

**INDONESIA - IMPROVEMENT OF SOLID WASTE MANAGEMENT
TO SUPPORT REGIONAL AND METROPOLITAN CITIES
(P157245)**

**CONSOLIDATED SUMMARY OF
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND
ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)**

February 2018

**GOVERNMENT OF THE REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS AND HOUSINGS
DIRECTORATE GENERAL OF HUMAN SETTLEMENT**

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Indonesia Solid Waste Management Program

Consolidated Summary ESMF and city ESIA

January 2018

1. Introduction

This document presents a consolidated executive summary of the Environmental and Social Management Framework (ESMF) for the project entitled Indonesia: Improvement of Solid Waste Management to Support Regional and Metropolitan Cities. It includes summary of the key environmental and social issues, risk and impact mitigation approaches, and related considerations for this project which is country-wide in its application. An overview of the city (sub-project) level impact assessment and management plans specific to two cities prepared for the investment activities is provided – Makassar (Tamangapa landfill) and Padang (Aie Dingin landfill). This consolidated executive summary may be read in conjunction with, or in reference to, the full ESMF and the Environmental and Social Impact Assessments prepared for investments as sub-projects in Makassar and Padang cities.

1.1 Brief project description

The Improvement of Solid Waste Management to Support Regional and Metropolitan Cities (ISWMP) is to support the implementation of the government's national program to improve solid waste management services for selected urban populations across Indonesia. The program will extend support for up to 50 cities/districts across Indonesia, to strengthen solid waste management planning and systems. The project is designed around four components:

- Component 1: Institutional and Policy Development (US\$5 million Total Budget; US\$3 million IBRD).
- Component 2: Integrated Planning Support and Capacity Building for Local Government and Communities (US\$56 million Total Budget; US\$39 million IBRD).
- Component 3: Solid Waste Infrastructure in Selected Cities (US\$1,016 million Total Budget; US\$45 million IBRD).
- Component 4: Implementation Support and Technical Assistance (US\$15 million Total Budget; US\$ 13 million IBRD).

Additional capital investment in solid waste management infrastructure will be available for cities that meet readiness criteria, including preparation of safeguards for the bio-physical and social environment. ISWMP sub-projects will be located throughout Indonesia, with the higher-impact activities under Component 3 likely in Java, Kalimantan, Sulawesi and Sumatera islands initially, and later foreseeably also in NTT, NTB and possibly Maluku, Papua or West Papua. Two city sub-projects to rehabilitate landfills have been prepared in advance of loan agreement – Padang (West Sumatra) and Makassar (South Sulawesi), however most will be identified during project implementation. As such, a framework approach will be applied to prepare for social and environmental impact management.

The ISWMP will be implemented through a Central Project Management Unit (CPMU) in Directorate General of Human Settlement (DG Cipta Karya) and city governments' Project Implementation Units linked to the Environment Agency.

1.2 Overview of screening and safeguard category

This project has been defined as Category A project because of the potentially significant environmental impacts on air, soil, water, and public health, and due to social impacts associated with wastepickers and livestock.

The initial screening of cities, and the Environmental and Social Impact Assessments for certain cities, reflect the GoI Laws and regulations, and the WB's Operation policy and Procedures (WB OP/BP 4.01).

Initial screening for sub-projects under ISWMP has reviewed the status of solid waste management in 46 cities/districts, outlined the likely activities and the impacts that are generally associated with such activities. This has determined that almost all of the sub-projects within ISWMP will require UKL-UPL (partial EA) or AMDAL (Full EA), as there is a moderate to high potential for significant environmental and social impacts as a result of activities under Component 3 which entails sub-projects investing in infrastructure and landfill rehabilitation, whereas for other components there are no or only negligible potential impacts. ESIA and ESMPs (Environmental and Social Management Plans) have been prepared for Padang and Makassar landfill rehabilitation sub-projects that will be implemented in the first year.

When UKL-UPL or AMDAL are prepared, detailed information on impacts and the mitigations planned for both environmental and social aspects are required, along with consultation with the affected peoples, in accordance with OP 4.01. Additional studies and analyzes, as well as consultation, may also be required in order to meet Bank environmental and social safeguard policy requirements, for example to update information and management plans where a site's AMDAL/RKL and consultation process were incomplete. At the sub-project level, additional policies may apply. In all cases, effort to minimize impacts and to create social value through the design of the project are required.

1.3 Overview of environmental and social baseline conditions

Poor waste collection, handling and treatment systems mean that the landscape within cities and beyond city borders throughout Indonesia are increasingly polluted with waste from various sources. According to the Ministry of Environment's 2014 analysis, 57% of metropolitan city landfills (TPAs) are predominately considered "controlled" with the remaining 43% of landfills considered "open dumping" sites (none are "sanitary" as mandated by law). Across all other city sizes, open dumping is still the normal paradigm despite its illegality. Open dumping is reported for 86% of large cities, 70% of medium cities, and 88% of small cities. In reality, almost 100% of waste in Indonesia ends up in non-sanitary facilities, where ground and surface water become highly polluted, air quality is affected due to dust, and odor and gas emissions are mismanaged.

Many existing landfill sites are in catchments that are also prone to severe erosion because of steep slopes and soil structure. The landfills have been established for many years, often decades, and have become central to some local economies and human settlements. The downstream areas of the sites are often under cultivation and local small industries such as livestock feed are associated with the sites. While they are not located in forest areas, there may be downstream or adjacent protected forests or reserves, including marine reserves.

The typical sites are in peri-urban areas, populated with mixed industry and rural land users, often dominated in the immediate vicinity by informal recycling businesses of various scales. The sites are also generally used by waste pickers, and in many cases, by livestock such as cows and goats, grazing for food inside the dumping areas. From the available maps, data from the Ministry of Social Welfare and the World Bank on locations of Indigenous Peoples, it is possible that there are indigenous peoples living in the vicinity of the cities/districts where ISWMP project activities will be implemented.

1.4 Overview of potential environmental and social impacts

Most of the sub-projects are expected to involve redesign and refurbishment of existing landfills, and will thus take place within the legal and physical footprint of the existing solid waste facilities (landfills) in the selected areas, and will bear many positive environmental impacts including improved air, water, soil quality and vector management. Key environmental risks relate to landfill refurbishment and new investments under Component 3, with activities such as: (i) upgrading existing sanitary landfills through rehabilitation of leachate treatment systems and waste treatment plants (e.g. mechanical biological treatment (MBT) facilities) and (ii) excavations of old waste and construction of new sanitary cells, including the installation of landfill gas collection. If not properly managed, these construction activities pose risk to air, land, and water (surface and ground) pollution as potentially harmful substances are moved around and released. This is an especially pertinent risk as most of these landfill sites have years of accumulated pollutants. Environmental risks will also arise during the operations and maintenance stages of program investments, if local capacity building is unsuccessful or local governments do not allocate the required operational funds for satisfactory safeguard management.

While many of the sub-projects are associated with upgrading and remedial and rehabilitation of existing sites, there may be a requirement for additional or expanded facilities which require additional land, but would not significantly alter existing land use patterns. A small number of sub-projects may be implemented on land that has been acquired for the project purposes, but where resettlement is still being carried out by the local government.

Economic displacement is the most consistent social impact across all sub-projects. While the changes in collection services are expected to accommodate local people who work in waste collection, and bring positive impacts at a broader community level, the changes in operation at the reformed or new landfills will have potential adverse economic effects on local community enterprises and livelihoods of waste pickers and livestock owners.

1.5 Summary of key impact mitigation preparations

The ESMF specifies the appropriate roles and responsibility and outline the necessary reporting procedures for managing and monitoring environmental and social concerns related to the project-supported activities. It is also the basis of the project funding required to implement the ESMF requirements. The ESMF requires each city/district through its Project Implementation Unit (PIU) to appoint safeguards specialists and environmental and social focal points to ensure implementation and monitoring of commitments including screening of sub-projects, assessments of impacts (AMDAL, UKL-UPL), consultations with affected people and wider stakeholders, and where necessary, additional studies, surveys and processes of consultation and follow-up, including preparation of documented plans for example related to land acquisition, resettlement, with provision of compensation and other assistance.

A Land Acquisition and Resettlement Policy Framework (LARPF) has been prepared to give more flexibility during ISWMP project implementation, as some proposed activities may require additional land, temporarily or permanently. Where land is not acquired, social and economic impacts are to be addressed through the UKL-UPL, AMDAL/RKL-RPL¹ and/or site-specific Social Management Plans. Sub-projects for landfill rehabilitation in Makassar and Padang have prepared ESIA, which includes detailed ESMPs. For key impacts relating to waste pickers, in-principle agreements for re-oriented employment within the landfill context, and for alternative livelihood training have been established. In relation to livestock, in-principle agreements to manage this impact include establishing grazing zones within non-active parts of the landfill and feed lots outside the landfill areas.

Despite the fact that the proposed existing landfill site or proposed new landfill are not located in a recorded sensitive cultural heritage zones, as a preventive measure, it is recommended that the Tourism Agency (*Dinas Pariwisata*) be informed about the project and that the process described in the relevant section of the ESMF be followed for chance find procedure.

An Indigenous Peoples Planning Framework (IPPF) has also been prepared to provide cities with guidance on preparing Indigenous Peoples Plans for sub-projects where indigenous people are identified during the screening process or subsequently.

1.6 Summary of consultation and disclosure

The draft ESMF was presented to national-level stakeholders, NGO as well as representatives from the regions where the sub-projects would be implemented, at a consultative workshop that was conducted at the Grand Kemang Hotel, South Jakarta, in May 16, 2017; and at Public Works Ministry in South Jakarta in October 27, 2017. Participants at the workshop were presented with draft ESMF in the Bahasa Indonesian language, a presentation and facilitated discussion with question and answer session involving environmental and social experts from the government team and from the World Bank or consultants. In addition, the ESIA and ESMPs for sites under preparation for first-year investments have involved 2 rounds of public consultation and have been disclosed specifically at the city level (Padang and Makassar). The consultations for ISWMP build on those held in each city, carried out in context of the AMDAL (ESIA) for sub-projects.

At each consultation there was broad support for the project objectives and approach; at the central level questions related to implementation arrangements and specifically to the mechanisms for grants/funding to cities, whereas at the city level questions and comments related mostly to the relationship between the project and waste-to-energy proposals, and to the options for waste pickers and livestock owners.

The ESMF has been disclosed on the Ministry of Public Works website and through the World Bank's external website; ESIA including ESMP for the cities have been provided at the landfill sites and in relevant government offices as well as the World Bank's external website.

¹ RKL/RPL is part of AMDAL documents and contain environmental and social management plans (RKL) and environmental and social monitoring plans (RPL).

1.7 Summary of project Grievance Redress preparation

As part of the ISWMP ESMF a project-level Grievance Mechanism has been established, with appointed personnel and contact details for public access to the Central Project Implementation Unit and World Bank. In addition, for each sub-project there is a tailored mechanism involving the head of landfill and head of local environment or cleanliness agency as responsible for grievance handling. Public information on the grievance handling process for each site is posted at the landfill and the local environment or cleanliness office.

2. Summary of sub-project ESIA's – Padang (West Sumatra)

At the Padang city landfill, Aie Dingin, the main priorities of the World Bank sponsored project are to rehabilitate and upgrade the site to reduce the environmental, social, and public health impacts and to conform with the GoI and WB international sanitary landfill standards, and to create additional space/operating life through construction of new cells and Intermediate Treatment Facilities creating additional operating capacity to serve the City and surrounding areas for at least ten to twenty more years (depending on the operational regime).

In order to achieve this, the project will support preparation of the following works:

- Support to capacity building and training of local government landfill operation unit, and/or establishment of Government Public Service Agency (BLUD). Including O&M planning and budgeting support and training;
- Reshaping of existing waste mass in order to maximize disposal efficiency within available area and extend the landfill life. Also to stabilize landfill slopes and prevent failures resulting in infrastructure damage and potential loss of life;
- Capping and closing of existing full waste cells in order to minimize rainfall infiltration to the waste mass, and thus minimize leachate generation, minimize odor and flyblown waste, minimize rodents, flies and other disease vectors, and facilitate gas capture which can then be extracted through a piped system for flaring or WtE power generation;
- Construction of new lined landfill cells to conform to GoI and WB sanitary landfill design standards. Construction will include provision of stockpile material (soil) for daily/intermediate cover, and provision of a gravel bed and piped leachate collection and transfer system;
- Construction of a new leachate treatment system (LTP) utilizing appropriate, robust, design measures that minimize operating costs and potential for breakdown/failure of expensive/sensitive equipment, and maximize leachate treatment and discharge water quality to conform with GoI wastewater discharge standards and WB international guidelines and best practice.
- Rehabilitation and upgrading of associated site infrastructure, including internal access roads drains, management and operation buildings, Heavy Equipment (HE), and HE workshop, site fencing, guard posts, weighbridge, sorting station, internal site power, water and sanitation systems; and
- An Intermediate Treatment Facility (ITF), which will include site preparation to allow for follow-on development, under a separate project intervention, for waste reduction and/or waste to energy facilities.

2.1 Summary of Environmental and Social Baseline

There is a comprehensive environmental and social baseline based on a desk study of existing baseline data on Aie Dingin landfill, including:

- Aie Dingin Landfill Environmental Laboratory Analysis 2017;
- Aie Dingin Landfill Detailed Engineering Design Review 2015;
- Padang City Solid Waste Management Master Plan;
- West Sumatera Province Regional Environmental Status (*Status Lingkungan Hidup Daerah/SLHD*) 2015;
- Padang City Sanitation Strategy Update (*Pemutakhiran Strategi Sanitasi Kota*) 2016-2020;
- Padang City in Figures (*Kota Padang Dalam Angka*) 2014 – 2017;
- Padang City in Figures (*Kota Padang Dalam Angka*) 2016-2017
- Koto Tangah Sub-district in Figures (*Kecamatan Koto Tangah Dalam Angka*) 2015
- West Sumatera Regional Environmental Status (*Status Lingkungan Hidup Daerah Sumatera Barat*) 2014-2015
- Monitoring by Padang City Environmental Agency (*Dinas Lingkungan Hidup Kota Padang*).
- Socio-economic survey of waste pickers and non-waste pickers residing nearby Aie Dingin Landfill

In addition to the desk studies, the ESIA project team conducted a series of walk-over site investigations, Social surveys, public consultations, and interviews with project stakeholders.

The environmental and social baseline includes summary and analysis of provincial and site specific data for; climate, airquality, noise, Greenhouse Gas (GHG) emissions, geomorphology, geology, site topography, seismicity, soils, water (surface and ground) quality, waste water (leachate) quality, biodiversity, deomographics and socio-economics.

The social safeguard screening study was conducted with three methods: (a) desktop study, to explore a demographic profile of the study area by utilizing secondary sources; (b) household survey, to profiling the waste pickers, waste buyers, livestock owners who rely their economic sources on the landfill, as well as non-dependent households residing around the landfill site; (c) interviews with key stakeholders from government agencies and community leaders. Household surveys were conducted using a questionnaire covering several aspects such as socio-economic condition, access to education, health and markets, and their perception about the landfill rehabilitation project plan. Interviews with stakeholders are conducted to gain an overview of the socio-economic and socio-cultural conditions of potential affected people, perceptions of project plans and grievance mechanisms.

The scope or boundary of social baseline is defined by the proximity of settlement to the landfill, where the Aie Dingin landfill is closest to Balai Gadang Village administratively as well as geographically. The initial planned solid waste management project will affect the lives of communities residing in the vicinity of that landfill, especially those families depending economically on waste utilization (recycling and primary processing). The most significant groups affected are waste pickers, waste buyers and livestock owners who feed their livestock from organic waste on the landfill. In addition, the proposed project also has the potential to impact the surrounding population, resulting from the operational of dump trucks transporting garbage to the landfill, water sources and other environmental impacts.

Public Consultations are required as one of the conditions for E&S Safeguards. Public consultations are also required as part of the Environmental Impact Assessment (DELH) process for the Government of

Indonesia. A Public Consultation was conducted on the 29th August 2017. The public consultation consisted of an open forum meeting where members of the project, local government, environmental consultants, community representatives, and other project stakeholders were invited to hear a presentation of the project by the local government supported by the environmental consultant, followed by an open discussion and feedback involving all parties present.

As a continuation of the WB project Feasibility Studies, a second round of public consultations was held on 11th October 2017 to ensure continued updating and feedback to the project area community and stakeholders of the proposed extension and upgrading plans. The results of both rounds of public consultations have been incorporated in the ESIA process and the discussion results will be taken into account in the final FS documents.

The results of the surveys and public consultations show that overwhelmingly the project area community and stakeholders are in favor of the planned project development (both waste pickers (86.4%) and non-waste pickers (96.8%) alike approved the plan). Respondent expectations for the project include that the landfill still provide opportunities for them to make a living (18.4%), and that the landfill is cleaner, more comfortable, and better managed. Non-waste pickers hope that the smell of waste can be reduced, there will be better landfill management, and cleaner and more comfortable conditions around the site.

2.2 Summary of impacts anticipated at Aie Dingin landfill

The ESIA document provides a summary and analysis of potential risks and impacts associated with the planned project development following through the full project life cycle from pre-construction, construction, through to operation and final closure. The overall impact of the sub-project is expected to be positive for both the surrounding area and wider population. The main areas of potential risks and negative impacts include:

- Soil and water (surface and ground) contamination in particular from uncontrolled leachate discharge;
- Tensions between the project area community and migrant labour² (construction phase);
- Air quality, including dust and odour;
- Greenhouse Gas (GHG) emissions;
- Noise and vibration (particularly during the construction and operation phases);
- (Temporary) Traffic congestion (particularly during the construction and operation phases);
- Visual impact; and
- Impact on waste pickers, livestock owners and intermediate recyclers' livelihoods.

3. Summary of ESIA – Makassar, South Sulawesi

The main priorities of the World Bank sponsored sub-project at Tamangapa Landfill (Makassar) are to rehabilitate and upgrade the site to reduce the environmental, social, and public health impacts and to conform with the GoI and WB international sanitary landfill standards, and to create additional space/operating life through construction of new cells and Intermediate Treatment Facilities, with

² The ratio of migrant labour to local population will be small. The exact number of workforce will be available in the detailed engineering design (DED), however as an indicative figure, similar sized landfill rehabilitation in Indonesia has required 50-75 workers during construction stage.

additional operating capacity to serve the City for at least ten - twenty more years depending on the operational regime. In order to achieve this this project will support preparation of the following works:

- Support to capacity building and training of local government landfill operation unit, and/or establishment of Government Public Service Agency (BLUD). Including O&M planning and budgeting support and training;
- Reshaping of existing waste mass in order to maximize disposal efficiency within available area and extend the landfill life. Also to stabilize landfill slopes and prevent failures resulting in infrastructure damage and potential loss of life;
- Capping and closing of existing full waste cells in order to minimize rainfall infiltration to the waste mass, and thus minimize leachate generation, minimize odr and flyblown waste, minimize rodents, flies and other disease vectors, and facilitate gas capture which can then be extracted through a piped system for flaring or WtE power generation;
- Construction of new lined landfill cells to conform to Gol and WB sanitary landfill design standards. Construction will include provision of stockpile material (soil) for daily/intermediate cover, and provision of a gravel bed and piped leachate collection and transfer system;
- Construction of a new leachate treatment system (LTP) utilizing appropriate, robust, design measures that minimize operating costs and potential for breakdown/failure of expensive/sensitive equipment, and maximize leachate treatment and discharge water quality to conform with Gol wastewater discharge standards and WB international guidelines and best practice.
- Rehabilitation and upgrading of associated site infrastructure, including internal access roads drains, management and operation buildings, Heavy Equipment (HE), and HE workshop, site fencing, guard posts, weighbridge, sorting station, internal site power, water and sanitation systems; and
- An Intermediate Transfer Facility (ITF), which will include site preparation to allow for follow-on development, under a separate project intervention, for waste reduction and/or waste to energy facilities.

3.1 Summary of Environmental and Social Baseline

There is a comprehensive environmental and social baseline for Tamangapa Landfill, including:

- TPA Tamangapa Environmental Impact Assessment (AMDAL Tamangapa landfill), 2007;
- Feasibility Study of Makassar Landfill Gas Project, World Bank, 2007;
- Addendum to Makassar Landfill Gas Project – Environmental Due Diligence, 2007;
- Makassar in Figures (Kota Makassar dalam Angka), Statistical Bureau, 2014 – 2016;
- Tamangapa Landfill Environmental Monitoring Report, Semester I 2016
- Planning Instrument of Makassar (Instrumen Perencanaan Kota Makassar), 2016;
- Detailed Engineering Design (DED) TPS 3R Makassar Municipalities, 2016;

- Makassar Sanitation Strategy (Strategi Sanitasi Kota Makassar), 2016;
- Solid Waste Management Master Plan Makassar (Master Plan Sistem Pengelolaan Sampah Kota Makassar), 2016; and
- Detailed Engineering Design (DED) Makassar Municipality Landfill, 2016
- Brief Tamangapa Village Profile 2016 from the Office of Tamangapa Village;
- Profile of Manggala Village 2016 from the Office of Tamangapa Village
- Makassar Municipality in Figures, 2017, BPS
- Sanitation White Book of Makassar Municipality, 2014

In addition to the desk studies, the ESIA project team conducted a series of walk-over site investigations, social surveys, interviews with project stakeholders and public consultation on the sub-projects and on the ESMF.

The environmental and social baseline includes summary and analysis of provincial and site specific data for; climate, air quality, noise, Greenhouse Gas (GHG) emissions, geomorphology, geology, site topography, seismicity, soils, water (surface and ground) quality, waste water (leachate) quality, biodiversity and demographics.

Primary socio-economic data was collected by means of social household surveys and Key Informant Interviews (KII) covering 136 project area households, consists of 93 waste pickers, 43 other community members or non waste pickers, and 15 waste buyers.

As a continuation of the WB project Feasibility Studies, a further round of public consultations was held on 10th October 2017 to ensure continued updating and feedback to the project area community and stakeholders of the proposed project extension and upgrading plans. Overall the results of the social surveys and public consultations showed that more than 90% of waste picker and non-waste picker respondents agree with the project development plan of Tamangapa Landfill.

3.2 Summary of key impacts anticipated at Tamangapa Landfill

The ESIA document provides a summary and analysis of potential risks and impacts associated with the planned project development following through the full project life cycle from pre-construction, construction, through to operation and final closure. The overall impact of the sub-project is expected to be positive for both the surrounding area and wider population. The main areas of potential risks and impacts include:

- Soil and water (surface and ground) contamination in particular from uncontrolled leachate discharge;
- Tensions between the project area community and migrant labour³ (construction phase);
- Air quality, including dust and odour;
- Greenhouse Gas (GHG) emissions;
- Noise and vibration (particularly during the construction and operation phases);

³ The ratio of migrant labour to local population will be small. The exact number of workforce will be available in the detailed engineering design (DED), however as an indicative figure, similar sized landfill rehabilitation in Indonesia has required 50-75 workers during construction stage.

- (Temporary) Traffic congestion (particularly during the construction and operation phases);
- Visual impact; and
- Impact on waste pickers and intermediate recyclers' livelihoods and potential income generation.

4. Summary of Alternatives for Waste Management Solutions

Both Makassar and Padang are large municipalities with a population of approximately 1.7m and 1.0 m respectively, producing around 1000 tonnes (Makassar) and 600 tonnes (Padang) of waste per day . The existing landfills of Tamangapa and Aie Dingin are reaching their capacity, and time is running out to develop a long term solution for solid waste management. A summary of alternatives considered as part of the ESIA's and in the ESMF are presented in the table below. The analysis and conclusions for both sub-projects were similar, as explained further below.

Alternative	Description	Pro's	Con's
1	Do Nothing	Least cost option	Does not address existing environmental, social, public health issues. Landfill will be full within a few years with no long term alternative.
2	Rehabilitate existing site & build new cells & infrastructure within the existing site boundary.	Will address existing environmental, social, public health issues. Existing site is already approved for waste disposal that will serve another ten to twenty years	More costly than developing a new site. Limited available space for expansion.
3	Close existing site and develop new landfill on an alternative location	New site will allow optimal development of long-term sanitary landfill solution. Cost may be less than rehabilitating/extending existing site.	Will take at least 3-5years to identify, design and construct a new site. Makassar and Padang are heavily developed urban city with limited site options. There will be heavy opposition to any new site from local community. It does not address environmental, social, public health issues at existing site that will continue to cause long-term and secondary impacts to the environment and public health
4 (a)	Develop Advanced waste reduction (3R) and/or waste to energy incinerator.	Maximizing waste reduction. Provides income generation from recycling and/or power production. Reduction of potential GHG emissions.	It does not (directly) address environmental, social, public health issues at existing site. It will compete with picker population for recyclables if

Alternative	Description	Pro's	Con's
		<p>It requires very little space (<5Ha) and can be developed on the existing site in conjunction with Alternative 1. to extend the operating life of the existing landfill. It can be integrated into Alternative 2 to enhance recycling and extend life span of the rehabilitated landfill.</p> <p>The 3R can improve socio-economic issues by employing the waste pickers into the recycling activities that will improve their income and provide sufficient PPEs to improve health issues.</p>	<p>they are not engaged to participate recycling sectors in 3R. It still requires landfill (approx. 20% waste + ash from thermal process). It will generate dioxins and furans requiring quenching. The technology is very expensive, both in terms of CAPEX & OPEX. Long lead-time, 3-5 years and it require advanced operation, management, and maintenance capacity which does not exist at present. It is high risk, no existing commercial scale thermal process WtE plants are currently in operation in Indonesia.</p>
4 (b)	Develop green waste open windrow composting operation to produce topsoil for capping and possible grazing land for cattle	<p>It reduces GHG production. Low cost for CAPEX and OPEX. It allows use of salvaged mature cell earth to mix with compost to produce topsoil. It provides work for waste picker population. It can use co-mingled green waste for daily cover, enhancing biogas recovery and preventing disease vectors and wind-blown debris/litter.</p>	<p>Need to segregate municipal green waste and market green waste to produce uncontaminated soil products free of sharps or glass or metal pollution. Needs large area for concrete slab under pile and front loader to turn windrow. May take up former workshop roofed area to prevent wet season drainage problems, requiring a new maintenance shed.</p>
4 (c)	Anaerobic digester lagoon in leachate treatment facility	<p>It increases BOD strength of waste stream and increases efficiency of anaerobic process and gas production for carbon credits. It diverts organic waste stream and does not compete with waste pickers for recyclables. It provides further safe work for pickers. It can power floating aerators to increase efficiency of treatment and</p>	<p>It requires pickers to segregate waste and divert restaurant and other un-comingled waste. It requires power for contra-shear macerator and pumps to blend with leachate. Needs floating plastic cover with life of 10 years and de-sludging of inert from lagoon every ten years when cover is replaced.</p>

Alternative	Description	Pro's	Con's
		reduce area of leachate treatment train. It reduces strength of leachate and area of treatment train	Needs safety gas vents, emergency flare and high speed gas turbine generator(s) Needs gas vapor removal and plant maintenance. Needs additional volume in anaerobic pond to take 10 days HRT flow of additional food and leachate slurry injected through multi-port inlet manifold

Based on the analysis, alternative no 2 is a preferred option to immediately address the current situation and provide a sufficient extension of life to the current landfills in Padang and Makassar alike, while also developing capacity for other longer term solutions. Rehabilitation of the existing site is required to address the environmental, social, and public health issues, regardless of future landfilling requirements. Under this scenario, the existing cells will be reshaped capped and closed, reducing leachate, odor, disease vectors, and GHG emissions. The waste mass will be reshaped to stabilize cells and reduce the risk of slope failure, and to optimize use of the available space and create additional airspace for new cells that will extend the site life for up to 8-10 years (without 3R/WtE).

Both sites already have approved ESIA's (AMDAL), the areas are zoned for landfilling, and are accepted by the surrounding community. As such, these conditions also provide the fastest option for future waste disposal requirements. Beyond rehabilitating the existing waste mass and infrastructure, extension works will include new sanitary landfill cells, leachate treatment system and associated infrastructure required to meet both GoI (Law 18/2008 on Solid Waste Management) and international sanitary landfilling standards. The extension works will include a sorting station to provide a safe working environment for waste pickers and to maximize 3R waste reduction. Space will be allocated for advanced waste reduction / waste to energy (Alternative no 4) which could potentially further increase the operating life of the sites up to 20+ years, through significant waste reduction processes.

Addressing the existing conditions of the sites and extending within the existing boundaries will be relatively expensive given the limited, 8-10 years (without 3R/WtE), potential extension capacity. However, it provides a rapid solution to the current problem and buys enough time for additional long-term solutions, such as advanced 3R/WtE and/or expansion of the current sites beyond their existing boundaries, or identification and development of a new site.

5. Environmental and Social Management Plans for Aie Dingin and Tamangapa landfills

The ESMF provides the overall guidance for management of environmental and social impacts. For the sub-projects identified during project preparation, Aie Dingin (Padang) and Makassar (Tamangapa), an Environmental and Social Management plan (ESMP) has been developed as a comprehensive

management approach for the implementation and monitoring of all environmental and social risk and impact mitigation measures, including those in the government document RKL-RPL and some which go beyond. The ESMPs include budgets for costs of mitigation measures, which will be developed in more detail during the DED phase, which will then be included to the Project costing for the O&M plan, and which may also be updated when needed.

The ESMPs are living documents that will need to be updated on a regular basis commensurate with the specific design, planning and implementation of the upgrade of the facility. Reporting is periodic as outline per site, with semi-annual reporting to government. World Bank reviews all mitigation reports on at least an annual basis, and approves any further plans developed under the ESMF. In addition to impact mitigation and monitoring, the ESMPs include specific processes for grievance handling, to be developed further and socialised with key stakeholders at each site.

The ESMPs for both sites include the following management strategies:

During pre-construction stage:

- Ensure specifications of the construction project tender include sessions on air quality and odour control during construction for contractor to comply with;
- Ensure a proper design of landfill gas collection system done by the consultant to control landfill gas;
- Ensure the design and specifications of construction tender include maintenance aspect to assess operation performance and efficiency of gas collection system;
- Ensure the final capping layers are designed to meet Government of Indonesia requirement (Minister of Public Work Regulation No 03/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management) on final capping standard to ensure gases tight;
- Socialisation of Chance Finds procedure with local government;
- Socialisation of Emergency Response Plan with all relevant stakeholders.

During construction stage:

- Apply good practice in construction in sequencing the construction works in phases to minimise scatter impacts that are difficult to control;
- Apply dust control measures, such as regular water spraying for heavily transport area (access roads and active construction areas);
- Ensure the cab of all soil storage trucks is covered with tarpaulins;
- Use hoarding to attenuate winds to reduce the likelihood of wind-blown dust;
- Stockpiles of construction materials will be shielded from wind using bins and monitored daily during the construction phase. In addition, they will be located away from public and residential areas;
- Vehicle washing facilities provided to minimise the quantity of material deposited on public roads;
- Check records and evidence to ensure vehicles and machineries used comply with emission standards;
- Ensure landfill gas collection and flaring system are constructed as per design and in line with applicable laws and regulations;

- Manage contractor's implementation of the Air Quality and Odour Management Plan during construction works;
- Conduct greening surrounding the area of the waste facility to capture greenhouse gases;
- Fencing and feedlots as alternative locations for livestock;
- Ensure adequate employment of waste pickers in construction activities to avoid or reduce jealousy or tension associated with the presence of any outside workers that may be required;
- Redevelopment or creation of areas where waste sorting can be carried out formally or informally; and
- Implementation of Chance Finds procedure where applicable.

During operation stage:

- Check record and ensure waste transportation trucks used comply with emission standards;
- Develop waste hauling route to ensure the route is planned with the shortest distance to reduce vehicle emissions;
- Proper operation of ITF facilities;
- Proper operation of gas collection system and flaring system to ensure they are in line with applicable laws and regulations;
- Frequent covering of waste in cells with soil to reduce odor emission;
- Develop standard operation procedure for waste loading and unloading;
- Covering vehicles during waste transportation to minimise odour emission;
- Progressively provide permanent capping (final cover) with cell that is fully utilised to stop emissions;
- Capture and combust landfill gas from escaping to the atmosphere through a standardized gas collection system;
- Utilize methane gas captured in the landfill to generate energy or replace the use of non-renewable sources, such as coal and oil;
- Daily maintenance of heavy and light vehicles that operate in the landfill;
- Transportation planning in and out of the landfill;
- Provide progressively final capping of landfill cells that are fully utilised to minimise landfill gas emission;
- Fencing and feedlots as alternative locations for livestock;
- Employment of waste pickers in landfill operation activities; and
- Redevelopment or creation of areas where waste sorting can be carried out formally or informally.