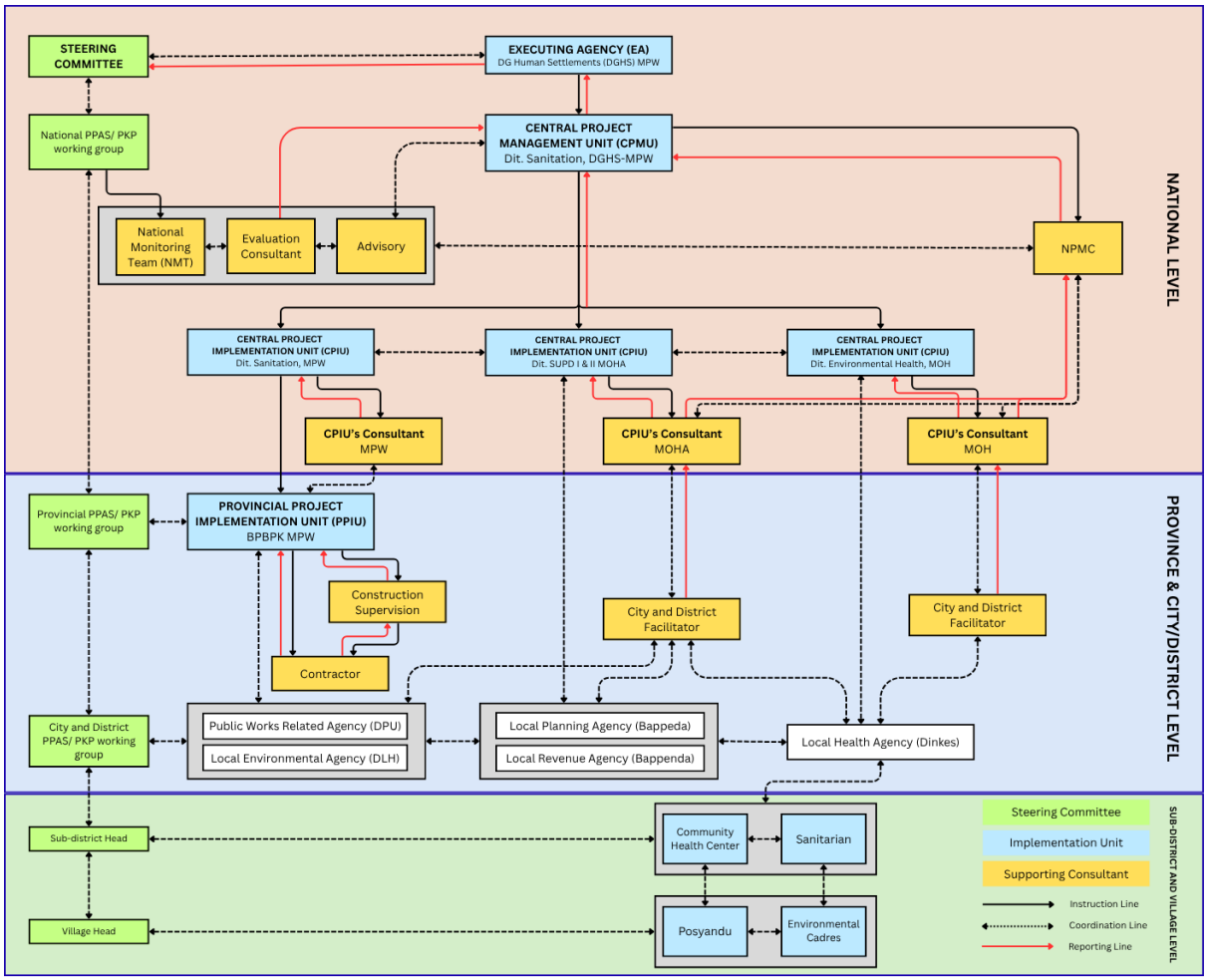


Figure 2: A Schematic Diagram of Implementation Arrangement

3.4.4 BPBPKs serve as the Provincial PIUs (PPIUs). These include BPBPK Aceh, BPBPK Central Java, BPBPK West Java, BPBPK East Java, BPBPK DI Yogyakarta, and BPBPK South Kalimantan. The BPBPKs function as PPIUs under the CPIU of MPW.

3.4.5 At the city and district levels, the Project is supported by Public Work Agencies (Dinas Pekerjaan Umum/DPU), Environmental Agencies (Dinas Lingkungan Hidup/DLH), Local Planning Agencies (Bappeda), Local Health Agencies (Dinkes), and Local Revenue Agencies (Bapenda). These agencies will support the CPMU and PIUs at central and provincial levels through monitoring and provision. Community Health Centers (Puskesmas) and sanitation units at the sub-district level, and Integrated Health Services (Posyandu) and healthcare services at the urban ward and village levels, will support the Project for SWM awareness raising and behavior change activities.

3.4.6 **Procurement Policy.** AIIB's Procurement Policy (revised June 26, 2024) and the AIIB Directive on Procurement Instructions for Recipients (July 26, 2024) are applicable to this Project, including the contracts to be financed under the PSW Grant supported by AEPW.

3.4.7 **Procurement Institutional Arrangements.** The selection of the National Project Management Consultant (NPMC), National Monitoring Team (NMT), the Advisory and Evaluation Consultants, and the CPIU MPW consultant will be carried out by BP2JK (Regional Procurement Services Office) under the close supervision of DG Binkon (DG Construction Development).

3.4.8 The procurement of non-consulting services and the selection of CPIU MOHA consultants will be done by MOHA UKPBJ (the Procurement Services Unit of MOHA), under the General Services Office of the Secretariat General of MOHA. The procurement of non-consulting services and the selection of CPIU MOH consultant will be done by the MOH Procurement Office. The procurement of civil works under component 1 will be carried out at the provincial level by BP2JK in the same provinces as the BPBPKs.

3.4.9 **Project Delivery Strategy.** The Project Delivery Strategy (PDS), including the Project Procurement Plan (PP), has been agreed with the Bank and will be updated, as necessary, from time to time during implementation. Procurement activities under the PSW Grant for Components 1 and 3 will be identified during implementation and included in the revised Procurement Plan. A summary of major procurement activities and key strategies is presented below:

3.4.10 The selection of main consultants will be as follows:

(i) Firms: For MPW: the NPMC, NMT, Evaluation Studies and Consultant, and the CPIU MPW consultant; for MOH and MOHA: CPIU consultants. The selection will follow the International Open Competitive Selection (IOCS) with Quality and Cost Based Selection (QCBS) method. The Bank's Standard Procurement Document (SPD) for Consulting Services will be used for all selection of consultants (firms).
(ii) Individual Consultants for Advisory.

3.4.11 The contracts for Event Organizers (estimated at less than USD 400,000) will be procured by PIU MOH and PIU MOHA through National Competitive Tendering (NCT). The harmonized bidding documents for non-consulting services, normally used by the World Bank, and determined consistent with the AIIB's Procurement Policy on Core Procurement Principles and Procurement Standards, will be used. AIIB's Covenant of Integrity form will be included in the NCT bidding documents.

3.4.12 Procurement of subprojects at the provincial level is expected to include the following:

(i) Construction of Waste Treatment Facilities and landfills upgrading (estimated contract values USD 3 - 23 million). The procurement will follow the NCT using LKPP[25] issued harmonized bidding document for construction works (which is normally used in World Bank-financed projects for national open competitive procurement). The NCT

[25] The Government Procurement Policy Agency

determined consistently with the Bank's Procurement Policy on Core Procurement Principles and Procurement Standards, will be used. The AIIB's Covenant of Integrity form will be included in the NCT bidding document.

(ii) Procurement of supporting heavy equipment (estimated contract is less than USD 300,000 and the equipment is available off the shelf). The NCT and the LKPP-issued bidding document for goods, which have been determined as consistent with the Bank's Procurement Policy on Core Procurement Principles and Procurement Standards, will be used. The AIIB's Covenant of Integrity form will be included in the NCT bidding document.

(iii) The supervision consultant (contract values range from USD 200,000 - 1.6 million). It is unlikely the nature and scope of this consulting service will attract foreign competition and there are sufficient numbers of qualified national consultants to carry out the assignment, and so the selection will follow National Competitive Selection (NCS) with QCBS method. The Bank's SPD for Consulting Services will be used for all selection of consultants (firms).

3.4.13 **The e-Procurement System.** The national e-procurement system (SPSE) has been assessed and accepted by the World Bank and ADB and will be used for the procurement under NCT and selection of consultants under NCS. The SPSE-ICB application, as has been assessed and accepted by ADB, will be used for the selection of consultants subject to IOCS.

3.4.14 **Advance Procurement and Retroactive Financing.** No advanced procurement activities and actions are anticipated for this Project.

3.4.15 **Financial Management (FM).** As the CPMU, the MPW (DGHS) is responsible for overall financial management, including consolidating transactions and financial reports from all PIUs at central and provincial levels. The DGHS has accumulated experience from previous projects funded by other MDBs, such as the World Bank and ADB. The three CPIUs will closely coordinate with CPMU on budget preparation, financial management guidelines and procedures, financial reconciliation and reporting, and audit arrangements. At the provincial level, FM will be handled by task force units at the BPBPK, consisting of a commitment officer, treasurer, and verification team. BPBPKs will manage contracts for construction and supervision and process payments after invoice verification. They will closely coordinate with the PMU on FM issues during project implementation. Most BPBPKs also have experience in managing some projects under other MDBs. To support FM, at the implementation stage, an FM consultant will be hired under the CPMU and CPIUs. The FM consultant will be supporting the government officers in managing project specific FM tasks, including financial reporting for the purpose of government and lenders requirements.

3.4.16 **AEPW Project Specific Window (PSW) Grant.** The Project is jointly co-financed by AEPW, which is providing a USD 40 million grant to be administered by AIIB through its PSW. The AIIB Board of Directors approved the establishment of the PSW on March 19, 2024, allowing AIIB to accept, manage, and disburse grants on behalf of PSW contributors into eligible AIIB projects. AEPW is an industry-founded, non-governmental and not-for-profit organization based in Singapore. Its mission is to end plastic waste, with the belief that *"through collaboration and collective action, this complex problem can be solved"*. The AEPW has been sponsoring programs and activities; including promoting investments in the plastic waste recycling, reuse and reduce sector in Indonesia for the past 2-3 years.

3.4.17 **The Use of PSW Grant.** AEPW intends to support SWM-SUD Project implementation by financing equipment and facilities for waste collection and segregation, waste transport vehicles, and initiatives for a sustainable circular economy approach. Support provided by the PSW grant shall be in line with the Project timeline, limited to the Project scope, and aligned with AEPW's purposes in supporting the Project.

3.4.18 **Implementation period.** The Project is expected to be implemented from December 2025, to March 2031. The enhancement of the SWM master plan, capacity building of local government, and community engagement activities will be undertaken in Q2 2026. The ESIAs/ESMPs for each subproject shall be completed before commencement of any civil works contract. Construction of Waste Treatment Facilities and landfill upgrading will commence in 2026. Regarding the PSW Grant, the Borrower is expected to complete its internal approvals for the Grant in the beginning of 2026, after which AEPW is expected to approve its contribution to the PSW Grant. The grants for SWM and circular economy initiatives will start in 2026.

3.4.19 **Monitoring and Evaluation.** The CPMU will be responsible for monitoring Project implementation, together with the steering committee. A monitoring and evaluation team under the NPMC will provide support to the CPMU, overseeing the progress of components and achievement of result indicators. In addition, the NMT will provide support to the steering committee in monitoring the Project's progress towards the national SWM targets and providing policy support. The evaluation consultant will assess Project performance at exit, including satisfaction surveys, waste reduction at source, and other aspects extending beyond the Project timeline. The Project Operations Manual (POM) will detail the monitoring and evaluation arrangements.

3.4.20 **AIIB's Implementation Support.** AIIB will carry out implementation support missions two times a year to monitor the overall Project progress. The frequency of missions will be adjusted based on the Project performance. In addition to formal missions, AIIB may conduct additional visits, when required, to resolve specific matters related to finalizing designs, procurement, FM, and E&S matters, and to review and improve engineering supervision and implementation plans.

3.4.21 **Implementation Readiness**

(i) Designation of core CPMUs, CPIUS, PPIUs staff has been completed, including key roles such as project director, procurement and contract, and technical specialists. A circular letter on the appointment of CPMU, CPIUs, and PPIUs has been drafted and will be issued prior to Negotiations.
(ii) Provision of budget/counterpart fund for Project implementation in the first financial year is under preparation, pending confirmation of the new government's program and ministerial budget.
(iii) The overall work plan and annual work plan for 2025 and 2026 have been finalized.
(iv) The ESIAs/ESMPs, Livelihood Restoration Plan, and Resettlement Plan (if any) for the three priority subprojects will be cleared by AIIB before the start of any civil works in Year 1 of implementation.

(v) The procurement plan has been finalized. Bidding documents for critical packages, advisory, and the NPMC are under preparation and will be processed after the Negotiations.

(vi) The Project Operations Manual has been drafted and will be finalized prior to Project approval.

4. Project Assessment

A. Technical

4.1 **Project Design**. The overall Project design applies the following approaches: (i) an integrated service delivery approach that covers the solid waste management value chain, i.e., waste collection, transportation, treatment, and safe disposal; (ii) institutional support at the LG level and community engagement to provide an enabling environment and ensure sustainability of SWM implementation; (iii) emphasis on waste reduction through the 3Rs (Reduce, Reuse, Recycle) at the community level, and resource recovery, and limiting the construction of new landfills in line with Indonesia's SWM regulations; and (iv) support the transition of the SWM sector to a circular economy approach.

4.2 **Technical Design.** Furthermore, the technical design of the Project is fully informed by the findings of the following studies and assessments carried out during Project preparation: (i) rapid waste sector assessment; (ii) selection of Project location based on the robust readiness criteria; (iii) knowledge sharing of good SWM practices with locally-adaptable SWM solutions and capacity building for key Project stakeholders; (iv) policy briefs including regulatory and institutional assessments and technical guidance on best practicable options for SWM; (v) Project framework documents relating to E&S, fiduciary aspects for all participating locations; (vi) feasibility studies for subproject investments in three participating LGs; (vii) subproject specific E&S instruments for 3 participating LGs; and (viii) draft POM. The remaining subproject investments will be prepared with the support from PSW grant.

4.3 DEDs for subprojects in all 10 Project locations have been prepared by LGs and will be further reviewed and enhanced by DED consultants with preparation support from AEPW. The infrastructure designs of three subprojects in the first batch have been reviewed based on the guidelines prepared under the Project's feasibility studies, in line with SWM regulations and the relevant technical guidelines of line ministries and agencies. All DEDs are subject to third party reviews by a project management consultant. The consultant will also support construction management and civil works contracts management during implementation, with oversight from MPW, CPMU, and CPIUs.

4.4 **Technology Options.** An assessment to select appropriate waste treatment solutions was conducted, considering the following parameters: (i) waste composition analysis; (ii) availability of off-takers, (iii) lower residual amount; (iv) mixed waste inputs; and (v) suitability of inert residuals for processing in residual processing units. The technical options were further evaluated taking into account factors including waste reduction efficiency, land requirements, residue types, investment costs, and operational costs. RDF, composting, and MRF were identified as the most suitable solutions based on the assessment. RDF is envisaged as a solution to tackle waste management problems, as it can: (i) reduce existing waste in overloaded landfills by enhancing material recovery; (ii) contribute to emission reduction through substituting fossil fuels in industries such as cement, which are considered ready for energy efficiency improvements; and (iii) reduce the financial burden on local governments and generate revenue through sales of fuels to off-takers. Composting was selected as it extends landfill lifespans, reduces GHGs emissions by diverting organic waste from landfills, and improves soil quality through compost use as fertilizer. MRFs are essential in the circular

economy as they efficiently separate different types of recyclable materials, such as plastics, metals, glass, and paper, from mixed waste. This process supports resource conservation, waste reduction, and sustainable material management. MRFs also divert a significant amount of waste from landfills, reducing environmental impacts from disposal, and extending landfill lifespans.

4.5 **Operational Sustainability.** The Project aims to establish a comprehensive and sustainable approach to promoting integrated SWM by addressing infrastructure gaps and local governments' institutional and financing needs. The Project will provide capacity building and technical assistance to strengthen the technical and financial capacity of SWM operators. This includes support for the transition of the current operator (e.g. Environment Agency, UPTD[26]) to become a semi-private entity, such as the Badan Layanan Umum Daerah (BLUD) which is a local public service entity. Training and assistance will also strengthen accountability of local waste management institutions, given the direct linkage between revenues, actual cost, and level of service. Transparency and traceability of fund sources and use will be prioritized to incrementally cover operations and maintenance costs and ensure long-term sustainability. Moreover, local governments will be required to develop financial sustainability plans to meet the SWM O&M costs. The SWM Masterplan will be enhanced and updated to further integrate SWM into the Local Medium-Term Development Plan (RPJMD) and APBD. LGs have signed MOUs with off-takers to secure sales of Waste Treatment Facilities' products which will contribute to long-term operational sustainability by improving revenues. Detailed agreements specifying quality standards for RDF and/or recyclables, factoring in requirements such as composition and calorific value, will be signed several months before the RDF plants start production.

B. Economic and Financial Analysis

Economic Analysis

4.6 The Project aims to enhance solid waste management services in selected cities and districts in Indonesia. The Project focuses on improving solid waste infrastructure, strengthening institutional capacity, and supporting the circular economy. The economic analysis primarily examines Component 1 (Development of Solid Waste Infrastructure) and Component 3 (Support for SWM Initiatives and Circular Economy), which together constitute nearly 90 percent of the total project cost. Although Components 2 and 4 will provide significant economic benefits, these are difficult to quantify and were therefore not included in the analysis. Using a cost-benefit approach, the analysis evaluates net benefits by comparing incremental benefits and costs, with economic viability assessed through the Economic Internal Rate of Return (EIRR) and Net Present Value (ENPV).

4.7 Key assumptions include a 20-year Project economic life from 2025 to 2044, comprising three years of construction and 17 years of operation. CAPEX (capital expenditure) investments are phased over the implementation period, and both OPEX (operating expenditures) and benefits begin post-construction. Costs are adjusted using a conversion factor, and all values are expressed in constant 2024 prices. Economic benefits are derived from reduced greenhouse gas emissions, savings in chemical fertilizers, avoided health

[26] UPTD is local technical implementing unit.

treatment costs, avoided workday losses, land cost savings, and cost savings from substituting coal with RDF. Costs encompass construction, supervision, equipment, waste collection, transportation, and operation and maintenance.

4.8 The results indicate that the Project is economically viable, with an ENPV of USD 90.4 million and an EIRR of 27 percent. Sensitivity tests show that the Project remains viable under various scenarios, including reduced benefits and increased costs. The baseline scenario projects significant benefits from emission savings, composting, health improvements, and substituting coal with RDF, while sensitivity analysis confirms the robustness of the Project's economic viability even when key variables are adjusted.

Scenarios	EIRR (%)	ENPV (USD million)
Baseline	27	90.4
1: Reduce 20 percent of total benefit	20	45.8
2: Increase 20 percent of total cost	21	63.8
3: Combined scenarios 1 and 2	15	19.5

Financial Analysis

4.9 **The Financial Analysis of the Project.** The financial viability assessment evaluates both financial and socio-economic data gathered from the Feasibility Study on current (2024) conditions and practices in the targeted local governments (LGs). It also incorporates plant capacities as defined in the DED for the 10 LGs to create the "with Project" scenario. The Feasibility Study collected extensive financial data—such as budget allocations, expenditures on SWM, tariff rates, and tariff collection efficiencies—from Tasikmalaya, Rembang, and Temanggung to assess key financial indicators over the Project's 20-year lifespan. Additionally, market information on output prices, including RDF, compost, and materials from the proposed material recovery facilities within ISWTF, was gathered for the analysis.

4.10 **Financial Viability and Operational Sustainability.** Due to low cash inflow from inadequate tariff collection and limited sales of recyclables, the Project may incur a negative NPV in the case of capital repayment by LGs. Considering the public health and environmental implications, capital investment will be subsidized from the central budget to support LGs that, similar to other developing economies, lack financial capacity to provide capital investment for its SWM services. Thus, the financial analysis primarily focuses on ensuring the Project's operational sustainability. The analysis relies on a well-designed business model involving institutional arrangements, O&M cost recovery, revenue from end products/recyclables, and possible government support.

4.11 **Results.** The Project's financial indicators are robust in the base case, with a 9% discount rate yielding a positive NPV over 20 years and an IRR of 27%. The analysis further examines the Project's operational sustainability under various scenarios, highlighting its sensitivity to fluctuations in costs, income, and market conditions. Stress tests were conducted for scenarios involving increased O&M costs, decreased expected income, and a high-risk situation where tariff collection efficiency starts below 1% and remains below 5% for the next 10 years. Additionally, the analysis considered a scenario in which no market for RDF is established (see Table 2). More details on the economic and financial analysis can be found in Annex 3.

Table 2: Operational Sustainability and Sensitivity Analysis

Scenario	Change	NPV (Bn IDR)	IRR (%)
Base case		176	27%
Increase in O&M costs	10%	80	17%
Decrease in income	10%	62	16%
Worst tariff collection efficiency	<5%	67	16%
No market for RDF offtake		-243	N/A

C. Fiduciary and Governance

Procurement

4.12 **Procurement Capacity Assessment.** The overall procurement risk after mitigation is Medium.

4.13 The procurement under MPW will be done by BP2JK at the provincial level, which directly reports to DG Binkon. The BP2JK offices have an adequate capacity to conduct procurement and possess prior experience in carrying out procurement with various Development Partner-financed projects (e.g., World Bank and ADB). All procurement staff of BP2JK are certified and have received appropriate training. In addition, since BP2JK reports to DG Binkon, DG Binkon also provides the necessary guidance, as demonstrated in other Development Partner-financed projects.

4.14 The procurement of non-consulting services and the selection of consultants under MOH will be carried out by the MOH Procurement Office, which reports to the Secretary General of MOH. The MOH Procurement Office has adequate procurement staff, experienced Development Partner-financed projects. Recent experience includes managing complex procurement of goods and consultant selection under the Development Partner's joint and parallel co-financed (including AIIB) Modernization of the Health System Project (Ref P000787).

4.15 The procurement of non-consulting services and the selection of consultants under MOHA will be carried out by the UKPBJ (the MOHA Procurement Services Unit), which reports to the MOHA Procurement Office under the Secretary General of MOHA. The UKPBJ office has adequate staff experience in the selection of consultants in World Bank-financed projects, including the Improvement of Solid Waste Management to Support Regional and Metropolitan Cities (Project ID P157245).

4.16 **Procurement Risks and Mitigation Measures.** Procurement delays and inadequate contract quality control and monitoring are the two most apparent risks for the Project.

4.17 To mitigate procurement delays, it is planned that the selection of the NPMC consultant will be initiated as soon as the Loan Negotiation is completed, so that the consultant can be onboard close to the Loan effectiveness date. Prior to NPMC consultant being onboard, the CPMU will be supported by the existing consultant financed by AEPW.

4.18 MPW, as the executing agency, has a rigorous internal check-and-balance system within its organization to ensure the quality of technical specification and procurement processes. Most of these controls and reviews are performed by DG Binkon, including reviews prior to the Minister's approval for contracts above IDR 100 billion (approximately USD 6 million) for civil works and IDR 10 billion (approximately USD 600,000) for consulting services.

Financial Management.

4.19 The FM assessment concluded that the proposed arrangements are adequate and able to provide accurate and timely information on the status of funds. The Project will follow the government system for budgeting, internal control, accounting, reporting, funds flow, and auditing. Key risk factors include delays in budget allocation and internal control systems, which will be mitigated through close monitoring and hiring experienced FM consultants to support the PMU and CPIUs. The overall Financial Management risk after mitigation is Medium.

4.20 Budgeting. The Project will follow the government system. For loan financing, each CPIU will prepare its own budget document and submit it to MOF, at least three months before each implementation year. As for grants, the funds will be allocated under MPW (mainly by BPBPK) for grant expenditures as well as for technical assistance costs.

4.21 MPW will prepare a separate budget document for grant financing. The budget submitted to MOF should be in accordance with the Annual Work Plan (AWP) approved by the Bank. The CPMU will consolidate all planned expenditures for the year under all sources of financing (including GOI budget) and finalize the plan into AWP before submission to the Bank. The CPMU will be responsible for coordinating with all PIUs so that budgets will be available timely for each implementation year to minimize delays.

4.22 **Internal Control.** Payments will be processed in central and provincial units. At each CPIU expenditures include consulting services, non-consulting services, training, workshops, studies, and incremental operating cost. These annual expenditures allocations must be included in the AWP approved by the Bank before the payment is made. Meanwhile, at the provincial level, the expenditure includes procurement of goods and equipment, construction works, and supervision services. At the central level, payment and verification will be managed by the Central task force, supported by the department's verification team, before approval by the commitment maker (PPK) and payment order (SPM) treasurer. Once approved, the document will be forwarded to the cash office of MOF (KPPN) for payment from the Designated Account (DA) to the respective supplier/contractor's bank account. At the provincial level, payment requests will be processed by the provincial Balai, supported by the verification team, before approval by PPK. The payment verification process will rely on government systems. Controls will be further improved by providing a verification team for this specific Project and creating payment verification guidelines for every type of expenditure under the Project. Controls will be further strengthened by the involvement of the MPW Inspectorate General in conducting technical/operational audits on selected works/activities during the project cycle.

4.23 **Accounting and Financial Reporting**. The CPMU and all PIUs will maintain separate accounting records for all payment orders (SPM) and remittance orders (SP2D) on a cash

basis in accordance with government accounting standards. All financial transactions will be recorded in the government accounting system and included in government accountability reports. The original records will be kept on file for auditing purposes. The CPMU will prepare a set of consolidated financial reports (Interim Financial Reports) for each AIIB loan and PSW grant, to be submitted to the Bank, no later than 45 days after the end of each quarter.

4.24 **Audit Arrangement.** The Project will be audited annually by the Supreme Audit Institution of Indonesia, (BPK-Badan Pemeriksa Keuangan), for both loan and grant financing. The audit report for each AIIB loan and PSW grant, including audited annual financial statements and management letters, will be presented in English and submitted to the Bank no later than six months after the end of the fiscal year. To ensure that the audit is conducted by BPK, the Bank will send a letter to MOF prior to the audit year, listing the subprojects to be audited by BPK. After the Project commencement and before the first audit, the Bank will meet with BPK to agree on the scope and expectations, especially regarding the format of the audit and financial report.

4.25 **Disbursement.** The Project will mainly use advances from all available disbursement methods. Direct payment will only be used for significant transactions above USD 250,000 per transaction. A separate Designated Account (DA) for each loan and PSW grant will be opened in the Central Bank. The Project will also submit a separate withdrawal application for loan and PSW grant to request an advance based on a six-month cash forecast, while preparing reports on the use of funds in each DA. All expenditures under each financing will be reported in separate Statement of Expenditures (SOEs), included in the respective withdrawal applications. The PMU under MPW DGHS, supported by an FM consultant, will be responsible for DA reconciliation and expenditure consolidation under each financing (AIIB loan and PSW grant) from all PIUs. The withdrawal application for each loan and PSW grant will be forwarded to DG Treasury MOF by MPW for review and approval before final submission to the Bank.

4.26 For funds flow under the loan and PSW grant, the process will follow the existing Government registered arrangement, in which each PIU will have access to the DA once approvals are complete, and the DA is opened. The provincial unit (BPBPK) of MPW will also be able to access the DA directly after submitting the complete payment documents (e.g., payment instruction document) to the MOF Local Cash Office (KPPN). For the provision of solid waste infrastructure under Component 1, once the eligibility of Malang district is confirmed, the Central Government will allocate funds under the PSW grant to finance the solid waste infrastructure in Malang district. For the grant's mechanism, the Local Government will use its own funds to finance selected activities (e.g., procurement of equipment, potential construction of small transfer stations, and technical assistance activities) and follow the existing regulations related to APBD (Local Government Budget). After verifying LG's budget allocation, the Central Government will allocate funds under the PSW Grant to match and finance the activities that follow PSW grant mechanism under Component 3. After completion of procurement or construction, the assets will be handed over by the Central Government to the Local Government. For component 4, payments to consultants and non-consultant service providers will be made from each DA (Loan and PSW Grant), based on the applied percentage of the contracts. Meanwhile, for Incremental Operating Costs (IOCs), payments will be made only from AIIB loan proceeds, directly from the DA of the loan to the service providers.

4.27 For all Project components, including component 3, the Annual Work Plan (AWP), serves as the basis for budget (DIPA) and will be prepared and submitted for AIIB's approval in Q4 of the year before implementation year. This AWP will specify the source of finance (loan, PSW grant, and GOI funds) for activities in the proposed locations. Once the DIPA for component 3's financing is set and assigned for the implementation year, payments will be made directly from the DA to the supplier or service provider for loans and PSW grants. Meanwhile for government owned funds, the payment will be made from the GOI account to the supplier or service provider.

4.28 As per the funds flow chart below, payments at both the central and provincial levels will be made directly from the Designated Account (separate account of AIIB loan and PSW Grant), which is managed by MOF, to contractors or other service providers. The payment process will be initiated upon review of submitted documents and approval by the treasurer and commitment officer at each implementing unit. Expenditures will be consolidated at the central level on a periodic basis by the Project Management Unit (PMU), with support from the FM consultant. The same process, as depicted in the chart below, will also apply to the AEPW Grant.

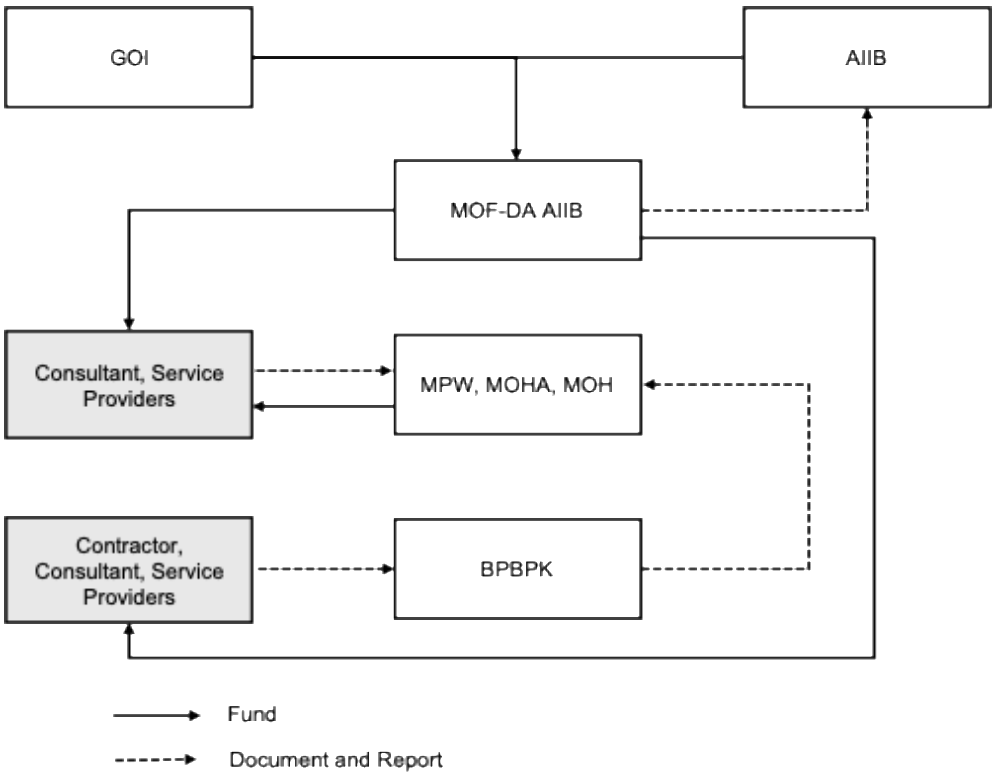


Figure 3: Flow of Funds – Advance Disbursement Method

4.29 Governance **and Anti-corruption.** The AIIB's Policy on Prohibited Practices shall apply to the Project. AIIB is committed to prevent fraud and corruption in the projects it finances. Thus, the Bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive, or obstructive practices, and misuse of resources, theft, or coercive practices relating to the Project and to take necessary measures to prevent and address any issues in a timely manner, as appropriate. Detailed requirements will be specified in the AIIB-funded packages' contract documents.

D. Environmental and Social

4.30 **Environmental and Social Policy and Categorization.** AIIB's Environmental and Social Policy (ESP), including the Environmental and Social Standards (ESSs) and the Environmental and Social Exclusion List (ESEL), applies to the Project. The initial Environmental and Social (E&S) due diligence determined that ESS 1 (Environmental and Social Assessment and Management) applies to the assessment of E&S impacts for Project activities. ESS 2 (Land Acquisition and Involuntary Resettlement) also applies as Project-related activities may lead to land acquisition and economic displacement affecting the livelihoods of waste pickers and nearby communities deriving income from the landfills. ESS 3 (Indigenous Peoples) does not apply, as no Indigenous Peoples have been identified in the subproject areas. As per the Bank's ESP, the Project has been assigned Category A, considering the potential adverse environmental and social (E&S) risks and impacts from upgrading existing landfills and constructing integrated waste treatment facilities and supporting infrastructure for around 10 subprojects.

4.31 **Environmental and Social Instruments.** Since not all subprojects have finalized the detailed design and facility locations, an Environmental and Social (E&S) Management Planning Framework (ESMPF) has been developed which includes a Resettlement Planning Framework (RPF). The Borrower has prepared three draft ESIAs for the first batch of subprojects, disclosed on October 30, 2024, and re-disclosed on July 22, 2025. The Resettlement Plans (RPs) and Livelihood Restoration Plans (LRPs) must be prepared for Project-Affected Persons and waste pickers and completed prior to construction. A ministerial decree on the implementation of Waste Infrastructure and Facilities in the Handling of Household Waste with an annex on the integrated risk-based approach for landfill rehabilitation, issued in August 2013, was used to incorporate E&S aspects into subproject FSs and DEDs. The ESMPF has also incorporated the standardized Notes of Commitment (NOKES) between MPW and local government to ensure proper operation of the landfill, including the E&S aspect (Annex 4). The ESMPF was prepared and reviewed through intensive and regular engagement with the client to meet the ESP requirements. An assessment of local government's capacity in managing solid waste infrastructure and projects is provided in more detail in Annex 4. Three ESIAs (including ESMPs, Land Acquisition Audit Reports (LAARs) Social Management Plans (SMPs), Gender Action Plan (GAP) and Stakeholder Engagement Plans SEPs) for three sub-projects were finalized and re-disclosed after stakeholder consultation on July 22, 2025. The three LRPs corresponding to the completed ESIAs are expected to be submitted by December 2025. The ESIAs, ESMPs and other plans, including RPs and LRPs if any, for the remaining seven subprojects shall be approved by the Bank completed and publicly disclosed before any commencement of civil works contract and all actions required under said plan were conducted in accordance with the plans' provisions. Each Local government will formally submit the LRP with an official cover letter signed by the Head of District/Mayor to ensure accountability and commitment on staff and budget for implementation. The LRP preparation process will continue to be coordinated with relevant LG offices in the preparation of LRPs to ensure comprehensive support for the affected waste pickers during implementation.

4.32 **Environment Aspects.** The Project is expected to generate positive environmental and social outcomes by developing Waste Treatment Facilities and reduced waste loads to the environment. This has been confirmed by the positive responses from the community during

the preliminary survey, ESIA site visits, and pre-appraisal mission. The beneficiaries of the Project are expected to be approximately 6.2 million residents in the participating cities, through increased access to improved SWM services and better environmental, social, and health conditions, improved working conditions for sanitation workers, and better livelihood opportunities in the waste management sector. Implementation of the physical Investments may, however, cause a wide range of risks and impacts to the environment and human health during the construction and operation phases. During the construction stage, activities such as heavy equipment mobilization, land preparation, excavation, and construction of temporary facilities can have significant environmental impacts. These include air quality impacts due to dust and pollutant emissions from vehicles and equipment, noise pollution and vibration impacts, from construction activities, soil contamination from the use of heavy equipment, runoff, and soil erosion leading to water quality impacts, and potential loss of habitat and species due to land clearing and traffic congestion and deterioration of road due to heavy traffic. These impacts have been assessed, and mitigation measures are proposed in the ESIAs/ESMPs for three subprojects i.e., Tasikmalaya, Rembang, and Temanggung where DEDs are finalized. ESIAs/ESMPs of the remaining subprojects will be prepared in parallel with DEDs (funded by AEPW). During the operation stage, key environmental impacts include air quality impacts from landfill gas emissions, soil contamination from poorly managed leachate and waste disposal practices, potential water quality impacts from landfill leachate, and waste management impacts from the generation of mixed waste with potential impacts to the off takers. Mitigation measures such as landfill gas control systems, proper waste management practices, Project's influence and control to off-takers, training and regular water and air quality monitoring are proposed in the ESIA/ESMP to address these impacts. These measures are also applicable to the remaining subprojects.

4.33 Based on the available ESIAs for three subprojects, potential adverse impacts, sensitive receptors have been identified at all three sites, and impact assessments have been carried out. ESIA/ESMP includes proposed mitigation measures to mitigate the impact on sensitive receptors. The off-takers and associated facilities for each site have also been identified, and a comprehensive impact assessment and mitigation measures will be included.

4.34 **Social Aspects.** The Project will follow a framework approach, and an Environmental and Social Management Planning Framework is prepared and disclosed. For eligible cities/districts, land has been already available and acquired by the government for the construction and expansion of the facilities, in line with the government readiness criteria and the ESMPF. However, land acquisition may be required for associated facilities in other sites, including construction of temporary disposal sites and improvement of access roads that may lead to temporary access restrictions for affected land titleholders.

4.35 The Project may also involve direct and indirect economic displacement for the waste pickers (seasonal, organized, and informal), waste collectors, and waste truck drivers. Based on the available ESIA of three locations, a total of 152 waste pickers deriving income from the existing landfill, comprising 98 women and 54 men, will be adversely affected in the first three locations (i.e., Tasikmalaya, Rembang, and Temanggung). Vulnerable groups, including elderly and children, will also be disproportionately affected by the Project activities.

4.36 While the landfill is adjacent to residential and agricultural land, the impacts are site-specific and are not expected to cause significant harm to the nearby communities. Mitigation

measures such as buffer zones will be established to ensure that any adverse effects are addressed. Other social issues are anticipated around the associated facilities, such as temporary landfill options and access roads. These mitigation measures are integrated into site-specific ESIAs.

4.37 To mitigate the adverse impacts on the identified Project-affected people and other vulnerable groups, site-specific LRPs for all subprojects targeting waste pickers, women, and other vulnerable groups will be prepared. The LRPs will include compensation and assistance measures for the identified Project-affected people and other entities, including specific social programs and assistance for children and the elderly; training opportunities based on the result of Training Needs Assessment (both technical and non-technical related to SWM, RDF technology, and circular economy); development of re-skilling and up-skilling programs for waste truck drivers / waste pickers; provision of alternative work programs in RDF factories or logistics related fields; capacity building through entrepreneurship training in the field of waste management and others; health screening, services, and benefits for waste pickers and waste truck drivers; provision of employment opportunities in the ISWFT; access to benefits from the solid waste value chain; support for business opportunities; and formalization of the involvement of informal waste pickers into the landfill operation, among others.

4.38 **Occupational Health and Safety, Labor and Employment Conditions.** In addition to typical construction work-related OHS risks, existing risks that will continue to be relevant are: a) the waste pickers, landfill workers, and staff due to interactions with waste, exposure to dangerous gases such as methane, moving equipment, compost and RDF products and heavy machinery, leading to possible workplace accidents and injuries and health impacts from exposure to toxic waste, medical waste, fire and smoke, and pathogens; b) potential risk Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) risks on communities due to possible labor influx; and c) child and women protection concerns on SEA/SH and Gender Based Violence (GBV) in light of the prevalence of women and children among waste pickers at the landfill. Measures to improve workplace safety for all workers include provision of personal protective equipment (PPE) and safety training as well as improving security standards and protocols for landfill sites and waste facilities will be formulated to protect the workers and to be included in the site-specific ESMPs.

4.39 **Stakeholder Engagement, Consultation and Information Disclosure.** Several consultations, discussions, and interviews were carried out with key stakeholders, including relevant government units, Project-affected people, local communities, women, waste pickers, other vulnerable groups, and other interested parties, during the preparation of site-specific ESIAs. The consultation process, including comments and suggestions received from stakeholders and how they are addressed, is documented in the E&S instruments. In addition, the Client organized Public Stakeholder Consultations, conducted in Bahasa Indonesia, for Temanggung on June 2 and 10, 2025; for Tasikmalaya on June 18 and 24, 2025; and for Rembang on June 11 and 17, 2025. These sessions presented the results of the draft ESMPF and ESIAs for each of the three subprojects, with participants attending both physically and virtually. The consultation process will continue and be expanded to facilitate meaningful consultation and provide opportunities for public participation during project implementation. The ESMPF and ESIAs for the first three subprojects were disclosed in English and summary in Bahasa Indonesia on October 30, 2024 and re-disclosed on July 22, 2025, at the Ministry of Public Works (MPW) website link: https://ciptakarya.pu.go.id/produk.

4.40 Grievance Redress Mechanism. A multi-tier Grievance Redress Mechanism (GRM) will be established at the Project and subproject level for Project affected people to receive and facilitate the resolution of the concerns or complaints of local communities, other stakeholders particularly women, vulnerable groups, and people who believe they have been adversely affected by E&S impacts of the Project. A separate GRM for Project contracted workers will also be developed to address complaints on workplace grievances. The Client will also utilize the existing GRM of MPW available via their website https://ciptakarya.pu.go.id.

4.41 Project-level GRM will be operational before any Project activities that require the GRM coverage begin. Information on established multi-tier GRMs and Bank's Project-affected People's Mechanism (PPM), in local languages, will be disclosed in a timely and appropriate manner to communities surrounding the Project sites before implementation.

4.42 **Bank's Project-Affected People's Mechanism.** The Project-Affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP, in situations when their concerns cannot be addressed satisfactorily through the Project-level GRM or AIIB Management processes. For information on AIIB's PPM, please visit: https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html.

4.43 **Monitoring and Supervision Arrangements**. The CPMU will have the overall responsibility for project preparation, coordination, supervision, and monitoring of Project including E&S impacts, coordination with all PIUs, and submission of consolidated Project implementation reports to AIIB. The CPMU will be supported by the NPMC, which will have one environmental and one social staff member. The NPMC will manage the implementation and monitoring of ESMPF, ESIAs, ESMPs, RPs and LRPs (if any), across all 10 project locations. They will also prepare bi-annual E&S monitoring reports to be submitted to CPMU and AIIB, accordingly. At the sub-project level, the Provincial will be responsible for implementing the subprojects and managing the Implementation and Supervision Consultants as well as contractors.

4.44 The Project will mobilize Supervision Consultants during construction, either as a firm or individuals, which include environmental and social specialists responsible for day-to-day supervision of civil works to ensure full compliance with the ESS measures required by AIIB and the Government of Indonesia. The contractor will be responsible for preparing site-specific Environmental and Social Management Plans (C-ESMPs) based on the ESIAs/ESMPs, ensuring daily implementation of these plans, and submission of monthly progress report including E&S compliance monitoring to Supervision Consultant. An advisory and evaluation team will be hired to verify project E&S compliance as part of the POM and the project team will carry out field-based E&S supervision during implementation. Detailed monitoring and reporting arrangement with clearly defined roles and responsibilities and templates for periodic and annual progress reports will be developed and included in the POM. The Client will submit regular project progress and monitoring reports to AIIB, including E&S aspects as stipulated above.

E. Climate Change

4.45 **Climate Change.** The design and development of the proposed Project has considered climate change-related risks through an assessment of alignment with the mitigation and adaptation goals of the Paris Climate Agreement. In the context of SWM, achieving PA alignment involves implementing strategies and measures that contribute to reducing GHG emissions, promoting circular economy principles, and minimizing the environmental impact of waste disposal. The Project emphasizes a transition away from traditional waste management practices, such as open dumping/unmanaged disposal and landfilling without gas collection, toward more sustainable approaches like separate waste collection (in preparation for reuse and recycling), material recycling/recovery (i.e. recyclable waste and RDF production), waste reduction, composting, and sanitary landfilling systems with leachate treatment and landfill gas capture.

4.46 Paris alignment assessment has been carried out following the AIIB Paris Agreement (PA) methodology:

(i) Climate Mitigation. The Project invests in infrastructure and activities which are considered consistent ("Universally Aligned") with the PA's mitigation goals, in accordance with the AIIB Paris Agreement (PA) methodology.

In addition, the proposed Project interventions are in line with the possible mitigation actions to deliver Indonesia's Nationally Determined Contributions (NDCs) and Long-term Strategy (LTS) within a context of overall reduction of GHG emissions in the waste sector, including promotion of the 3R principle to reduce waste at source and improved waste treatment through landfilling with gas capture, composting, and material recycling/recovery. Hence, the Project is expected to support a low emissions pathway for Indonesia and have a low impact on GHG emissions.

Further, the Project will invest in infrastructure and institutions to support the development of ISWTFs for Indonesia, which are expected to reduce emissions compared to a without-Project scenario. The Waste Treatment Facilities will involve various GHG reduction measures such as waste segregation, material recycling/recovery, composting, upgrading anaerobic landfill sites with leachate treatment and landfill gas capture systems. It is expected that an annual average reduction in greenhouse gas (GHG) emissions of 308,144 tCO2e through the proposed investments in participating cities.

(ii) Climate Adaptation. An assessment was conducted to assess the physical climate risks that the Project is to be exposed.[27] Extreme heat, flooding, storm surge, landslide and sea level rise have been identified as key climate hazards with potential to pose material risks to the physical integrity and performance of the Waste Treatment Facilities. To effectively solve these risks, a range of adaptation measures have been identified and will be integrated into Project design and/or O&M processes. Such measures include the

[27] Although the assessment was only carried out for three (Rembang, Tasikmalaya and Temanggung) out of the ten sites included in the proposed project at time of preparing this PD, an initial physical climate risk screening for the remaining seven sites identified the same set of climate hazards as those for the three sites studied. Given that the scope of project activities in the seven un-studied sites are broadly the same as those three studied, it is expected that the same set of adaptation measures as identified for the three studied sites should also be integrated into the project design and/or O&M processes for the remaining seven sites.

installation of fire protection systems to manage extreme heat-induced fire risks, expansion of drainage and leachate treatment capacity, climate-resilient design of drainage, slope stabilization, preparation of emergency preparedness and response plan, and climate risk-informed labor health and safety measures. Further, there is no inconsistency between the proposed project activities and the national/sectoral adaptation policies and priorities in Indonesia including those outlined in its enhanced nationally determined contributions. Therefore, in line with AIIB Methodology for assessing the alignment with the adaptation and climate resilience goals of the Paris Agreement, the Project is aligned with the adaptation and climate resilience goals.

4.47 **Climate finance.** In line with the joint MDB Common Principles for Climate Mitigation Finance Tracking, component 1,2 and 3 (i.e. in total, USD 138 million) qualify as climate mitigation finance, given their focus on waste management activities, including separate waste collection (in preparation for reuse and recycling), material recycling/recovery (i.e. recyclable waste and RDF production), waste reduction, composting, and sanitary landfilling systems with leachate treatment and landfill gas capture. In line with the joint MDB methodology for tracking adaptation finance and AIIB guidance note on tracking adaptation finance, 15% of the AIIB finance for component 1, USD 18.6 million, is estimated to be adaptation finance associated with Type 1 (structural) adaptation measures included in this project. Hence, the Project is qualified for USD 18.6 million in climate finance with dual benefits (both mitigation and adaptation benefits) and USD 119.4 million in climate mitigation finance.

F. Gender and Social Inclusion Aspects

4.48 **Gender Aspects.** The Project recognizes that women and children are amongst the most vulnerable among waste pickers at landfill sites. They have few alternative sources of livelihood compared to male waste pickers. Their contributions to recovery and recycling in the context of underdeveloped formal waste management systems are largely overlooked and unsupported. Improving solid waste management must account for women waste pickers, who are exposed to health and safety threats in hazardous, unsanitary environments without adequate protection and safety.

4.49 The Project has consulted and involved women and other vulnerable groups in the design, planning, delivery, and evaluation of the solid waste disposal sites. Consultations identified possible interventions to improve working conditions for women and vulnerable groups currently involved in waste collection, sorting, and disposal networks as well as facilitate gender inclusion in overall Project operations. The Project also conducted separate consultation with women and vulnerable groups during ESIA appraisal and preparation.

4.50 To mitigate adverse impact on women waste pickers, the Project design includes: (a) provisions for women waste pickers to access benefits from the solid waste value chain; (b) support to business opportunities; (c) training opportunities based on Training Needs Assessment (TNA) results; and (d) an increase in the percentage of women accessing SWM services as workers. Entitlements for women will also be included, together with measures to address gender-based violence, sexual harassment, and sexual abuse. Continuous consultation with women and other vulnerable groups will be conducted throughout the project cycle.

4.51 In addition, a Gender Action Plan (GAP) will also be developed to address and prevent potential negative impacts on women. This plan aims to promote inclusion and equality, prevent gender-based violence, sexual exploitation and abuse, sexual harassment, and provide a safe and confidential complaint channel for victims of GBV and sexual exploitation, abuse and harassment. More detailed information regarding the GAP and supporting baseline analysis are included in Annex 5.

G. Risks and Mitigants

Table 3: Summary of Risks and Mitigation Measures

Risk Description	Assessment (H/M/L)	Mitigation Measures
Program/Project Preparation Risks		
Technical designs		
▪ Non-compliance with RDF quality and safety standards.	M	▪ Clear requirements are set out in the project design to enable the production of RDF to meet off-takers' standards. The detailed engineering designs are being reviewed by a third-party consultant to ensure the soundness of RDF plant design. Advisory teams with capacity building activities and project management consultants will be engaged to supervise the operation and maintenance of RDF facilities. In addition, a detailed MoU between local governments and off-takers will be prepared to ensure the RDF product meets the quality standard.
Program/Project Implementation Risks		
Implementation capacity		
▪ Weak institutional capacity for implementation and sustainability	L	▪ The Project provides robust institutional and capacity building programs that support the CPMU and project LGs for carrying out all the investment activities and undertaking institutional strengthening for long-term sustainability of the Project. In addition, they will be supported by a NPMC, project management consultant, in coordinating and overseeing all project activities. Individual experts will be appointed under the Project to strengthen the CPMU and the LGs. All project activities fall under the duty and function of each CPIU/ministries
Environment and Social		

Risk Description	Assessment (H/M/L)	Mitigation Measures
▪ **Land acquisition and resettlement.** Lands for Waste Treatment Facilities and temporary disposal sites during construction	M	▪ When selecting the participant cities, priority was given to LGs with sufficient land available for Project activities. All LGs have committed to using the identified land, which is owned by the government, for this Project.
▪ **Capacity to Implement E&S instruments**		▪ The MPW has extensive experience working with other MDBs such as the World Bank (WB), Asian Development Bank (ADB), and KfW in implementing ESMPF for solid waste investment projects across Indonesia, e.g., the Indonesia Solid Waste Management Project (IWSMP) and the Local Service Delivery Project (LSDP) financed by the World Bank, Emission Reduction in Cities (ERIC) finance by KfW, GIZ and Marine Plastic reduction program with ADB. ▪ The CPMU will be supported by the NPMC, who will have one environmental and one social staff member. The NPMC will manage the implementation and monitoring of ESMPF, ESIAs, ESMPs, RPs and LRPs (if any), across all 10 project sites.
The project will have positive impacts on the environment and negative impacts will be site specific and limited to construction and operational activities of landfill and Integrated solid waste management facilities.		▪ The ESIA and ESMP and other relevant plans for each sub-project must have been completed prior to the commencement of any civil works. ▪ The Supervision Engineer, in accordance with PU regulations, will engage Environmental and Social (E&S) specialists to oversee contractor performance and the associated reporting system, with all reports shared with AIIB. ▪ The CPIU will prepare semi-annual E&S monitoring reports including E&S aspects during construction and operation, and AIIB E&S specialist will undertake supervision missions at least two times a year.
Financial management		
▪ The capacity of FM personnel at national and sub-national levels may	M	▪ Experienced FM consultants will be hired in each PIU at the central level to provide support in FM critical areas,

Risk Description	Assessment (H/M/L)	Mitigation Measures
vary among units and targeted project locations, which may result in lower FM quality in internal control and financial reporting areas. ▪ Delay in budget availability at the beginning of the implementation year leads to delay in implementation. ▪ Relatively weak internal control, mainly on payment verification, as indicated in some previous foreign-funded projects' audit report by BPK and BPKP (Indonesian State Finance and Development Surveillance).		including monitoring and capacity building at the sub-national levels. In addition, training and hands-on support on FM operations will be provided by the Bank team. ▪ Timely preparation and submission of budget plans by every PIU for all sources of financing to the DG Budget MOF. The proposal will be submitted at least six months before the start of the year. The budget proposal will be based on the AWP approved by the Bank. ▪ Closer monitoring of the project's payment verification and establishment of the project's payment procedures/guidelines to facilitate compliance with the Bank's standards. Additionally, the FM consultant will provide support to the verification team regarding the process and document requirements outlined in the guidelines, ensuring proper verification is in place.
Procurement of large and complex packages		
▪ Procurement delay and inadequate contract quality control and monitoring	M	▪ The selection of NPMC consultant will be initiated as soon as the Loan Negotiation is completed, so that the consultant will be onboard around or not too far from the Loan effectiveness date. Prior NPMC consultant is on board, the NPMU will be supported by the existing consultant financed by AEPW. ▪ MPW as the executing agency also has a rigorous internal check and balance system within its organization to ensure the quality of technical specification as well as the quality of procurement. Most of these controls and reviews will be done by DG Binkon, including the procurement review prior to the Minister's approval for contracts above IDR 100 billion (approximately USD 6 million) for civil works and IDR 10 billion (approximately USD 600,000) for consulting services.

Annex 1: Results Monitoring Framework

Project Objective (PO):	To improve integrated solid waste management services for populations in selected cities and districts in Indonesia									
Indicator Name	**Unit of measure**	**Baseline Data 2025**	**Cumulative Target Values**					**End Target YRn+1 2031**	**Frequency**	**Responsibility**
			2026	**2027**	**2028**	**2029**	**2030**			
Project Objective Indicators: (Outcome indicators measure each aspect of the PO statement and are to track progress toward the achievement of the PO)										
1. Number of people served by the improved SWM services (gender-disaggregated)	Total Number (Thousand)	0	0	1,554	3,109	4,768	6,218	6,218	Annual	CPMU
	Female (Thousand)	0	0	777	1,555	2,384	3,109	3,109	Annual	
2. Waste properly collected at the treatment facility	Tons/year	0	0	0	42,900	230,100	542,100	776,100	Bi-annual	CPMU
3. Waste properly treated by the improved SWM services	Tons/year	0	0	0	30,030	161,070	379,470	543,270	Bi-annual	CPMU
4. Waste properly disposed in residual landfills	Tons/year	0	0	0	12,870	69,030	162,630	232,830	Annual	CPMU
Intermediate Results Indicators: (To measure key intermediate results under each component that are necessary for showing progress toward achieving PO. They can capture outputs or short-term outcomes.)										
Component 1. Provision of Solid Waste Infrastructure										
5. Number of solid waste management Facilities (landfills, ISWFT) constructed/	Number	0	0	0	6	12	19	19	Annual	CPIU MPW

upgraded and operational										
Component 2. Institutional Strengthening and Community Participation										
6. Number of households engaged in solid waste management community empowerment activities (gender-disaggregated)	Number	0	0	388,492	776,985	1,165,477	1,553,969	1,553,969	Annual	CPIU MOH
	Female	0	0	777,985	1,553,969	2,330,954	3,107,939	3,107,939	Annual	
7. Number of households that conducted waste segregation	Number	0	0	194,246	388,492	582,738	776,985	776,985	Annual	CPIU MOH
8. Number of informal waste workers who benefitted from the improved solid waste management services (gender-disaggregated)	Number	0	0	0	75	169	230	272	Annual	CPIU MPW, CPIU MOHA
	Female	0	0	0	54	121	165	196	Annual	
9. Number of legalized SWM Master Plans	Number	0	0	0	3	6	10	10	Annual	CPIU MPW, CPIU MOHA
10. Number of local government regulations on solid	Number	0	0	0	3	6	10	10	Annual	CPIU MOHA

waste management submitted (Raperda)										
11. Number of legalized regulations on waste retribution collection mechanisms	Number	0	0	0	3	6	10	10	Annual	CPIU MOHA
12. Number of semi-private model/ BLUD established	Number	0	0	0	3	6	10	10	Annual	CPIU MOHA
Component 3. Support for SWM and Circular Economy Initiatives										
13. Percentage of activities in the SWM master plan implemented	Percentage	0%	0%	0%	1%	4%	8%	11%	Annual	CPIU MPW, CPIU MOHA
14. Number of plastic waste collected and treated	Tons/year	0	0	0	3,275	17,357	49,865	93,266	Bi-annual	CPIU MPW
Component 4. Implementation Support										
15. Share of registered complaints followed-up within 30 days	Percentage	0%	90%	90%	90%	90%	90%	90%	Annual	CPMU

Annex 2: Detailed Project Description

1. **Selection criteria for participating LGs.** The Project will benefit 10 or more participating local governments selected based on the MPW's screening criteria. The selection criteria include, but are not limited to, the following: commitment to operations and maintenance, land availability, completeness of planning documents, and the existence of potential off-takers for waste products such as RDF, recyclables and compost.[28] Following these criteria, the GOI has reaffirmed the inclusion of the following cities and districts, which may also be subject to change: Temanggung, Rembang, Tasikmalaya (first batch); Jepara, Banyuwangi, and Regional Aceh (second batch); and Cirebon, Gunung Kidul, Tabalong, and Regional Magelang (third batch). The first batch was selected considering their progress on technical documents, including feasibility studies, environmental and social (E&S) documents, detailed engineering design (DED), and implementation readiness. The sequencing of batches is flexible: LGs listed in later batches may be advanced to an earlier batch if they demonstrate stronger readiness, while others may be shifted depending on circumstances. Additional LGs may be included in the Project subject to fund availability and the fulfillment of selection criteria. The Project's Steering Committee will assess the eligibility of LGs and approve their participation. After Project approval, implementation is expected to begin in the first batch locations, while planning documents for the second and third batch locations are prepared in parallel.

2. **Component 1. Provision of Solid Waste Infrastructure.** This component will finance priority investments in waste management infrastructure in each participating LG, including support for better utilization and upgrading existing infrastructure. Priority investments include construction of ISWTF (resource recovery, composting and RDF plants) and upgrading existing landfills, and construction of residual landfills. It will provide heavy equipment to support the operations at ISWTF and residual landfills, as well supervision consultants to oversee the works.

Table 1: Proposed Investments under Component 1[29]

No	Site	Project scope	Proposed Technology	Proposed Capacity (ton/day)
1	Temanggung	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction 4. Procurement of heavy equipment	RDF, MRF, and Compost, Landfill residue	125
2	Rembang	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF, landfill residue	100
3	Tasikmalaya	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF, landfill residue	50

[28] The waste products generated from Waste Treatment Facilities will include 1) RDF that can be used as substitute fuels to reduce the use of fossil fuels in cement kilns; 2) recyclable materials that can be reused and 3) composts that are generated from organic wastes. Potential offtakers for these products have been identified in the 10 participant cities. The selection criteria requested LGs to sign MoUs with offtakers including suppliers for recyclables and composting and cement factories.

[29] These technical options are based on the current feasibility studies report (FSR) and detailed engineering design (DEDs) submitted by the first batch cities. Other technical options will be assessed based on the submission of other documents from second and third batch cities.

4	Jepara	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF	100
5	Aceh Region	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF with Biodrying, MRF	300
6	Magelang Region	1.Residual Landfill development 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF	200
7	Gunungkidul	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction 4. Procurement of heavy equipment	RDF, MRF	75
8	Banyuwangi	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF, Composting	250
9	Tabalong	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF, MRF, Composting	100
10	Cirebon	1. Existing landfill rehabilitation 2. Landfill residue construction 3. ISWTF construction and RDF technology 4. Procurement of heavy equipment	RDF (tentative option), MRF	50

3. Prioritized investments include the construction of ISWTFs, which comprise plants for waste sorting, resource recovery, RDF production, and composting[30]. RDF plants will produce alternative fuels from waste to minimize the need for landfill space. Selection of RDF technology was determined based on the following parameters: (i) waste composition analysis; (ii) availability of off-takers, (iii) residual amount lower than 12%; 4) acceptance of mixed waste inputs; 5) suitability of inert residual for processing in residual processing units. Material recovery, composting[31] and RDF production will follow the processing flow comprising sorting, magnetic separation, screw pressing, rotary drying, shredding, and final storage[32]:

(i) *Reception Unit:* (a) Tipping Area (Pre-Sorting): the initial point where waste is received and pre-sorted; waste is categorized into wood waste and bulky waste for separate processing. (b) Bag Opener: mixed waste is directed to the bag opener, which opens bags to facilitate further sorting.

(ii) *Separation Unit:* (a) Disc Screen: separate residual and inert materials such as chicken feed, charcoal, glass fragments, ash, and soil/sand. (b) Manual Sorting: a portion of waste undergoes manual sorting, where workers separate items into categories including paper, hazardous waste and others; the baling process is included here. (c) Magnetic Separator: isolates metal materials. (d) Turbo Separator: separates organic from inorganic waste based on weight and other physical properties. After processing

[30] Cities including Temanggung, Tabalong, Banyuwangi will incorporate composting functions in the ISWTF.
[31] Material recovery refers to the process of retrieving valuable materials from waste, enabling their reuse in manufacturing or other applications. Material recovery facilities sort and prepare recyclables for end-users. Material recovery facilities contribute to energy conservation, job creation, and can generate community revenue through the sale of recyclables. Composting is a method that utilizes decomposition process of organic wastes and turns them into fertilizer.
[32] These technical options are based on the current FSR and DEDs submitted by the first batch cities. Other technical options will be assessed based on the submission of other documents from second batch cities. Technical options that are feasible, with low operating costs and in line with the effluent quality requirements will be considered.

in granulators, organic waste including kitchen waste and market waste is sent for composting.

(iii) *Mass and Volume Reduction Unit:* (a) Screw Press: reduces the moisture content of the organic waste, producing liquid residue. (b) Woodchipper: processes wood waste, reducing its volume for easier handling.

(iv) *Volume Reduction Unit:* (a) Rotary Dryer: T reduces the volume and mass of waste by removing vapor. (b) Shredder Machine: shreds inorganic waste into smaller pieces for further processing. (c) Centrifugal Dryer: further reduces the volume of inorganic waste.

(v) *Storage Unit:* (a) Organic Storage (Mixer): stores and mixes processes organic waste, mainly wood and leaves collected by street sweepers. (b) MDU Storage: stores manually sorted waste (MDU). (c) Inorganic Storage (Mixer): stores inorganic waste processed by the shredder and centrifugal dryer.

(vi) *Output:* RDF production: organic and inorganic waste from storage units is used to produce RDF, which is then sent to industries for use as fuel; the baling process is included here.

Figure 1: A Schematic of Material Recovery Facility, Composting and RDF Production in Integrated Waste Treatment Facilities

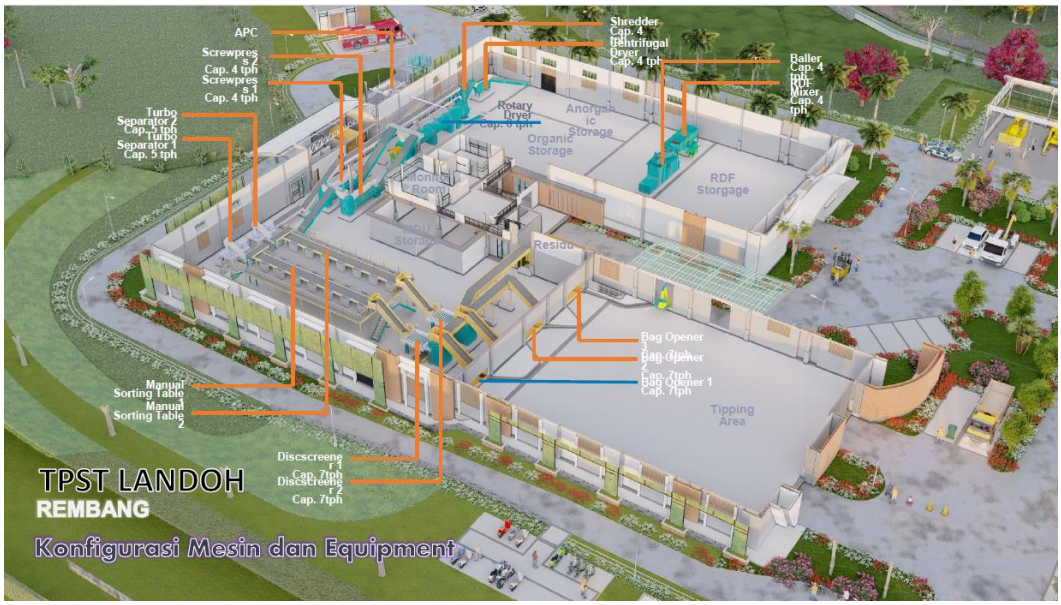


Figure 2: A Schematic plan of Integrated Waste Treatment Facilities in Rembang

Figure 3: An Illustration of Integrated Waste Treatment Facilities in Rembang

4. This component will also finance upgrading of existing landfills, including closing overloaded cells, constructing landfills for residuals after RDF production, and expanding existing leachate treatment plants (LTP). To minimize leachate, adequate soil cover, an impermeable base layer, and a leachate collection system are proposed. Legacy waste will be compacted and capped in cells, while the remaining land will be used for the proposed ISWTF and residual landfills. This component will also provide heavy equipment such as trucks and excavators to support operations at the ISWTF and residual landfills, as well construction management consultants to oversee the civil works. LTPs will treat leachate through a series of structured stages, including up-flow anaerobic sludge blanket (UASB) reactors, facultative ponds, maturation ponds, and constructed wetlands:

(i) The process begins at the inlet, where raw leachate is introduced into the system. From there, the leachate flows into the UASB reactor, the first stage of treatment. The UASB reactor operates for 7 days and is designed with an octagonal base of 4.4 m on

each side and a height of 6.0 m. After passing through the UASB reactor, the leachate's biochemical oxygen demand (BOD5) and total suspended solids (TSS) are reduced.

(ii) Following UASB treatment, the leachate flows into the facultative pond for an additional 8 days. The facultative pond measures 24.0 m in length, 12.0 m in width, and 2.0 m in height. This stage further reduces the BOD5 and TSS through combined aerobic and anaerobic processes to continue breaking down the organic matter.

(iii) Next, the leachate moves into the maturation pond, where it remains for another 8 days. The maturation pond, with dimensions of of 32.0 m by 12.0 m by 1.5 m, further refines the leachate by reducing the BOD5 and TSS, ensuring additional biological treatment to stabilize effluent quality.

(iv) The final treatment stage is the constructed wetland, which operates for 4 days and mimics natural wetland processes. The wetland measures 36.0 m in length, 12.0 m in width, and 0.7 m in height.

5. The design of residual landfill incorporates a controlled landfill method for the final disposal of waste. Key criteria for sanitary landfill operations include: an impermeable base layer to prevent leachate infiltration into the ground; a drainage system with minimum slope; and phased construction of the landfill base aligned with the leachate collection and treatment system. The landfill base will be lined with compacted clay or a geomembrane (HDPE), depending on ground conditions. Drainage channels will be constructed to prevent rainwater and surface water from entering landfill. The landfills will also capture and manage landfill gas. Gas handling design and cost are included in the DED for both residual landfills and the closure of existing landfills. The Project will install ventilation pipes and landfill gas collection systems. Flaring systems to burn off excess methane are proposed, with standards ensuring efficient combustion.

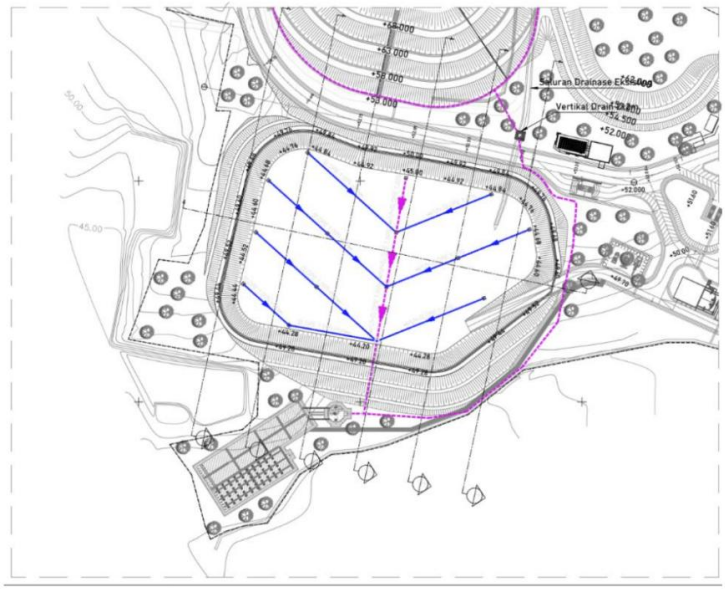


Figure 4: A proposed plan of residual landfill in Rembang

6. A landfill site will comprise the area designated for waste filling as well as additional areas for support facilities. Within the filling area, work may proceed in phases, with only part of the area under active operation at any given time. The layout must include the following facilities: (a) access roads; (b) equipment shelters; (c) digital weighing scales; (d) office space; (e) compost plant within the ISWTF (if included in the scope); (f) material resource recovery facility in the ISWTF; (g) RDF facility within the ISWTF; (h) landfill

boundaries and areas for stockpiling cover and liner material; (i) drainage facilities; (k) leachate treatment facilities; (l) landfill gas control and destruction facilities; and (m) monitoring wells.

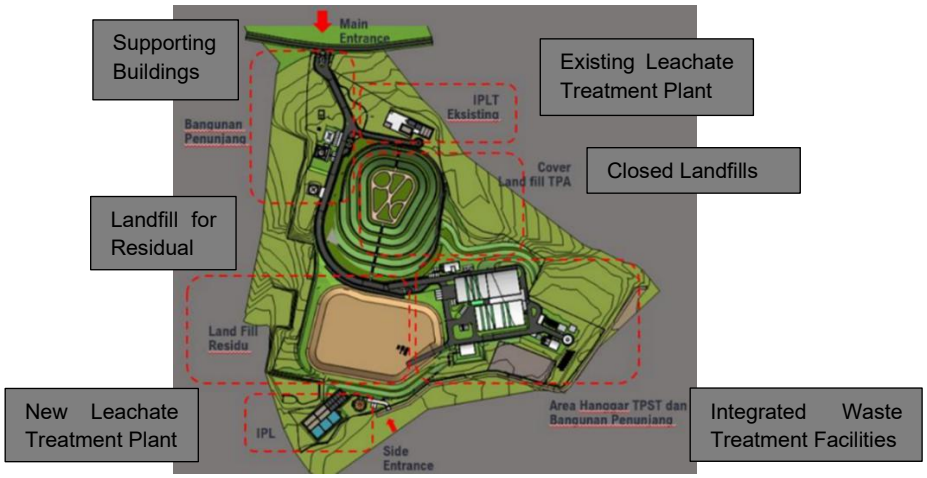


Figure 5: Proposed Design Layouts – the Integrated waste treatment facilities and Landfill for residual waste in Rembang

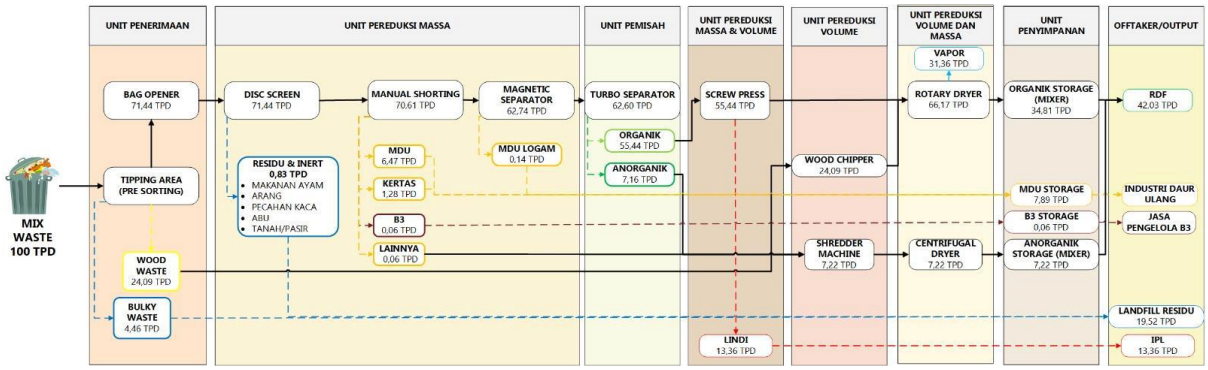


Figure 6: Mass Balance of the Integrated waste treatment facilities and Landfill for residual in Rembang

7. **<u>Component 2: Institutional Strengthening and Community Participation</u>**. Component 2 aims to enhance the role sub-national institutions and strengthen community participation in SWM. Overall, this component will support key areas of institutional strengthening and capacity building for LGs in SWM, such as setting up cost recovery waste tariffs, strengthening the financial, technical, and institutional capacity of operators, and providing capacity building and training. Further, the component also supports community participation in waste reduction, particularly in segregation, collection, and recycling.

8. **Sub-component 2.1 Institutional strengthening.** This sub-component aims to improve institutional performance in SWM, covering regulatory, institutional, management, and human resource aspects. Consultation support and technical assistance to local governments to strengthen their capacity in SWM. The activities under Sub-component 2.1 include: (i) facilitation support for LGs in strengthening SWM regulations at the sub-national level; (ii) technical assistance to support the transition of current operators (e.g. Environment Agency, UPTD[33]) into semi-private entities, such as BLUD (Local Public Service entity); (iii) support to LGs in issuing regulations on solid waste tariff collection. The CPIU of the

[33] UPTD is local technical implementing unit

Directorate of Synchronization of Regional Government Affairs I and II, Ministry of Home Affairs, is responsible for the implementation of Sub-component 2.1.

9. **Sub-component 2.2 Community participation**. This sub-component aims to enhance community engagement and awareness of household waste management, focusing on waste segregation and retribution collection. Local governments will provide guidance and support to communities in SWM. The main activity is the implementation of the waste management pillar under the Community-Led Total Sanitation (CLTS) program[34]. Activities under this pillar are designed to empower communities to take ownership of their waste management practices and to promote sustainable and environmentally friendly SWM. The CLTS activities include: (i) social mapping undertaken by communities to identify and map waste generation and accumulation areas; (ii) education, promotion, public campaigns on waste retribution collection, waste reduction, and household-level waste handling, including timely waste tariff payment and behavior change; (iii) SWM trainings and capacity building for communities on: waste segregation (how to separate waste into categories such as organic, non-organic, recyclable, and non-recyclable); composting (how to compost organic waste to produce organic fertilizer); recycling (how to recycle plastics, glass, paper, and metal); and waste reduction (how to reduce waste by using reusable bags, containers, and water bottles). The CPIU Directorate of Environmental Health, Ministry of Health, is responsible for implementing Sub-component 2.2.

10. **Sub-component 2.3. Updating and enhancement of the Master Plan for SWM (RIPS).** The master plan must be adopted as an official SWM planning document, serving as a reference for local medium-term and annual planning, and ensuring synchronization with other sectoral development plans of the LGs[35]. It must be legalized by the mayor or head of district and disseminated to all stakeholders. The master plan must include service areas, service levels, the SWM system (covering technical, institutional, regulatory, financial, and community participation aspects), and implementation stages. Sub-component 2.3 aims to update and enhance master plans so they serve as timely references, guides, and benchmarks for LGs in SWM, ensuring effectiveness, integration, and sustainability. The CPIU Directorate of Sanitation, Ministry of Public Works, is responsible for implementing Sub-component 2.3.

11. **Component 3: Support for SWM and Circular Economy Initiatives.** This component aims to enhance waste management services by supporting the efforts of local governments and communities in sustainable waste management. Sub-component 3.1 will provide grants for eligible LGs to strengthen their capacity to optimize waste segregation, collection, and transportation services. Sub-component 3.2 will provide grants for community groups, villages, urban wards, and LGs to implement eligible SWM activities using a circular economy approach. These activities aim to minimize waste and keep materials in use for as long as possible at the highest value, involving reducing, reusing, repairing, recycling, and recovering materials at every stage of the product lifecycle. All relevant project implementation units will need to involve in Component 3 in accordance with the detailed rules set out in the POM.

12. Waste transport and collection have been identified as areas needing improvement, as inadequate fleets and poor vehicle conditions at the local level have resulted in low

[34] CLTS -*Community-based Total Sanitation* program was one of the government's priority programs under Ministry of Health to achieve universal access to clean water and sanitation. It is implemented through five pillars activities, which are: (1) open-defecation free campaign, (2) hand washing with soap, (3) household drinking water treatment, (4) solid waste management, and (5) wastewater management.

[35] Seven participant cities have existing master plans to be updated and enhanced while the other three cities, Rembang, Aceh, Tabalong have existing SWM technical plans which will need further development to become master plans. Among the 10 cities, only Temanggung, Gununkidul, Bayuwangi have legalized master plans. The law requested master plans should be reviewed and updated every 5 years.

collection efficiency, with some cities and districts below 50 percent.[3637] The grants can promote collection and transportation systems that move waste from households to intermediate aggregation and collection facilities (TPS), 3R intermediate recycling facilities (TPS3R), and final disposal site (TPA). Eligible transport at equipment may include trikes, arm roll trucks, compactor trucks with efficient sorting capabilities. Grants should also support the transition to eco-friendly transportation methods, such as vehicles with improved energy efficiency, to reduce emissions, lower operational costs, and promote sustainability.

13. Lack of community participation in waste segregation has resulted in a high volume of mixed waste in participating cities. Most household and market waste is disposed of without prior segregation, and is often mixed with organic and inorganic waste, including hazardous waste such as batteries. The grants will support LG and community initiatives to enhance the capacity of 3R facilities to facilitate segregation of organic, inorganic (recyclables and non-recyclable) and hazardous waste. This sub-component will also promote segregation at community level by incentivizing LGs to carry out community engagement and behavior change campaigns through a variety of information, education, and communication (IEC) activities.

14. **Sub-component 3.1 Grants for SWM initiatives**. This sub-component aims to support LGs in implementing integrated SWM and increasing their capacity for waste segregation, collection, and transportation through provision of equipment, vehicles and infrastructure. The grants, commensurate with counterpart financing, will be provided to eligible LGs that meet or exceed predetermined performance criteria.

15. Grants can also be leveraged to establish additional waste collection schemes, especially in areas where access challenges (e.g., poor-quality roads or narrow streets) prevent main collection trucks from operating. Such scheme would expand SWM service coverage by involving local entities or community groups, creating a more flexible system. They could also cater to different waste streams, including residual waste, recyclable materials (via recycling banks), and organic waste (through home- or village-level composting).

16. Grants may also also be used to purchase standardized containers in intermediary collection facilities for waste storage and separation. Currently, the lack of standardized containers hampers proper segregation, leading to contamination, reduced recycling rates, and more waste sent to landfills. Providing containers that meet specific criteria for durability, size, and waste segregation can improve hygiene, enhance operational efficiency, increase convenience, and support better recycling practices.

17. The selection criteria for LGs to receive the grants include: (i) legalizing the SWM master plan and integrating it into the local budget; (ii) issuing regulations on cost-recovery tariffs; (iii) establishing proper SWM operators, such as BLUD; and (iv) conducting community campaigns on waste segregation and timely tariff payments.

18. The grants mechanism under Subcomponent 3.1 will operate as follows: (i) LGs that meet the selection criteria will be eligible to receive grants; (ii) LGs must allocate a local budget to match the grant ; (iii) the CPMU, through the PPIU, will procure waste collection equipment and vehicles and hand them over to LGs; (iv) the grants will be used for procuring equipment for segregation, collection, and transportation.

[36] The current waste collection modes include 1) transferring waste directly from source (roadsides, schools, restaurant, mosques) to landfills using garbage trucks (direct individual collection) and 2) transferring waste from source via transfer stations to landfills using waste collection devices like garbage carts (indirect individual collection). Challenges in waste collection include limited collection facilities resulting in unserved areas. In some cities, 71% of transfer stations do not have daily waste collection due to insufficient container capacity and aged vehicles.

[37] Waste collection rate in some participating cities below 50%: Temanggung (18.82%), Rembang (33.3%), Tasikmalaya (43.93%), Gunungkidul (42.59%), Cirabon (36.5%).

19. The CPMU will establish the required ratio of local budget to match the grant amount. Equipment and vehicles financed by the grants should be used to enhance transport efficiency, including through route optimization, and expand waste collection services to underserved areas.

20. **Sub-component 3.2 Grants for circular economy initiatives**. This sub-component will provide grants to community groups, villages, urban wards, and LGs to strengthen SWM through a circular economy approach, with support for additional equipment, vehicles, and technical assistance. Grants will be awarded to entities that meet or surpass predetermined project performance criteria.

21. Activities supported by circular economy grants will focus on enhancing both technical and biological cycles to promote sustainability and resource efficiency. The technical cycle aims to keep products and materials in circulation at their highest utility for as long as possible through reuse, repair, remanufacturing, and recycling. Biological cycles seek to cascade nutrients from organic waste through multiple uses, transforming them into valuable resources. Types of supported activities may include:

- Provision of training and technical advice to develop circular economy solutions, such as new recycling technologies, environmentally friendly innovations, or product redesigns. This would foster local innovation, promote circular economy business models (e.g., sharing platforms[38][39], resource recovery[40]), and create jobs while reducing waste;
- Promoting solutions for organic waste, which constitutes a significant portion of many waste streams, to transform it from a cost burden into valuable resource. Initiatives such as municipal- or community-level composting can convert food and garden waste into nutrient-rich fertilizer. Community engagement in organic waste management will foster awareness and participation, create a culture of sustainability while strengthening local food systems.

22. The selection criteria for recipients include: (i) demonstrated recycling of waste into new material for at least one year; (ii) compliance of waste products with national standard; (iii) no history of environmental or social issues associated with prior activities; (iv) established networks with off-takers; (iv) involvement in or support the CLTS program for at least one year.

23. The mechanism for applying the grants will be as follows: (i) community groups, villages/ urban wards, and LGs that meet the criteria may apply; (ii) grants will be awarded in the form of equipment, vehicles, and capacity-building resources; (iii) the CPMU, through the PPIU, will procure and deliver the goods and resources and hand them over to LGs; (iv) grant volume will be determined based on the scale and scope of proposed activities.

24. Sub-component 3.2 will also focus on capacity building to deepen understanding of the circular economy transition, including the regulatory frameworks and mechanisms that the government can use to accelerate adoption, and ways to support the private sector through

[38] Creation of resource-sharing groups or freecycling platforms where residents exchange or share items like tools, appliances, or household goods, reducing the need to purchase new products and decreasing waste. These groups will help to build social cohesion and encourage a more sustainable, resource-efficient way of living.
[39] The establishment of Reuse centers or repair workshops could also be established, where community members bring items like electronics, furniture, or clothing to be repaired, refurbished, or repurposed, extending their life cycle and reducing the volume of waste sent to landfills.
[40] The creation of recycling collection and sorting facilities, such as waste recycling banks in schools, or other community hubs. These facilities would allow residents to bring in their separated waste, providing a convenient and accessible way to promote recycling at the local level. In addition to collection, these sites could include dedicated spaces for further sorting and temporary storage of recyclables, ensuring that materials are properly prepared for sale to recycling markets.

public-private partnerships and other initiatives. Key themes will include waste management and recycling systems, sustainable design and innovation, and resource efficiency. Targeted stakeholders include government officials, community groups, private sector off-takers, and other relevant actors. Capacity building will be delivered through workshops, e-learning modules, guidelines, and study tours to promote knowledge exchange and peer learning during Project implementation.

25. In addition to grants, Sub-Component 3.2 will pilot integrated SWM models using circular economy approaches in one or two cities/districts demonstrating advanced progress. It will also assist the GOI in preparing cities and districts for the implementation of circular economy approaches under the proposed Solid *Waste Development to Support Circular Economy (SWD-SCE) Project.*

26. **Component 4: Implementation Support**. This component will support project management during implementation, including procurement, financial management, monitoring and evaluation, environmental and social risk and impact management. It will also provide support to relevant national and local officials to ensure effective implementation through: (i) a National Project Management Consultant under the CPMU; (ii) a National Monitoring Team (NMT) under the Steering Committee for oversight of the overall solid waste program; (iii) advisory individual consultants for the CPMU and CPIUs; (iv) evaluation and studies consultants; and (v) incremental operating costs.

Annex 3: Economic and Financial Analysis

Introduction

1. The economic analysis focuses on Component 1 (Development of Solid Waste Infrastructure) and Component 3 (Support for SWM Initiatives and Circular Economy), which together account for nearly 90 percent of the total Project cost. Although Components 2 and 4 will generate significant economic benefits, these are more difficult to quantify and therefore excluded from the economic analysis. This analysis employs a cost-benefit method to estimate net benefits, calculated as the difference between incremental benefits and incremental costs. Economic viability is assessed using the Economic Internal Rate of Return (EIRR) and Net Present Value (ENPV). A "without-project" scenario is assumed as the baseline, under which no additional investment is made and household solid waste continues to remain largely uncollected.

2. The economic analysis draws on data collected from multiple sources, including the Feasibility Study Report, Bank Indonesia, the Ministry of Public Works, the World Health Organization, and the World Bank.

Key Assumptions

3. The economic analysis is underpinned by several key assumptions that guided the cost-benefit estimation and viability assessment:

(i) The Project's economic life is assumed to be 20 years (2025-2044), comprising 4 years of construction and 16 years of operation. The base year for price evaluation is 2024.
(ii) The CAPEX schedule is phased as 6 percent, 44 percent, and 50 percent during the construction period.
(iii) OPEX and benefits are assumed to start immediately after the construction. A phasing approach is applied, beginning with 10 percent of full capacity in 2026, increasing by 30 percent each year until reaching full capacity in 2030.
(iv) Economic costs for construction and operations and maintenance (O&M) are derived from the Financial Model and converted to economic values using a conversion factor of 0.89.[41] Taxes and interest payments are excluded from the calculation.
(v) All costs and benefits are expressed in constant 2024 prices and converted at USD1= IDR15,739.
(vi) A social discount rate of 12 percent is applied.

Economic Costs

3. The Project costs are financed through a combination of investment from AIIB, the GOI budget, and a grant from AEPW. Capital costs are grouped into three categories: (i) construction, supervision, and heavy equipment for the solid waste management plants, (ii) waste collection and transportation equipment; and (iii) waste segregation and recycling infrastructure. Operations and maintenance costs include repair and maintenance of SWM plants and transportation vehicles, daily fuel and electricity consumption, and labor costs. The financial costs for the 10 sites are converted into economic prices by adjusting for taxes and applying a conversion factor of 0.89. Details are provided in Table 3.1.

[41] Source from the feasibility study report.

Table 3.1: Cost breakdown by financial and economic costs

Components	Financial costs (USD million)	Economic costs (USD million)
Capex	183.2	142.7
Opex per year	8.6	6.7

Economic Benefits

4. The analysis estimates economic benefits across six categories: (i) reduced greenhouse gas (GHG) emissions, (ii) avoided coal consumptions; (iii) avoided workday losses; (iv) avoided land costs; (v) avoided health treatment costs for diarrhea and malaria; and (vi) savings in chemical fertilizers. These benefits are primarily calculated based on the expected number of beneficiaries, proxied by total population data collected from the statistics office at the city or district level. The local population is projected to grow at an annual rate of 0.7 percent over the Project's period. [42]

Emission Saving Benefit

5. GHG emissions for all stages were calculated using the SWM GHG Calculator (2023). [43] The majority of emission savings from the Project are attributed to: (i) the replacement of fossil fuels by RDF produced under the Project and used in industries such as cement and power plants; (ii) the avoidance of landfill dumping for the solid waste processed by the RDF plant; and (iii) a minor portion result from incremental recycling of reusable materials enabled by the upgraded solid waste management system.

6. The GHG assessment reveals that the proposed SWM project generates 636,294 tons CO2 in the baseline stage of 2024 (without-project scenario). The 2024 baseline emissions are assumed constant throughout the project period. In the baseline stage, total emission reductions are assessed at 34,643 tons of CO_2, mainly from implementing the proposed RDF plant. Emission reductions are projected to increase to 410,258 tons CO_2 in 2030, compared to baseline emissions in 2024, and then decrease slightly to 390,320 tons CO_2 in 2036. These figures reflect the combined effect of increasing waste generated, higher recycling percentages planned during the project years, and the operational capacities of RDF facilities.

7. Emission savings in other years are derived through linear forecasting based on the three available forecasts. The lower-bound shadow carbon price was used to convert the savings to economic value, estimated at USD 44 per ton in 2024 and increasing by 2.25 percent annually beyond 2030.[44] The total value of emission savings is estimated at USD 371.5 million over the assessment period.

Avoided Coal Consumption.

8. The Project will substitute RDF for coal and other fossil fuels in cement and energy production. It is projected to produce 229,282 tons of RDF annually, equivalent to 199,376 tons of coal using a conversion factor of 1.15. [45] According to open-source data and the feasibility study, the economic price difference between coal and RDF is USD 79.5 per ton.

[42] World Bank. 2024. Source https://data.worldbank.org/indicator/SP.POP.GROW?locations=ID
[43] The SWM-GHG Calculator (2023) is developed by the IFEU Institute, Hiedelberg, Germany. The SWM GHG Calculator is an Excel-based user-friendly tool that allows for defining certain boundary conditions for the various treatment options that may be considered for managing solid waste.
[44] Sourced from Stern and Stiglitz (2017). The carbon price ranges from USD44 to USD87 per ton in 2024. To be conservative with the estimation, the low-end price is adopted, which is specified in AIIB's CBA guideline.
[45] Source: https://www.sciencedirect.com/science/article/abs/pii/S0957582021001233

Over the assessment period, this substitution is expected to yield an estimated benefit of USD 232.12 million from reduced coal consumption.

Workday Saving

9. Income loss occurs when workers fall sick from diarrhea and malaria. Each incident is assumed to result in 1.5 days of sick leave. Based on the incidence rates referenced in the health benefit section, the total number of sick days avoided is calculated by applying these rates and the Project impact rate to the working-age population within the service area. The avoided sick leave days are then multiplied by the average daily minimum wage of IDR 124,205 per day. The resulting benefit from avoided income loss is estimated at USD142.7 million.

Avoided Landfill Cost

10. By diverting waste from landfills and reducing the amount of residue sent to landfill cells, the Project will reduce the demand for additional landfill space. Assuming a 75 percent diversion rate, approximately 77,656 square meters of land will be saved annually.[46] The feasibility study estimates land costs between IDR 0.6-1.5 billion per hectare, with a conservative estimate of IDR 0.6 billion per hectare (equivalent to IDR 8,850 per square meter). Over the assessment period, this translates into 18,071,339 square meters of land preserved, valued at USD 5.1 million.

Avoided Health Treatment Benefit

11. Unmanaged solid waste poses public health risks, particularly malaria and diarrhea. A systematic review indicates that unmanaged dumpsites could affect at least 30 percent of households.[47] Based on this evidence, the analysis assumes that 30 percent of the Project's expected beneficiaries would benefit from improved waste management. The incidence rates applied are 3.5 percent for diarrhea and 0.4 percent for malaria.[48] Due to limited data on adult diarrhea treatment in Indonesia, only treatment costs for children under five were included.[49] The estimated economic health costs are USD14.9 per treatment for diarrhea (under five) and USD 21 per treatment for malaria (all ages). The combined avoided health treatment costs amount to USD 6.8 million over the assessment period.

Savings from Compost Use

12. Composting reduces reliance on chemical fertilizers, lowering costs for farmers while improving soil fertility and crop yields. This is especially beneficial for small-scale farmers with limited resources. The calculation begins with the RDF output capacity to estimate compost generation each year. A waste-to-compost conversion rate of 25 percent (four weeks) and a 50 percent substitution rate between compost and fertilizer were applied. Based on the feasibility study, the price difference between unsubsidized fertilizer and compost is approximately USD 80 per ton. The incremental benefit of switching to compost is estimated

[46] Other assumed parameters are the landfill height of 20 meter, the landfill form factor of 0.7, and the waste density of 200.
[47] Source: Vinti et al. (2021) Municipal Solid Waste Management and Adverse Health Outcomes: A Systematic Review. *Int J Environ Res Public Health*. 18(8):4331. doi: 10.3390/ijerph18084331.
[48] Ani Isnawati. 2019. Indonesia basic health survey: self-medication profile for diarrhea with traditional medicine. Source: Diarrhea - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7040255/; World Health Organization. 2024. Malaria - https://data.who.int/indicators/i/B868307/442CEA8?m49=360
[49] In tropical countries like Indonesia, the rate of stunting among children under 5 is over 30 percent. Stunting is a powerful risk factor associated with 53 percent of deaths related to infectious diseases in developing countries. Source: World Bank (2017). Improving Service Levels and Impact on the Poor: A Diagnostic of Water Supply, Sanitation, Hygiene, and Poverty in Indonesia. WASH Poverty Diagnostic.

by applying the price difference to the amount saved in fertilizer, resulting in a benefit value of USD 1.4 million during the operation period

Other Benefits of Improved SWM.

13. This is not an exhaustive list of potential benefits arising from the planned investments. In addition to the benefits quantified in the analysis, are several other benefits are expected to accrue from the Project:

(i) Transportation Cost Savings: Significant cost savings are expected in the transportation of RDF to cement and energy plants located closer to the RDF production site and farther from seaports. Moreover, the Project will optimize waste collection routes, reducing the overall transportation costs associated with waste management. This optimization will lower fuel consumption and reduce greenhouse gas emissions from transportation.
(ii) Promoting a Circular Economy and 3R Practices: The project will reduce solid waste generation by promoting circular economy principles and adopting 3R (Reduce, Reuse, Recycle) practices through the Material Recovery Facility (MRF) plants. These plants will sort and process recyclable materials, reducing the amount of waste sent to landfills and reintroducing valuable materials into the economy, fostering resource efficiency and sustainability.
(iii) Health, Safety and Environmental Benefits: The project will mitigate the risks of vector-borne diseases by improving waste management, leading to safer, cleaner environments. This includes reducing the incidence of water and air pollution and creating healthier living conditions for communities. The reduction in open dumping and burning of waste will also lower the exposure to hazardous pollutants.

14. Therefore, the total benefits of the project are likely to exceed those quantified here, as these additional environmental, health, and economic advantages further underscore the long-term value and sustainability of the planned investments.

Cost Benefit Calculation

15. Total costs and total benefits are projected over a 20-year period (2025-2044). The ENPV of the Project, at a 12 percent discount rate, is estimated at USD 90.4 million, with an EIRR at 27 percent. The positive ENPV and the significant margin between the EIRR and the social discount rate confirm that the Project is economically viable.

Table 3.2: Cashflow on the economic costs and benefits (unit: USD million)

Year	Costs		Benefits						Balance
	CAPEX	OPEX	Emission Saving	Coal Saving	Workday Saving	Land Saving	Health	Compost	Net Cashflow
2024	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	8.60	0.67	0.93	1.36	0.52	0.01	0.02	0.01	-6.37
2027	63.08	2.34	4.40	4.77	2.15	0.06	0.10	0.03	-53.61
2028	71.68	4.34	10.08	8.85	4.70	0.14	0.22	0.05	-51.64
2029	0.00	6.35	17.23	12.93	7.90	0.25	0.37	0.08	32.42
2030	0.00	6.68	20.51	13.61	8.49	0.31	0.40	0.08	36.73
2031	0.00	6.68	20.81	13.61	8.49	0.31	0.40	0.08	37.03
2032	0.00	6.68	21.11	13.61	8.49	0.31	0.40	0.08	37.33
2033	0.00	6.68	21.41	13.61	8.49	0.31	0.40	0.08	37.63
2034	0.00	6.68	21.71	13.61	8.49	0.31	0.40	0.08	37.92
2035	0.00	6.68	22.00	13.61	8.49	0.31	0.40	0.08	38.22
2036	0.00	6.68	22.30	13.61	8.49	0.31	0.40	0.08	38.52
2037	0.00	6.68	22.60	13.61	8.49	0.31	0.40	0.08	38.82

2038	0.00	6.68	22.90	13.61	8.49	0.31	0.40	0.08	39.12
2039	0.00	6.68	23.19	13.61	8.49	0.31	0.40	0.08	39.41
2040	0.00	6.68	23.49	13.61	8.49	0.31	0.40	0.08	39.71
2041	0.00	6.68	23.78	13.61	8.49	0.31	0.40	0.08	40.00
2042	0.00	6.68	24.07	13.61	8.49	0.31	0.40	0.08	40.29
2043	0.00	6.68	24.36	13.61	8.49	0.31	0.40	0.08	40.58
2044	0.00	6.68	24.65	13.61	8.49	0.31	0.40	0.08	40.86
Total	143.36	113.91	371.54	232.12	142.67	5.09	6.76	1.38	502.97
ENPV									90.0
EIRR									27%

Sensitivity Analysis

16. A sensitivity analysis was conducted to assess the impact of percentage change in total benefits and costs. The results, presented in Table 3.3, indicate that the Project remains economically viable under all assessed scenarios.

Table 3.3: Result of the sensitivity tests

Scenarios	EIRR (percent)	ENPV (USD million)
Baseline	27	90.0
1: Reduce 20 percent of total benefit	20	45.8
2: Increase 20 percent of total cost	21	63.8
3: Combined scenarios 1 and 2	15	19.5

Financial Analysis

17. The financial viability assessment draws both on financial and socio-economic data from the Feasibility Study, which examined current (2024) conditions and practices in targeted local governments. It also incorporates plant capacities defined in the Detailed Engineering Designs (DEDs) for the 10 LGs to develop the "with-Project" scenario. The Feasibility Study complied extensive financial data—including budget allocations, SWM-related expenditures, tariff rates, and tariff collection efficiencies—from Tasikmalaya, Rembang, and Temanggung to assess key financial indicators over the Project's 20-year lifespan. Additionally, market information on output prices, such as RDF, compost, and recyclable materials from the proposed material recovery facilities within the ISWTF, was used in the analysis.

18. Financial Capacities of Local Governments for SWM interventions. Analysis of LG budget allocations reveals that revenue budgets for SWM remain significantly constrained. Among the three LGs assessed, annual budget allocations for SWM were as low as IDR 1.7 billion (USD 109,000), with considerable year-on-year variations. Average expenditures were IDR 3.7 billion in 2022 and IDR 4.34 billion in 2023, primarily directed toward waste transportation and landfill disposal. Historically, investment in SWM has been low; for instance, Rembang allocated only 0.17 percent of its total APBD budget to SWM between 2014 and 2022. Currently, only about 57 percent of the population in the targeted locations has access to waste management services, resulting in practices such as open dumping or burning. These findings highlight the urgent need for increased investment in waste treatment infrastructure to ensure safe and environmental sound practices.

19. Tariff collection efficiency for waste management services in the LGs is notably low. Among the three LGs assessed, only 4.6 percent of households, on average, pay tariffs for the waste services they receive. Limited financial resources and institutional capacity hinder LGs' ability to cover operational costs and finance necessary capital investments in SWM infrastructure. Drawing on lessons from development partner-supported projects, capital subsidies remain critical to enable LGs to deliver efficient and sustainable waste management services.

20. Financial Viability and Operational Sustainability. Given the low cash inflow resulting from inadequate tariff collection and limited revenue from recyclables, the Project may yield a non-positive NPV if capital repayment is required from LGs. In view of the public health and environmental benefits, capital investments will therefore be subsidized by the central government to support LGs which, as in many other developing economies, lack the financial capacity to finance SWM infrastructure. Accordingly, the financial analysis focuses primarily on ensuring the Project's operational sustainability. This will be achieved through a well-structured business model that emphasizes institutional arrangements, O&M cost recovery, revenue generation from end products and recyclables, and, where possible, supplementary government support.

21. The assessment draws data from feasibility study conducted across 10 LGs. The business model incorporates factors such as waste collection coverage (as defined in the DED), average household tariff rates, tariff collection efficiency, and sales of plant outputs in the targeted LGs. Parameters from three representative LGs were used to generate generalized estimates for the remaining seven LGs, thereby providing a comprehensive picture of operational sustainability. The analysis is based on the following key parameters.

Table 3.4: Key FA related information collected from three locations.

Information from three locations					
Locations	**DED #HH**	**HH served**	**% of HH Served**	**Revenue (2023, IDR)**	**% of HH Paying Tariff**
Temanggung	202,837	123,690	61%	1,262,686,500	4.73%
Rembang	98,521	54,623	55%	350,000,000	2.70%
Tasikmalaya	155,525	117,707	76%	170,000,000	0.83%
Average	152,294	98,673	64%	594,228,833	2.75%

22. **Tariff collection efficiency**. Tariff collection efficiency is a critical determinant of O&M costs recovery for SWM facilities. A portion of O&M expenses is expected to be covered through household tariffs at the LG level. The feasibility study revealed substantial variation in collection efficiency across the served households in the three LGs, ranging from 0.83 percent in Tasikmalaya to 4.73 percent in Temanggung. For the base scenario, an average tariff collection efficiency of 2.75% was applied. To ensure realism, the analysis focuses only on non-poor households as the primary target for tariff collection.

Table 3.5: Key assumptions for tariff collection efficiency

Scenarios for tariff collection: Base, Worst and Best Cases						
Year	**YoY increment**	**Tariff Collection Base Case**	**YoY increment**	**Tariff Collection Worst Case**	**YoY increment**	**Tariff Collection Best Case**
2025	0%	2.8%	0%	0.8%	0%	4.7%
2026	0%	2.8%	0%	0.8%	0%	4.7%
2027	0%	2.8%	0%	0.8%	0%	4.7%
2028	1%	3.8%	0%	0.8%	1%	5.7%
2029	1%	4.8%	0%	0.8%	1%	6.7%
2030	1%	5.8%	0%	0.8%	1%	7.7%
2031	1%	6.8%	1%	1.8%	1%	8.7%

2032	1%	7.8%	1%	2.8%	2%	10.7%
2033	1%	8.8%	1%	3.8%	2%	12.7%
2034	1%	9.8%	1%	4.8%	2%	14.7%

23. Revenues from outputs. The business model also considers potential revenue from the sale of end products derived from waste at the 10 eligible locations. The proposed interventions include constructing RDF plants with an estimated output capacity of 1,633 tons per day (TPD), and recovering 151 TPD of valuable materials through the MRFs inside the ISWTFs. The Project will also generate 62 tons of compost every four weeks. In addition to upgrading and rehabilitating existing facilities, substantial investments will be made to enhance the operational efficiency across waste management – spanning waste collection, segregation, treatment, and disposal. With these interventions, only 14 percent of total waste generated across the targeted locations is expected to be disposed in landfill cells.

24. The sale of recyclable materials, RDF, and compost is critical for generating revenue and cash flow to cover the O&M costs of the targeted waste management plants. The market price of RDF is estimated at IDR 400 (USD 0.03) per kilogram, while recyclable materials are estimated at IDR 2,360 (USD 0.13) per kilogram. Although income from RDF, MRF, and compost is critical for operational sustainability, the analysis adopts a conservative approach to projected sales efficiency, assuming a gradual scale-up to 70 percent within eight years.

Output Sales Efficiency		
Year	**YoY increment**	**Sales efficiency**
2025	0%	0%
2026	0%	0%
2027	0%	0%
2028	15%	15%
2029	15%	30%
2030	15%	45%
2031	15%	60%
2032	10%	70%
2033	0%	70%
2034	0%	70%

25. The Project Costs. The costs of the Project are financed through a mix of sources, including an AIIB loan, GoI budget contributions, and a grant from AEPW. Capital costs are grouped into three categories: (i) construction, supervision, and heavy equipment for SWM plants; (ii) waste collection and transportation equipment; and (iii) waste segregation and recycling infrastructure. O&M costs include repair and maintenance of SWM plants and waste transportation vehicles, daily fuel and electricity consumption, and labor costs. The Project's annual O&M cost is estimated at IDR 129 billion for the 10 SWM plants.

26. Operational Sustainability Analysis. Operational viability was assessed using key financial indicators, specifically the Internal Rate of Return (IRR) and Net Present Value (NPV). The IRR reflects the expected return on investment, while the NPV evaluates the net value of the projected cash flows in present terms. The analysis considers projected revenues from the sales of compost, materials recovered from the MRF, and outputs from the RDF plant, along with tariff collections from households as contributions to O&M costs. A discount rate of 9%, representing the average commercial lending rate[50], was applied to calculate financial indicators, adjusting future cash flows to their present value. The assessment of these indicators is based on the following assumptions.

Table 3.6: Key assumptions to assess financial indicators

Item	Estimates
Total Beneficiaries of the Project (DED estimation)	8,807,786

[50] The commercial rate consists of the cost of capital and the risk premium, and the proposed BLUD modality will have access to finance at the commercial bank's rate; after the project is handed over to the LGs.

Portion of the Beneficiaries Currently Served	57%
Household Tariff Rate (IDR, Monthly)	10,964
Average Tariff Collection Efficiency (2025, Base Case)	2.8%
Poverty Rate (2023, GoI)	9.0%
Portion of the Beneficiaries Targeted for Tariff Collection	91.0%
Output Sales Efficiency (2028)	15%
Targeted Sales Efficiencies (2032)	70%
RDF Output Capacity (TPD)	628
MRF Output Capacity (TPD)	151
Compost Output Capacity (Tons, Every 4 Weeks)	62
RDF Market Price (IDR/Ton)	400,000
Market Price of Recyclable Valuables (IDR/Ton)	2,078,093
Market Price of Compost (IDR/Ton)	900,000
Capital Investment in 10 Locations (Bn IDR)	1,619
Yearly O&M Costs (Bn IDR)	112.4
Discount Rate	9%
Average Inflation rate (2023, WB)	1.5%
Project Life (Years)	20

27. Formulation of Base Case. The base case scenario is derived from field data collected in three locations: Temanggung, Rembang, and Tasikmalaya. In these areas,296,020 households are currently served by SWM facilities, of which, 13,549 (4.6 percent) pay the user tariff. This represents 2.75 percent of the household's coverage projected for 2030. Accordingly, the base case assumes a tariff collection efficiency of 2.75 percent, with a one-percentage-point year-on-year increase from 2028 to 2034, reaching 9.8 percent by 2035. Output sales efficiency is conservatively capped at 70 percent by 2032, starting at 15 percent in 2028.

Table 3.7: Operational Sustainability: Base Case

Year	Costs	Revenue Inflows				Base Case
	O&M Costs	Revenues from tariff	Revenues from sales of RDF	Revenues from sales of recyclable materials	Revenues from sales of composts	Net Income
	Bn IDR	Bn IDR	Bn IDR	Bn IDR	Bn IDR	Bn IDR
2025	0	0	0	0	0.0	0
2026	0	0	0	0	0.0	0
2027	7	0	0	0	0.0	-6
2028	61	4	7	8	0.1	-42
2029	124	14	30	37	0.2	-57
2030	126	18	45	57	0.4	-19
2031	128	22	61	77	0.5	18
2032	130	25	73	91	0.6	45
2033	132	31	74	92	0.6	51

2034	134	34	75	94	0.6	55
2035	136	34	76	95	0.6	55
2036	138	38	77	97	0.6	59
2037	140	38	78	98	0.6	59
2038	142	38	79	100	0.6	59
2039	144	41	81	101	0.6	64
2040	146	41	82	103	0.6	64
2041	149	41	83	104	0.7	64
2042	151	46	84	106	0.7	69
2043	153	46	86	107	0.7	69
2044	156	46	87	109	0.7	69
2045	158	50	88	111	0.7	74

28. Results. The Project's financial indicators are robust in the base case, with a 9 percent discount rate yielding a positive NPV over 20 years and an IRR of 27 percent. The analysis also explores the Benefit-Cost Ratios, NPV, and IRR across various discount rates and project lifespans (see Table 3.8).

Table 3.8: Financial Indicators in the Base Case

	BCR = 20 Years	**BCR=25 Years**	**BCR=30 Years**
	1.28	1.31	1.34
	IRR = 20 Years	**IRR=25 Years**	**IRR=30 Years**
	26.5%	27.1%	27.3%
	Bn IDR		
Discount Rate	**NPV = 20 Years**	**NPV = 25 years**	**NPV = 30 years**
1%	636	945	1,284
2%	540	784	1,039
3%	460	653	845
4%	391	545	689
5%	334	455	565
6%	284	381	465
7%	242	320	384
8%	207	269	317
9%	176	226	263
10%	150	190	219
11%	127	160	182
12%	108	134	151
13%	91	113	126
14%	77	94	104
15%	65	79	87
16%	54	65	72
17%	45	54	59
18%	37	44	48
19%	30	36	39
20%	24	29	31

29. Sensitivity Analysis. The analysis further examines the Project's operational sustainability under alternative scenarios, highlighting its sensitivity to fluctuations in costs, income, and market conditions. Stress tests were conducted for scenarios involving increased O&M costs, decreased expected income, and a high-risk situation where tariff collection

efficiency starts below 1 percent and remains under 5 percent over the next 10 years. The analysis also considered a scenario in which no market for RDF is established (see Table 3.9).

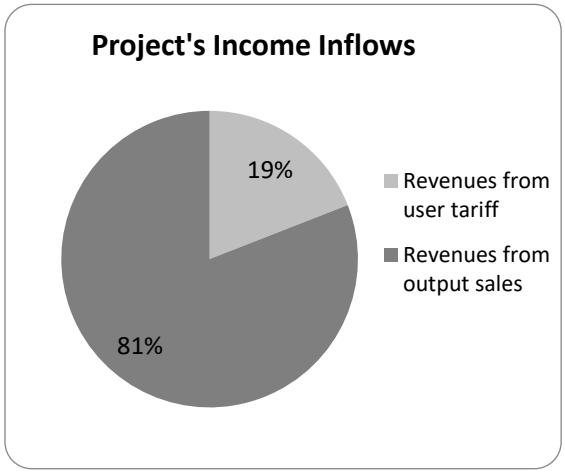
Table 3.9: Operational Sustainability and Sensitivity Analysis

Scenario	Change	NPV (Bn IDR)	IRR (%)
Base case		176	27%
Increase in O&M costs	10%	80	17%
Decrease in income	10%	62	16%
Worst tariff collection efficiency	<5%	67	16%
No market for RDF offtake		-243	N/A

Implications on Project Implementation

30. Improving User Tariff Collection Efficiency. The majority of the plants' overall income (81 percent) comes from output sales, which is constrained by plant design capacity and subject to market demand and price fluctuations. While the Project can remain sustainable with a 10 percent reduction in income, the NPV becomes negative if income is reduced by 20 percent. However, there is potential to increase income from user tariffs by improving tariff collection efficiency. Data from three locations show that fewer than 5% of households currently pay for SWM services, even though user tariffs are low (USD 0.70 per household per month). The Project aims to invest in Components 2 and 3 to strengthen institutional capacity through incentivization and policy reforms, targeting a 30 percent tariff collection efficiency, which would ensure the Project's sustainability even in ahigh-risk scenario.

Table 3.8: Project's Income Inflows



31. Ensuring Output Offtakes. The project plans to invest in RDF, MRF, and compost plants, and the sale of outputs is essential for revenue flow. While markets for recyclable materials and compost are well established, securing sustainable and reliable business agreements with RDF offtakers is crucial for the Project's operational sustainability. RDF accounts for approximately 44 percent of the projected income from total output sales, and without this income the Project cannot achieve cash positivity, making IRR calculations infeasible. However, the Project has already secured agreements with RDF offtakers that have expressed strong commitments to using environmentally friendly raw materials and contributing to GHG emission reduction initiatives.

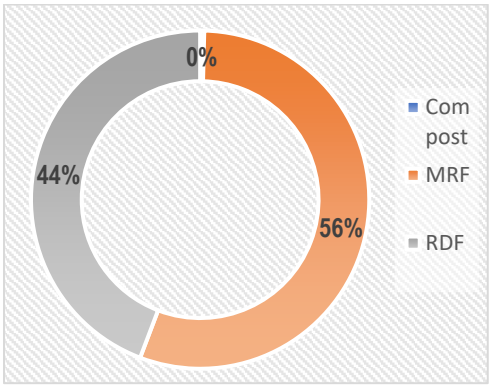


Table 3.9: Composition of Output Sales

32. **Subsidy Requirement**. As the Project is designed to fully cover O&M costs during the implementation period, a financial simulation was conducted to assess whether subsidy support would be required once the Project is operationalized with its targeted outcomes. Under low-risk scenarios—such as a 10 percent increase in O&M costs, a 10 percent

decrease in income, or tariff collection efficiency remaining below 5 percent, the Project remains financially sustainable after implementation and does not require subsidies. However, in high-risk scenarios, financial viability weakens. For example, a 20 percent increase in O&M costs results in a subsidy requirement of IDR 10 billion in Year 6, while a 20 percent decline in income results in a requirement of IDR 14 billion in Y6. Most notably, in the absence of an RDF market, the Project would consistently require subsidy support throughout its operation. These findings highlight the importance of containing operating costs and securing reliable revenue streams—particularly through improved tariff collection and RDF offtake agreements—to minimize long-term reliance on subsidies.

Table 3.10: Subsidy requirement in a low and high-risk scenarios

Scenario	Change	Negative Net Income After Project Implementation?	Required Amount of Subsidy (Bn IDR)
Base case		No	0
Increase in O&M costs	10%	No	0
Decrease in income	10%	No	0
Worst tariff collection efficiency	<5%	No	0
Increase in O&M costs	20%	Yes	10(Y6)
Decrease in income	20%	Yes	14(Y6)
No market for RDF offtake		Yes	Always

33. **RDF market**. The market for Refuse-Derived Fuel (RDF) in Indonesia is expanding, driven by the need to manage increasing waste volumes and reduce reliance on coal. The viability of the RDF market has been demonstrated by the successful operation of the RDF plant in Cilacap which serves as a national model by selingl RDF to the Cement producer PT Solusi Bangun Indonesia (SBI). Most of the participating LGs in SWM-SUD have signed MoUs with SBI. The company operates cement factories in Java and Aceh with a total capacity of 14.8 million tons of cement per year, and has strong demands for RDF as part of its Corporate Social Responsibility commitments to substitute coal with alternative fuels. The cement factory in Cilacap absorbs approximately 160 tons of waste per day. In addition, the sale of RDF to SBI generates around IDR 80 million per month in additional local revenue, which is sufficient to cover operating costs.

Annex 4: Environmental and Social

Environmental and Social Management Planning Framework

1. The ESMPF has been prepared to guide the subsequent preparation of the ESIAs, ESMPs which includes a Resettlement Planning Framework (RPF) for the selected subprojects. Its main function is to provide guidance, procedures for managing E&S risks and impacts of the Project. Consultations with the client and local governments had been undertaken in finalizing the ESMPF and to incorporate best practices of the country system such as the application of Notes of Agreement (Nota Kesepakatan, NOKES) between the MPW and participating local governments which includes environmental and social requirements for landfill operation and the application of the Ministry of Public Works Decree No. 3/2013, which provides detailed guidelines for determining the acceptable risk level of landfill rehabilitation projects. The ESMPF had been consulted in country in February, March and April 2025.

2. Three ESIAs for Temanggung, Tasikmalaya and Rembang (including ESMPs, Land Acquisition Audit Reports (LAARs) Social Management Plans (SMPs), Gender Action Plan (GAP) and Stakeholder Engagement Plans (SEPs) were finalized and re-disclosed after stakeholder consultation on July 22, 2025. ESIAs for Aceh and Jepara are in the finalization process while those for the remaining subprojects are under preparation (scoping visit and baseline survey). Generic key environmental and social risks, impacts, and mitigation measures identified in the finalized ESIAs are summarized below.

Environmental Aspects

3. Overall, these subprojects are expected to generate positive environmental and social outcomes from the ISWTFs, reducing the waste load on the environment. Approximately, 11 million residents in participating cities are expected to benefit from increased access to improved SWM services, better environmental, social, and health conditions, improved working conditions for sanitation workers, and enhanced livelihood opportunities in the waste management sector. However, the implementation of physical Investments may also generate a range of environmental and human health risks during the construction and operation phases.

4. Construction activities will involve the mobilization and operation of heavy equipment, site preparation for ISWTFs, and the construction of hangars, transfer stations, operational roads and rehabilitation and rearrangement of the existing landfills. Key potential environmental impacts during the construction stage include:

(i) Air quality impacts. Vehicles and equipment such as excavators, bulldozers, cranes, generators, and trucks used for platform leveling and excavation are likely to raise dust levels and particulate matter, reducing visibility and releasing pollutants such as NOx, SO_2, and CO. With properly maintained equipment, standard operating procedures and an appropriate work schedule, air pollution is expected to be insignificant. Residentials are relatively far from the construction site. Dust can be managed through measures such as ground watering, natural vegetation barriers and PPE for construction workers.
(ii) Noise and vibration impacts. Movement of vehicles and heavy equipment will increase noise levels and vibrations. Without proper controls, high noise may cause discomfort and hearing loss for construction workers, landfill staff, surrounding communities, and nearby fauna. Mitigation includes the use of well-maintained machinery, sound barriers, proper scheduling, and provision of earplugs or earmuffs.

(iii) Soil contamination. Excavation and earthmoving may result in leaks of hazardous materials (oil, grease, chemicals, etc.) from heavy equipment. Potential contamination will be addressed through controlled drainage, training, spill response protocols, and site revegetation.
(iv) Runoff, soil erosion, and water quality. Clearing, earthworks, and infrastructure development may increase surface runoff, leading to sedimentation and pollution of nearby water bodies. However, the scale of the work is small and within the existing landfill site. These impacts will be mitigated through appropriate drainage and erosion control measures.
(v) Loss of habitat and species. Land clearing will reduce habitat for flora and fauna in the subproject areas. However, none of the sites are located in Key Biodiversity Areas (KBAs) or Protected Areas mostly they are in the existing landfill site in the peri-urban area.

5. These risks and mitigation measures are assessed in the ESIA/ESMPs for Rembang, Temanggung, and Tasikmalaya. Similar assessments and mitigation will be carried out for the remaining seven subprojects currently under preparation, with residual impacts managed through ESMP implementation.

6. During the operational phase, potential environmental impacts include:

(i) Air quality impacts. Waste decomposition in landfills first occurs aerobically, producing CO_2 and water. As oxygen is depleted, anaerobic conditions develop, generating gases such as hydrogen sulfide and ammonia. These gases may continue to be emitted even after closure. A landfill gas control system will be installed to mitigate emissions.
(ii) Soil contamination**.** Risks include poorly managed leachate, accidental waste spillage, and leakage of fuel or lubricants. These will be managed through housekeeping measures, proper drainage, landfill cover, and effective LTP operation.
(iii) Water quality impacts. Surface and groundwater may be polluted by landfill leachate if LTPs are not functioning properly. Regular quarterly water quality monitoring and ongoing LTP maintenance will mitigate these risks.
(iv) Waste management impacts. Operational activities will generate various types of wastes, including rejected and recyclable materials, surplus construction inputs, and domestic waste from RDF facilities. These wastes may be mixed with hazardous materials. Inert and hazardous wastes will therefore be segregated and disposed of in designated landfills by certified contractors as per GoI regulations.

7. Impacts during the operation stage—including potential environmental impacts from off-takers and the means to control or influence them—are assessed in the ESIAs/ESMPs of the three subprojects. Mitigation measures have been proposed accordingly. Similar assessments will be carried out for the remaining subprojects, with appropriate budget provisions included.

8. The new facilities are proposed to be constructed and operated within existing landfill sites in the selected areas, which are located away from sensitive environmental receptors. All project sites have been visited during preparation by the AIIB team, the client and ESC consultants as part of the ESIA studies. These visits covered existing environmental and social issues, additional infrastructure and facilities require and design modifications.

9. Potential adverse impacts will be minimized or mitigated by adopting state-of-the-art technologies, sound engineering design, and site-specific construction, operation, and maintenance measures consistent with good international practice. During the pre-appraisal mission, detailed actions for improvement were agreed with the client for the first batch of

subprojects (Rembang, Temanggung, and Tasikmalaya). These actions have been incorporated into the ESIAs and DEDs.

Social Aspect

10. Key social issues during Project implementation include the potential economic displacement of waste pickers (organized, informal, and seasonal) and possible land acquisition for constructing or improving access roads and temporary disposal facilities. Many of the waste pickers in the first three sites are women and other vulnerable groups, including children and the elderly, who are currently engaged in waste collection, sorting, and disposal of materials such as Polyethylene Terephthalate (PET), plastics, aluminum, and others from the landfill. In particular, the Project may cause the loss or reduction of existing livelihoods of waste collectors, waste pickers, and informal recyclers who rely on revenue from landfills, as waste pickers will no longer be involved in the design and operation of the ISWTF. Continuous engagement with Project-affected people—receiving and incorporating their feedback and informing them about Project progress and opportunities, as well as potential adverse impacts—is reflected addressed in the Stakeholder Engagement Plan (SEP)). Mitigation measures for identified social risks and impacts are incorporated into the preparation of site-specific ESIAs and ESMPs, as well as site-specific Livelihood Restoration Plans (LRPs).

11. Gender equity and social inclusion will also be addressed in this Project. Given that many waste pickers are women who may be disproportionately affected during Project construction, their participation is recommended from design through implementation. The Project aims not only to provide employment for women but also to improve their working and living conditions. Recommendations for incorporation by the Government include: (a) provisions for women waste pickers to access benefits from the solid waste value chain; (b) support for business opportunities; (c) training opportunities based on the results of a Training Needs Assessment (TNA); and (d) increased access of women to employment and services in solid waste management. Entitlements for women will also be integrated, alongside measures to prevent gender-based violence (GBV), sexual harassment (SH), and sexual exploitation and abuse (SEA).

12. Potential risks of GBV and SH/SEA, particularly during Project construction due to the influx of migrant workers, will be incorporated into the Gender Action Plan (GAP). Key focus areas of the GAP include: addressing gender wage gaps and unsafe working conditions for female workers; preventing gender-based violence; protecting the livelihoods of women waste pickers and people with disabilities; mitigating exposure to toxic waste; improving environmental quality; preserving cultural practices; creating flexible work environments; promoting women's economic empowerment; utilizing the Project as an educational site; addressing odor complaints; implementing gender-responsive facility management; ensuring participatory monitoring and evaluation; and establishing inclusive grievance mechanisms for women and vulnerable groups.

Project Site	Nearest sensitive receptors	Offtakers	Associated facilities
Rembang	The project site is not within protected area Surface water and ground water is sensitive receptors; mitigation measures are proposed in ESMP including leachate treatment plant to avoid the	PT Semen Gresik Rembang, the planned offtakers complies with national regulations and holds several certifications, including the Green Label Certificate, ISO 14001:2015 for Environmental	The construction of the access road to the ISWTF is the responsibility of the local governments. The road, estimated to be 1.4 km in length, will be

	adverse impacts to these sensitive receptors Other than that agriculture land and residential area within 300 meters is sensitive receptors, ESMP includes mitigation measures to mitigate the impacts on these receptors	Management System, ISO 50001:2018 for Energy Management System, and ISO 45001:2018 for Occupational Health and Safety Management System. The revised ESIA will include the impact assessment and mitigation measures of offtakers	widened to accommodate two RDF trucks traveling side by side (6 metre), ensuring smoother and more efficient transportation to and from the facility. ESMP includes mitigation measures of associated facilities
Tasikmalaya	Rice fields, residential community within 300 meters and water stream, water bodies, soil etc	Sugar factory in Tasikmalaya will be the offtaker of RDF, the revised ESIA will assess and present mitigation measures for offtaker	The access road to ISWTF Nangkaleah is the responsibility of the local government. The access road is too narrow, having a width of 4m. LG will widen the access road to 5m. The E&S impacts of associated facilities are included in ESIA, and mitigation measures are proposed in ESMP
Temanggung	Cultural/heritage sites, agriculture land, residential area, ground water and surface water bodies, soil etc	The RDF product from the project will be supplied to multiple industrial partners. PT Solusi Bangun Indonesia, a cement company, will use the RDF as an alternative fuel for its cement Production. The revised ESIA will include E&S impacts and mitigation measures of offtakers	Access road to ISWTF is the responsibility of local government. This road is to access the temporary dumping site during construction. It is planned to be located west of the main gate of TPA. The revised ESIA will include further details of the access road and present E&S impacts and mitigation measures.

Client's and Local Government's (LG) commitment, capacity and resources

13. During the pre-appraisal mission, AIIB team visited TPA Sanggrahan (Temanggung), TPA Bandengan (Jepara), and TPA Landoh (Rembang) from 8–12 August 2024 and met with key stakeholders such as the Regency, Secretary of Regency, Head of Regional Planning Agency, Head of Public Works, Environmental Agency, staff from Regional Public Works offices, the Design Consultant, the potential off-takers and other relevant district official to discuss the Local Governments' (LGs) commitment, capacity and resources. From the Central Government, the mission was also participated by the Director of Multilateral Funding National Planning Agency (Bappenas), the Sanitation Directorate of the Ministry of Public Works, the Directorate of Loans and Grants (Ministry of Finance), and the Directorate of Synchronization of Local Government Affairs (Ministry of Home Affairs). The presence of senior officials from

the Central Government, CPMU, and district governments led to several key strategic decisions on E&S mitigation measures at the subproject level, including the signing of MoUs with off-takers, allocation of budgets by local governments for landfill O&M, commitments to safeguard waste pickers' livelihoods, and provision of proper temporary disposal areas during construction.

14. During site visits, important information related to E&S aspects were obtained such as the local government capacity and resources to undertake environmental monitoring (TCLP test, water, soil and air quality), the pictures of the construction of the geo-membrane for the landfill in Jepara, Temanggung in 2009 and 2012 and its leachate treatment plant. This provides an indication that there are locally available resources and experience in landfill construction. Both institutional and technical capacity are present locally.

Annex 5: Gender Equality and Social Inclusion

1. To address project risks and strengthen benefits to women and vulnerable populations, gender and social inclusion considerations are integrated into the subproject Environmental and Social Impact Assessments (ESIAs) and associated Project management instruments.

2. Where ESIAs have been completed (i.e., Tasikmalaya, Rembang and Temanggung), the analysis of the legal and policy frameworks and gender equality commitments indicates a strong basis for gender equality and justice[51], particularly through planning and budgeting processes. However, unlike formal waste collectors in Indonesia (97 percent men/ 3 percent women)[52], who are protected under state policies, informal waste pickers – or *scavengers*– perform precarious work under unsafe occupational conditions. Project efforts to support their transition into formal systems require careful consideration of both risks and potential benefits.

3. **Sub-Project ESIA findings.** Baseline assessments, stakeholder consultations, and census data indicate that in existing subproject locations, women make up the majority of the informal scavenger workforce (approximately 60-70 percent). For most, landfill scavenging is the primary livelihood, and women experience disproportionate disadvantages linked to their gender. Findings show that women scavengers face overlapping conditions and responsibilities that exacerbate time poverty and deepen gender inequality. Compared to men scavengers, women scavengers are:

(i) Present in greater numbers at the base of the recycling and waste management chain, with limited opportunities for upward mobility. Male-headed scavenging households earn a higher average income (IDR 1,196,348 per month) compared to female-headed households.
(ii) Primarily responsible for waste management in their homes and communities, in addition to care work. Women scavengers must balance landfill work with household chores such as cooking, cleaning, laundry. On average, they spend 8.02 hours scavenging per day and 15.98 hours per week on household duties.
(iii) Facing additional gendered barriers to finance
(iv) Experiencing unsafe working conditions and other negative health impacts, including risks of sexual exploitation and harassment (SE/SH)
(v) At greater risk of harm from relocation of stalls due to land preparation and construction activities

4. These risks intersect with, and are exacerbated by, age, disability, and other vulnerabilities.

5. Based on the sub-project ESIA's identification of vulnerable groups and analysis of the cultural, economic, and legal factors that influence experiences of women and vulnerable populations, a comprehensive approach was developed to foster a more equitable environment. This approach seeks to advance women's rights and participation across all areas of society, thereby supporting sustainable development in the project locations.

6. Subproject Gender Action Plans (GAPs) were developed for locations where ESIAs are complete. These GAPs align with the gender approach and priorities of the local Governments, including the Rembang District Regional Regulation No.5/2022 on Gender

[51] For example, the PPRG (Gender Responsive Planning and Budgeting) in Temanggung has been nominated for the Anugerah Parahita Ekapraya (APE) award for its commitment to gender mainstreaming.
[52] Ocean Conservancy. 2019. The role of gender in waste management: Gender perspectives on waste in India, Indonesia, the Philippines and Viet Nam. Singapore: GA Circular. Available at https://oceanconservancy.org/wp-content/uploads/2019/06/The-Role-of-Gender-in-Waste-Management.pdf

Mainstreaming (PUG) and the Grand Design of Gender Mainstreaming in Temanggung. Recognizing the precarity faced by informal women scavengers and vulnerable groups, the GAPs include the following measures:

(i) Protect the livelihoods of women waste pickers and other affected persons, including disabled individuals, by ensuring livelihood restoration plans specifically target women, elderly, and vulnerable scavengers, adopt gender-sensitive and inclusive approaches, and ensure compensation mechanisms consider the vulnerability of these groups
(ii) Mitigate exposure of women to health risks by providing access to special health services for working women, routine health checks for exposure to chemicals, and reproductive health consultation services
(iii) Improve air, water, and environmental quality to protect women and communities near the plant and landfill sites
(iv) Preserve traditional ceremonies and other cultural practices/sites significant to women
(v) Create a flexible work environment for women scavengers, accommodating their household chores and additional labor roles, by providing adjusted compensation based on their caretaking responsibilities
(vi) Promote women's economic empowerment to strengthen overall economic growth and stability through technical and non-technical training related to waste management, RDF technology, and recycling
(vii) Address barriers to women entrepreneurs by building capacity through entrepreneurship training, supporting small women-owned or women-led businesses (e.g., junk shops, kiosks), and facilitating access to microcredit for small business diversification
(viii) Implement gender-responsive facility management and design to accommodate different gendered needs
(ix) Socialize the development plan for the waste facilities with community involvement, with targeted outreach to women and vulnerable populations
(x) Address gender wage gaps, lack of social security, and unsafe working conditions for female workers (e.g., occupational safety audits, provision of PPE suited for women, and training specific to female workers)
(xi) Prevent gender-based violence and sexual exploitation, including by formulating anti-GBV and SE/SH policies with strict sanctions, ensuring these are well socialized to all workers, and conducting regular training
(xii) Ensure participatory monitoring and evaluation with a focus on women's perspectives
(xiii) Establish an inclusive and accessible complaint mechanism for women and vulnerable groups

7. Additional management and monitoring measures:

(i) Conduct socio-economic baselines to understand scavenger conditions and estimate the impact of construction activities and landfill temporary relocation on their livelihoods
(ii) Develop livelihood restoration programs for scavengers whose livelihoods are significantly affected
(iii) Monitor income levels by tracking changes in scavenger income pre- and post-relocation/construction and providing assistance to those most affected
(iv) Ensure transparent communication by regularly informing scavengers about project plans, upcoming changes, and available support through consultations and meetings
(v) Review community grievances related to project activities and maintain a grievance redress mechanism

8. Each measure is accompanied by proposed tracking indicators and designated responsible parties, including NGOs, local governments, health clinics, contractors, and others.

9. As additional subproject locations are finalized in terms of detailed design and supporting facilities, further ESIAs and Gender Action Plans (GAPs) will be developed under the Environmental and Social Management Planning Framework.

Annex 6: Member and Sector Context

A. Member Context

1. Indonesia, the world's fourth most populous nation and 10th largest economy by purchasing power parity, has experienced impressive economic growth since the late 1990s. Despite an average GDP growth rate of 5% per year over the past decade, the country still grapples with income inequality and corruption. The labor market is dominated by a large informal sector, accounting for nearly 60% of total employment. [53] Although the unemployment rate is relatively low at around 5%, unemployment and low wages remain significant issues. The government has implemented various programs to improve labor market conditions, such as vocational training and job placement services.

2. Significant progress has been made in reducing poverty, with the poverty rate dropping from 24% in 1999 to around 9% in 2024. This success is largely attributed to government poverty alleviation programs, including conditional cash transfers, subsidized healthcare, and rural development projects. However, approximately 26 million Indonesians still live below the poverty line, indicating the need for continued efforts. Infrastructure development has been a key priority to support economic growth and improve living standards, with several ambitious projects launched, including new airports, seaports, roads, and power plants. Despite these efforts, infrastructure gaps persist, particularly in remote and rural areas.

3. The government has allocated about 3% of GDP for infrastructure development, targeting economic recovery, provision of basic services, and improved connectivity. The 2020-2024 Medium-Term National Development Plan (RPJMN) and the 2022 Regulation of the coordinating minister for Economic Affairs include 200 pipeline projects in the National Strategic Project, with a total investment value of IDR 5,481 trillion (USD 365 billion). The Indonesia Investment Authority (INA), the newly established sovereign wealth fund, aims to promote sustainable infrastructure investments. Further investments are necessary to realize Indonesia's growth ambitions, with reforms needed to attract private capital and close the financing gap.

4. Indonesia is undergoing rapid urbanization, which will significantly shape its economic prospects and place heavy pressure on basic services and infrastructure. The urban population has been increasing at an annual pace of about 2%, reaching 163 million people or 59% of the total population in 2023.[54] By 2045, approximately 220 million people, or more than 70% of the population, will be urban.[55] Urban poverty remains a challenge, with around 10 million poor people living in urban areas.[56] Infrastructure gaps, particularly in solid waste management, sewerage systems, and other basic services, hinder urban development and economic growth.

5. Solid waste management is critical for Indonesia's rapidly developing economy, especially in relation to tourism. The government has set aggressive objectives to increase tourism's role in the economy, but inadequate solid waste management infrastructure

[53] Source: World Bank Indonesia Economic Monitor Indonesia Economy Projected to Remain Resilient (worldbank.org)
[54] Source: World Bank World Development Indicators Indonesia | Data (worldbank.org)
[55] Source: Augment, Connect, Target: Realizing Indonesia's Urban Potential (worldbank.org)
[56] Source: World Bank (2013): Urban Poverty and Program Review, Policy Note

threatens to undermine these efforts. [57] Uncollected waste leads to air pollution, health issues, and decreased property values, affecting economic growth and the well-being of the population. Addressing these challenges requires targeted infrastructure investments and policy reforms to support sustainable development and improve living standards.

B. Sector Context

1. Indonesia has made ambitious commitments to improve solid waste management, including the RPJMN 2025-2029 targets of achieving 85% household waste collection coverage, 38% waste processing, and reducing residual waste disposal to landfill to 47%, as well as the national commitment to reduce marine plastic leakage by 70% by 2029. Despite these commitments, national waste management statistics show that waste reduction at source has reached only around 13.6%, and just 48.8% of total waste is properly managed.

2. The majority of Indonesia's landfills are classified as "open dumping" sites, with none meeting the "controlled or sanitary" standards mandated by law. Open dumping is prevalent across cities of all sizes, and finding new disposal sites is increasingly challenging due to land shortages. Waste reduction and recycling efforts are also lagging, with limited financial support and modest results from initiatives like the Waste Bank program. The decentralization reforms have transferred responsibility for waste management to local governments, but inconsistencies in regulations and insufficient funding hinder progress.

3. Local governments allocate an average of 0.5% of their budgets to solid waste management, far below the required 5% to provide adequate services. [58] The current tariff system is complex and fails to cover operational costs, leading to heavy subsidies and poor revenue generation. Even when operational financing is sufficient, outcomes are lacking due to deficits in infrastructure investments and technical capacity. The private sector is willing to partner with public institutions but concerns about governance and financial management limit their involvement.

4. National government agencies play a critical advisory and regulatory role, with the MPW providing technical advice and the MOE developing policies and coordinating pollution control efforts. However, performance varies significantly between cities, with some achieving high collection rates while others report rates below 30%. To achieve the RPJMN's goal of 100% sanitation coverage, MPW estimates that approximately USD5 billion in new investments will be needed over the next four years, highlighting a significant financing gap.

5. To address these challenges, Indonesia needs to increase investment in solid waste management infrastructure, improve regulatory frameworks, and enhance technical capacity at the local level. Encouraging private sector participation through better governance and financial management practices is essential. Achieving the ambitious targets set by the government will require coordinated efforts from national and local authorities, substantial financial resources, and a commitment to sustainable waste management practices.

[57] Source: Stemming the Plastics Tide in Indonesia: Policy, Investments, and Research (worldbank.org)
[58] Source: https://documents1.worldbank.org/curated/en/608321575860426737/pdf/Indonesia-Improvement-of-Solid-Waste-Management-to-Support-Regional-and-Metropolitan-Cities-Project.pdf

Annex 7: Country Credit Fact Sheet

Recent Economic Developments

1. **Recent Economic Developments.** Indonesia is an upper middle-income country with a GDP per capita of around USD 4,900 and a population of 277 million. Country's economic resilience is rooted in over two decades of prudent macroeconomic management, contributing to robust growth, poverty reduction, and economic inclusion.

2. In 2023, Indonesia's economy grew by 5.0 percent, driven by resilient private consumption and investment. The positive momentum continued into 2024, with a similar growth rate, supported by strong public consumption and investment, offsetting weaker exports. Following a post-pandemic increase to over 5 percent in 2022, inflation has been brought under control, and stands at 2.3 percent as of August 2025; within the central bank's target range of 1.5–3.5 percent.

3. Fiscal policy has been prudent, guided by a fiscal rule, consisting of a 3 percent of GDP deficit ceiling and a 60 percent of GDP public debt ceiling. In the past few years, fiscal deficits have been moderate, around 2 percent of GDP. The good performance reflected strong revenues, thanks to the new tax reform bill, higher VAT collection, and trade-related taxes, boosted by higher global commodity prices. Public debt stands at around 40 percent of GDP, stable and well below the ceiling.

4. The current account shifted from a surplus of 1 percent of GDP in 2022 to small deficits, driven by lower commodity prices and weaker growth in major trading partners, but remains manageable. The exchange has been stable generally stable. The external debt is low and stable, at around 30 percent of GDP. Foreign reserves, around USD 150 billion, as of August 2025, cover around 5 months of imports, which is adequate, according to the IMF.

5. In August 2025, Indonesia witnessed civil unrest, which affected confidence and resulted in some depreciation of the currency. The government responded with commitments towards more fiscal spending to support growth.

Key Economic Indicators	2022	2023	2024	2025*	2026*	2027*
GDP growth 1/	5.3	5.0	5.0	4.8	4.8	4.9
Inflation (e.o.p.) 1/	5.4	2.8	1.6	2.2	2.3	2.5
Fiscal balance 2/	-2.3	-1.9	-2.3	-2.6	-2.6	-2.5
Public debt 2/	40.1	39.6	40.2	41.0	41.0	41.0
Public gross financing needs 2/	4.4	4.5	5.3	5.9	5.5	5.2
Current account balance	1.0	-0.1	-0.6	-1.5	-1.6	-1.4
External debt	30.1	29.8	29.4	28.3	27.5	26.6
Gross external financing need	3.5	5.0	5.8	6.1	6.2	6.2
FX reserves (months of imports)	137.2	146.4	155.7	150.7	..	..
Exchange rate (IDR/USD, e.o.p.)	15.592	15,439	16,157	16,578	..	..

Source: IMF WEO Apr/Jul 2025, report 24/270; in percent of GDP, unless indicated otherwise; *=projections; e.o.p.=end-of-period
Notes: 1/ percent change year-on-year; 2/ general government; 3/ most recent data from central bank, as of Sep 19, 2025.

6. **Economic Outlook and Risks.** Growth is projected to moderate slightly, to 4.8 percent in 2025 and 2026, amid heightened global uncertainty, including trade shocks and rising protectionism. This slowdown presents a challenge to the government's recent growth target of 5.4 percent for 2026. Growth is expected to remain driven primarily by domestic demand, supported by increased social spending, while external demand remains weak. Inflation is expected to remain well-anchored, and within the central bank's target range, as recent pressures from food and tobacco due to El Nino have eased.

7. The fiscal stance is expected to remain pro-growth and pro-social, reflecting the new administration's priorities, including the free nutritious meal program, school infrastructure upgrades, and enhanced food security measures. This is expected to moderately widen the fiscal deficit to 2.6 percent of GDP in 2025 and 2026, but still below the statutory ceiling of 3 percent, as some efficiency measures to reduce expenditures are put in place.
Similarly, the current account deficit is expected to remain manageable, even though it is likely to widen slightly, to around 1.5 percent of GDP in 2025 and 2026, with resilient domestic fueling imports and exports subdued by a weaker global demand and escalating trade tensions.

8. According to the IMF, Indonesia is at a low overall risk of sovereign stress and public debt, projected to remain stable at around 41 percent, is sustainable. Public financing needs are manageable. Indonesia has a good track record of prudent economic management, as reflected in generally low fiscal deficits, stable inflation and an investment grade rating—BBB/Baa2 with a stable outlook—from all three major rating agencies. Risks are somewhat tilted to the downside. Externally, geopolitical uncertainties, which may disrupt global supply chains and increase trade costs. Domestically, unresolved social tensions, while unlikely to undermine political stability in the near term, complicate the outlook and affect policymaking and business confidence going forward.