

**CITY TECHNICAL CAPACITY SUPPORT FOR SOLID WASTE
MANAGEMENT INVESTMENT PREPARATION FOR INDONESIA**

**ENVIRONMENTAL & SOCIAL
SAFEGUARDS - MAKASSAR
FINAL REPORT**



DINAS LINGKUNGAN HIDUP KOTA MAKASSAR
Jalan Jenderal Urip Sumoharjo No. 8, Kota Makassar,
Provinsi Sulawesi Selatan

2017

EXECUTIVE SUMMARY

Indonesia's Long Term National Urban Development Plan 2015-2045 sets the targets of urban service standards and increasing capacity of city management. Solid waste management is high on the national agenda, as exemplified by the National Medium Term Development Plan's (RPJMN) ambitious "100-0-100" targets of eliminating all slums and providing universal access to water and sanitation (including solid waste collection) by 2019¹. This sets a highly ambitious goal for the improvement of public service delivery, because it is currently estimated that only 70% of Indonesia's 135 million urban residents have access to waste collection services and only 55% of urban solid waste is handled at a transfer station or processing facility.

There is now a clear consensus amongst senior management staff in National Development Planning Ministry (Bappenas), MPWH, and MoEF that a nation-wide, scalable programmatic approach that supports the solid waste management sector will need to be prepared to address the serious challenges in the sector. The WB has recently signed a US\$100 million loan agreement with the Government of Indonesia to support them in developing and implementing this program.

- **High Level Objective:** To improve solid waste management services for urban populations across Indonesia.
- **Specific Objective:** To provide short-listed cities with technical support to rapidly prepare solid waste management investments ready for design-build bidding. This would include assessing the quality, identifying and filling gaps in the terms of feasibility studies, environmental impact assessments, resettlement action plans, and tendering documents.

To achieve these objectives, the program will be organized around four components:

- **Component 1:** Institutional and Policy Development (Approx. US\$10 million Total Budget; US\$3 million IBRD).
- **Component 2:** Integrated Planning Support and Capacity Building for Local Government and Communities (Approx. US\$100 million Total Budget; US\$27 million IBRD).
- **Component 3:** Solid Waste Infrastructure in Selected Cities (Approx. US\$1,000 million Total Budget; US\$60 million IBRD).
 - **Sub-Component 3.1:** Support for Integrated Solid Waste Management Systems for High Capacity Cities.
 - **Sub-Component 3.2:** Support for Solid Waste Management Systems in Lower Capacity Cities.
- **Component 4:** Implementation Support and Technical Assistance (Approx. US\$60 million; US\$10 million IBRD).

Success will be measured by the such metrics as:

- People in urban areas provided with access to regular solid waste collection under the program (number);
- Measurement of national program functional capacity;

¹ The "100-0-100" target refers to 100% household access to water supply; zero slums; and 100% household access to sanitation (including waste water treatment and solid waste collection).

- Sanitary municipal waste disposal capacity created under the program (tons/year); and
- Amount of waste diverted from landfills (tons/year).

This project forms part of Component 3.1 which aims to provide financing for a select group of cities (maximum 10 cities) that have demonstrated sufficient capacity and commitment in solid waste management to justify large investments in complex systems and advanced treatment technologies. Cities selected under this component would receive support for investing in all needed infrastructure aspects of solid waste management not currently in place, including collection, transfer, treatment, disposal, and waste recycling/composting. This component would include financing for advanced treatment technologies, such as anaerobic digesters and refuse-derived fuel production.

Following an extensive screening process starting with 107 sites and selecting a short-list of 12 sites, the list has further been refined down to four Tier 1. Candidate Cities; Makassar, Palembang, Padang and Magelang, which will proceed to Feasibility study phase. As part of the Feasibility Studies, and as a requirement of WB safeguard procedures, each site must meet Environmental and Social Safeguards procedures. The following report represents the environmental and social impact assessment for Makassar, TPA Tamangapa.

The Environmental and Social Impact Assessment (ESIA) is an important project planning and safeguards tool. The application of the ESIA process at the project preparation stage ensures that the project is environmentally sound, socially acceptable and technically feasible, and has a strong understanding of the risks, benefits, and monitoring and management requirements for the project.

This Environmental and Social Impact Assessment was designed to conform with GoI Laws and regulations, and to the WB's Operation policy and Procedures (WB OP/BP 4.01). This project was defined as Category A project by following the WB's criteria and because of the potential environmental effects for categorizing the projects based on the potential environmental impacts.

Section 1 and 2 where the project introduction and description are given is followed by Section 3 where a summary of the political, legal and administrative structures are presented. A summary of relevant WB policies are given in Section 4. Information about the current environmental situation in the project area is given in Section 5. Project impact analysis and description of the potential mitigation and management measures are covered in Section 6. Research covers the following: geophysical site condition, surface and underground water, air and climate, noise, ecology, social, socio-economic, and cultural heritage. Public consultation and Grievance Mechanism are covered in Section 7. And the environmental and social monitoring and management plan (ESMP) is covered in Section 8.

Makassar Project

Makassar is the capital city of South Sulawesi. Makassar City borders are formed by Kabupaten Maros to the north, Kabupaten Maros to the east, Kabupaten Gowa to the south, and Makassar Strait to the west. The administrative area of the city covers approximately 175.77 km² and is divided into 14 administrative districts (Kecamatan) with Kecamatan Tamalanrea having the largest area, approximately 38.37 km². The population of Makassar City is approximately 1,741,300 people in 2017. The city of Makassar generates approximately 1,000 - 1,200 tons of waste per day or 4,495 m³/day. Organic waste comprises approximately 68% of the total waste stream.

TPA Tamangapa, the main landfill serving Makassar municipality, is located in Manggala Sub-District, Makassar. It is located ±14 km from Makassar city centre. It has been in operation since 1993.

Summary of TPA Tamangapa Existing Condition

Description	Existing Condition
Name	TPA Tamangapa
Location	Tamangapa Village, Manggala Sub-District, Makassar City 5°10'35.07" S 119°29'25.16" E
Year of operation	1993, landfill revitalization on 1 ha has been conducted in 2011.
Area	16.86 ha
Land Status	Government property
Distance to the nearest residence	Less than 1 km (~0.2 km)
Distance to river	3 km
Distance to coast	14 km
Distance to downtown	14 km
Distance to airport	30 km
Topography	Mostly flat
Environmental document	AMDAL (2007)
Landfill Operational Method	Controlled Landfill
Waste To Dispose	1,200 tonnes /day
Landfill Capacity	800 – 1,000 tonnes/day ¹
Cells	6 cells, consists of B1, B2, C1, C2, D, E. C1 was the only cell equipped with lining and leachate collection system as it was built by Satker PPLP South Sulawesi Province (using national budget APBN) as pilot project of sanitary landfill in 2011.
Impermeable layer	Clay
Groundwater Monitoring Well	4 units These are being monitored every 6 months. However, inconsistency in number of wells being monitored is occurred as reflected in the existing RKL-RPL (monitoring & management) report.
Gas collection facility	HDPE gas pipeline
Leachate Treatment Plant	<ul style="list-style-type: none"> • Status: Active • Consists of anaerobic pond, facultative stabilization pond and aerobic pond.
Leachate Collection System	Only installed in Cell C1.
Heavy equipment	<ul style="list-style-type: none"> • Bulldozer: 4 damaged unit, 5 active units • Excavator: 2 active units
Supporting Facility	<ul style="list-style-type: none"> • Entrance Gate • Weighbridge (active)

Description	Existing Condition
	<ul style="list-style-type: none"> • Sorting Area • Office • Security Post • Workshop • Composting Unit (inactive) • Landfill Methane Collection and Flaring System (inactive) • Access and operational road
Waste Pickers	~400 people
Cattles	~700 cows
Remaining Landfill Lifetime	3 – 5 years since 2017

Source: Site Visit, July 2017

TPA Tamangapa is being operated at present as barely more than an open dump. 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 Gol and WB international sanitary landfill standards, and to create additional space/operating life through construction of new cells and Intermediate Treatment Facilities. 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 odour 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.

The above project activities will aim to ensure that TPA Tamangapa is upgraded to an international sanitary landfill facility with additional operating capacity to serve the City for at least ten - twenty more years depending on the operational regime).

Environmental and Social Baseline

This study had built a comprehensive environmental and social baseline for TPA Tamangapa based on a desk study of existing baseline data including:

- TPA Tamangapa Environmental Impact Assessment (AMDAL TPA Tamangapa), 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;
- TPA Tamangapa 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) TPA Makassar Municipalities, 2016

In addition to the desk studies, the project team conducted a series of walk-over site investigations, social surveys, public consultation 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, and biodiversity.

The Social economic and cultural baseline was prepared from secondary data sources including:

- Brief Tamangapa Village Profile 2016 from the Office of Tamangapa Village;
- Profile of Manggala Village 2016 from the Office of Tamangapa Village
- Manggala Sub-district in Figures, 2016, BPS
- Makassar Municipality in Figures, 2016, BPS
- Makassar Municipality in Figures, 2017, BPS
- Top 10 prevalent diseases from Community Health Centre (Puskesmas) of Tamangapa
- Top 10 prevalent diseases from Community Health Centre (Puskesmas) of Manggala Village
- Sanitation White Book of Makassar Municipality, 2014

Primary 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. The results of the public consultations are provided in Section 7 and Appendix 4.

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 TPA Tamangapa. The surveys and consultations revealed the community's perceptions and expectations toward the project development plan:

- Most of respondents expect that the development/modernization of landfill would be realized as soon as possible.
- The future new landfill should not prevent waste pickers to still do scavenging, but instead the landfill is expected to create better income to waste pickers and communities. Their livelihood should be taken care of.
- The development and modernization of landfill is expected to create local jobs opportunities.
- The future new landfill is expected to create better live and environment, reduce smell, flies and dust, eliminate slum image, reduce traffic jam, and improve land condition around the landfill.
- The future landfill should be developed with sufficient budget, clean, modern/advanced technology, so that waste can be processed and managed in a better way and give positive impact.

Impacts and Mitigation Measures

Section Six 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 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 transmigrant labour (construction phase);
- Airquality, 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 to waste picker and intermediate recyclers livelihoods and potential income generation.

A full matrix of risks impacts and mitigation/management measures is provided in Section 6.

Environmental and Social Management Plan

The Environmental and Social Management plan (ESMP) consists of plans for the comprehensive management of the implementation and monitoring of all environmental and social risk and impact mitigation measures, derived from all environmental and social assessment and study efforts conducted on the Project. Budgeting of costs to cover mitigation measures are to be developed during the DED phase, which will then be included to the Project costing for the O&M plan.

The project has gone through a comprehensive screening and assessment process to identify risks and impacts and to determine the type of mitigation and monitoring measures, such as the presence of Indigenous Peoples, any need to acquire land, and any restrictions on access to natural resources.

The ESMP provided in Section 8. is a living document that will need to be updated on a regular basis commensurate with the specific design, planning and implementation of the upgrade of the facility.

RINGKASAN EKSEKUTIF

Rencana Pembangunan Perkotaan Nasional Jangka Pandang tahun 2015-2045 menargetkan standar pelayanan kota serta peningkatan kapasitas pengelolaan kota. Pengelolaan sampah merupakan salah satu aspek penting dalam agenda tersebut, seperti tertera dalam RPJMN dimana terdapat target “100-0-100” untuk mengentaskan wilayah kumuh dan menyediakan akses untuk air bersih dan sanitasi (termasuk pengumpulan sampah) di tahun 2019². Target ini dirasa cukup tinggi terutama untuk peningkatan pelayanan public, karena kondisi saat ini diperkirakan hanya sekitar 70% dari 135 juta penduduk perkotaan di Indonesia mempunyai akses pelayanan pengumpulan sampah dan hanya sekitar 55% dari sampah perkotaan ditangani baik di TPS maupun TPA.

Kesepakatan antara petinggi di Bappenas, MPWH dan Kementerian Keuangan menetapkan bahwa program berskala nasional sebagai pendekatan untuk mendukung pengelolaan sampah harus disiapkan untuk mengatasi hal ini. Bank Dunia telah menandatangani kesepakatan pinjaman sebesar US\$100 juta dengan Pemerintah Indonesia untuk mendukung pembangunan serta implementasi program tersebut.

- **Tujuan Utama:** Meningkatkan pelayanan pengelolaan sampah untuk masyarakat perkotaan di Indonesia.
- **Tujuan Khusus:** Memberikan dukungan teknis untuk beberapa kota agar secara cepat dapat menyiapkan investasi pengelolaan sampah untuk keperluan penawaran desain pembangunan. Hal ini termasuk menilai kualitas, mengidentifikasi dan melengkapi kekurangan dalam hal studi kelayakan, analisis dampak lingkungan, rencana akuisisi lahan/pemindahan serta dokumen tender.

Untuk mencapai tujuan tersebut, program ini akan dikelompokkan menjadi empat komponen:

- **Komponen 1:** Pengembangan Lembaga dan Peraturan (Sekitar US\$10 juta Total Anggaran; US\$3 juta IBRD).
- **Komponen 2:** Dukungan Perencanaan Terpadu serta Pembangunan Kapasitas untuk Pemerintah Daerah dan masyarakat (Sekitar US\$100 juta Total Anggaran; US\$27 juta IBRD).
- **Komponen 3:** Infrastruktur sampah di kota terpilih (Sekitar US\$1,000 juta Total Anggaran; US\$60 juta IBRD).
 - **Sub-Komponen 3.1:** Dukungan untuk Sistem Pengelolaan Sampah Terpadu untuk Kota dengan Kapasitas Tinggi.
 - **Sub-Komponen 3.2:** Dukungan untuk Sistem Pengelolaan Sampah Terpadu untuk Kota dengan Kapasitas lebih Rendah.
- **Komponen 4:** Implementasi Dukungan serta Bantuan Teknis (Sekitar US\$60 juta; US\$10 juta IBRD).

Keberhasilan akan diukur berdasarkan:

- Jumlah orang di perkotaan yang dilayani oleh akses pengumpulan sampah dalam program tersebut (angka);
- Pengukuran kapasitas fungsional program nasional;

² Target “100-0-100” mengacu pada 100% akses ke penyediaan air; nol kawasan kumuh; dan 100% akses sanitasi (termasuk pengolahan air limbah dan pengumpulan sampah).

- Kapasitas TPA saniter yang terbangun dari program ini (ton/tahun); dan
- Jumlah sampah yang dialihkan dari TP (ton/tahun).

Proyek ini merupakan bagian dari Komponen 3.1 yang bertujuan untuk menyediakan pembiayaan untuk beberapa kota (maksimal 10 kota) yang telah menunjukkan kapasitas yang cukup serta komitmen dalam pengelolaan sampah dalam upaya menjustifikasi investasi yang besar dalam sistem yang kompleks dan teknologi pengolahan yang canggih. Beberapa kota yang dipilih di bawah komponen ini akan menerima dukungan untuk investasi dalam aspek infrastruktur yang dibutuhkan dalam hal pengelolaan sampah yang tidak sesuai, termasuk pengumpulan, pemindahan, pengolahan, pembuangan dan re-cycle/pengomposan. Komponen ini termasuk pembiayaan untuk teknologi yang lebih maju seperti *anaerobic digester* serta *refuse-derived fuel production*.

Selanjutnya proses penyaringan yang lebih luas dimulai dari 107 lokasi dan memilih daftar yang lebih pendek dari 12 lokasi, daftar tersebut kemudian disaring lagi menjadi empat Tingkat 1. Kota yang merupakan kandidat; Makassar, Palembang, Padang dan Magelang, yang akan diproses menuju tahap Studi Kelayakan. Sebagai bagian dari Studi Kelayakan dan syarat dari prosedur *safeguard* Bank Dunia (WB), setiap lokasi harus memenuhi prosedur *safeguard* lingkungan dan sosial. Laporan berikut ini mewakili analisis lingkungan dan sosial untuk Makassar, TPA Tamangapa.

Environmental and Social Impact Assessment (ESIA) merupakan hal yang penting dalam tahap perencanaan dan merupakan alat dalam *safeguard*. Fungsi proses ESIA dalam tahap persiapan proyek meyakinkan bahwa proyek ini secara memenuhi daya dukung lingkungan, dapat diterima secara sosial dan layak dalam hal teknis (*environmentally sound, socially acceptable and technically feasible*) serta dapat diketahui mengenai risiko, manfaat, kebutuhan pemantauan & pengelolaan proyek.

ESIA ini disusun untuk memenuhi ketentuan dalam Undang-undang serta peraturan di Indonesia serta Prosedur dan Peraturan Operasi Bank Dunia (WB OP/BP 4.01). Proyek ini merupakan proyek Kategori A berdasarkan kriteria Bank Dunia dan potensi dampak lingkungan terhadap udara, tanah, air serta kesehatan masyarakat.

Bab 1 dan 2 berisi tentang pendahuluan serta deskripsi proyek dilanjutkan dengan Bab 3 yang merupakan ringkasan dari struktur politik, hukum dan administrasi. Ringkasan peraturan Bank Dunia ditampilkan di Bab 4. Informasi mengenai Rona Lingkungan Awal ditampilkan di Bab 5. Analisis dampak lingkungan serta langkah-langkah mitigasi dan pengelolaan lingkungan yang diperlukan dibahas di Bab 6. Analisis ini mencakup: kondisi geofisik, airtanah dan air permukaan, udara dan iklim, kebisingan, ekologi, sosial, sosio-ekonomi, serta peninggalan sejarah. Konsultasi publik dan mekanisme keluhan ditampilkan di Bab 7, sedangkan rencana pengelolaan dan pemantauan lingkungan (ESMP) ditampilkan di Bab 8.

Proyek Makassar

Makassar adalah ibu kota provinsi Sulawesi Selatan. Batas Kota Makassar terdiri dari Kabupaten Maros di bagian utara dan timur, Kabupaten Gowa di bagian selatan serta Selat Makassar di bagian barat. Wilayah administratif Kota Makassar seluas 175,77 km² dan dibagi menjadi 14 kecamatan dengan Kecamatan Tamalanrea sebagai kecamatan yang terluas dengan luas sekitar 38,37 km². Populasi di Kota Makassar adalah sekitar 1.741.300 jiwa di tahun 2017. Timbulan sampah Kota Makassar adalah sekitar 1.000 – 1.200 ton/hari atau sekitar 4.495 m³/hari. Porsi sampah organik adalah sekitar 68% dari total sampah yang ditimbulkan.

TPA Tamangapa, merupakan TPA utama yang melayani sampah dari Kota Makassar, terletak di Kecamatan Manggala, Kota Makassar. TPA ini terletak sekitar 14 km dari pusat kota Makassar. TPA ini dioperasikan dari tahun 1993.

Ringkasan Kondisi Eksisting TPA Tamangapa

Keterangan	Kondisi Eksisting
Nama	TPA Tamangapa
Lokasi	Desa Tamangapa Village, Kecamatan Manggala, Kota Makassar 5°10'35.07" LS 119°29'25.16" BT
Tahun operasi	1993, revitalisasi TPA seluas 1 ha telah dilakukan di tahun 2011
Luas	16,86 ha
Status lahan	Milik pemerintah
Jarak ke penduduk terdekat	Kurang dari 1 km (~0,2 km)
Jarak ke sungai	3 km
Jarak ke pantai	14 km
Jarak ke pusat kota	14 km
Jarak ke bandara	30 km
Topografi	Umumnya datar
Dokumen lingkungan	AMDAL (2007)
Metode operasi TPA	<i>Controlled Landfill</i>
Sampah yang dibuang	1.200 ton/hari
Kapasitas TPA	800 – 1.000 ton/hari ¹
Sel	6 sel, terdiri dari B1, B2, C1, C2, D, E. C1 merupakan satu-satunya sel yang dilengkapi dengan lapisan dan sistem pengumpul lindi yang mana dibangun oleh Satker PPLP Provinsi Sulawesi Selatan (menggunakan anggaran nasional APBN) yang merupakan proyek pilot <i>sanitary landfill</i> tahun 2011.
Lapisan kedap air	Tanah liat
Sumur pantau	4 unit Dilakukan pemantauan setiap 6 bulan. Namun demikian, jumlah sumur yang dipantau per semester tidak konsisten seperti tercantum dalam dokumen implementasi RKL-RPL.
Fasilitas pengumpul gas	Perpipaan gas dengan material HDPE
Unit pengolah lindi	<ul style="list-style-type: none"> • Status: Aktif • Terdiri dari kolam <i>anaerobic</i>, kolam stabilisasi fakultatif dan kolam <i>aerobic</i>.
Sistem pengumpul lindi	Hanya dipasang di Sel C1.
Alat berat	<ul style="list-style-type: none"> • <i>Bulldozer</i>: 4 unit rusak, 5 unit aktif • <i>Excavator</i>: 2 unit aktif

Keterangan	Kondisi Eksisting
Fasilitas pendukung	<ul style="list-style-type: none"> • Gerbang masuk • Jembatan timbang (aktif) • Area pemilahan • Perkantoran • Pos keamanan • Bengkel • Unit pengomposan (tidak aktif) • Sistem flaring dan pengumpul metan (tidak aktif) • Jalan akses dan operasional
Pemulung	~400 jiwa
Ternak	~700 sapi
Sisa umur TPA	3 – 5 tahun sejak 2017

Sumber: Kunjungan lapangan, Juli 2017

TPA Tamangapa, Makassar saat ini dioperasikan selayaknya *open dumping*. Prioritas utama dukungan Bank Dunia terhadap proyek ini adalah untuk rehabilitasi dan peningkatan area proyek untuk mengurangi dampak terhadap lingkungan, sosial dan kesehatan masyarakat serta untuk memenuhi ketentuan peraturan perundang-undangan di Indonesia maupun Bank Dunia dalam hal standar sanitary landfill, serta menambah umur TPA dengan penambahan sel-sel baru serta pembangunan Intermediete Treatment Facilities (ITF). Dalam rangka mewujudkan tujuan tersebut, proyek ini akan menunjang persiapan dari pekerjaan sebagai berikut:

- Membantu dalam pelatihan serta peningkatan kapasitas pemerintah daerah unit operasi TPA, dan/atau pembentukan BLUD. Termasuk perencanaan operasi dan pemeliharaan serta anggaran dan pelatihan;
- Membentuk kembali massa sampah yang ada untuk memaksimalkan efisiensi pembuangan di lokasi yang tersedia dan meningkatkan umur TPA. Dan juga untuk kestabilan kemiringan lereng serta mencegah kegagalan/ kerusakan akibat kerusakan infrastruktur dan potensi hilangnya nyawa;
- Melapisi dan menutup sel sampah yang sudah penuh dalam rangka mengurangi infiltrasi air hujan ke dalam massa sampah sehingga dapat meminimasi pembentukan lindi, mengurangi bau dan sampah busuk, meminimasi pengeras, alat serta vektor penyakit lainnya dan juga memfasilitasi penangkapan gas yang bisa diambil melalui sistem perpipaan untuk flaring maupun pembangkitan energi dari sampah (WtE);
- Konstruksi sel landfill baru yang memenuhi ketentuan standar desai dan Pemerintah Indonesia dan Bank Dunia. Standar konstruksi tersebut termasuk ketentuan akan material stockpile (tanah) untuk penutup harian/intermediete, ketentuan mengenai lapisan kerikil serta pipa pengumpul lindi dan sistem transfer;
- Konstruksi sistem pengolahan lindi (LTP) baru menggunakan prakiraan desain yang sesuai dan kuat yang dapat meminimasi biaya operasi dan terdapat kemungkinan adanya kerusakan alat yang cukup mahal/rentan serta memaksimalkan pengolahan lindi dan kualitas air yang dibuang untuk memenuhi ketentuan Pemerintah Indonesia mengenai standar baku mutu air buangan serta peraturan Bank Dunia maupun *best practice*

- Rehabilitasi dan perbaikan infrastruktur penunjang termasuk saluran pembuangan di sisi jalan akses internal, bangunan operasi dan pemeliharaan, alat berat, bengkel alat berat, pagar, pos jaga, jembatan timbang, area penyortiran, area listrik internal, sistem pengairan dan sanitasi; dan
- Sebuah *Intermediate Treatment Facility* (ITF), termasuk persiapan lokasi agar dapat dikembangkan, di bawah intervensi proyek terpisah, untuk mengurangi sampah dan/atau fasilitas WtE.

Kegiatan proyek di atas bertujuan untuk memastikan TPA Tamangapa diperbaiki menjadi fasilitas *sanitary landfill* berstandar internasional dengan tambahan kapasitas operasi untuk melayani kota serta area di sekitarnya selama kurang-lebih sepuluh sampai dengan dua puluh tahun lagi (tergantung dari cara pengoperasiannya).

Rona Awal Lingkungan dan Sosial

Rona lingkungan awal dalam studi ini disusun dari berbagai data termasuk:

- Dokumen Amdal TPA Tamangapa tahun 2017;
- Studi Kelayakan Makassar *Landfill Gas Project*, Bank Dunia, 2007;
- Adendum Makassar *Landfill Gas Project – Environmental Due Diligence*, 2007;
- Kota Makassar dalam Angka, 2014 – 2016;
- Laporan RKL-RPL TPA Tamangapa, Semester I 2016
- Instrumen Perencanaan Kota Makassar, 2016;
- *Detailed Engineering Design* (DED) TPS 3R Makassar, 2016;
- Strategi Sanitasi Kota Makassar, 2016;
- *Master Plan* Sistem Pengelolaan Sampah Kota Makassar, 2016; dan
- *Detailed Engineering Design* (DED) TPA Makassar, 2016

Sebagai tambahan dari studi data di atas, tim juga melakukan investigasi langsung di lokasi kegiatan, melakukan survei sosial, konsultasi publik dan wawancara dengan pemangku kepentingan.

Rona awal lingkungan dan sosial memasukkan ringkasan dan analisis data tingkat provinsi maupun data lokasi kegiatan untuk berbagai komponen termasuk iklim, kualitas udara, kebisingan, emisi gas rumah kaca, geomorfologi, geologi, topografi, seismik, tanah, kualitas air permukaan, kualitas airtanah, kualitas air limbah (lindi) serta keanekaragaman hayati.

Data sekunder yang digunakan untuk menyusun rona awal sosial dan budaya terdiri dari:

- Profil Desa Tamangapa 2016 dari Pemerintah Desa Tamangapa;
- Profil Desa Maggala 2016 dari Pemerintah Desa Manggala;
- Kecamatan Maggala dalam Angka, 2016;

- Kota Makassar dalam Angka, 2016-2017;
- 10 penyakit umum di Puskesmas Tamangapa;
- 10 penyakit umum di Puskesmas Maggapa; dan
- Buku Putih Sanitasi Kota Makassar, 2014.

Data primer dikumpulkan dari survei rumah tangga dan informan kunci/*Key Informant Interviews* (KII) yang mencakup 136 rumah tangga di lokasi proyek, terdiri dari 93 pemulung, 43 anggota masyarakat lainnya (bukan pemulung) dan 15 pembeli sampah (pengepul).

Sebagai tindak lanjut dari proyek studi kelayakan Bank Dunia. Konsultasi publik dilaksanakan pada tanggal 10 Oktober 2017 untuk memastikan informasi lebih lanjut serta tanggapan terhadap masyarakat di lokasi proyek serta pemangku kepentingan. Hasil konsultasi publik dapat dilihat pada Bab 7 dan Lampiran 4.

Hasil dari survei dan konsultasi publik menunjukkan masyarakat sekitar serta pemangku kepentingan menyatakan dukungan dengan proyek yang direncanakan (lebih dari 90% pemulung dan non-pemulung). Survei dan publik konsultasi ini menghasilkan persepsi dan ekspektasi masyarakat terhadap rencana proyek sebagai berikut:

- Sebagian besar responden berharap agar pengembangan TPA akan segera dilaksanakan
- TPA yang baru nantinya tidak akan melarang pemulung untuk memulung, dan diharapkan bisa membuat pemasukan yang lebih besar bagi pemulung dan masyarakat. Mata pencaharian mereka harus diperhatikan.
- Pengembangan dan pemutakhiran TPA diharapkan dapat menciptakan lapangan pekerjaan bagi masyarakat sekitar.
- TPA yang baru diharapkan dapat menciptakan kehidupan dan lingkungan yang lebih baik, mengurangi bau, lalat dan debu, mengurangi pandangan mengenai kawasan kumuh, mengurangi kemacetan, dan peningkatan kondisi tanah sekitar TPA.
- TPA nantinya harus dikembangkan dengan anggaran yang cukup, bersih teknologi modern/canggih, sehingga sampah dapat diproses dan dikelola lebih baik serta memberikan dampak positif.

Prakiraan Dampak dan Penanganannya

Bab enam menampilkan ringkasan dan analisis risiko dan dampak yang berpotensi untuk timbul akibat adanya rencana pengembangan proyek diseluruh tahapan kehidupan proyek dari tahap pre-konstruksi, konstruksi, operasi dan penutupan. Potensi risiko dan dampak utama termasuk:

- Kontaminasi tanah, airtanah dan air permukaan akibat adanya buangan lindi yang tidak terkelola;
- Ketegangan antara masyarakat lokal dengan pekerja pendatang (tahap konstruksi);
- Kualitas udara termasuk debu dan kebauan;
- Emisi gas rumah kaca (GRK);

- Kebisingan dan getaran (terutama pada tahap konstruksi dan operasi);
- Kemacetan lalu-lintas sementara (terutama pada tahap konstruksi dan operasi);
- Dampak visual; dan
- Dampak terhadap pemulung serta mata pencaharian pendaur ulang sampah serta potensi perolehan pendapatan.

Matriks prakiraan risiko dampak dan penanganannya ditampilkan di Bab 6.

Rencana Pengelolaan Lingkungan dan Sosial/*Environmental and Social Management Plan (ESMP)*

ESMP terdiri dari rencana pengelolaan yang menyeluruh dari implementasi dan pemantauan seluruh prakiraan risiko dampak lingkungan dan sosial beserta penanganannya, yang diperoleh dari studi dan analisis lingkungan serta sosial yang dilakukan di proyek ini. Penganggaran biaya penanganan akan dikembangkan pada saat penyusunan DED, untuk kemudian dimasukkan ke dalam biaya proyek untuk komponen perencanaan operasi dan pemeliharaan.

Proyek ini telah melewati proses penyaringan dan analisis yang menyeluruh untuk mengidentifikasi risiko beserta dampak yang selanjutnya digunakan untuk menentukan penanganan serta pemantauan yang tepat, seperti kehadiran masyarakat adat (*Indigenous People*), kebutuhan untuk akuisisi lahan, dan adanya larangan untuk mengakses sumber daya alam.

ESMP ditampilkan di Bab 8 merupakan dokumen yang harus terus diperbaiki secara periodik disesuaikan dengan desain spesifik, perencanaan dan implementasi perbaikan fasilitas.

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Appendix 2. The World Bank Safeguard Policies

Appendix 3. Technical Standards for Sanitary Landfill

Appendix 4. Public Participation & Disclosure Documents

Appendix 5. Grievance Mechanism

Appendix 6. Social Survey Photographs

ABBREVIATIONS AND ACRONYMS

ABR	Anaerobic Baffled Reactor
AMDAL	<i>Analisis Mengenai Dampak Lingkungan</i> - Environmental Impact Assessment
APBD	<i>Anggaran Pendapatan dan Belanja Daerah</i> - Annual Regional Government Budget
BAPEDAL	<i>Badan Pengendalian Dampak Lingkungan</i> - Board of Environmental Impact Management
BAPPEDA	<i>Badan Perencanaan Pembangunan Daerah</i> - Municipal Development and Planning Agency
BAPPENAS	<i>Kementerian Perencanaan Pembangunan Nasional</i> - National Development and Planning Ministry
BLUD	<i>Badan Layanan Umum Daerah</i> - Government Public Service Agency
CSSWM	Common System for Solid Waste Management
DHPS	Department of Housing and Public Services
DHPU	Department of Housing and Public Utilities
DLH	<i>Dinas Lingkungan Hidup</i> - Environmental Agency
DPRD	<i>Dewan Perwakilan Rakyat Daerah</i> - Provincial Government Legislatures
EA	Environmental Assessment
EE	Ecological Expertise
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP	Executive Power
ESIA	Environment and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FS and CD	Feasibility Study and Conceptual Design
GHG	Green House Gases
GOI	Government of Indonesia
HE	Heavy Equipment
ISWMP	Integrated Solid Waste Management Programme
ITF	Intermediate Transfer Facility
IVM	Integrated Vector Management
KSNP-SPP	<i>Kebijakan dan Strategi Nasional Pengembangan Sistem Pengelolaan Persampahan</i> - National Policy and Strategy for Developing Solid Waste Systems
LFG	Landfill Gases
LTP	Leachate Treatment Plant
MED	Ministry of Economic Development
MEMR	Ministry of Energy and Mineral Resources
MOEF	Ministry of Environment and Forestry
MPW	Ministry of Public Works
MPWH	Ministry of Public Works and Housing
NGO	Non-Government Organisation
NSUP	National Slums Upgrading Program
NUWAS	National Urban Water Supply Program
OI	Operational Instructions
PIU	Program Implementation Units

PMU	Program Management Units
PPSP	<i>Percepatan Pembangunan Sanitasi Permukiman</i> - Urban Sanitation Development Program
RPJMN	Rencana Pembangunan Jangka Menengah Nasional - National Medium Term Development Plan
SIA	Social Impact Assessment
SPPL	<i>Surat Pernyataan Pengelolaan Lingkungan</i> - Statement of Assurance for Implementation of Environmental Management and Monitoring
SWM	Solid Waste Management
SWMC	Solid Waste Management Company
TECG	Thermal Effect Creating Gases
TPA	<i>Tempat Pemrosesan Akhir</i> - Landfill
UEIP	Urgent Ecological Investment Project
UKL-UPL	<i>Usaha Pengelolaan Lingkungan dan Usaha Pemantauan Lingkungan</i> - Environmental Management and Monitoring Efforts
WB	World Bank
WtE	Waste to Energy

1 INTRODUCTION

1.1 Program & Sector Background & Description

Indonesia's Long Term National Urban Development Plan 2015-2045 sets the targets of urban service standards and increasing capacity of city management. Solid waste management is high on the national agenda, as exemplified by the National Medium Term Development Plan's (RPJMN) ambitious "100-0-100" targets of eliminating all slums and providing universal access to water and sanitation (including solid waste collection) by 2019³. This sets a highly ambitious goal for the improvement of public service delivery, because it is currently estimated that only 70% of Indonesia's 135 million urban residents have access to waste collection services and only 55% of urban solid waste is handled at a transfer station or processing facility. However, collection of solid waste varies widely between cities. Some cities have strong performance in solid waste management, with high collection rates (>80%), recycling schemes and local budget allocations that demonstrate commitment to the sector. On the other hand, some cities have abysmal performance with low collection rates (<20%) and little political commitment demonstrated.

The most recent data (2013) suggests that approximately 105,000 tons of municipal solid waste is generated daily in Indonesian urban areas and quantities continue to rapidly increase with an expected 150,000 tonnes of waste produced daily by 2025 (45% increase over 12 years). It is estimated that approximately 40% of solid waste is generated by private households whereas the remaining percentage is produced by a variety of sources, such as markets (20%), streets (9%), public facilities (9%), offices (8%), and industry (6%). Hence, not only does Indonesia need to increase collection to include roughly 30% of existing urban households currently with no service access, but will also need to contend with the annual increase of about 4,000 tons of solid waste produced every year due to increasing urban populations and rates of waste generation.

In addition to serious waste collection shortfalls, final disposal of waste is also an urgent and challenging issue. Of the 55% of solid waste actually collected and transferred to disposal sites, roughly 60% of the collected waste is not deposited in a sanitary landfill with appropriate environmental and social standards. In 2006, the Ministry of Public Works (MPW) issued a regulation (21/PRT/M/2006) mandating that all open dump landfills be either closed or upgraded to sanitary facilities by 2011. In 2008, the Waste Management Act (No. 18/2008) again required all local governments to close open dumping sites by 2013. However, despite the successive regulations and law, few sanitary landfills are currently operational and open unsanitary landfills remain the norm. These landfills often have numerous negative consequences, such as groundwater and surface water contamination, air pollution and very hazardous working conditions for "waste pickers".

Following decentralization reforms, the national government's role has been limited to an advisory and regulatory role with municipal governments as the primary implementers. The responsibilities of the Ministry of Public Works and Housing (MPWH) in solid waste management are generally (not strictly) limited to providing technical advice, promoting pilot projects, and supervising large-scale off-site solid waste facilities. The Ministry of Environment and Forestry (MoEF) also has an important responsibility for developing policies, formulating regulations, and coordinating efforts in pollution control. However, local governments are ultimately responsible for solid waste management, as established in Presidential Decree No. 2/2002 and reaffirmed in the Waste Management Act (No. 18/2008).

³ The "100-0-100" target refers to 100% household access to water supply; zero slums; and 100% household access to sanitation (including waste water treatment and solid waste collection).

The BAPPEDA (municipal planning agency) and DLH (cleansing services unit) are the key local government agencies responsible for the planning and implementation of solid waste management. However, the funds allocated by local governments have been critically insufficient for the high recurrent expenditures needed for collecting waste, and for investments and maintenance of sanitary landfills. In addition, the transfer of solid waste responsibilities to local governments was often not accompanied by a subsequent transfer of the necessary technical skills. Given the severity of the challenge, the MPWH and MoEF are keen to support local governments and spur investments in the sector. However, in order to reach the RPJMN's goal of 100% sanitation coverage, MPWH estimates that new investments of approximately US\$5 billion will be needed in the solid waste sector over the next four years. With less than US\$1.5 billion predicted to be available from the national government until 2019 (including funding from international development agencies) and only limited additional financing available from local governments, there are considerable investment financing gaps to achieve policy targets.

1.2 Improvement of Solid Waste Management Project for Regional Areas and Metropolitan Cities

There is now a clear consensus amongst senior management staff in National Development Planning Ministry (Bappenas), MPWH, and MoEF that a nation-wide, scalable programmatic approach that supports the solid waste management sector will need to be prepared to address the serious challenges in the sector. Meetings have highlighted the urgent need to establish a national solid waste management program to channel infrastructure investments, invest heavily in city capacity building, and reorient the national government's role to enable city-driven initiatives in the solid waste management sector.

The structure of the proposed program will be fully aligned to enhance the performance of existing government initiatives and programs, such as the Sustainable City Index in Bappenas, Urban Sanitation Development Program (PPSP) in MPWH, and most importantly it will be synchronized with the Solid Waste Sector Roadmap 2016 - 2025 currently being prepared by MoEF. The program will be designed similarly to the existing Indonesian urban programs such as the National Slums Upgrading Program (NSUP) and the National Urban Water Supply Program (NUWAS) to apply experience gained in these programs and to avoid unnecessary transaction costs and duplication. For example, implementation arrangements may be harmonized with existing multi-ministerial working groups, such as the Water and Sanitation Working Group.

The objective of the new program will be to improve solid waste management services for urban populations across Indonesia. Success will be measured by the such metrics as, (i) people in urban areas provided with access to regular solid waste collection under the program (number); (ii) measurement of national program functional capacity; (iii) sanitary municipal waste disposal capacity created under the program (tons/year); and the (iv) amount of waste diverted from landfills (tons/year). To achieve these objectives, the program will be organized around four components in similar fashion to other Indonesian urban infrastructure programs supported by the World Bank:

- Component 1** : **Institutional and Policy Development (Approx. US\$10 million Total Budget; US\$3 million IBRD).** This component will support institutional strengthening and capacity building of central government agencies responsible for various technical and administrative aspects of solid waste management services (e.g. MoEF, MPWH, Bappenas, Ministry of Energy and Mineral Resources (MEMR)).

- Component 2** : **Integrated Planning Support and Capacity Building for Local Government and Communities (Approx. US\$100 million Total Budget; US\$27 million IBRD).** This component will finance the costs of experts and community facilitators throughout the project cycle to support capacity building (including training, workshops, and knowledge exchange events between cities as well as urban sub-districts) of local governments and communities to design and manage solid waste service improvements (approximately 50 cities to be supported).
- Component 3** : **Solid Waste Infrastructure in Selected Cities (Approx. US\$1,000 million Total Budget; US\$60 million IBRD).** This component includes two sub-components as summarized below.
- Sub-Component 3.1** : **Support for Integrated Solid Waste Management Systems for High Capacity Cities.** This component would provide financing for a select group of cities (maximum 10 cities) that have demonstrated sufficient capacity and commitment in solid waste management to justify large investments in complex systems and advanced treatment technologies. Cities selected under this component would receive support for investing in all needed infrastructure aspects of solid waste management not currently in place, including collection, transfer, treatment, disposal, and waste recycling/composting. This component would include financing for advanced treatment technologies, such as anaerobic digesters and refuse-derived fuel production. This sub-component is envisioned to facilitate the creation of model cities for solid waste management cities that can act as both inspirations and performance benchmarks for all other cities in Indonesia.
- Sub-Component 3.2** : **Support for Solid Waste Management Systems in Lower Capacity Cities.** This component would provide a financing mechanism for a short-listed group of cities (approx. 20-30 cities) to be selected for smaller and partial investments to improve their collection, treatment, and disposal of solid waste. For Indonesia to reach its 100% sanitation goal it will be necessary to also support cities that still face problems in adequately managing waste collection and disposal services and to provide sufficient financing to improve these operations. Many of those cities may not need nor would be capable of managing large and costly sanitary landfill sites or treatment facilities, but their capacity could substantially benefit from the provision of limited investments to existing infrastructure and at existing sites. These investment options could include: investments to improve operations at existing waste disposal sites (such as improvements in waste reception and disposal logistics, leachate collection and treatment, landfill gas capture), construction of waste transfer stations, collection equipment, sanitary closure and environmental rehabilitation of old dumping sites, and investments in waste sorting and segregated waste collection.

Component 4 : **Implementation Support and Technical Assistance (Approx. US\$60 million; US\$10 million IBRD).** This component will provide technical support, advisory services and training of Program Management Units (PMUs) at national level, and for Program Implementation Units (PIUs) at provincial and city levels (approx. 50 cities). Strengthening implementation and management capacity will involve support for monitoring and evaluation systems for the proposed program, enhancing stakeholder's collaboration at all levels, and training to make substantial use of participatory techniques for community engagement. Costs of national management consultants and oversight service providers will be financed under this component.

As part of the preparation for the programmatic approach, the Government of Indonesia and World Bank have agreed on the need for a Program Implementation Roadmap that will outline both the actions and investments needed for establishing an effective SWM Program. The Roadmap would highlight required i) Policy Reforms; ii) Implementation Arrangements; iii) Technical Sectoral Guidelines; iv) Local Capacity Building Needs (planning, operational, and financing); and v) Investment Plan for First \$1 Billion (USD) of Integrated Waste Management Infrastructure.

The WB, in consultation with the Government of Indonesia, have already prepared an initial shortlist of seven cities/districts to be included in the project:

The results of the initial long list analysis and screening produced a shortlist of seven sites for further detailed screening:

No.	Location	Landfill (TPA)
1	DKI Jakarta	AD and TPA Bantar Gebang
2	Denpasar	TPA Regional Sarbagita
3	Makassar	TPA Tamangapa
4	Manado	TPA Sumompo
5	Palembang	TPA Karyajaya
6	Padang	TPA Aie Dingin
7	Magelang - City & Regency	TBA

Following the continued screening process the list has further been refined down to four Tier 1. Candidate Cities; Makassar, Palembang, Padang and Magelang, are selected to proceed to Feasibility study phase. As part of the Feasibility Studies, and as a requirement of WB safeguard procedures, each site must meet Environmental and Social Safeguards procedures.

The following report represents the environmental and social impact assessment for TPA Tamangapa, Makassar.

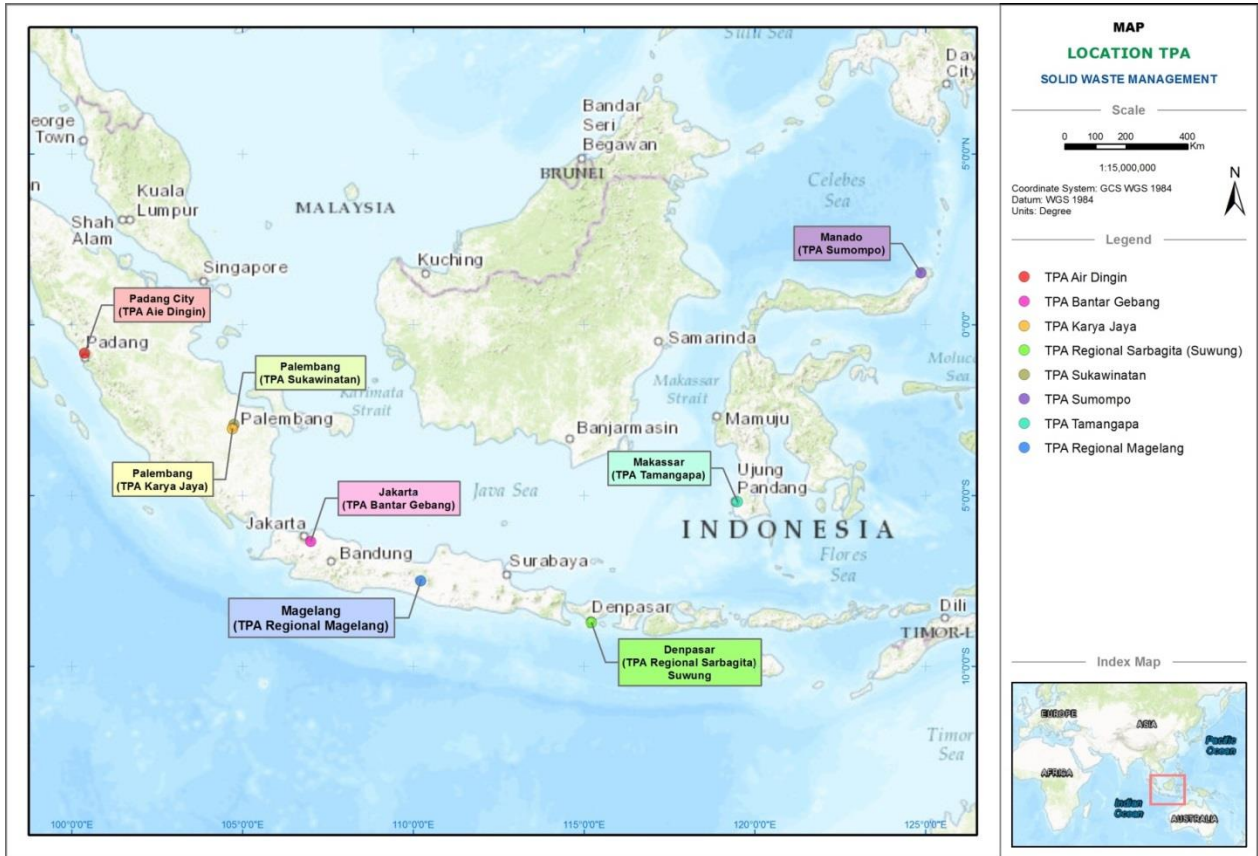


Figure 1-1 Location of Proposed Landfills Selected for Screening

1.3 Application of Environmental & Social Impact Assessment

Environmental and Social Impact Assessment (ESIA) is an important project planning and safeguards tool that provide basis for decision making on a proposed development. The application of the ESIA process at the project preparation stage ensures that the project is environmentally sound, socially acceptable and technically feasible, and has a strong understanding of the risks, benefits, and monitoring and management requirements for the project. The ESIA process at the early stage of project preparation also provides a throughout screening of the environmental, socio-economic implications as well as consider preferred alternatives for the development.

ESIA study for solid waste management projects is required by law in Indonesia. Under the Indonesia’s Environmental Protection Law, there are three levels of environmental impact assessment and management measures, based on the project environmental and social impact classification:

- Full environmental impact assessment (AMDAL);
- Environmental Management and Monitoring Efforts (UKL-UPL);
- Statement of Assurance for Implementation of Environmental Management and Monitoring (SPPL).

Although requirements for these are covered by national legislation, implementation may vary for each administrative region; this translates into differences in responsibility of the proponent and/or variation in requirements for some types of activities between regions. A list of business and/or activities requiring each type of assessment should exist in each region. As such, in the screening of the Project

Shortlisted sites, including Makassar, it is important to refer to local regulations on environmental assessment.

As regards project activities that are not included in the government's list of types of business and/or activities require AMDAL and UKL-UPL, there is a requirement to conduct environmental management and monitoring according to the relevant Standard Operating Procedures available and to have a Statement of Assurance for Implementation of Environmental Management and Monitoring (SPPL).

The World Bank have their own set of Environmental and Social Safeguards requirements which adhere to international standards and best practice. These are summarised in Section 4.

The application of ESIA is of utmost importance for solid waste management projects due to potential significant impacts on environment such as air, soil, and groundwater in and around landfills as well as major social issues. Also in many cases, particularly with large cities, landfills are located close to community settlements and/or employ large numbers of individuals on the site for management and recycling activities (waste pickers). This results in further potential health and safety concerns which need to be addressed through the ESIA.

1.4 Purpose of the Report

This ESIA report is prepared for the Government of Indonesia with the following purpose:

- To provide necessary insight and adequate basis for Government of Indonesia about the potential impacts that could be encountered in the implementation of the development plans, and requirements for mitigation, monitoring and management measures for Makassar landfill and any of the 4 landfills under consideration for investment when a full EIA process has to be conducted in order to comply with the Government of Indonesia's regulations.
- To address the gaps and additional requirements between Government of Indonesia's regulations and World Bank's Environmental & Social Safeguards, thus to help ensure that the Bank finance the environmentally sound and sustainable project.

This study is based on the WB's policy on Environmental Assessment (OP/BP 4.01) and investments proposed in the framework of the project may make application of OP/BP 4.12 Involuntary Resettlement necessary. For this reason, these policies will be considered as basic when preparing the Makassar documents. At the same time, the WB and project team will study the possibility of application of other safety policies in this project.

The potential impacts of the project on the natural environment and social situation have been defined in the report. Social research was carried out, including social surveys and public consultations.

As one part of the project preparation, the assessment of the project's environmental and social impact was conducted, the preventive measures and mitigation procedures (including corresponding monitoring) in order to avoid, minimize and eliminate the project's possible negative impacts were identified.

The Environmental and Social Management Plan (ESMP) is included in the ESIA report in order to define the activities required to mitigate the potential negative impacts. Public consultations were conducted to discuss the project proposed plans and recommended ESMP and Grievance redress mechanism.

1.5 The Report Structure

This Environmental and Social Impact Assessment was designed to conform with GoI Laws and regulations, and to the WB's Operation Policy and Procedures (WB OP/BP 4.01). This project was defined

as Category A project by the WB's criteria and because of the potential environmental effects for categorizing the projects based on the potential environmental impacts. The following Sections make up this environmental and social report:

1. Introduction
2. Project Background, Objectives, & Description
3. Political, Legal and Administrative Structure
4. Description of WB Environmental & Social Policies
5. Project Environmental and Social Baseline
6. Project Environmental & Social Impacts & Mitigation Measures
7. Public Consultation and Grievance Mechanism
8. Environmental and Social Management Plan – ESMP

Section 1 and 2 provide project introduction and description, followed by Section 3 where a summary of the political, legal and administrative structures is presented. A summary of relevant WB policies are given in Section 4. Information about the current environmental conditions in the project area is given in Section 5. Project impact analysis and description of the potential mitigation and management measures are covered in Section 6. Study areas cover the followings: geophysical site condition, surface and underground water, air and climate, noise, ecology, social, socio-economic, and cultural heritage. Public consultation is covered in Section 7, and environmental and social management plan (ESMP) is provided in Section 8.

2 PROJECT BACKGROUND

2.1 Project Objectives & Approach

2.1.1 Project Objectives

High Level Objective: To improve solid waste management services for urban populations across Indonesia.

Specific Objective: To provide short-listed cities with technical support to rapidly prepare solid waste management investments ready for design-build bidding. This would include assessing the quality, identifying and filling gaps in terms of feasibility studies, environmental impact assessments, resettlement action plans, and tendering documents.

2.1.2 Project Approach

The project will be fully aligned to support existing government initiatives and programs for the development of integrated SWM systems for large ('High Capacity') cities across Indonesia.

The project has a set duration of 4.5 months beginning in June 2017. The project consists of three key Stages:

Stage 1: Initial Screening of Nation-Wide Landfill Long List – WB, GoI and Consultant screening of long list of 104 sites and identification of priority list of 7 – 10 sites. (Two Months Duration)

Stage 2: Screening Study Fact Finding, & Analysis (Seven Cities) - fact finding (e.g. local government commitment, land availability) and preparation of an interim report as basis for decision-making during a workshop to be organized and attended by all relevant stakeholders and participating cities or district. (Six Weeks Duration)

Stage 3: Feasibility Studies for the Selected Measures (Four Cities) - on the basis of the interim report and decisions taken during the workshop and further investigations and analysis of the selected technologies, and options, etc. (Three Months Duration)

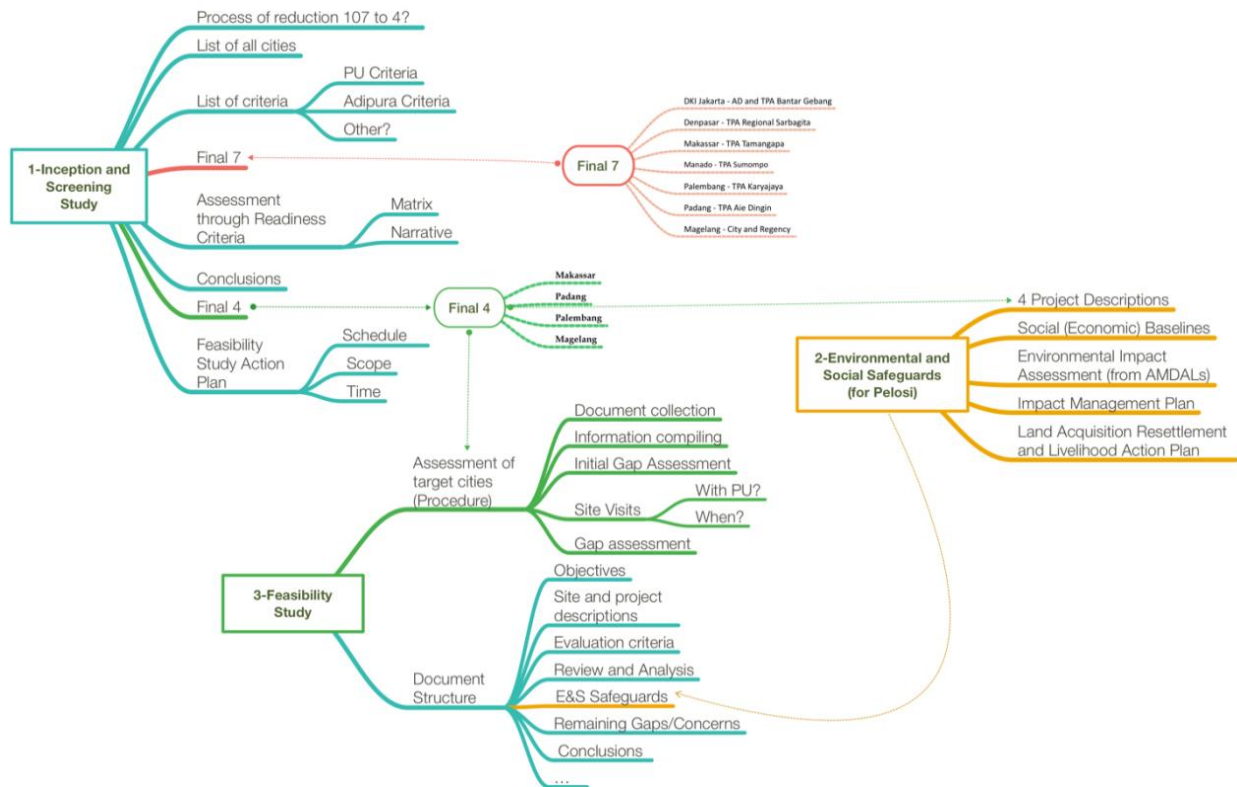


Figure 2-1 Stages of Project Approach

2.2 Study Methodology

2.2.1 Data Sources for Environmental and Social Baseline

Secondary data source used to establish the environmental setting are as follows:

- a. TPA Tamangapa Environmental Impact Assessment (*AMDAL TPA Tamangapa*), 2007;
- b. Feasibility Study of Makassar Landfill Gas Project, World Bank, 2007;
- c. Addendum to Makassar Landfill Gas Project – Environmental Due Diligence, 2007;
- d. Makassar in Figures (*Kota Makassar dalam Angka*), Statistical Bureau, 2014 – 2016;
- e. TPA Tamangapa Environmental Monitoring Report, Semester I 2016
- f. Planning Instrument of Makassar (*Instrumen Perencanaan Kota Makassar*), 2016;
- g. Detailed Engineering Design (DED) TPS 3R Makassar Municipalities, 2016;
- h. Makassar Sanitation Strategy (*Strategi Sanitasi Kota Makassar*), 2016;
- i. Solid Waste Management Master Plan Makassar (*Master Plan Sistem Pengelolaan Sampah Kota Makassar*), 2016; and
- j. Detailed Engineering Design (DED) TPA Makassar Municipalities, 2016

Secondary data for social baseline was gathered from the following government agencies and NGO:

- a. Brief Tamangapa Village Profile 2016 from the Office of Tamangapa Village;
- b. Profile of Manggala Village 2016 from the Office of Tamangapa Village;

- c. Manggala Sub-district in Figures, 2016, BPS;
- d. Makassar Municipality in Figures, 2016, BPS;
- e. Makassar Municipality in Figures, 2017, BPS;
- f. Top 10 prevalent diseases from Community Health Centre (Puskesmas) of Tamangapa;
- g. Top 10 prevalent diseases from Community Health Centre (Puskesmas) of Manggala Village; and
- h. Sanitation White Book of Makassar Municipality, 2014

Primary data for the social study was collected by means of

- Questionnaires collecting household socioeconomic data from 136 households, consists of 93 waste pickers, 43 other community members or non-waste pickers, and 15 waste buyers.
- Key informant interviews conducted to some local stakeholders. Details of list of interviewed stakeholders in the section 2.1

2.2.2 Social Study Methodology

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 get the profiles of waste pickers and waste buyers who rely their economic and livelihood sources on the landfill operation, 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 general information of respondents; socio-economic status; educational background/level; accessibility health, markets and public services and infrastructures; community stakeholders; project socialization and grievance mechanism and their perception about the landfill rehabilitation project plan. Interviews with stakeholders are conducted to gain an overview of the landfill, the socio-economic and socio-cultural conditions of potential affected people, perceptions of project plans and grievance mechanisms.

The sampling procedure in this survey is done with the following approach. Methodologically, the collection of 10% of the total waste picker population in TPA Tamangapa is considered to be representative of the population. Based on the estimated maximum number of waste pickers working in TPA Tamangapa (about 400 people), a total of 40 respondents methodologically have met the principle of representation. However, the factual number of waste picker respondents taken in this survey is 93 people or 23.25% of the estimated waste picker population. Respondents were selected randomly with the inclusion categories of men, women, children, and women single parent. In regards to community respondents, a number of respondents were purposively (43 respondents) taken from Tamangapa Village and Manggala Villages especially those who live near the landfill location that were chosen by simple random sampling. The survey was conducted during day and night to get sample representation from those who work at night and day time. 15 waste buyers (Pengepul) were randomly selected from the areas close to TPA Tamangapa.

The social survey was conducted from 14 to 18 August 2017 that involved 6 enumerators and 1 coordinator from local NGO, *Yayasan Peduli Negeri (YPN)*. Key informant Interview (KII) was made with:

- Ir. H. Moh. Ramdhan Pomanto, Mayor of Makassar Municipality
- H. A. Iskandar, SE, MM, Secretary Dinas of Environment

- Rahim, Head of landfill office
- Samsir, Officer in the landfill office
- A. Anshar AP, S.STP., MS, Head of Manggala Village
- Saharuddin Ridwan, Head of Association of Waste Bank Indonesia and Executive Director of *Yayasan Peduli Negeri*
- Andi Nurdianza, Waste Bank Manager at *Yayasan Peduli Negeri*
- Dang Aleh, livestock owners
- Makmur, Head of *Yayasan Pabbata Ummi Yapta-U*

2.3 Makassar City & TPA Tamangapa Site Description

2.3.1 Location, Population, and General Background

Makassar is the capital city of South Sulawesi. It is located at approximately 119° E and 5° S. Makassar City borders are formed by Kabupaten Maros to the north, Kabupaten Maros to the east, Kabupaten Gowa to the south, and Makassar Strait to the west. The administrative area of the city covers approximately 175.77 km² and is divided into 14 administrative districts (Kecamatan) with Kecamatan Tamalanrea having the largest area, approximately 38.37 km². The population of Makassar City is approximately 1,741,300 people in 2017.

2.3.2 Existing Waste Management

With the total local community of 1.7 million people, the city of Makassar generates about 1,000 - 1,200 tons of waste per day or 4,495 m³/day. The organic waste comprises approximately 68% of the total waste stream. The service area consists of 143 Kelurahan with the waste sources coming from protocol roads, residence, housing estate, trade centers, shops, commercial areas, offices, and surrounding government agencies.

Table 2-1 Service Area, Waste Generation, and Waste Transported to TPA in Makassar City

No	Kecamatan	Waste Generation (m ³ /day)	Waste Transported to TPA (m ³ /day)
1	Mamajang	338	315.9
2	Mariso	336	321.08
3	Tamalate	323	306.84
4	Rappocini	354	339.48
5	Makassar	321	302.1
6	Ujungpandang	339	327.12
7	Wajo	309	279.36
8	Bontoala	331	318.79
9	Ujung Tanah	341	319.87
10	Tallo	348	336.28
11	Panakuk kang	354	339.32
12	Manggala	302	189.06

No	Kecamatan	Waste Generation (m ³ /day)	Waste Transported to TPA (m ³ /day)
13	Biringkanaya	287	273.61
14	Tamalanrea	212	201.36

Source: DKP of Makassar City, 2016

Map of service area for solid waste in Makassar City can be seen in Figure 2-2. The existing waste management system in Makassar City is presented in Figure 2-3.

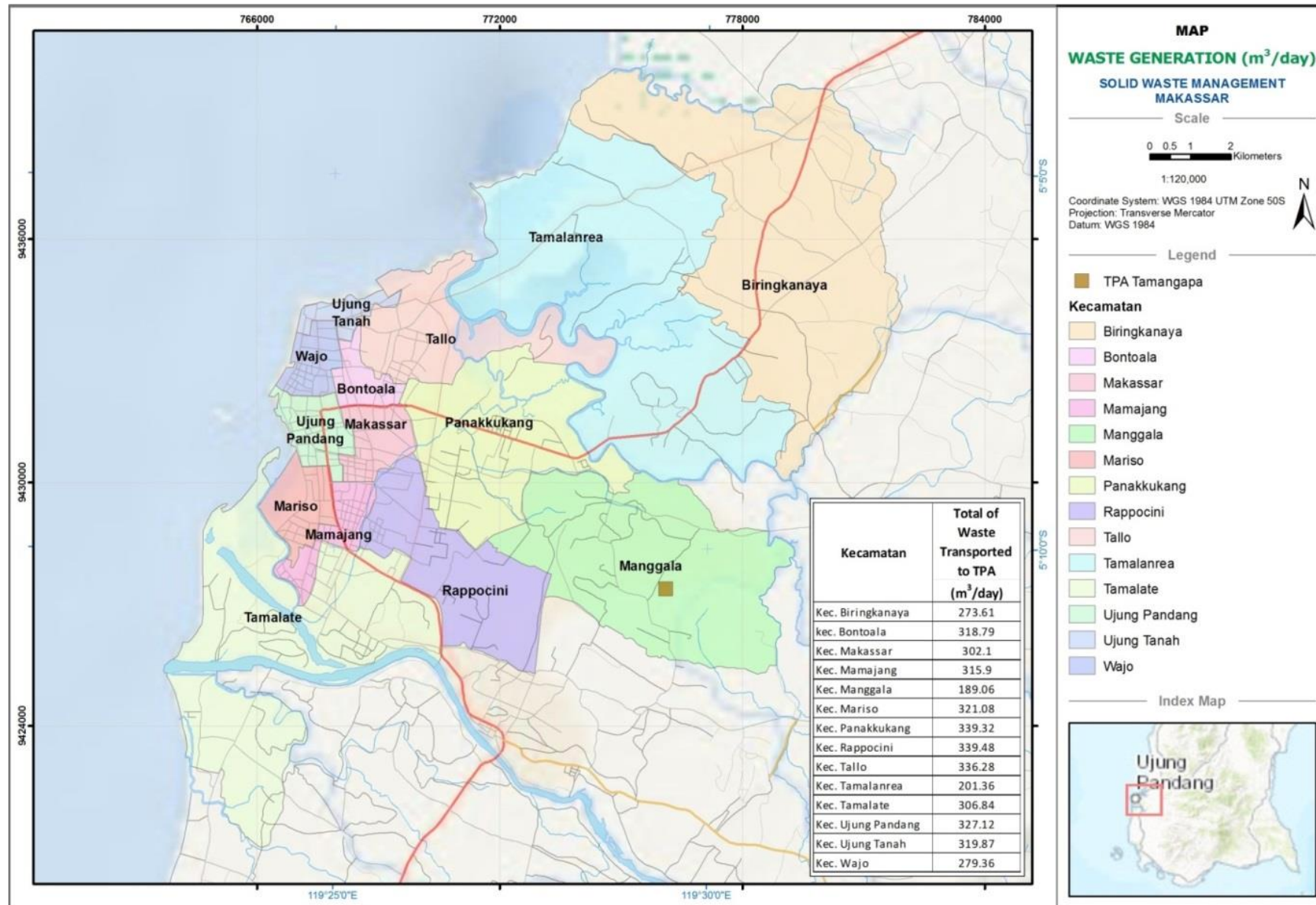


Figure 2-2 Waste Service Area in Makassar

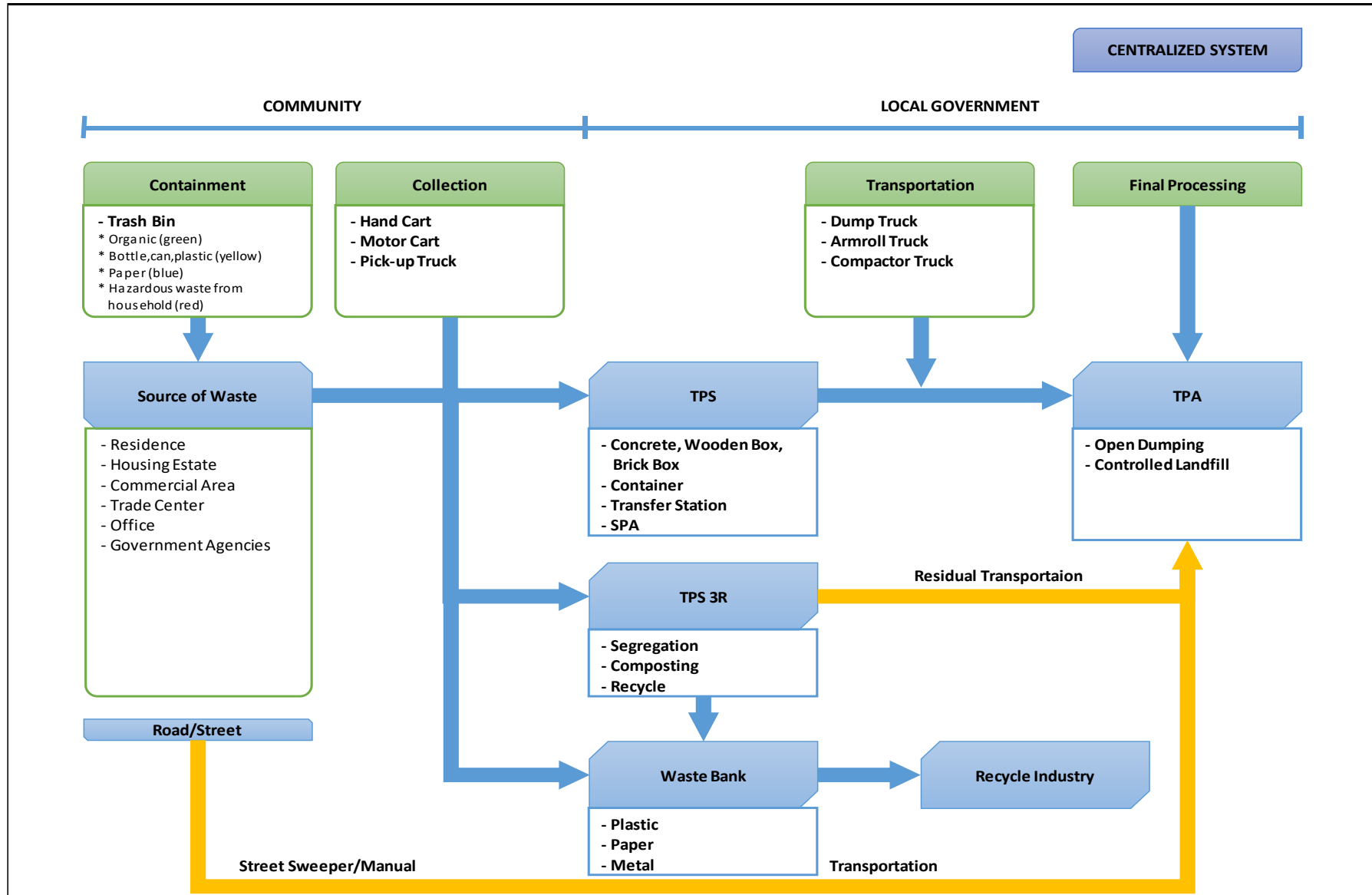


Figure 2-3 Existing Solid Waste Management Flowchart in Makassar

2.3.3 Existing Landfill Site Description

TPA Tamangapa, the main landfill in the city of Makassar, is located in Manggala Sub-District, Makassar. It is located ±14 km from the downtown of Makassar. It has been serving Makassar’s waste since 1993. The area to the north, south and west of the Site are settlement area, located in less than 1 km from the landfill boundary. To the east side of the Site is predominantly lowland. The waste-picker houses along with the *bandar*⁴ workshops are located close to the landfill entrance gate.

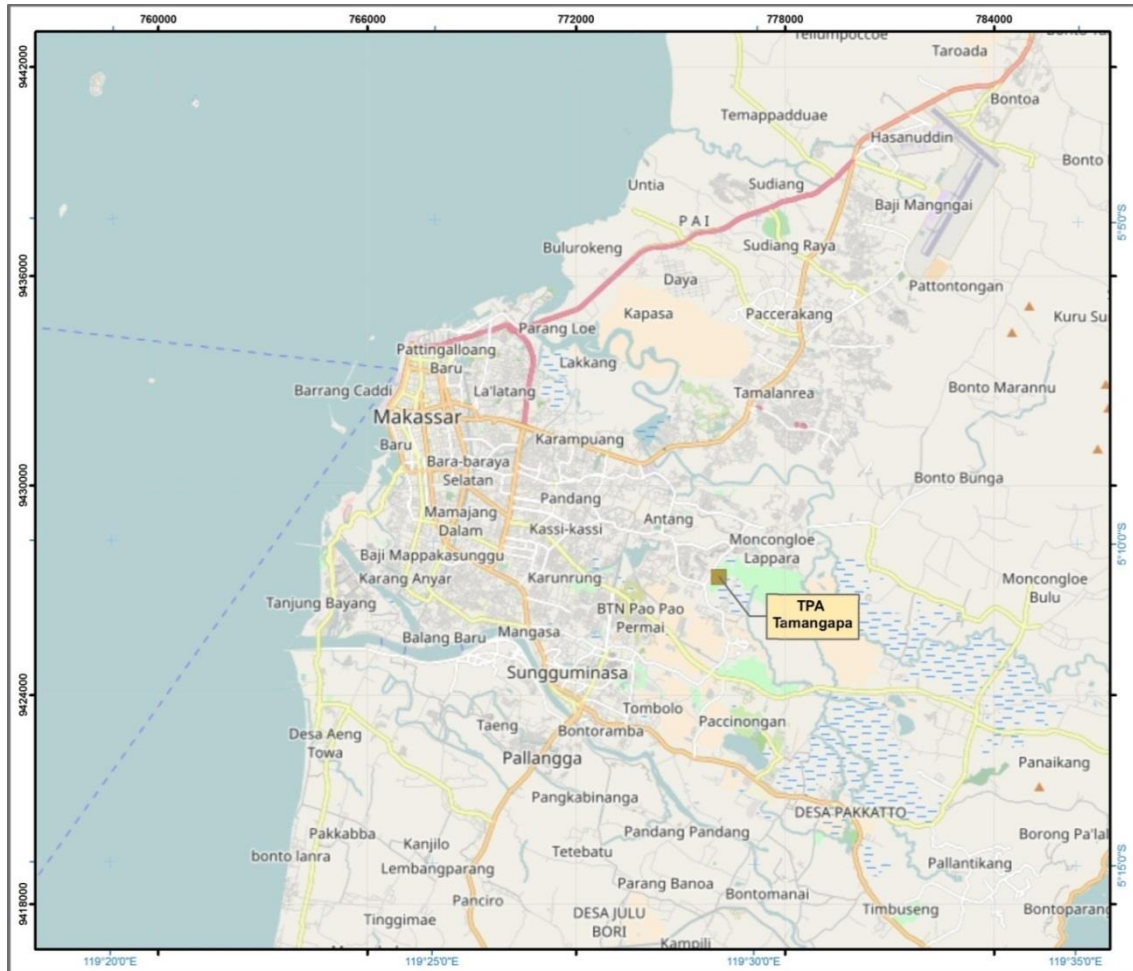


Figure 2-4 Location of TPA Tamangapa

The summary of TPA Tamangapa existing condition is presented in the Table 2-2 below. Lay out of TPA Tamangapa is shown in Table 2-2.

⁴ Private Sector intermediate waste recycling collector and sorter.

Table 2-2 Summary of TPA Tamangapa Existing Condition

Description	Existing Condition
Name	TPA Tamangapa
Location	Tamangapa Village, Manggala Sub-District, Makassar City 5°10'35.07" S 119°29'25.16" E
Year of operation	1993, landfill revitalization on 1 ha has been conducted in 2011.
Area	16.86 ha
Land Status	Government property
Distance to the nearest residence	Less than 1 km (~0.2 km)
Distance to river	3 km
Distance to coast	14 km
Distance to downtown	14 km
Distance to airport	30 km
Topography	Mostly flat
Environmental document	AMDAL (2007)
Landfill Operational Method	Controlled Landfill
Waste To Dispose	1,200 tonnes /day
Landfill Capacity	800 – 1,000 tonnes/day ¹
Cells	6 cells, consists of B1, B2, C1, C2, D, E. C1 was the only cell equipped with lining and leachate collection system as it was built by Satker PPLP South Sulawesi Province (using national budget APBN) as pilot project of sanitary landfill in 2011.
Impermeable layer	Clay
Groundwater Monitoring Well	4 units These are being monitored every 6 months. However, inconsistency in number of wells being monitored is occurred as reflected in the existing RKL-RPL (monitoring & management) report.
Gas collection facility	HDPE gas pipeline
Leachate Treatment Plant	<ul style="list-style-type: none"> • Status: Active • Consists of anaerobic pond, facultative stabilization pond and aerobic pond.
Leachate Collection System	Only installed in Cell C1.
Heavy equipment	<ul style="list-style-type: none"> • Bulldozer: 4 damaged unit, 5 active units • Excavator: 2 active units
Supporting Facility	<ul style="list-style-type: none"> • Entrance Gate • Weighbridge (active)

Description	Existing Condition
	<ul style="list-style-type: none">• Sorting Area• Office• Security Post• Workshop• Composting Unit (inactive)• Landfill Methane Collection and Flaring System (inactive)• Access and operational road
Waste Pickers	~400 people
Cattles	~700 cows
Remaining Landfill Lifetime	3 – 5 years since 2017

Source: Site Visit, July 2017



Figure 2-5 Lay Out of TPA Tamangapa

2.4 Project Description

TPA Tamangapa in Makassar is a pre-existing landfill, as described in the previous sections, the main landfill serving the SWM needs of Makassar City. The site is being operated at present as barely more than an open dump. The main priorities of the World Bank sponsored project are to rehabilitate and upgrade the site to reduce environmental, social, and public health impacts and to conform with the Gol and WB international sanitary landfill standards, and to create additional space/operating life through construction of new cells and Intermediate Treatment Facilities.

Referring to Figure 2-5 and Table 2-2, the overall plan area of the TPA Tamangapa Site is approximately 16.86 ha; with about 2.86 ha currently allocated to access routes, support facilities (office, weighbridge, security, workshop, etc.) and leachate treatment; leaving nominally 14 ha for existing and/or future waste disposal.

Given what is likely to be maintained as permanent access along the east and west sides due to the existing wetlands and public road/current residents, respectively; future/rehabilitated landfill cells are likely to be generally rectangular-shaped with approximate plan dimensions of 200 m (east-west) by 100 m (north-south); with maintenance access roads, surface water drainage, and landfill cell lining/ leachate collection system termination details and leachate sumps located along corridors on the east and west boundaries.

It has been preliminarily estimated that; with the relatively high, seasonal rainfall (refer to Figure 5-4); the future leachate treatment plant will, in its rehabilitated form, occupy approximately 3ha. Rehabilitation of the waste disposal area is anticipated to include, but not necessarily be limited to: perimeter containment bunding; re-shaping of the existing surfaces to a long-term stable configuration across disposal areas; and installation of a dual-purpose system serving as capping/closure for the previously placed waste and base lining/leachate collection for future waste to be placed vertically above. Collected leachate will be transported to the leachate treatment plant before being discharged to the environment. Landfill gas will be collected and pipes for treatment and/or use in power (electricity or heat) generation.

It is estimated that; at a current waste disposal rate of 1,200 tonnes/day, and in consideration of annual increases commensurate with population and consumer demand; the current Site will have an effective life of 3 to 5 years. The 3R and other waste reduction measures, and/or physical, horizontal expansion of the Site will increase this.

The main project development components can be summaries as follows:

- 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 odour 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.

Very simple treatment options may be available to reduce concentrations of organic material in leachate by approximately 50% (essentially pond systems), but the area requirements for these systems are excessive.

The proposed treatment concept includes a buffer storage or equalization tank to reduce the size / capacity of the downstream in-line treatment sections. The actual treatment system includes anaerobic treatment to reduce the concentrations of organic material in the leachate and has a potential for recovery and utilization of biogas, followed by treatment of residual organic material and nitrogen removal in a nitrification / denitrification type activated sludge plant with final polishing of the treated leachate in engineered wetlands (reed beds).

The treatment system is designed to provide at least partial treatment to the landfill leachate should mechanical equipment fail. Inlet (lift) pumps to the LTP will need to function at any point of time and a power back-up system will be provided for this part of the system.

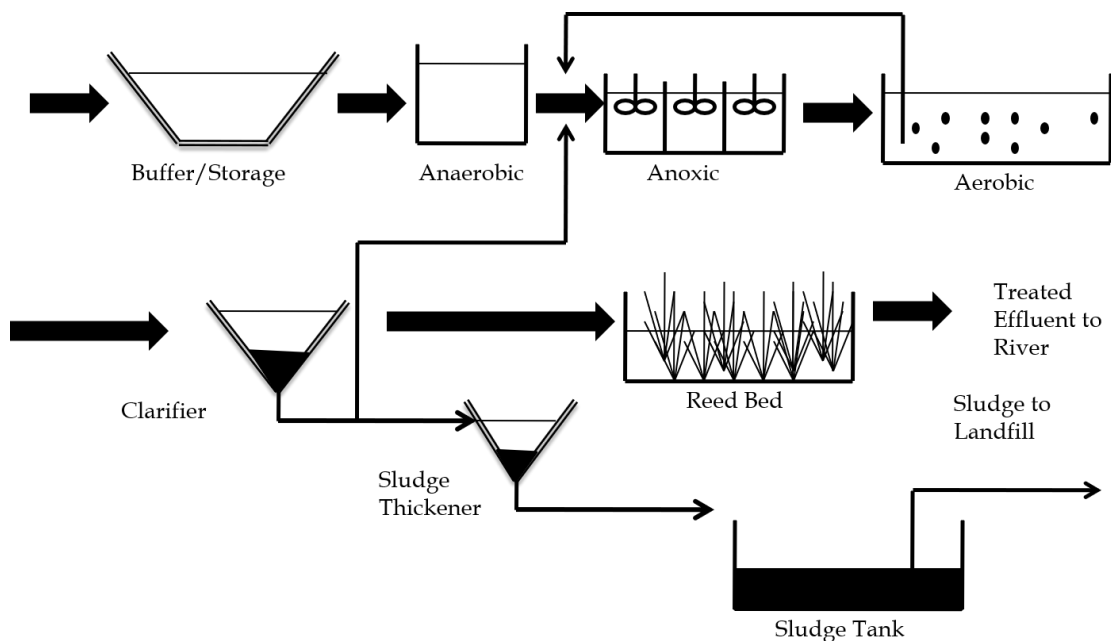


Figure 2-6 Scheme of Leachate Treatment Plant

- 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.

The above project activities will aim to ensure that TPA Tamangapa is upgraded to an international sanitary landfill facility with additional operating capacity to serve the City for at least ten - twenty more years depending on the operational regime). The example of site plan for TPA Tamangapa Rehabilitation is shown in Figure 2-

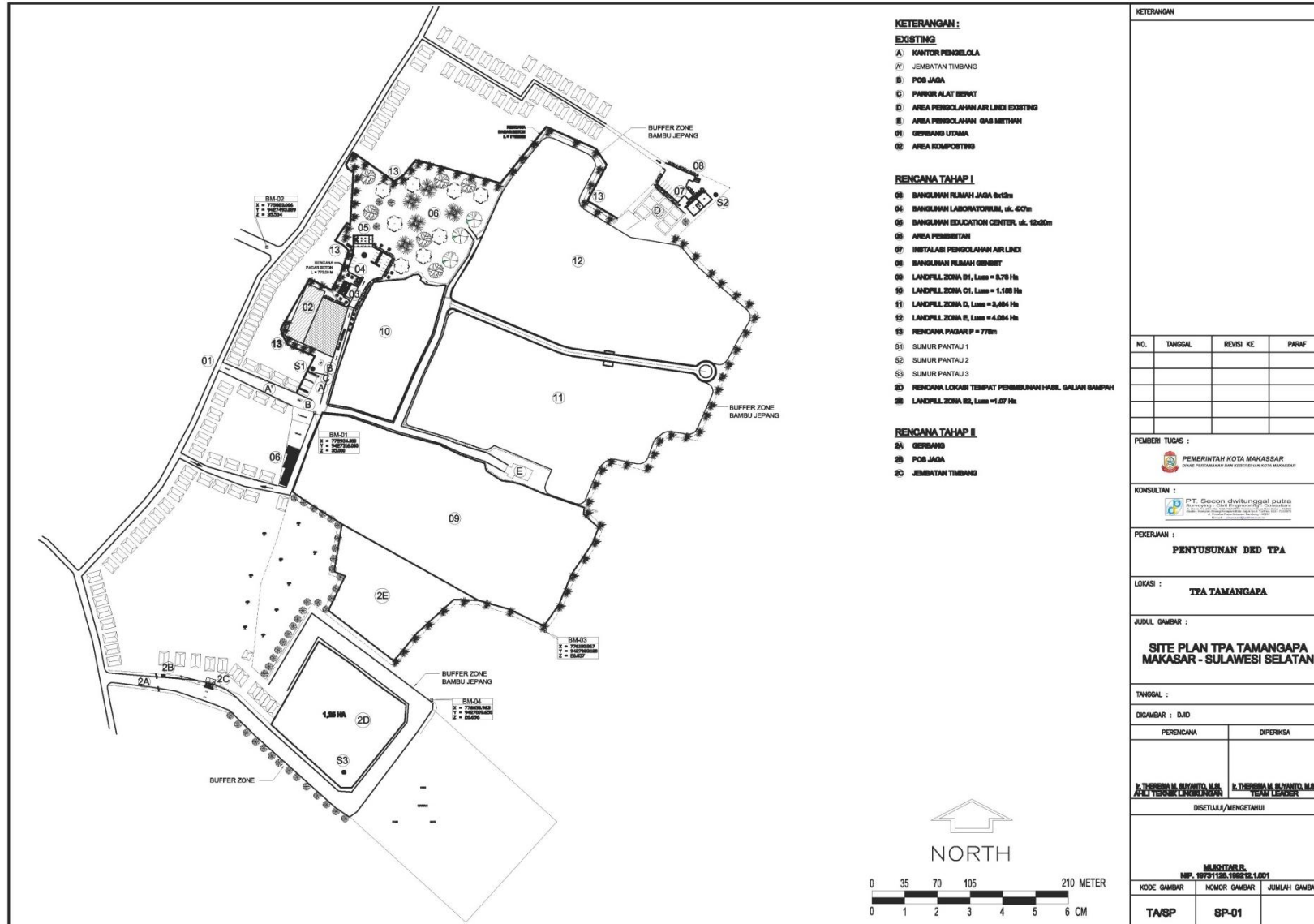


Figure 2-7 Example of Site Plan for TPA Tamangapa Rehabilitation

2.5 Analysis of Alternatives

Makassar is a large municipality (Population 1.7m) producing over a thousand tonnes of waste per day. The existing landfill of Tamangapa is reaching capacity and time is running out to develop a long term solution for solid waste management. A summary of alternatives considered by the project team are presented in the **Table 2-** and text below:

Table 2-3 Summary of Alternatives for Waste Management Solutions

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 will be less than rehabilitating/extending existing site.	Will take at least 3-5years to identify, design and construct a new site. Makassar is a heavily developed urban city with limited site options. There will be heavy opposition to any new site from local community. Does not address environmental, social, public health issues at existing site that will continue to cause longterm and secondary impacts to the environment and public health
4 (a)	Develop Advanced waste reduction (3R) and/or waste to energy incinerator.	Maximises waste reduction. Provides income generation from recycling and/or power production.	Does not (directly) address environmental, social, public health issues at existing site. Competes with picker population for recyclables if

Alternative	Description	Pro's	Con's
		<p>Reduces potential GHG emissions.</p> <p>Requires very little space (<5Ha).</p> <p>Can be developed on the existing site in conjunction with Alternative 1. to extend the operating life of the existing landfill.</p> <p>Can be integrated into Alternative 2 to enhance recycling and extend life span of the rehabilitated landfill.</p> <p>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</p> <p>Still requires landfill (approx. 20% waste + ash from thermal process).</p> <p>Will generate Dioxins requiring quenching.</p> <p>Very expensive, both in terms of CAPEX & OPEX.</p> <p>Long lead-time, 3-5 years.</p> <p>Requires advanced operation, management, and maintenance capacity which does not exist at present.</p> <p>High Risk! No existing commercial scale thermal process WtE plants are currently in operation in Indonesia.</p>
<p>4 (b)</p>	<p>Develop green waste open windrow composting operation to produce topsoil for capping and possible grazing land for cattle</p>	<p>Reduces GHG production.</p> <p>Low cost for CAPEX and OPEX</p> <p>Allows use of salvaged mature cell earth to mix with compost to produce topsoil.</p> <p>Provides work for waste picker population</p> <p>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 greenwaste and market greenwaste to produce uncontaminated soil products free of sharps or glass or metal pollution.</p> <p>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>
<p>4 ©</p>	<p>Anaerobic digester lagoon in leachate treatment facility</p>	<p>Increases BOD strength of waste stream and increases efficiency of anaerobic process and gas production for carbon credits.</p> <p>Diverts organic waste stream and does not compete with waste pickers for recyclables.</p> <p>Provides further safe work for</p>	<p>Requires pickers to segregate waste and divert restaurant and other unco-mingled waste.</p> <p>Requires power for contra-shear macerator and pumps to blend with leachate.</p> <p>Needs floating plastic cover with life of 10 years and de-sludging of inerts from lagoon every ten</p>

Alternative	Description	Pro's	Con's
		<p>pickers.</p> <p>Can power floating aerators to increase efficiency of treatment and reduce area of leachate treatment train.</p> <p>Reduces strength of leachate and area of treatment train</p>	<p>years when cover is replaced.</p> <p>Needs safety gas vents, emergency flare and high speed gas turbine generator(s)</p> <p>Needs gas vapour removal and plant maintenance.</p> <p>Needs additional volume in anaerobic pond to take 10 days HRT flow of additional food and leachate slurry injected through multi-port inlet manifold</p>

2.5.1 Do Nothing

TPA Tamangapa is currently operating at little more than an open dump. The landfill management team are doing their best with limited budget and resources, but there is only one lined cell with no leachate collection system, an ineffective, undersize leachate treatment system, and no safe working zones for waste pickers. The in-situ waste is between 10-15m high across six cells covering an area of more than 14ha. The waste cells have no capping so rainfall can infiltrate into the waste mass and increase leachate generation, and the waste slopes are less than 1:1 leaving a high risk of collapse and possible injury or loss of life to workers and/or waste pickers.

Under the ‘Do Nothing’ scenario, Tamangapa will continue to pose a significant environmental, social and public health risk both to workers, the surrounding community and the environment. GHG will continue to be emitted, groundwater and surface water will be polluted from uncontrolled leachate discharge, odour, wind-blown waste and disease vectors (rats, flies, etc.) will continue to affect workers, waste pickers and the surrounding community. It will also impose long term contamination of soil and groundwater that will create longterm and secondary impacts to the environment and nearby residents.

At the current rate of filling (1,000tpd), Tamangapa will be full within less than 5 years. Without an alternative SWM option, solid waste will rapidly build up across the city.

Analysis result: Least preferred option. Action must be taken to address the current poor condition of the site and lack of future disposal airspace.

2.5.2 Rehabilitate & Extend the Existing Site

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, odour, disease vectors, and GHG emissions. The waste mass will be reshaped to stabilise cells and reduce the risk of slope failure. The waste mass will be reshaped to optimise 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).

As the site already has an AMDAL, is zoned for landfilling, and is accepted by the surrounding community, this will 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 (U18-

2008) and international sanitary landfilling standards. The extension works will include a sorting station to provide a safe working environment for waste pickers and to maximise 3R waste reduction. Space will be allocated for advanced waste reduction / waste to energy (alternative 4) which could potentially further increase the operating life of the site up to 20+ years through significant waste reduction processes.

Addressing the existing condition of the site and extending within the existing boundary 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 site beyond its existing boundaries, or identification and development of a new site.

Analysis result: Preferred option to immediately address current situation and provide sufficient extension life to develop longer term solution.

2.5.3 Develop a New Landfill Site

Developing a new landfill on a 'greenfield' site provides the opportunity to start from first principles and design a proper built facility meeting the latest standards for sanitary landfilling specifically designed to match the operating budgets, capacity, and local conditions. A new site would ensure the City of Makassar would have a long term (20-30 years) solution to SWM needs.

Development of a new 'greenfield' site will take a minimum of three to five years, including the site screening and selection, pre & feasibility studies, EIA AMDAL and possibly an ESHIA, LARAP, Detailed Engineering Design (DED), tender, construction and commissioning. Identification, screening and selection of a new site will be extremely difficult as Makassar is a heavily developed city with limited suitable sites and it is highly likely there will be significant resistance from surrounding communities opposed to the location of a new landfill in their vicinity, which could further delay the development of the site. During this process the existing Tamangapa site will reach capacity with no further alternative for waste treatment and final disposal. The existing site will also still need to be properly remediated during the closure process to prevent long term environmental, social and public health impacts.

Analysis result: Not most preferred option due to the long development time and need to address the current poor site conditions. May be required as a future option following redevelopment of the current site.

2.5.4 Advanced Waste Reduction (3R) Composting, Waste to Energy Incinerator, or Digester

An advanced waste reduction system including sorting and recovery station for recyclables and a thermal process waste to energy system, incinerator would provide an effective waste reduction solution which could reduce final disposal requirements to <20% of the waste stream. A waste to energy incinerator is the current preferred option for the Makassar Wali Kota and a 3Ha area within the existing TPA Tamangapa site has already been reserved for an ITF/WtE project. WtE incinerators have a number of advantages including significant waste volume reduction, ~~income~~ and power generation, reduction in GHG production, relatively small footprint, and reduction in environmental impacts to soil and surface/groundwater from leachate production.

Although the above advantages of an incinerator project appear to address many of the current issues/needs, there are a number of drawbacks associated with this option, namely; very high CAPEX/OPEX in the region of US\$350million to establish the plant with a further \$50-\$70 per tonne requirement for operation and maintenance. In addition, like the new landfill option, the lead time for an incinerator project will be 3-5 years. At present there are no commercial scale thermal process WtE projects in operation in Indonesia, despite numerous attempts by national, international, and donor/IFI

backed project groups. The risks, therefore, remain very high without prior precedents to refer to. In association with this risk there is no existing capacity to operate, manage, and maintain such a plant. In order for the project to be successful, the Makassar government would need to engage a private sector operator with a solid track record of international experience in establishing and running a WtE incinerator project.

An advance WtE incinerator project would still not entirely negate the need for a final disposal site to manage the 20% waste/ash. As such the WtE option would be a good compliment to the Alternative 2. Rehabilitation of the existing site, as it would significantly extend the life of the landfill and provide final disposal facilities for the 20% waste/ash.

The target fuel is also the main recyclables separated out in the municipal and private collections and by the very large numbers of dependent waste pickers at the site. Therefore, an incinerator project would either impact the waste pickers livelihoods or, more likely, the incinerator waste stream would be impacted from waste pickers removing high CV recyclables before they reached the plant. This will then need supplementary fuel to support combustion at an acceptable temperature and will be very expensive – especially in the wet season.

Large Scale Composting: Has the advantage of being cheap, providing enhanced income/employment of waste pickers, reduces GHG production, and provides a cheap, readily available source of intermediate cover material. However, it does not deal with the complete waste stream so cannot work as a stand-alone option, and the composting facility requires a large hard-standing area for operation.

Simple Covered Anaerobic Digester Lagoon: Many technical advances have been made over a few decades to the traditional anaerobic lagoon, with its surface crust and odour problems. Anaerobic digestion is extremely efficient for strong (high BOD) wastes and takes about one third of the area of equivalent aerobic treatments.

The major change has been the advent of floating plastic covers and methane gas collection to a flare or gas turbine generator. These have become so efficient that water boards and private capital are setting them up to take strong liquid and biodegradable waste to generate power for profit.

Typical installations as common in Canada, Australia and worldwide comprise a 6 meter deep lagoon – may be clay lined or HDPE lined with a floating HDPE cover. If a clay pond, the cover must be anchored below top water level to seal in gas migration.

At Makassar, there is a leachate treatment plant proposed which incorporates an anaerobic digester with around 20 days hydraulic retention time – uncovered.

If we use a materials sorting facility for the pickers safe operations, then suitable food scraps may be diverted to a contra-shear or other macerator and added to the covered anaerobic digester to increase the waste stream strength and achieve higher biogas production. This will, at the same time divert around a quarter of the waste stream and a major contributor to landfill leachate strength. The mass of food scraps is almost entirely converted to biogas, saving significant air space and powering a more efficient leachate treatment facility.

Leachate from the anaerobic digester may also be pumped back at a low flow into trenches atop the filled cells to accelerate anaerobic digestion of waste as for a bio-reactor landfill. This accelerates settlement and extends airspace for the landfill as a further benefit of the operation. Any flares or gas generators can also accept landfill gas harvested from the covered cells in the future. Gas supply is consistent and guaranteed by this digester operation.

Analysis result: *Not preferred as a stand-alone option due to high cost, long lead-time, and high risk. Advanced Solid Waste treatment and reduction may be considered in conjunction with option 2, rehabilitation and extension of the current site, but not as a stand-alone option.*

3 THE LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Indonesian SWM Guidelines, Laws & Regulations

The Solid Waste Management in Indonesia is regulated under Indonesian Laws and Regulations. In addition, Indonesian Laws and Regulations are divided into five layers. At the top level is the nation, the Republic of Indonesia, which consists of 33 *provinsi* (provinces). Each province is headed by a *gubernur* (governor). The various *provinsi* (otherwise known as Level 1 regions) are further subdivided into *kabupaten* or regencies (Level 2 regions, headed by the *bupati* or district administrators), which are further subdivided into *kecamatan* (districts) and *desa* (villages). Within the provinces, there are municipalities or city governments, which enjoy the same status as regencies. These metropolitan regencies are referred to as *Kota* (or townships), not *Kabupaten*. Each *Kota* is headed by a *walikota* (town administrator or mayor).

Decrees issued at regional (provincial and local) government are based on laws, government regulations, and presidential and ministerial decrees already stipulated by the national legislature and central government. Such decrees are formulated in accordance with the particular circumstances of the regional government, such as population, territorial area of administrative jurisdiction, size of annual regional government budget (APBD), etc. Central government laws, regulations and decrees are first disseminated and socialized with regional governments before their regional government counterparts can be drafted and issued. This process can take considerable time – usually at least one year and sometimes up to two years or longer.

At provincial government level, the decrees are:

- Provincial Government Decree (*Peraturan Daerah* or *Perprov*)
- Provincial Gubernatorial Decree (*Peraturan Gubernur* or *Pergub*)

At local (*kota/kabupaten*) government level, the decrees are:

- Local Government Decree (*Peraturan Daerah* or *Perda*)
- Mayoral (*Walikota*) Decree (*Peraturan Walikota* or *Perwali*)
- Regency (*Bupati, Kabupaten*) Decree (*Peraturan Bupati* or *Perbup*)

Perda usually contain matter which impacts upon the APBD and therefore require the approval of the provincial or local government legislatures (DPRD) before signature by the governor, mayor or regent, as the case may be. *Pergub*, *Perwali* and *Perbup* can be signed by the heads of regional government without such referral.

For this study, the review will mainly focus on the top level of the Laws and Regulation at National Level. Regulations on solid waste management and environmental impact assessment from Government of Indonesia comprise of regulations enacted by central government, president, ministry, and also a variety of National Standards. The first national technical policy document for Solid Waste Management is Public Work Minister Regulation No 21/2006 on the National Policy and Strategy for Developing Solid Waste Management Systems (KSNP-SPP). A summary of the legal-normative documents related to the waste management and environmental impact assessment in Indonesia (including hazardous wastes) are provided in Appendix 1.

3.2 Application of WB Solid Waste Guidelines & Safety Policy

The WB's Safety Policy requires application of the Environmental Assessment (OP/BP 4.01) for this project. The main directives describing the WB's policy in the environmental assessment (EA) area are Operation Policy (OP⁵) and WB Procedure (BP⁶) 4.01 on the EA. EA is one of eleven key Operational Policies and associated Bank Procedures for projects applying for World Bank financial support. Application of this policy is required to identify, minimize and mitigate the potential negative/unsatisfactory ecological and social impacts of the project. Eleven key operational policies and associated procedures of the Bank regarding Environmental and Social Safeguards shown in Table 3-1 and Appendix 2 identify the requirements put forward for crediting the projects by the WB.

Table 3-1 World Bank's Environmental and Social Safeguard Key Policies

OP/BP 4.00 – Piloting the Use of Borrower Systems to Address Environmental and Social Safeguard Issues in Bank-Supported Projects
OP/BP 4.01 – Environmental Assessment
OP/BP 4.02 – Environmental Action Plans
OP/BP 4.03 – Performance Standards for Private Sector Activities
OP/BP 4.04 – Natural Habitats
OP 4.09 – Pest Management
OP/BP 4.10 – Indigenous Peoples
OP/BP 4.11 – Physical Cultural Resources
OP/BP 4.12 – Involuntary Resettlement
OP/BP 4.36 – Forests
OP/BP 4.37 – Safety of Dams
OP/BP 7.60 – Projects in Disputed Areas
OP/BP 7.50 – Projects on International Waterways

Based on WB policy for Environmental Assessment (OP/BP 4.01), Makassar TPA Tamangapa project is classified as a Category A project.

Application of applicable WB Safeguard policies to Makassar TPA Tamangapa can be summarised in the following:

- **Environmental Assessment (OP/BP 4.01)**

The project will have potential for ecological and social impacts. This makes the application of the WB's Environmental Assessment (OP/BP 4.01) policy in the proposed project necessary.

The Environmental Assessment Policy (OP/BP 4.01) is activated as the implementation of works related to building sanitary landfills or closing waste dumps, as well as the operation of proper disposal sites may generate significant environmental and social impacts that need to be avoided, mitigated and/or

⁵ Operation Policies (OP) – The World Bank's Operational Policies are short, focused statements that follow from the Bank's Articles of Agreement, the general conditions, and policies approved by the Board. OPs establish the parameters for the conduct of operations.

⁶ Bank Procedures (BP) – Bank personnel's explanation how to implement the policies established by OP's. They also explain the procedure and documentation providing the succession and quality of banking.

compensated with adequate environmental management tools. The main environmental impacts related to solid waste final treatment and disposal can be summarized as:

- (i) health and environmental impacts of solid waste facilities, including transfer, composting and landfill facilities;
- (ii) potential impact on soil and water quality;
- (iii) emissions of gases, and bad odors from waste collection and transportation vehicles; and
- (iv) landscape alteration.

To meet the Bank's OP/BP 4.01 policy, and considering that the Program subprojects will yet require Board approval, an Environmental Management Framework has been developed specifying detailed procedures for screening, evaluation, preparation and implementation of subprojects from an environmental perspective. The ESMF builds on the national environmental framework, aiming at complying with the Bank environmental and social safeguard policies.

- **Involuntary Resettlement (OP/BP 4.12)**

This policy will only be applied in the event that further land acquisition and resettlement is required by the project. In such a case, the ESMF will be used as basis to develop a detailed resettlement plan.

Based on the initial site visits and research conducted there are no immediately affected families within the project area, however, consideration must be given if the project plan changes/expands. There are approximately 300 people who derive a living through collection and recycling of waste at the landfill in addition to the communities living nearby the landfill. Their livelihoods could be altered/disrupted as part of the landfill development plans. Assessment of potential impacts and measures to address this are detailed in Sections 6 to 8.

- **Public Consultations and Disclosure (OP/BP 4.01)**

The Environmental Management Framework report, prepared by the WB team presents a guidance tool to ensure that the proposed program sub-projects comply with the existing environmental regulations and standards in Indonesia as well as with the WB's Safeguards Policies. Details on the Makassar TPA Tamangapa Public Consultation and disclosure are provided in Sections 6 and 7.

- **Physical Cultural Resources (OP/BP 4.11)**

Application of this policy will only be applied in the event of future identification of Cultural Heritage as the project progresses. According to the findings of the project team carrying out the area assessment there are no examples of cultural heritage, archeological monuments, etc, within the site boundary or project area of influence.

Nonetheless, as the project is at an early stage, it has been decided to trigger the Physical Cultural Resources Policy (OP/BP 4.11) and address mitigation measures by integrating 'chance finds' procedures into the ESMF. Therefore the policy is activated as a precautionary measure as during the development of civil works and operation of the landfills there can be unforeseen 'chance finds' that may require special treatment to avoid their damage or loss and to complete the necessary documentation. The EMP shall include management measures and procedures in case these findings take place.

3.3 Technical Standards for Sanitary Landfills and Identified Key Issues

Technical standard for sanitary landfill in Indonesia is stipulated in Minister of Public Works Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management Annex III – Technical Requirements in Landfill Provision, Operation, Closure or Rehabilitation. World Bank has also published the guidance in provision of an examination of some of the issues which need to be addressed in landfill siting and design. Technical Standards can be seen on Appendix 3.

However, for TPA Tamangapa Makassar there are main issues identified that do not comply with the technical standards and must be taken into consideration:

Landfill siting

- Distance to the nearest residence : less than 1 km (~0.2 km)
- Not all landfill cells are equipped with lining and leachate collection system. From 6 cells (B1, B2, C1, C2, D, E), only C1 cell was equipped with lining and leachate collection system as it was built by Satker PPLP South Sulawesi Province (using national budget APBN) as pilot project of sanitary landfill in 2011.

Landfill operation

- There was waste picking (\pm 400 people) and cattles herd (\pm 700 cows)
- Landfill operated in controlled landfill system (once a week active cell covered by cover soil)
- Remaining Landfill Lifetime are 3 – 5 years since 2017.
- No adequate leachate treatment plant, currently LTP only consists of anaerobic pond, facultative stabilization pond and aerobic pond with unregular effluent monitoring.

As described in Chapter 2.4, the project activities will aim to ensure that TPA Tamangapa is upgraded to an international sanitary landfill facility with additional operating capacity to serve the City for at least ten - twenty more years depending on the operational regime).

3.4 Institutional Framework & Capacity

Institutional framework for Solid Waste Management in Indonesia is the parties involved in solid waste management in integrated manner which includes central government, provincial government, district / municipality governments, private sector and community.

The implementation on solid waste management in Indonesia before decentralization was under the responsibilities of several ministries and institutions which are The Ministry of Public Works, Ministry of Home Affairs, Ministry of Health, Agency for Technology Assessment and Development, Board of Environmental Impact Management (BAPEDAL), and the Sub Directorate for Solid Waste Management. The involvements of many institutions on solid waste management implementation weaken the function of each institution. It caused overlapping roles and responsibilities and inefficiency on laws and regulations enforcement of solid waste management.

In 1999, the decentralization of the solid waste management took place and changed the structure of the Laws and Regulations in Indonesia. The Laws and Regulations both national and local in regard to the institution for solid waste management were changed. In this case, Central Government acts as regulator and local government acts as an agent to implement the regulations. As such, the local government has more responsibilities to define their strategies and planning in implementing solid waste management at local level.

To date, there are mainly four ministries involved in solid waste management as stated in the followings.

- a. The Ministry of Environment and Forestry has the responsibility for environmental pollution control related to SWM;
- b. The Ministry of Public Works and Housing has the responsibility for the guiding and financing construction in SWM related infrastructure, such as sanitary landfills;
- c. BAPPENAS has the responsibility for SWM sector planning and financial planning; and
- d. The Ministry of Settlement and Regional Infrastructure has the responsibility for providing technical guidance, promoting pilot projects, and supervising large-scale off-site sanitation systems including waste management system.

At local level, the Provincial Governments have the responsibility for coordinating cities/districts in the case of centralized final treatment/disposal in their regions, while the solid waste collection and transportation is being handled by individual or combined municipalities. The environmental pollution impact is being controlled under Local Environmental Agency (or locally known as *Badan Lingkungan Hidup/BLH*). Other institutions at municipal level who are involved in the Solid Waste Management are the Planning Agency (BAPPEDA) and the Cleansing Departments (or locally known as *Dinas Lingkungan Hidup*). These institutions are dealing with implementation of solid waste management, such as transportation from the transfer points to the final disposal site.

Furthermore, the municipality usually retains private companies in conducting the cleansing and collecting street waste in several commercial areas. Some large commercial and industrial enterprises in medium and big cities (e.g. Jakarta, Bandung and Surabaya) employ the Cleansing Department and/or private contractors.

The organization structure of *Dinas Lingkungan Hidup* Makassar is presented in Figure 3-1.

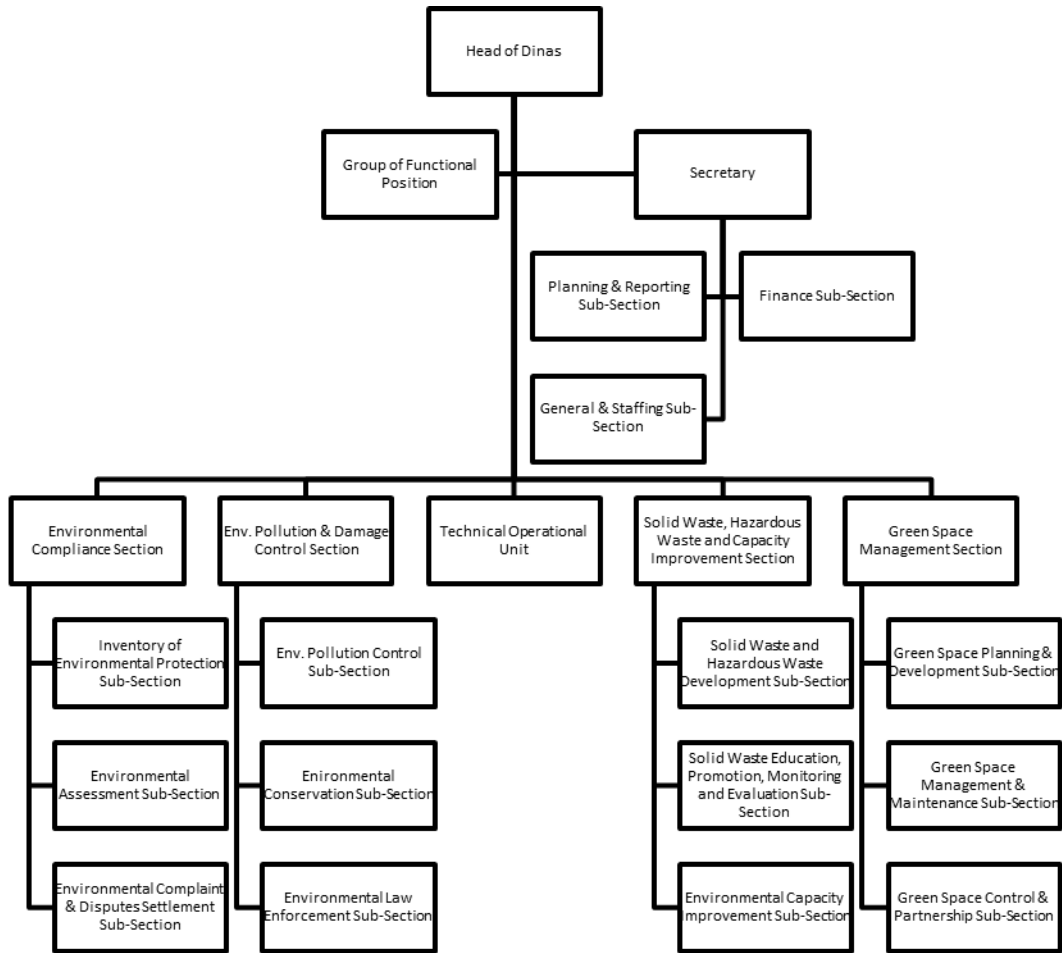


Figure 3-1 Organization Structure of Dinas Lingkungan Hidup Makassar

4 SCREENING AND CLASSIFICATION OF TPA TAMANGAPA FOR ENVIRONMENTAL & SOCIAL SAFEGUARDS MANagements

The World Bank's environmental and social assessment process generally begins with screening at the time of project identification. At this stage, the project is classified into one of three categories to signal the appropriate level of EA to be applied to the Project. The selection of the category should be based on project classification guidelines and, professional judgment and information available at the time of project identification and screening.

The environmental and social impacts of the project activities vary greatly with the type of activity. In the case of the Makassar TPA Tamangapa and other Tier 1⁷ for landfill development, there will be significant large scale infrastructure works which have the potential to impact both environment and social condition of the site and surrounding area.

The general activities under all Project components have been screened for environmental and social impacts. Section 6 contains a detailed list and matrix of potential impacts and mitigation measures for the Tamangapa site. WB Guidelines for technical assistance projects have been referenced, as the project involves substantial provision of TA leading to Bank-financed activities/investments in sub-projects.

Screening for the ISWMP follows the directions of both World Bank policies (See Section 3.) and Government Regulations. For environmental issues, the followings are the main laws relevant to the screening: Law No. 32/2009 on Environmental Protection and Management and Government Regulation (PP) No. 27/2012 on Environmental Permit, which outlines environmental assessment process (and instruments) required for activities potentially generating adverse environmental and social impacts.

For social issues, the followings are the main laws relevant to the screening: Law No. 2/2012 and Presidential Regulation No. 71/2012 on Land Acquisition for Public Interest, and Presidential Regulations No. 40.2014 on Changes to Presidential Regulation No. 71/2012 on Land Acquisition for Public Interest.

4.1 Government of Indonesia Environmental Screening & Impact Assessment Process

Under the laws and regulations of the Government of Indonesia, the process associated with the determination and preparation and approval of Environmental Impact Assessments (AMDAL or UKL-UPL) for each project is detailed in **Figure 4-1** below. If an AMDAL or UKL-UPL is deemed necessary for a project, the EIA process must be completed and approved before the project can be issued with an environmental permit (*Izin Lingkungan*) and can legally proceed.

⁷ First Round Priority City Landfill Development Subprojects

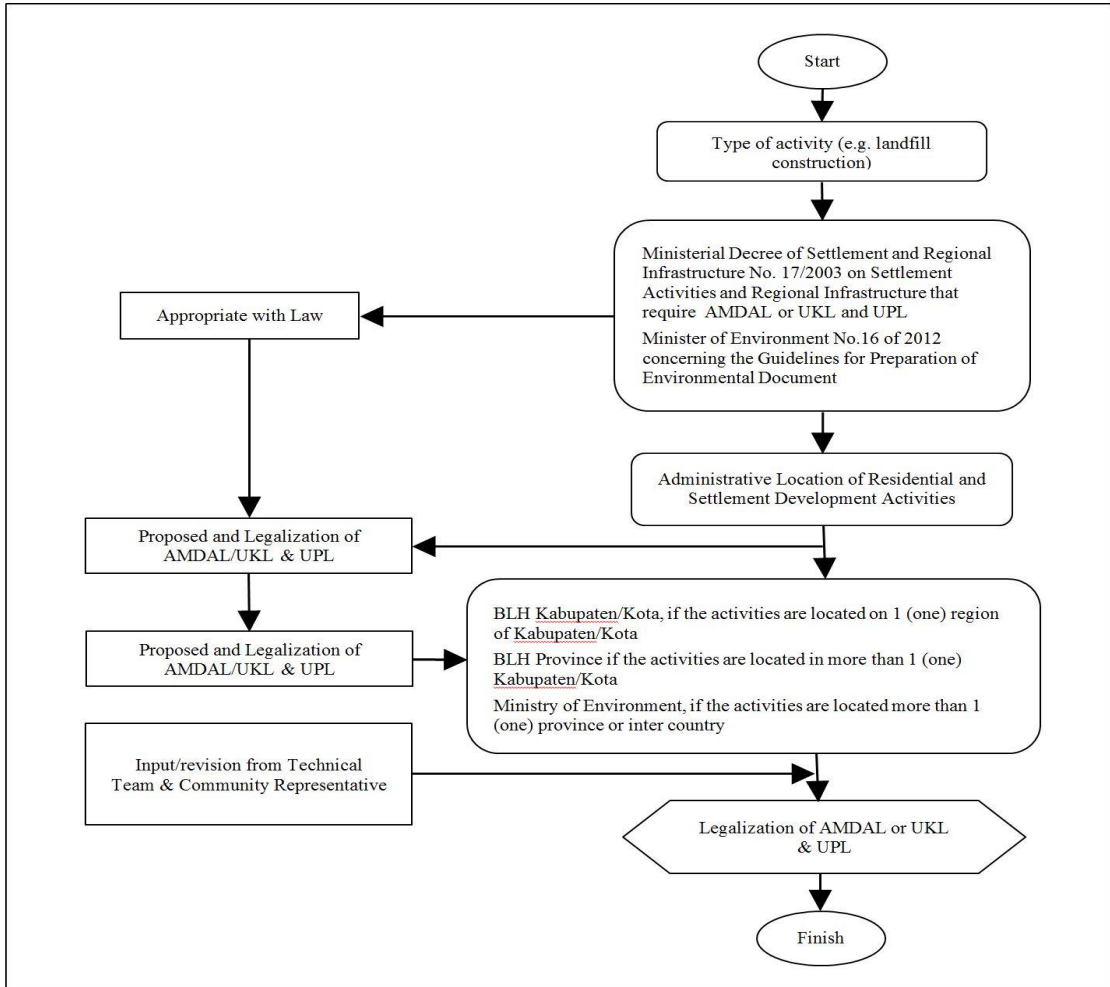


Figure 4-1 Indonesian Government Policy & Process for Environmental Safeguards

4.2 Environmental Screening Category

When determining the level of environmental assessment required as part of the project, it is essential to identify the environmental and social impacts based on activities to be undertaken. The assigned categories are based on a detailed risk and impact assessment (Table 4-1). The results of the assessment are presented in Section 5 of this report and summarised in a risk matrix and mitigation matrix.

Table 4-1 Bank's Project Classification

Category	Type of Risks and Impacts
A	<ul style="list-style-type: none"> • significant adverse impacts that are sensitive, diverse, or unprecedented, or that affect an area broader than the sites or facilities subject to physical works • conversion/alteration of natural habitats • significant quantities of hazardous materials • major resettlement
B	(Compared with Category A): <ul style="list-style-type: none"> • Potential impacts less adverse & more limited, fewer, site-specific, likely reversible • Mitigation measures can be more easily designed/implemented
C	<ul style="list-style-type: none"> • expected to have no adverse environmental impacts, or only minimal impacts easily and fully mitigated through routine measures

Source: OP 4.01 – Environmental Assessment, World Bank 2013

Initial reference to OP 4.01 is necessary to describe each screening category. Projects are classified into Category A if there can be significant adverse impacts expected, while impacts of a category B project are more site-specific and non-significant to humans and the environment. For a project to be classified as Category C, impacts have to be negligible. In practice, the significance of impacts, and the selection of screening category accordingly, depend on types and scale of the projects, location and sensitivity of environmental issues, and nature and magnitude of the potential impacts.

Majority existing landfill sites in Indonesia are located in non ideal locations such as poorly drained swampy areas, built-up urban areas, sensitive river basins, coastal zones, and catchments that are prone to severe erosion because of steep slopes and disbursive soil structures.

Most of the pre-existing landfills have been established for many years, often decades, predating current national environmental and social laws and regulations, 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, they are often sited at either downstream or adjacent to protected forests or reserves, including marine reserves.

The TPA Tamangapa in Makassar is a pre-existing facility. It is not located in any of the followings: sensitive biodiversity, forest reserve, sensitive river-basin or watershed. It is also not surrounded by high value agricultural land or residential settlements. In addition, there is no planned land acquisition, resettlement and/or loss of livelihoods, no indigenous peoples identified and no cultural heritage affected by the project.

However, there are still significant potential environmental and social impacts associated with the existing facility and proposed expansion project. The site covers a large area (nearly 20 ha). Due to the nature of landfill operation activities such as SW transport, processing and final disposal at the site, there are inherent risks of soil and water (both surface and groundwater) contamination from vehicle operation (fuel/grease), and leachate mismanagement, including poor treatment, leakage or accidental discharge. Air quality remains an issue with odour from open cells and leachate, release of gasses from decaying waste, dust and emissions from vehicles and heavy equipment, emissions from illegal waste burning, and fly blown waste from open cells and waste transport. Noise is also generated from proposed construction, landfill operation, and waste collection activities. There is potential for disease vectors from rats and flies and public health risks to landfill operators, waste pickers, and surrounding community. Also, there are many other sensitive social issues associated with proposed construction, waste transport, and landfill operation activities that involve transmigrant workers, waste pickers and surrounding communities.

Table 4-2 Potential Social and Environmental Impacts at TPA Tamangapa, Makassar

Critical Environmental and Social Components	TPA Tamangapa Applicability	Remarks
Sensitive biodiversity site/ Forest Reserve	Not Applicable	
Sensitive River Basin or Watershed	Not Applicable	
High Value Agricultural Land	Not Applicable	The agricultural land borders the landfill is no longer used for agriculture
Residential Settlements	Not Applicable	The landfill has been established since early 1990sh and it is concrete fenced to separate it from residential settlement
Land Acquisition, Resettlement and Loss of Livelihood	Not Applicable	No new land is acquired for the expansion
Indigenous Peoples	Not Applicable	People in the vicinity (1km buffer zone) of the Project are not considered to be indigenous. vicinity
Cultural Heritage	Not Applicable	None found

Soil and Water Contamination	Applicable	Due to vehicle operation and leachate mismanagement
Air Quality	Applicable	Odour and gaseous emissions
Noise	Applicable	During construction, land fill operation and waste collection
Public Health Risks	Applicable	Rats and flies attracted by the waste as diseases carriers affecting operating staff, waste pickers and surrounding communities.
Transmigrant workers	Applicable	Affecting social structure and order of surrounding communities.
Waste Pickers	Applicable	Health and safety issues
Surrounding Community	Applicable	Noise, public health, etc

Taking into account the WB framework classification in Table 4-2, guidance documents, GoI laws and regulations, and the site-specific risks and impacts outlined above and in Section 5, the Makassar TPA Tamangapa project is classified as Category A project requiring full EIA and environmental management plan.

5 ENVIRONMENTAL AND SOCIAL ASSESSMENT OF SOLID WASTE DISPOSAL

5.1 Environmental Baseline

5.1.1 Atmospheres

5.1.1.1 Climate

The climate of Indonesia is almost entirely tropical. The uniformly warm waters that make up 81% of Indonesia's area ensure that temperatures on land remain mostly constant, with coastal plains averaging 28°C, inland and mountain areas averaging 26°C, and higher mountain regions, 23°C. Temperature and air pressure vary little from season to season, and therefore rainfall is the main variable of Indonesia's climate. The region's relative humidity ranges between 70-90%. Winds are moderate and generally predictable, with dry winds originating from Australia usually blowing in from the south and east in June through September (dry season); conversely in December through March, northerly winds originating from Asia and the Pacific Ocean contain abundant water vapour causing the monsoon (wet season).

The TPA Makassar Project is located in Tamangapa, Manggala Sub-district in Kota Makassar, Sulawesi Selatan, about 12 km by road from city center of Makassar.

As with many areas of Indonesia, Kota Makassar only experiences two seasons, dry and wet, closely governed by wind patterns in Indonesia. Two transitional periods occur each year in April and November.

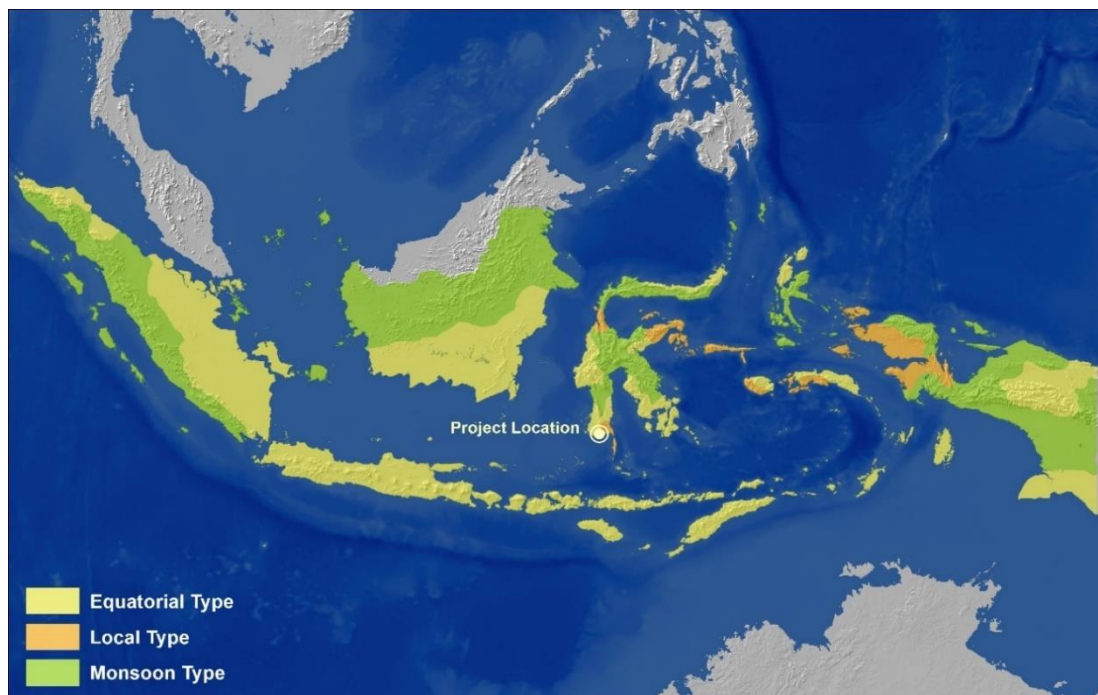


Figure 5-1 Climate Zones with Project Location

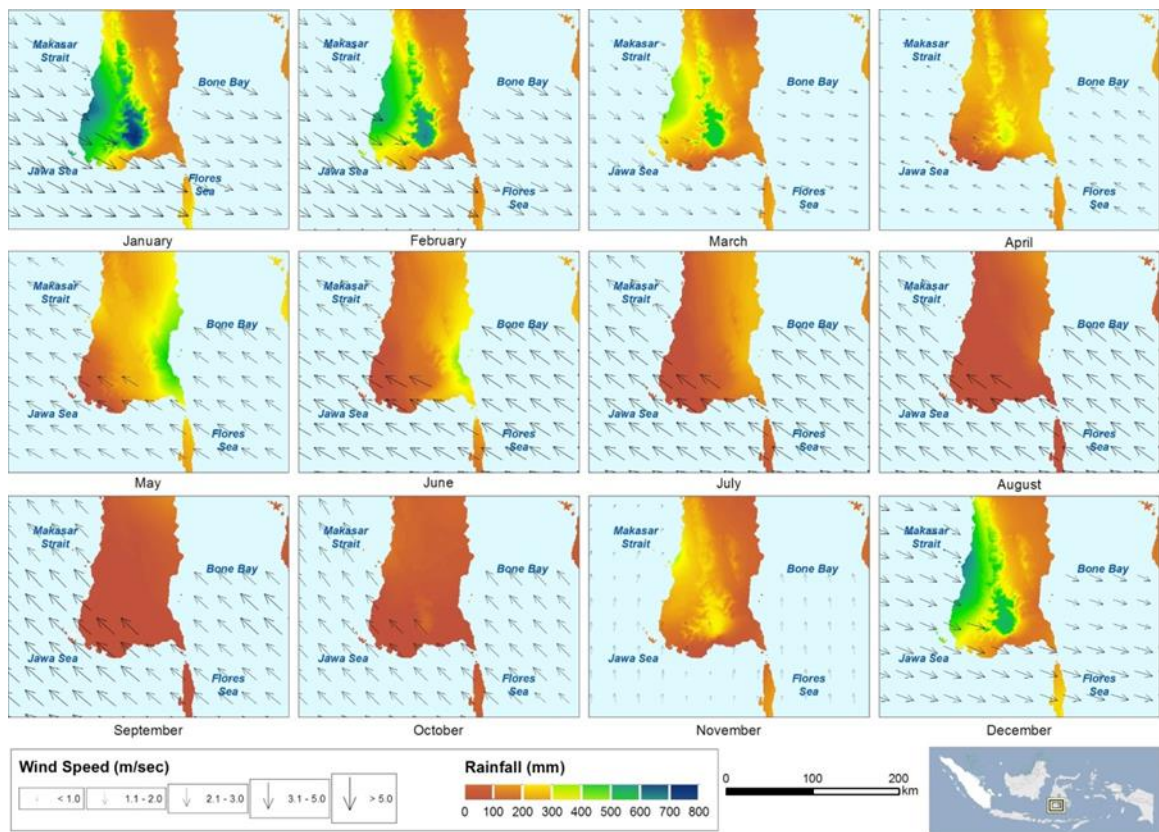
“Hard” climate data records (precipitation, temperature, humidity, solar radiation) for this region are limited. The nearest hard data location to the Project site is the Meteorological Station at Paotere (Makassar), approximately 15 km away. This was considered for a proxy for the Project site.

Various modelled climate data sets showing strong correlations were therefore used for rainfall, temperature, humidity, and solar radiation in this report.

Summary meteorological information may be found in Table 5-1 below.

Table 5-1 Meteorological Summary Table

Seasons		Temperature
Dry season: July to October		Annual average: 26.3°C
Wet season: December to March		Range of monthly average temperatures: 20.2°C to 32.0°C
Transition period: April and November		
Rainfall	Relative Humidity	Wind Pattern
Annual average: 101 mm/month	Annual average: 73%	Semi-annual reversal wind
Highest monthly average: 272 mm	Highest monthly average: 79% (February)	Wind direction: Predominantly from the Southeast (Dry Season) and Northwest (Wet Season)
Lowest monthly average: 6 mm	Lowest monthly average: 59% (September)	Average wind speed: 3 m/s
Wettest Month: January		
Driest Month: September		



Source: Physical Oceanography Distributed Active Archive Center (podaac) JPL/NASA

Figure 5-2 Rainfall and Wind Patterns by Month

Based on the climate type in the southern part of Sulawesi in general, including the Project location, is classified as Equatorial Savannah. Equatorial Savannah is described by many experts using several terms such as follows: 1) Aw Climate (Equatorial Savannah Climate, Dry Winter), by Koppen; 2) E4

Climate (rather dry area), by Schmidt-Ferguson 1950; and 3) E Climate region (<3 consecutive wet months) by Oldeman 1979.

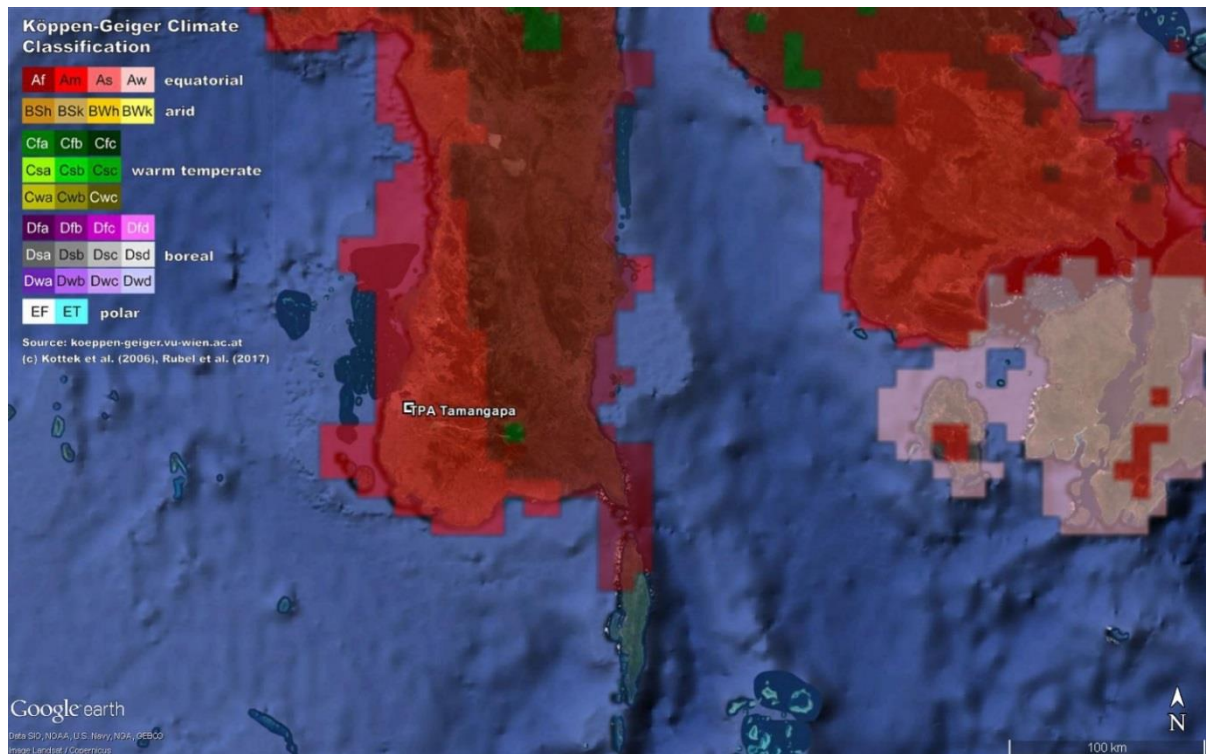
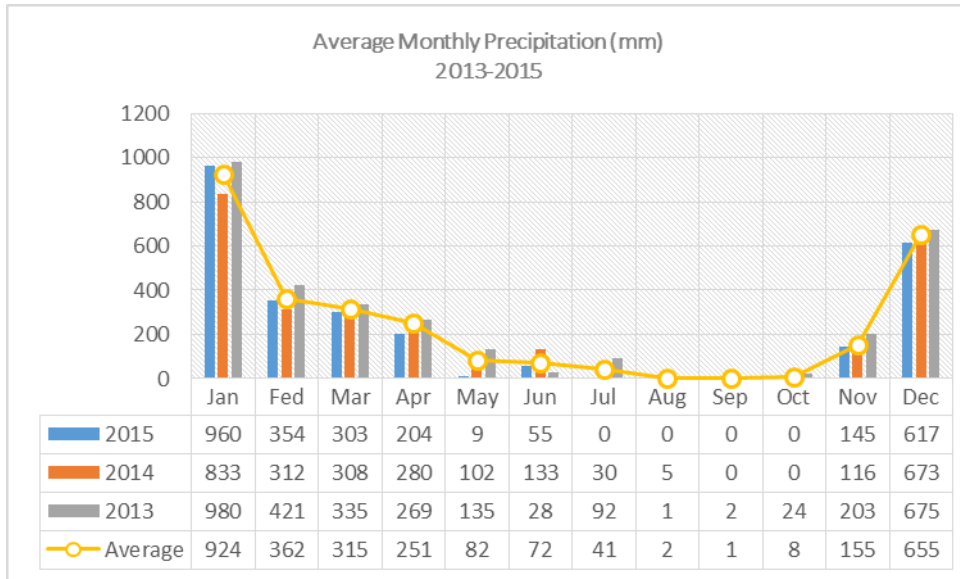


Figure 5-3 Köppen Climate Classification 1975 –Sulawesi Selatan Region

5.1.1.2 Rainfall

Rainfall is the amount of water falling on a flat ground surface during a certain period and measured in depth (mm) on a horizontal surface in the absence of evaporation, runoff, and infiltration. A rainy day is defined as a day and night period with at least 0.5 mm total rainfall.

Rainfall in a specific location is influenced by climate, topography, and rotation/combination of air currents. Climate (distribution pattern and the amount of annual rainfall) in Makassar is relatively dry. Based on the data from Makassar in Figure from the last three years 2013-2016 (**Figure 5-4**), the study area has two seasons similar to other areas in Indonesia in general, i.e., the rainy season and dry season. Rainfall data at the study location showed that the rainy season (rainfall >50 mm per month) occurs in November to April and the dry season (rainfall <50 mm) occurs from July to October. The amount of average monthly rainfall ranges between 0 to 980 mm, with the highest rainfall occurring in January and the lowest in September. Based on the average yearly rainfall, the Project location is classified as Equatorial Monsoon.

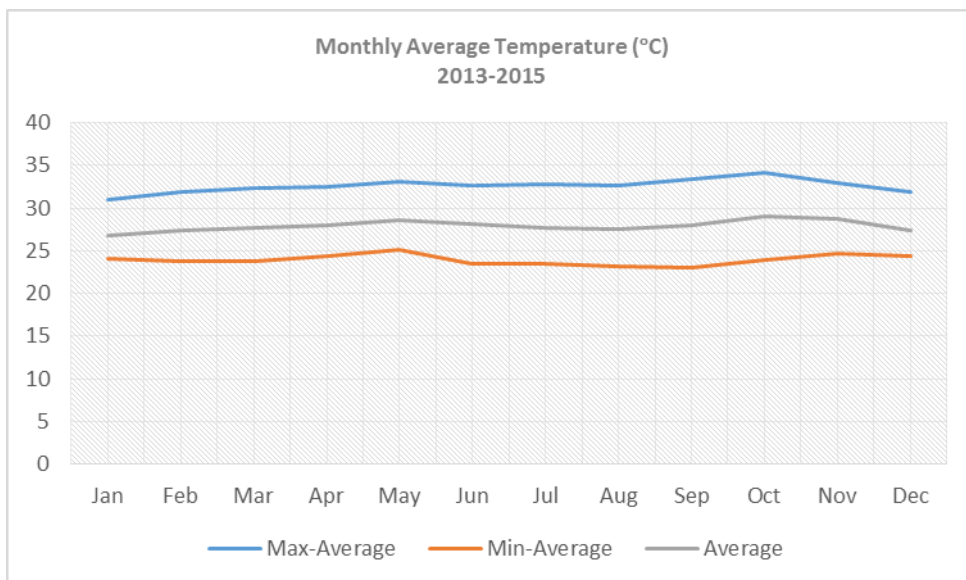


Source : Makassar in Figures, 2014 - 2016

Figure 5-4 Monthly Average Rainfall (mm)

5.1.1.3 Temperature

The air temperature at a specific location is determined by elevation relative to mean sea level and proximity to the coast. The Tamangapa, Makassar region is a lowland area approximately 15 km from the sea. The average monthly temperature during three year period (2013-2015) in the Project area ranged from 26.7 to 29.5°C. The highest average temperature was recorded in November 2015 (29.5°C), while the lowest was recorded in January 2014 (26.7°C).

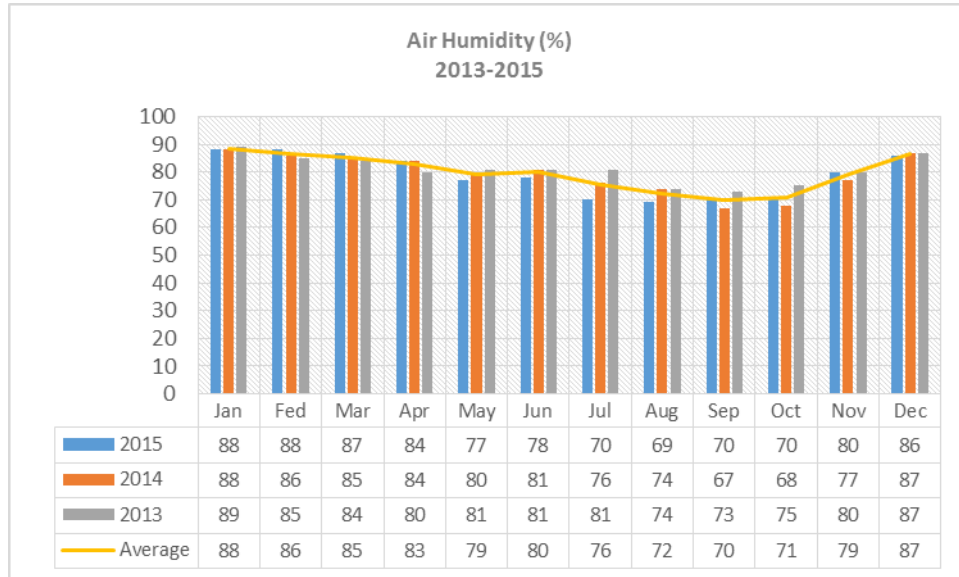


Source : Makassar in Figures, 2014 - 2016

Figure 5-5 Monthly Average Air Temperature (°C)

5.1.1.4 Humidity

As is typical for the tropics, the air humidity is relatively high in the Tamangapa, Makassar region where monthly humidity ranges between 67% to 89% during the period of 2013-2015, where the average monthly highest was in January 2013 and the lowest in September 2014, as presented in **Figure 5-6**. It is observed that humidity levels peak in the wet season and trough in the dry season, and essentially are inversely proportional to Solar Radiation throughout the year.

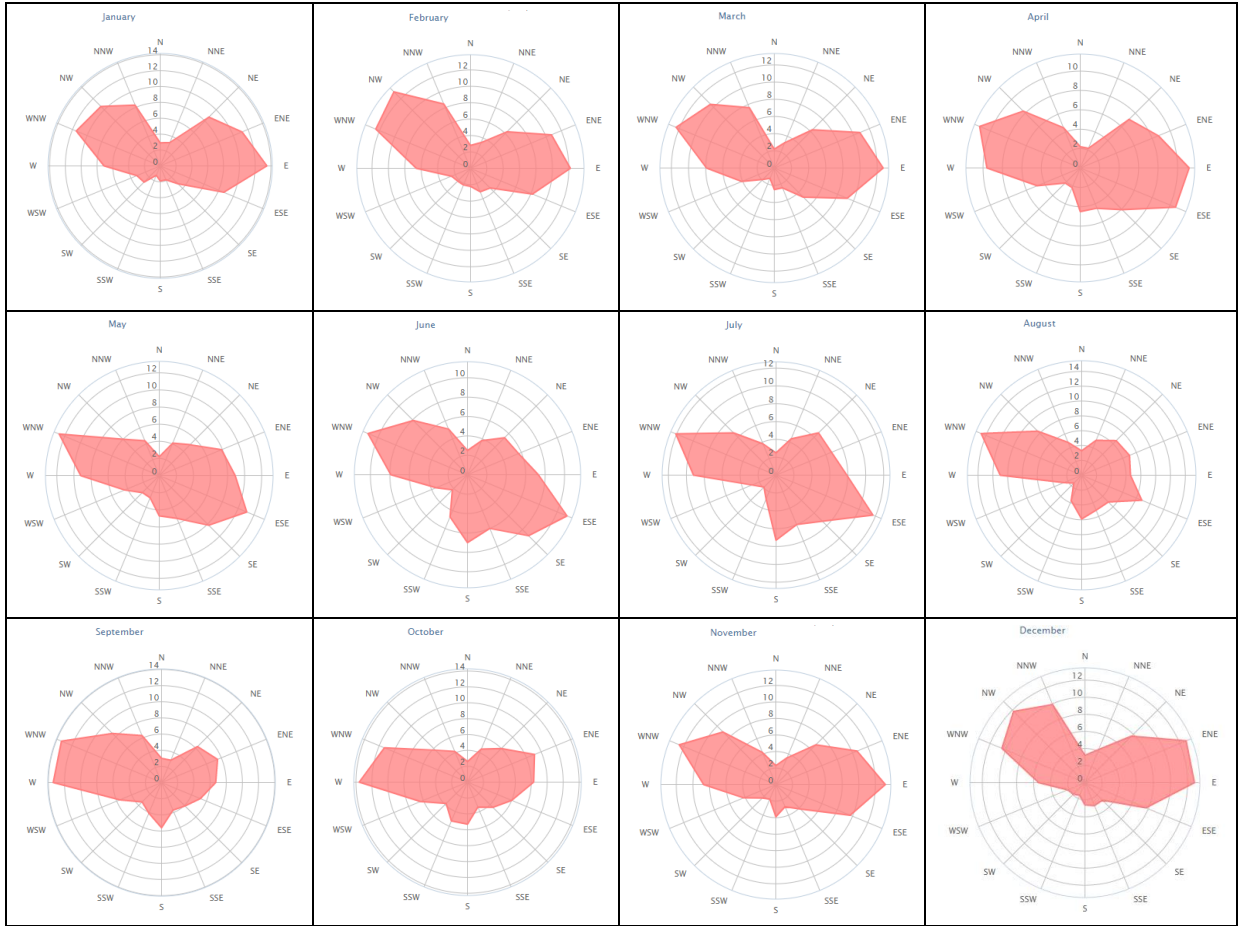


Source : Makassar in Figures, 2014 - 2016

Figure 5-6 Air Humidity (%) Average Graph during the Period of 2013-2015

5.1.1.5 Wind Speed and Direction

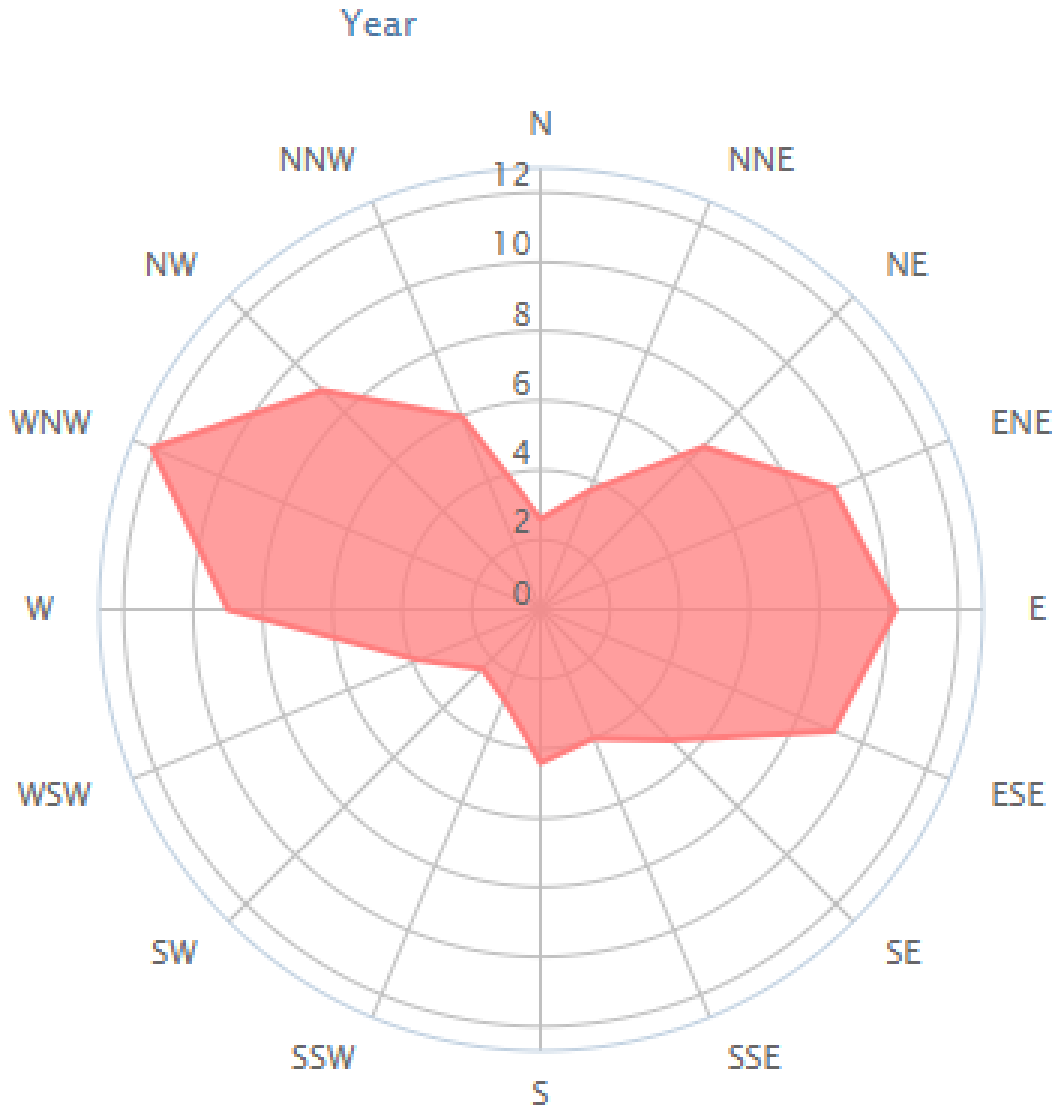
For analysis purposes, data was averaged by month and presented as monthly wind direction distribution in **Figure 5-7**. In July-August-September-October equatorial regions dip below the elliptic plane, developing a low-pressure center south of the equator, facilitating dominant winds to blow from the northern hemisphere to the south. Mid to late March, the sun angle is directly above the equator and by April, winds continue to blow from the northwest, but also from the east. The east winds become more dominant through April, as the low pressure center shifts into in the northern hemisphere causing winds to blow from the south, which veer eastward close to the equator. This eastern wind dominantly blows until June then November to January. This condition indicates that the Project location falls in dry season from July to October with the dominant wind blowing from the north. The percentage of wind blowing from the W/NW throughout the year is greater than from the E/SE. This indicates that the Project location is predominantly influenced by the NW monsoon from Asia.



Source : Makassar Airports, www.windfinder.com

Figure 5-7 Monthly Wind Direction Distribution (%) Graph during the Period of 2010-2017

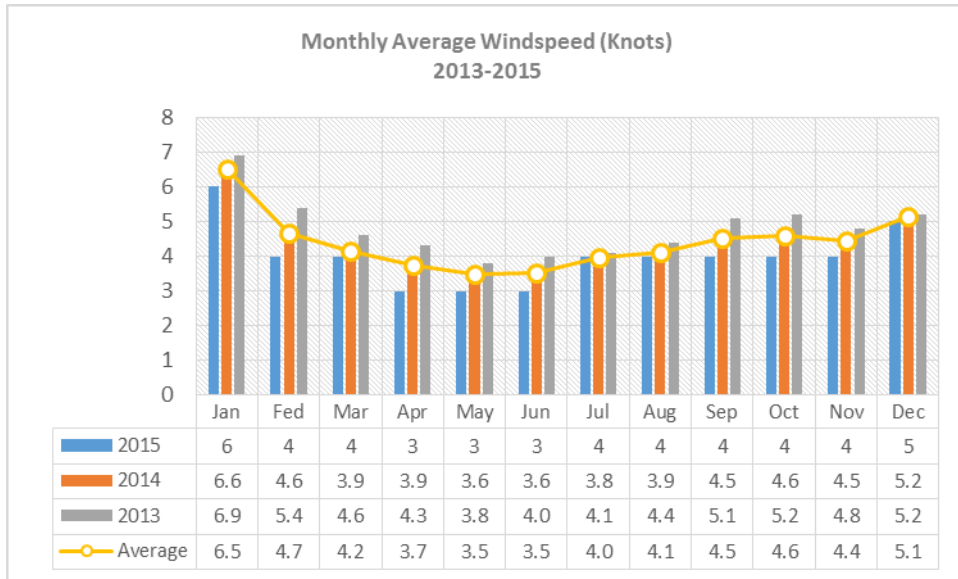
The windrose annual average profile 2010-2017 shows the Project area has dominant winds blowing from the northwesterly direction with average speed of 5 knots.



Source : Makassar Airports, www.windfinder.com

Figure 5-8 Yearly Wind Direction Distribution (%) Graph during the Period of 2010-2017

Monthly average surface wind data for the last 3 years (2013-2015) were also used in this study. It is reported that the average wind speed within this period was 4.4 knots with the minimum speed of 3 knots occurred in April, May and June 2015 and maximum speed of 6.9 knots occurred in January 2013.

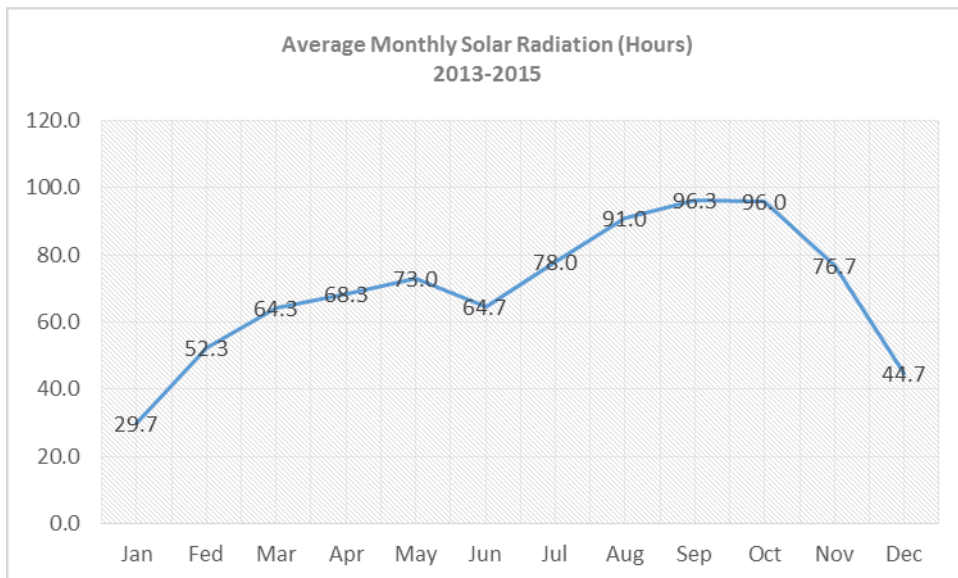


Source : Makassar in Figure, 2014-2016

Figure 5-9 Monthly Average Wind Speed (Knots) during the Period of 2013-2015

5.1.1.6 Solar Radiation

Monthly solar radiation is based on data from the Paotere Meteorological Station, during the period 2013 – 2015 in the region Tamangapa, Makassar ranges from 26 hours – 100 hours. The monthly solar irradiation average for the period was highest in August, September and October 2015 and the lowest occurred in January 2014. **Figure 5-10** shows the pattern of average solar irradiation in the transitional season I continued to climb and reached a maximum in the west season, then declined into the transitional seasons II and reaches a minimum in the east season.



Source : Makassar in Figure, 2014-2016

Figure 5-10 Solar Irradiation (%) Average Graph during Period of 2013-2015

5.1.1.7 Air Quality

Clean air is considered by the World Health Organization (WHO) to be a basic requirement of human health and well-being. According to this institution, air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. Motor vehicles, industrial facilities, and combustion are common sources of air pollution because the release pollutants of major public health consequence such as carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide that can cause respiratory and cardiovascular problems (WHO, 2006).

Where air quality is degraded, it is likely to be of higher sensitivity to additional impacts than where air quality is good. This is because air quality thresholds and standards may be exceeded and impacts may arise on human health or vegetation.

The air quality within the Project area is expected to be affected during the further development and ongoing operation of the TPA. Changes in air quality will arise from exhaust emissions and dust resuspension, vehicle emissions, bio-aerosols and odor, also direct stack emissions and fugitive emissions associated with biological processes, as well as emissions from burning of biogas. The impact on air quality can be measured through changes in concentration of standard air quality testing parameters like, SO₂, NO₂, CO, NH₃, Pb, H₂S and TSP in accordance with GOI and local government requirements.

Ambient air quality data were obtained through direct sampling in three sampling locations (**Table 5-2**) across the Project area.

Table 5-2 Air Quality Sampling Location

Sample ID	Location	Longitude	Latitude
AQN-1	Jl. AMD in front of TPA Tamangapa Location	E: 119° 29' 22.3"	S: 5° 10' 23.3"
AQN-2	In the TPA Tamangapa Area	E: 119° 29' 26.8"	S: 5° 10' 31.7"
AQN-3	Settlement located in the northern direction from TPA Tamangapa Area	E: 119° 29' 29.7"	S: 5° 10' 23.7"

Source : RKL-RPL Implementation Report, Semester I 2016

The data in **Table 5-3** below show that the results of the tested parameters of ambient air quality are quite variable but still well within the Threshold Values. Differences in concentrations of parameter results in each measurement location are highly dependent on environmental conditions and activities in the surrounding community.

Table 5-3 Ambient Air Quality Result

Parameter	Unit	Result						Standards*
		AQN-1		AQN-2		AQN-3		
		S-I	S-II	S-I	S-II	S-I	S-II	
Sulfur Dioxide (SO ₂)	µg/Nm ³	24.26	6.84	22.89	7.27	25.26	6.03	900
Nitrogen Dioxide (NO ₂)	µg/Nm ³	14.98	11.06	14.76	11.17	13.64	8.18	400
Carbon Monoxide (CO)	µg/Nm ³	1,173.62	979.53	969.66	894.98	758.56	794.12	30,000

Parameter	Unit	Result						Standard s*
		AQN-1		AQN-2		AQN-3		
Ammonia (NH ₃)	ppm	0.033	0.051	0.033	0.0518	0.033	0.049	2
Lead (Pb)	µg/Nm ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2
Particulates (TSP)	µg/Nm ³	14.59	12.96	12.75	12.59	15.82	11.48	230
Hydrogen Sulfide (H ₂ S)	ppm	0.0096	0.0093	0.01	0.0081	0.0098	0.0088	2

Source : RKL-RPL Implementation Report, Semester I 2016

* Standards for air quality by Sulawesi Selatan Governor Regulation No. 69 of 2010 and Indonesian Government Regulation No. 41 of 1999 on Air Pollution Control.

Details on air quality test parameters are described in Table 5-4 below:

Table 5-4 Main Air Pollutants and Potential Impact

Parameter	Potential Source Description & Impact
Sulfur Dioxide (SO ₂)	Sulfur Dioxide is one component of air pollutants originating from the burning of sulfur containing materials such as in motor vehicle engines, electric generators, or burning of organic waste. At certain concentrations, this gas can cause disruption to the environment, irritation to the human respiratory tract, disturbance to vegetation and can increase the acidity of rainwater. SO ₂ gas content in the ambient air in the study area ranged from 6.84 to 25.26 µg/Nm ³ . The concentration of SO ₂ is still well within the quality standard set at 900 µg/Nm ³ and so will not have an impact on humans or other living environments. The main source of emissions is probably caused by motor vehicles operating in the study area and mostly by the organic waste burning.
Nitrogen Dioxide (NO ₂)	Nitrogen Dioxide gas can be sourced from nature, the burning of organic matter, or motor vehicle exhaust. At certain concentrations, this gas can cause irritation and lung bleeding in humans, disturbance to vegetation as well as physical damage to buildings. In addition, NO ₂ contributes to lowering the acidity of rainwater. The test results of air quality in the study area indicate that concentrations of this gas are still far below the quality standard threshold and maximum values only attain 14.98 µg/Nm ³ . There are no reported impacts with these low NO ₂ concentrations. The main sources of NO ₂ gas are predicted to be from burning of organic matter, transportation activities and photochemical reactions in air.
Carbon Monoxide (CO)	CO gas is sourced from the incomplete combustion of organic materials, such as gasoline or diesel fuel combustion in motor vehicles, coal, or wood. At certain concentrations, this gas can cause toxic effects on the human body with symptoms such as headaches, dizziness, and shortness of breath. The highest concentration of this gas in the ambient air in the region was 1,173.62 µg/Nm ³ and the lowest was 758.56 µg/ Nm ³ . Although quite high, the concentrations are still far below the quality standard threshold so will not have a significant impact on humans and other environmental components. The main source of CO gas is likely from transportation activities, exhaust emissions from vehicles operating proximally to the sampling sites.
Ammonia (NH ₃)	The test data of ambient air quality in the study area indicate that concentrations of NH ₃ gas are still relatively low compared to the quality standard threshold, with a maximum recorded value of just 0.0518 ppm. The ammonia may be derived from

Parameter	Potential Source Description & Impact
Lead (Pb)	<p>the decomposition of solid waste, domestic wastes, or natural processes.</p> <p>Lead is one of the heavy metals that are harmful to human health. The main source of Pb in ambient air is engine exhaust from motor vehicles that use gasoline containing fuel additives such as tetraethyl lead. The existence of lead in the air at certain concentrations can cause health problems such as lack of appetite, headache, anemia, paralysis of limbs, convulsions, or impaired vision. Continuous Pb exposure and the cumulative nature of these heavy metals are harmful and a potential threat to community health. However, Pb was not detected in all of the sampling points in the study area.</p>
Particulates (TSP)	<p>TSP covers airborne particles produced by mechanical or natural events in the form of dust and dispersed by wind. The particle size ranges from 0.1 µm to 25 µm. Dust can cause respiratory system disorders, irritation of the eyes, and visual disturbances. The content of TSP in the study area are still relatively low compared to the quality standard threshold, with a maximum recorded value of just 15,82 µg/Nm³. Resuspension of dust due to road transportation activities and natural events such as the dispersion of fine particles of leaf crops (rice) due to wind are alleged to be the main sources of ambient air TSP in the study area.</p>
Hydrogen Sulfide (H ₂ S)	<p>Hydrogen sulfide occurs both naturally and from human processes. It is released from volcanoes, sulfur springs, undersea vents, swamps, salt marshes, and stagnant bodies of water, and is found in association with crude petroleum and natural gas. Hydrogen sulfide is also associated with municipal sewers and sewage treatment plants, landfill gases, manure handling operations, and pulp and paper operations. H₂S gas content in the ambient air in the study area ranged from 0.0081 to 0.01 ppm. The concentration of H₂S is still well within the quality standard set at 2 ppm and so will not have an impact on humans or other living environments. It is high probability that measured hydrogen sulphide concentration in then ambient air is a constituent of landfill gas emissions. Concentrations that substantially exceed the odour detection threshold can result in annoying and discomforting physiological symptoms of headache and nausea (Amoore, 1985). The World Health Organization (WHO) recommends that in order to avoid substantial complaints about odour annoyance, 30-minute average hydrogen sulfide concentrations should not exceed 5 ppb (7 µg/m³; WHO, 1981). Given the maximum measured H₂S in the ambient air of 0.01 ppm or equal to 10 ppb; it means that the H₂S concentration already exceed the odor detection threshold.</p>

5.1.1.8 Noise

Any operation of TPA Project creates noise such as noise from the vehicle transportation and heavy equipments operated at the TPA.

Indonesian legislation defines permissible limits for noise levels in different areas. Noise sampling was conducted in accordance with Ministry of Environment Decree No. 48 Year 1996 and Sulawesi Selatan Governor Regulation No. 69 Year 2010 regarding the Threshold Standard and Environmental Damage Criteria. The threshold values applicable in this regulation are industrial (70 dBA) and settlement (55 dBA) areas.

Noise data were directly sampled at three sites across the Project area of influence (using the same locations as air sampling). Results of the noise level analysis are presented in the following Table 5-5.

Table 5-5 Noise Level Analysis Results (Direct Reading)

Sample ID	Location	Noise Level (dBA)		Threshold Value (dBA)*
		S-I	S-II	
AQN-1	Jl. AMD in front of TPA Tamangapa Location	55 – 60.80	51.2	55
AQN-2	In the TPA Tamangapa Area	57.6 – 64.7	48.7	55
AQN-3	Settlement located in the northern direction from TPA Tamangapa Area	41.2 – 51.5	47.5	55

Source: RKL-RPL Implementation Report, Semester I & II 2016;

*Standards for noise for settlement by Sulawesi Selatan Governor Regulation No. 69 of 2010 and Indonesian Ministry of Environment Decree No. 48 Year 1996 Appendix I on Noise Threshold Standards.

As shown the noise levels in the settlement area was below the threshold standards of the Ministry of Environment Decree No. 48 of 1996 for settlement areas. However, noise level in the TPA and in the road nearby the TPA area were higher than the threshold standard of 55 dBA. Information from the RKL-RPL Implementation Report Semester I Year 2006 stated that the high noise level in these two location were caused by the activities of waste loading – unloading from the waste truck/vehicle and several heavy equipment utilized for waste dredging.

In conclusion, the ambient noise levels in the area, especially in the main project activities area are already quite high if it is compared to the noise threshold values in the settlement areas.

5.1.1.9 Green House Gases

Currently the emission of GHG calculated from the operation of TPA Tamangapa 1993 to 2015 are presented in the following Table 5-6.

Table 5-6 Emission Calculation of TPA Tamangapa from municipal solid waste which entered the landfill (1993-2015)

GHG Emission	Emission Calculation (ton/year)
Non Methane Hydrocarbon (NMHC)	9.05
H2S	1.52
CO2	13
CH4	11,093.95

5.1.2 Lithosphere

5.1.2.1 Geomorphology

The regional morphology of the South Sulawesi region is governed by a volcanic eruption center, namely the Lompobatang caldera of Pleistocene age (Sukamto and Supriatna, 1982). The mountainous area occupies the central area down to the south at an altitude ranging from 1397 m to 500 m above sea level, then hilly and undulating with a height of less than 500 m, and finally to

the southern low-lying areas, with a rather flat morphology and at an elevation of less than 15 m above sea level. The Project area is situated in this low lying, low elevation terrain.

5.1.2.2 Geology

5.1.2.2.1 Regional Geology

The regional geology of South Sulawesi (Figure 5-11) both surface and subsurface is based on secondary data and primary outcrop observations in the field including drilling results. Based on the Geological Map Sheet, 2010, 2110 and 2109; Ujung Pandang, Benteng and Sinjai scale of 1: 250,000 (Rab Sulamto and Supriatna, 1982) the location of the project site and surrounding areas are dominated by volcanic rocks, sedimentary rocks, and alluvium of Quaternary age. Based on the regional stratigraphy there are three lithologies in this area. The sequence from the most recent to the eldest is as follows.

Quaternary Alluvium Deposits – Qac

This sediment blankets on top of older rocks, with a widespread distribution in the floodplains of rivers and along coastal locations within the project site. These alluvium deposits have been recently formed in the Quaternary era as alluvial rivers, swamps, and beaches and are the youngest lithologies in the region. Generally, these deposits consist of gravels, coarse sands, silts and clay, and may contain organic matter and broken marine fossils. This sediment was found at a height of approximately 2 meters above sea level.

Quaternary (Pleistocene) Volcanic Rocks of Lompobatang – Qlv, Qlvp1, Qlvp2, Qlvb

Volcanic rocks of Lompobatang are composed of agglomerate, lava, breccia, and tuff, forming a stratovolcano cone with the highest peak at 2950 m above sea level. The volcanic rock is primarily of andesitic and basaltic composition. Lava flows located approximately 2.5 km north of Bantaeng are comprised of pillow lavas, local breccia, and tuff.

Morphology of the volcanic caldera is still clearly visible on aerial photographs; Qlvc depicts the eruption center and the lava dome, whereas a conical shape secondary vent shows there are at least two periods of activity, namely Qlvp1 and Qlvp2. The area around the eruption center is mainly composed of lava flows and agglomerates (Qlv), but moving distally is more likely to be composed of breccia, and lahar tuff deposits (Qlvb). Based on the estimated position regarding regional stratigraphy, these volcanic rocks are of Pleistocene age. The Lompobatang volcanic sequences unconformably overly Tertiary units, comprising the Baturape-Cindako (Tpbv) volcanic rocks and Camba Formation clastics (Tmc).

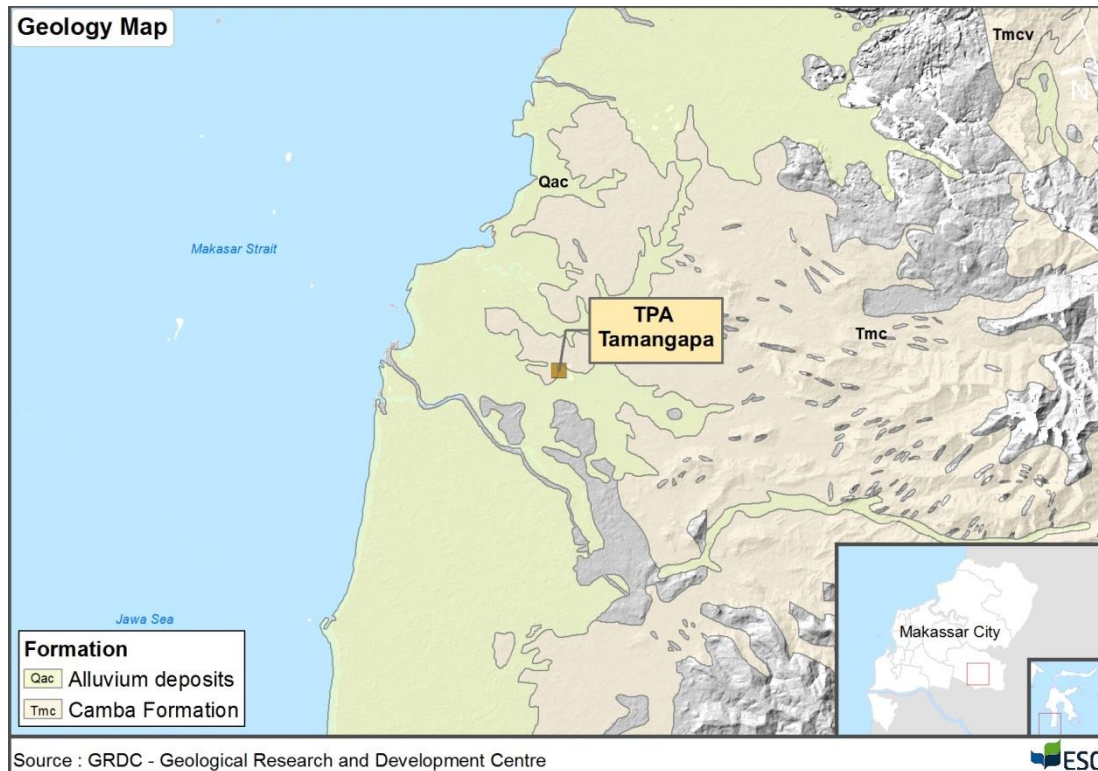


Figure 5-11 Geology at 250K Scale, Southern Sulawesi Region

5.1.2.2.2 Regional Structural Geology

In the eastern part of the project site are faults that are trending N-S and NW-SE. These faults occur in the Tonasa and Camba Formations, including some inactive faults. In addition, there is also stratigraphic faulting within Tonasa Formation limestones and sedimentary rocks of the Camba Formation due to overburden pressures.

The location of the project site is relatively far from the regional normal faults located to the east and the strike-slip faulting located offshore to the southwest. This may be seen in Figure 5-13 depicting the seismotectonic setting of South Sulawesi province. The geological structure of bedrock in the project area is stable and relatively safe from active and dynamic geologic processes that contribute to tectonic risk.

5.1.2.2.3 Project Site Geology and Topography

The Project site covers a relatively flat area with elevations ranging from 15 to 25 meters above sea level and gently sloping from the north to the south (Figure 5-12). Elevations in the north are slightly higher, where bedrock comprises volcanic rocks mapped as Lompobatang (Qlv) consisting of agglomerate, lava, breccia, and tuff deposits. This unit may likely be more weathered to the south. This and localized weathering effects form an overall flat but locally bumpy terrain. Slope varies from flat to moderately sloping, with slopes less than 3 to 10%.

Based on appearance and landform classification (Marsoedi, et al, 1994), the Project site location includes Uplifted Landform and Tilted Uplift Lompobatang volcanic rocks.

Field observations and drilling results conducted on 2007 have not uncovered evidence for active tectonic activity in the way of faulting, folding or signs of ground movement or landslides. The structure and state of the bedrock geology indicate long-term stability.

Slope stability is based on analysis of the type and nature of the constituent rocks and signs of ground movement. Bedrock is constituted of Lompobatang volcanic rocks (Qlv), displaying a low degree of weathering, and covered by a very shallow layer of soil (5 to 25 cm). Alluvial deposits are not locally aligned and there are steep cliffs (near rivers) as well as no sign of rock-fall, indicating ground movement is insignificant. The rock and soil making up the location of the Project site are relatively stable against the process of ground movement and the angle of slope is relatively small.

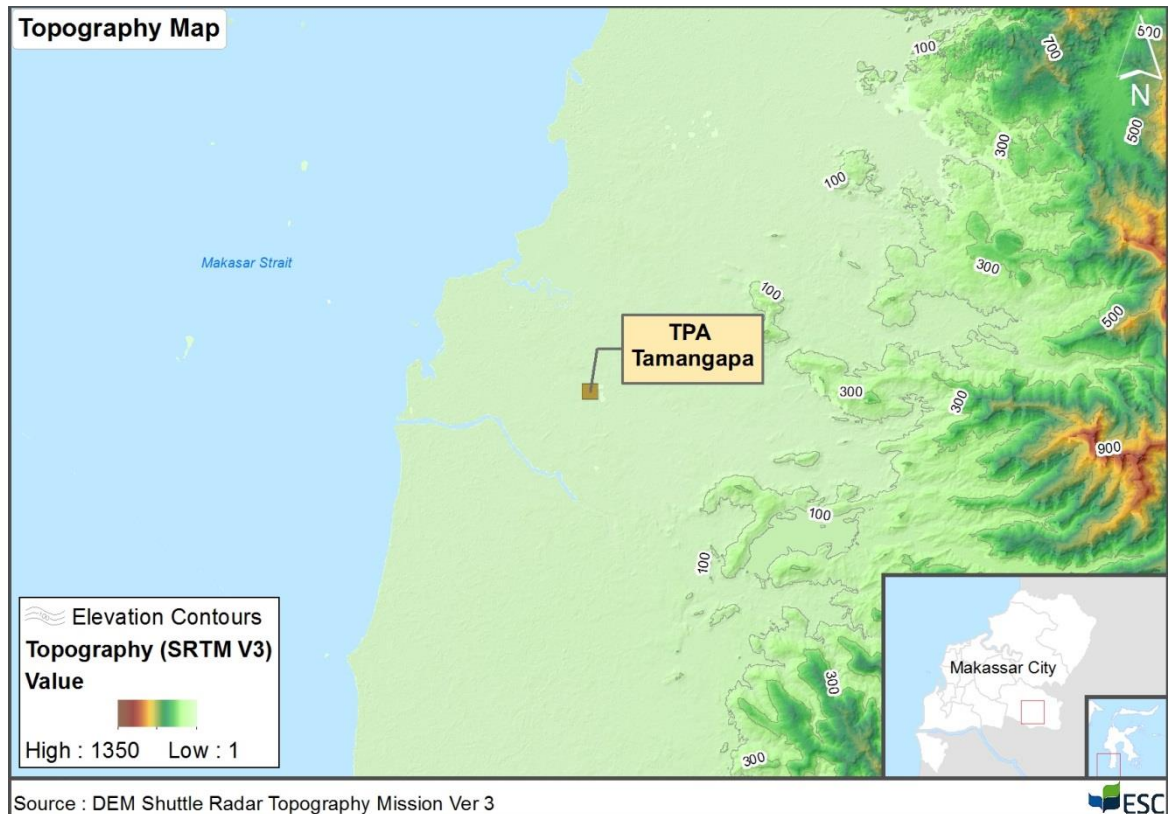


Figure 5-12 Study Area Topography Map

5.1.2.3 Seismicity

A review of the seismicity of the Project area is intended to highlight any associated risks and ensure planned infrastructure has sufficient resistance to potential earthquakes/tsunamis.

Based on the Seismic Hazard Map (GSHAP, 2000), Indonesia is categorized into six (6) earthquake zones; Zone 1 is the region with the lowest seismicity and Zone 6 with the highest seismicity. The Zones are defined by averaged bedrock peak accelerations due to the influence of recurring earthquakes on a 500-year periodicity.

Sulawesi Selatan Province brackets Zone 2 through Zone 6, with the Project site falling within Zone 2.

Based on historical earthquake damage in South Sulawesi over the last 100-year period, there are no unprecedented earthquakes or tsunamis that have affected Makassar City and surrounding areas, including the Project site.

Seismicity literature studies also show that the influences of active geological structures and faults do not appear to contribute to earthquakes or tsunamis in the Project site.

Figure 5-13 shows the complete lack of any significant seismic activity from 2004-2016 in the region.

Several earthquake hazard maps are produced in Indonesia and all indicate the Project region is relatively safe from the danger of significant seismic events:

- Indonesian Earthquake Zone Distribution Map (Water Resources Research Center, 2004) places the Project site in Earthquake Zone B (low risk coefficient).
- Indonesian Earthquake Zone Map (Public Works, 2010), places the Project site within earthquake Zone 2 (coefficient 0.10 g – low criteria).
- Earthquake Zone Alert Map (GRDC, 2010) indicates the Project site area is not included in the alert zone for earthquake.
- Earthquake Sources Zone Map in Indonesia indicates the Project Site area is not on the track of earthquake source zones.

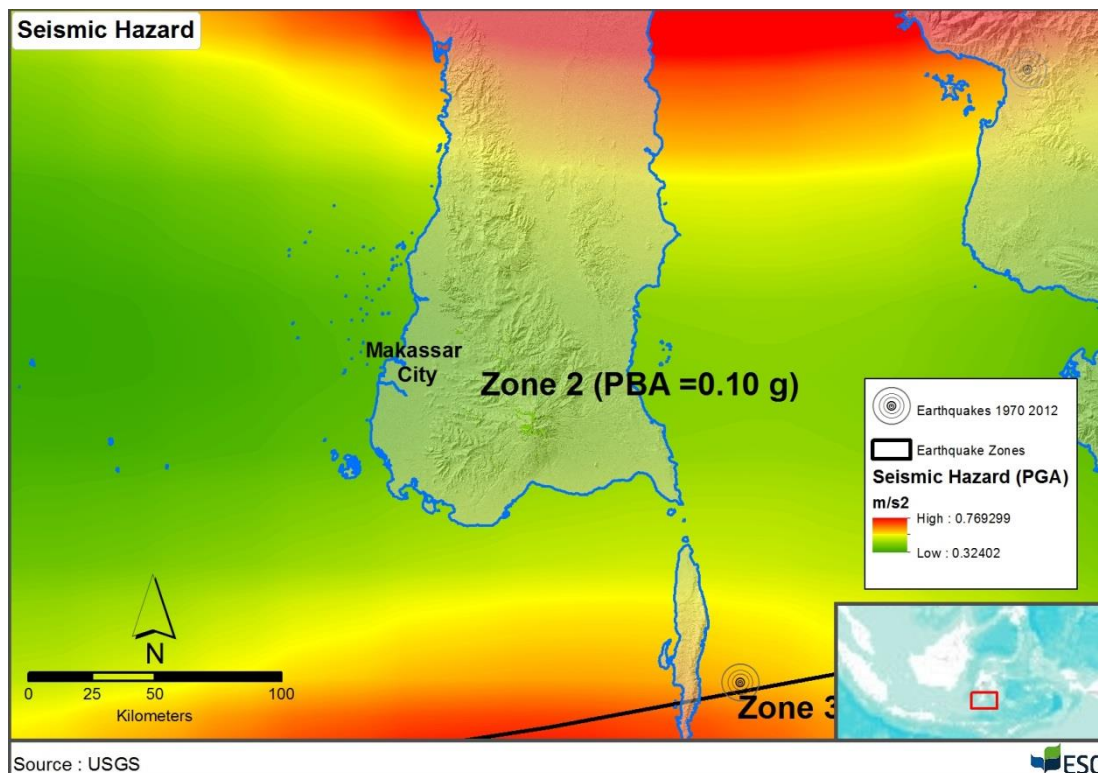


Figure 5-13 Seismic Hazard Map of Southern Sulawesi Region

5.1.2.4 Soil

Classification of soil types found in the study area and surroundings based on the Soil Map Review of Sulawesi Selatan Province, Soil Research Institute, Bogor (1968) are listed in **Table 5-7**, as well as the corresponding names. Based on the USDA Soil Taxonomy (1992), the soils in the study area were classified at the order levels Ultisols, Vertisols, and Inceptisols.

Table 5-7 Soil Classification

Pusat Penelitian Tanah, Bogor (1968)	USDA Soil Taxonomy (1992)	
	Order	Sub Order
Mediterranean Brown	<i>Ultisols</i>	<i>Ustults</i>
Grumusol Dark Gray	<i>Vertisols</i>	<i>Usterts</i>
Alluvial Brown Gray	<i>Inceptisols</i>	<i>Umbrepts</i>

Source: Soil Research Institute, 1968; Land Suitability Report, 1988, Nippon Koei Co., Ltd. & Associates, 1998.

Ultisols (Mediterranean Brown)

Mature to old soil, moderate to shallow effective depth, reddish yellow to red horizon identifier B-Argillic ground color, loam to clay texture, angled structure (angular blocky), sticky to very sticky moisture content, moderately acidic to acidic soil reaction and moderate permeability. Organic matter content is low to very low, cation exchange capacity and base saturation are low. Total nitrogen is very low and P₂O₅ and K₂O content are also low. Ultisols tends to cover more hilly terrain.

Inceptisols (Alluvial Brown Gray)

Young soil, varying effective depth and texture, unstructured and no defined horizons with Very sticky consistency, slightly acidic soil reaction, low organic matter content, low cation exchange capacity, and moderate to low base saturation. Total nitrogen is very low and P₂O₅ and K₂O content are also low. Inceptisols develop in low areas along the river and sloping land.

Vertisols (Grumusol Dark Grey)

Mature to moderately old soil, generally deep in effective depth, clay to heavy clay texture. The structure of the upper layers is angular and the bottom layers are cubic (blocky). Consistency is very sticky and plastic; very hard and cracked when dry with very low permeability. Moderate to low organic matter levels, low cation exchange capacity and high saturation. This soil type contains moderate levels of nitrogen and moderate contents of P₂O₅ and K₂O.

5.1.3 Hydrosphere

5.1.3.1 Hydrology and Floods

The Project Area is located at the Tallo Watershed which considered as a small watershed comprise of the area at Gowa District, Maros District and Makassar City. Tallo River is the main river of the Tallo Watershed. The upstream of Tallo River is located at Gowa and Maros District and flows to western direction to Makassar City. The upstream of Tallo Watershed are utilized for dry agriculture and the middle and downstream areas are utilized for agriculture and fishery.

Flood at the Tallo River occurs annually, particularly during the peak of wet season and high tide. At this event, flood impacts the northern portion of Makassar City particularly nearby Tallo, Tamalanrea and Biringkanaya Areas. Tallo River has high sedimentation level which can be observed by visual observation.

Tallo River has approximately 61 km length, 50 m surface width, 25 m riverbed width with approximately 4 m depth. Flow rates at Tallo River ranges from 20.4 m³/s to 33.8 m³/s. Tallo River

has meandering river type with sharp meander at the downstream area. It has approximately 20 – 80 m width at the upstream area and approximately 80 – 300 m width in the downstream.

According to the Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City) Year 2016, floods occur annually in December to February. High flood occurrences were recorded in 1967, 1976, 1983, 1986, 1999 and 2000. The total flood area in Kecamatan Manggala was 118.0164 Ha. The Flood Prone Area Map from BPBD Kota Makassar shows that the Project Area is located adjacent to the flood prone area.

5.1.3.2 Hydrogeology

An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a water well.

Based on review of Hydrogeology Map Sheets 2010 Ujung Pandang, 2109 Benteng and 2110 Sinjai Sulawesi (Mudiana. W, Mukna. HS and Soetrisno, S, 1984), the regional aquifer system is formed by two groups of aquifers:

- Upper aquifer group is predominantly alluvial deposits consisting of loose material, with groundwater flowing through the pore spaces between grains.
- Lower aquifer group consists of fissures or other hollow spaces within the underlying bedrock.

The main lithologies of the upper aquifer are swamp sediments, stream sediments, and coastal sediments consisting of fine to coarse sand, silt, and clay. Sand layers or lenses host the main pore spaces. In general, this kind of aquifer is characterized as unconfined (free aquifer) and contains free ground water.

The lower bedrock aquifer is formed by mostly compact volcanoclastic rocks consisting of sandstone, claystone, silt stone, tuff, and tuffaceous sandstones. These lithotypes generally have low permeability and at less coherent sections have moderate permeabilities. This groundwater is obtained in drill holes which penetrate a permeable layer between two impermeable layers and the groundwater is pressurized (artesian).

Regional free groundwater is potentially found in the producing aquifer type with medium to high distribution; this type of aquifer has moderate to somewhat high transmissivity, with moderate to high discharge rates (1 liter/sec - 5 liter/sec from wells), found in river and beach alluvial deposits. The aquifer with medium to rare productivity has widespread distribution, and characterized by being discontinuous, thin, and of low transmissivity, with a low well discharge rate and found in volcanic rocks. Potentially pressurized groundwater regional aquifers are of rare to very rare distribution; these types of aquifer have very low transmissivity with very low discharge rates deeper than 60 meters below the soil horizon and found in volcanic rocks.

5.1.3.3 Water Quality

The operation of TPA Tamangapa could adversely affect the quality of groundwater and river water. Water quality baseline data in the study area could be the basis for evaluating the potential impact that will arise against this environmental component due to Project activities.

Water sample testing in the study area was taken from wastewater and groundwater during the RK-RPL Implementation on 2016. The information on surface water quality in Tallo River as the main

River of Tallo Watershed were taken from the Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City) Year 2016. The sample coordinated and the locations of each are in Table 5-8.

Table 5-8 Water Sampling Locations in the Study Area

Test Sample	Water Body	Coordinate Point	
Surface Water – Tallo River			
SW-1	Zone 1 – Upstream of Tallo Watershed	-	
SW-2	Zone 5 – Downstream of Tallo Watershed (estuary)	-	
Wastewater			
WW-1	Drainage water inside the TPA Tamangapa	S: 05°10'31.88"	E: 119°29'50.2"
WW-2	Effluent Wastewater Treatment Plant TPA Tamangapa	S: 05°10'27.3"	E: 119°29'32.9"
Groundwater			
GW-1	Monitoring well inside the TPA Tamangapa	S: 05°10'31.95"	E: 119°29'20.58"
GW-2	Community well nearby TPA Tamangapa	S: 05°10'29.1"	E: 119°29'21.87"

Source: Pelaporan Hasil Pemantauan Pelaksanaan RKL-RPL (RKL-RPL Implementation Report), Semester I & II 2016; Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City), 2016

5.1.3.4 Surface Water

The water samples from Tallo River were tested against the Sulawesi Selatan Governor Regulation No. 69 Year 2010 regarding the Threshold Standards and Environmental Damage Criteria Appendix I Water Quality Criteria. Water quality result of Tallo River is presented in Table 5-9.

Table 5-9 Water Quality at Tallo River

Parameter	Unit	Concentration		Standard
		SW-1	SW-2	
Temperature	°C	29-31	28-30	-
pH	-	7	7	-
Electric Conductivity	mS/cm	0.22	17.63	-
Total Suspended Solid (TSS)	mg/L	204	42	400
BOD ₅	mg/L	83.2	83.2	6
COD	mg/L	192.4	209.7	50
NO ₃	mg/L	0.71	0.39	20
Phosphate	mg/L	0.25	<0.1	1
Oil&Grease	µg/L	<0.1	<0.1	1
Total Coliform	amount/1,000ml	2,400,000	0	2,000
H ₂ S	Mg/L	<0.002	<0.002	0.002

Source: Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City), 2016* Standards for water quality by Sulawesi Selatan Governor Regulation No. 69 of 2010 for Water Class III

Chemical parameters. BOD₅ and COD parameter values of test samples are high, at about 83.2 BOD₅ mg/L (the quality standard is 6 mg/L) while COD ranged from 192.4 to 209.7 mg/L (the quality standard: 50 mg/L). The BOD₅/COD ratio in the SW-1 and SW-2 were calculated at 0.43 and 0.4 showing that most of the pollutants in the Tallo River cannot be degraded biologically.

Microbial Parameters. The microbial parameters represents by Total Coliform were detected at high level on SW-1 (Upstream of Tallo River) which indicates the domestic waste pollution. The Total Coliform is detected at 2,400,000 amunt/1,000ml of water and is higher than the threshold standard of 2,000 amount/1,000ml in accordance to the Sulawesi Selatan Governor Regulation No. 69 Year 2010 for Water Class III.

High contaminants of microbial parameters in the surface water may related to the habit of the community for open defecation. Data from the Report of Strategi Sanitasi Kota Makassar 2016 (Makassar City Sanitation Strategy) stated that approximately 908 households in Makassar City particularly who lives in Kecamatan Biringkanaya, Kecamatan Tamalanrea, Kecamatan Tallo and Kecamatan Bontoala were having open defecation habit.

Pollution Index (PI). Surface water quality in the upstream and downstream of Tallo River has been polluted, based on several quality standards for parameters in PP 82 of 2001 and South Sulawesi Governor Regulation No 69 of 2010, as well as based on the calculation of PI with values ranging from 6.25 to 11.2 (Table 5-10).

Table 5-10 Pollution Index (PI) at Tallo River

Test Sample	Water Body	PI	Category
SW-1	Zone 1 – Upstream of Tallo Watershed	6.25	medium pollution
SW-2	Zone 5 – Downstream of Tallo Watershed (estuary)	11.2	high pollution

Source: Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City), 2016

5.1.3.5 Wastewater

The wastewater in TPA Tamangapa were sampled and the measurement results are compared in accordance to the Ministry of Environment and Forestry Regulation No. 59 Year 2016 regarding the Leachate Threshold Standard from Landfill Appendix I. The results of wastewater quality measurement during the RKL-RPL implementation on Semester I and II 2016 are presented in the following Table.

Table 5-11 Wastewater Quality at TPA Tamangapa

Parameter	Unit	Concentration				Standard
		WW-1		WW-2		
		S1-2016	S2-2016	S1-2016	S2-2016	
pH	-	7.84	7.24	8.2	7.59	6-9
BOD ₅	mg/L	468	132	393.08	1,429	150
COD	mg/L	1,160.9	327.6	982.3	3,571.6	300
TSS	mg/L	606	84	438	848	100

Parameter	Unit	Concentration				Standard
		WW-1		WW-2		
		S1-2016	S2-2016	S1-2016	S2-2016	
N Total	mg/L	662.68	15.28	438	942.39	60
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.05
Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	0.1

Source: Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City), 2016*
Ministry of Environment and Forestry Regulation No 59 of 2016

The results of wastewater quality during the monitoring programmes at Semester I & II 2016 compare to the leachate threshold standards from solid waste disposal in accordance to the Ministry of Environment and Forestry Regulation No. 59 Year 2016 are as follows:

Physical parameters. Physically, both leachate in the drainage channel inside the TPA area and effluent of the wastewater treatment plant are turbid with suspended solids content 84-848 mg/L (quality standard: 100 mg/L).

Chemical parameters. Acidity of the water samples varies from pH 7.24 to 8.2 which is still within the range of quality standards, set between pH 6 to 9. BOD₅ and COD parameter values of test samples are high, at about 132-1,429 BOD₅ mg/L (the quality standard is 150 mg/L) and 327.6 to 3,571.6 COD mg/L (the quality standard: 300 mg/L). The BOD₅/COD ratios are calculated at 0.4 for all sampling points indicating that most of the pollutants within the Tallo River cannot be degraded biologically. Three out of four detections of N total in the samples are higher than the threshold value of 60 mg/L. Mercury and cadmium are not detected in any sample.

5.1.3.6 Groundwater

The groundwater in TPA Tamangapa were sampled and the measurement results are compared against the Ministry of Health Regulation No. 416 Year 1990 Appendix II regarding the Clean Water Quality Standard. The results of groundwater quality measurement during the RKL-RPL implementation on Semester I and II 2016 are presented in the following Table.

Table 5-12 Groundwater Quality at TPA Tamangapa

Parameter*	Unit	Concentration				Standard**
		GW-1		GW-2		
		S1-2016	S2-2016	S1-2016	S2-2016	
Physic						
Odor	-	Normal	Normal	Normal	Normal	Normal/odorless
TDS	mg/L	212	193	96.4	281	1,500
Turbidity	NTU	0.441	5.01	0.687	0.235	25
Taste	-	Normal	Normal	Normal	Normal	Normal/tasteless
Temperature	°C	29.4-31	29.4-31	29.3-31	28.4-30	Ambient air ± 3°C
Color	TCU	7.5	15	7.5	7.5	50

Parameter*	Unit	Concentration				Standard**
Chemical						
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.001
Aluminum	mg/L	-	<0.07	-	<0.07	(-)
Arsenic	mg/L	<0.01	<0.01	<0.01	<0.01	0.05
Barium	mg/L	-	-	-	-	(-)
Iron	mg/L	<0.01	0.39	<0.01	<0.24	1
Fluoride	mg/L	0.52	0.05	<0.05	<0.05	1.5
Cadmium	mg/L	<0.003	<0.003	<0.003	<0.003	0.005
Hardness (CaCO ₃)	mg/L	88.1	-	70.29	--	500
Chloride	mg/L	89.31	52.03	68.4	16.69	600
Chromium 6	mg/L	<0.01	<0.01	<0.01	<0.01	0.05
Manganese	mg/L	-	0.09	-	<0.01	0.5
Sodium	mg/L	-	-	-	-	(-)
Nitrate	mg/L	1	0.71	0.98	0.69	10
Nitrite	mg/L	0.04	0.28	<0.01	<0.01	1
Silver	mg/L	-	-	-	-	(-)
pH	-	5.8	5.62	6.3	7.17	6.5-9
Selenium	mg/L	-	-	-	-	0.01
Zinc	mg/L	0.01	0.08	0.07	<0.01	15
Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	(-)
Sulfate	mg/L	<0.2	8.99	<0.2	29.44	400
H ₂ S	mg/L	-	<0.1	-	<0.1	(-)
Copper	mg/L					
Lead	mg/L	<0.01	<0.01	<0.01	<0.01	0.05
Microbiology						
Fecal Coliform	amount/100ml	-	-	-	-	(-)
Total Coliform	amount/100ml	-	-	-	-	50

Source: Dokumen Kinerja Lingkungan Hidup Kota Makassar (Environmental Performance Report of Makassar City), 2016; *List of parameters in accordance to the Minister of Environment & Forestry Regulation No. 59 Year 2016 Appendix II; **Standards for water quality by Ministry of Health Regulation No. 416 Year 1990 Appendix II; (-) No threshold standard applied

The results of groundwater quality during the monitoring programmes at Semester I & II 2016 compare to the standards clean water in accordance to the Ministry of Health Regulation No. 416 Year 1990 Appendix II are as follows:

Chemical parameters. Mostly, the measured parameters are still in the good condition and are lower than the threshold standards of clean water in accordance to the Ministry of Health Regulation No. 416 Year 1990. However, pH values are detected in the low level (acid condition) at two sampling locations during the monitoring programme on Semester I 2016 and one sampling location during the monitoring programme on Semesters II 2016. Typically, the groundwater pH values inside the TPA area are lower than the groundwater pH values in the nearby settlement. This condition is likely occurred due to the oxidation of the soil material within the TPA area.

Data from the AMDAL Study on 2007 show that the soil within the study area comprises of Entisol (aluvial soil which have greyish brown color) and have sandy clay loam texture. It is predicted that soil infiltration rate is at approximately 0.5-1.5 cm/hour (slow infiltrate) with permeability range at 0.5-2 cm/hour (slow). The dry inundation occurrence shows that there is sign of iron rust spots which have blackish color in the reduction condition and have reddish color in the oxidation condition. The soil acidity is relatively high particularly during the oxidation condition (pH < 4.5).

Along with the opening of land due to landfilling activities; soil will be exposed and oxidized. When runoff and leachate infiltrate through the exposed soil, acidic soil will react with the runoff or/and leachate resulting in additional acidity in the groundwater.

5.1.4 Biodiversity Resources

The Project Area is located in Tamangapa, Kelurahan Tamangapa, Kecamatan Manggala, South Sulawesi Province which is approximately 12 km from Makassar City or 26.8 km from Sultan Hassanudin International Airport, Indonesia. It is relatively far to the Bantimurung – Bulusaraung National Park.

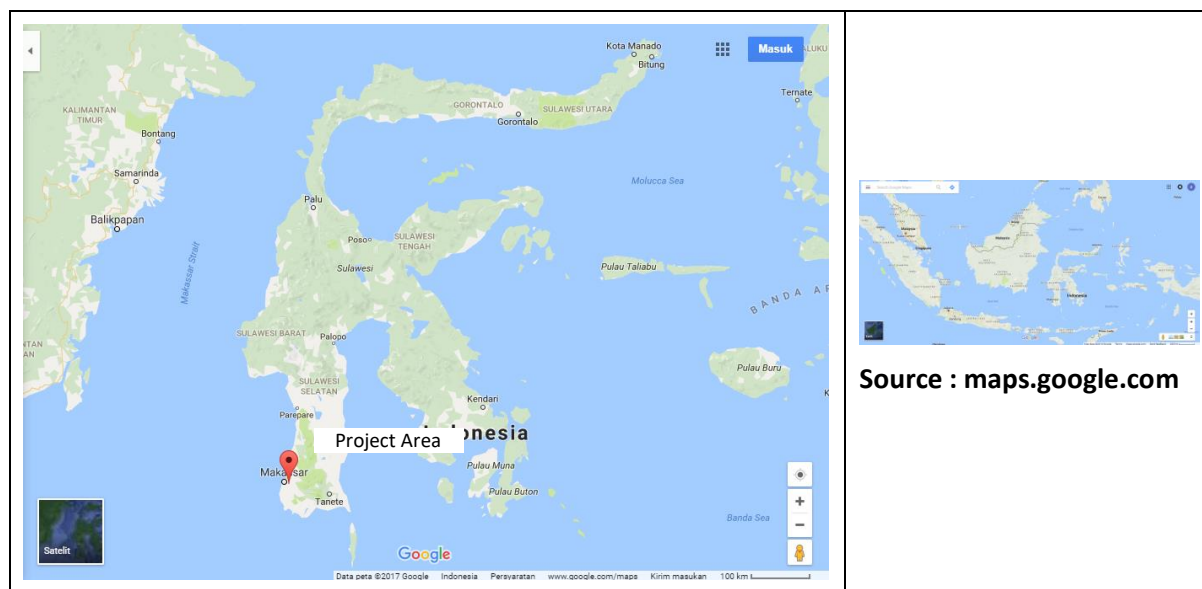


Figure 5-14 Location of the Project Area nearby the Bantimurung – Bulusaraung National Park

The biodiversity resources study is conducted based on desktop review (covers the terrestrial biodiversity). Secondary data is collected from reliable sources such as the IBAT survey, IUCN and other governmental agencies as applicable.

5.1.4.1 Biodiversity Important Habitats in the Project Area of Influence

5.1.4.2 Sulawesi Moist Forests Ecoregion

The Sulawesi lowlands are mainly tropical lowland evergreen and semi-evergreen rainforests, with monsoon forests at the tip of the southeast peninsula and small areas of freshwater and peat swamp forest. They are dominated by 7 species of dipterocarp trees, but also boast palms and ebonies in dense clumps. The Sulawesi montane rain forests, located in the region known as Wallacea, are dominated by oaks and chestnuts.

Endemic mammal species include the endangered mountain anoa (*Bubalus quarlesi*), crested macaque (*Macaca nigra*), vulnerable babirusa (*Babyrousa babyrussa*), and the Sulawesi montane long-nosed squirrel (*Hyosciurus heinrichi*).

Also found here and nowhere else are Sulawesi barebacked fruit bat (*Dobsonia exoleta*), Sulawesi tarsier (*Tarsius spectrum*), short-tailed Talaud melomys (*Melomys caurinus*), and Sulawesi palm civet (*Macrogalidia musschenbroekii*). Other species of interest include Sulawesi tree nymph butterfly (*Idea tambusisiana*), swallowtail butterfly (*Graphium androcles*), lowland anoa (*Bubalus depressicornis*), mountain anoa (*B. quarlesi*), sailfin lizard (*Hydrosaurus amboinensis*), and the reticulated python (*Python reticulatus*).

Amongst the endemic bird species are Sula scrubfowl (*Megapodius bernsteini*), bare-faced rail (*Gymnocrex rosenbergii*), Talaud kingfisher (*Todirhamphus enigma*), pied cuckoo-shrike (*Coracina bicolor*), cerulean paradise-flycatcher (*Eutrichomyias rowleyi*), Sulawesi hornbill (*Penelopides exarhatus*), henna-tailed jungle-flycatcher (*Rhinomyias colonus*), and the bare-eyed myna (*Streptocitta albertinae*).

While many of Indonesia's larger islands suffer from deforestation, Sulawesi still supports extensive tracts of both mountain and lowland moist forests. The island's steep slopes, and the relative lack of commercially valuable tree species, help contribute to the still extensive forests that cover over 60% of the island.

However, the logging that has occurred has had devastating effects on the landscape and the ecosystems. For example, extensive erosion on surrounding deforested slopes has clogged the irrigation systems of the once fertile rice fields of Palu Valley. Hunting and anthropogenic fires are also serious threats to the wildlife and habitat.

5.1.4.3 Gunung Moncong Lompobatang Important Bird Area

On Birdlife website, Birdlife international categorize the landscape based on its Important Bird Area (IBA). Important Bird Areas are sites that are significant for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site based approach is appropriate. The landscape name is Gunung Moncong Lompobatang (figure below). Gunung Moncong Lompobatang is categorised as an Important Bird Area with Criteria A1. The IBA criteria A1 is representative of a site that is known or thought regularly to hold significant numbers of a globally threatened species.

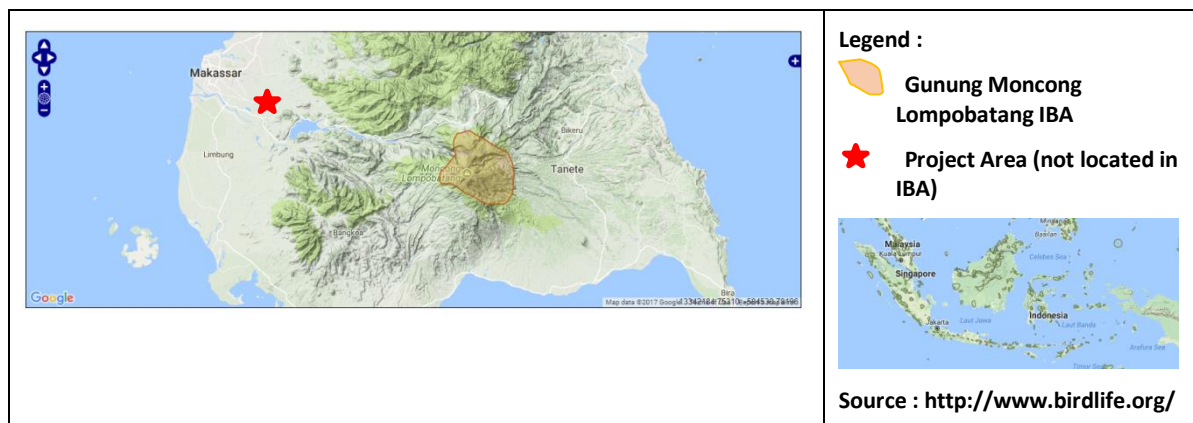


Figure 5-15 Gunung Moncong Lompobatang Important Bird Area

According to birdlife.org, the Gunung Moncong Lompobatang IBA area is 32.814 Ha located at 5o 19' 55" South (-5.33o) 119o 55' 48" East (119.93o) with elevation 1000-2730 m above mean sea level (AMSL). Moreover, the ESC Team were able to further assess the project location using IBAT. The results show that the project location is not located in any protected areas, priority sites for biodiversity and regions of conservation importance as described below:

- **Protected areas: national-level**

IUCN management categories Ia, Ib, II, III, IV, V, VI

Protected areas classified according to the International Union for Conservation of Nature (IUCN) global set of standard categories to classify protected areas, both terrestrial and marine, based on management objectives. These allow comparison between countries; unlike national naming designations (e.g. national park or forest reserve) which are not standardized internationally and do not necessarily convey information on management targets. The IUCN management category (where used) is assigned by the national authority.

- **Protected areas: international**

Natural/mixed World Heritage sites

A global list of internationally recognised sites of outstanding universal value to humanity. This designation is administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO). World Heritage sites are places on earth that are of Outstanding Universal Value (OUV) to humanity and therefore, have been inscribed on the World Heritage List to be protected for future generations.

The World Heritage Convention, which has been ratified by 191 countries, was adopted by United Nations Educational, Scientific and Cultural Organization's (UNESCO) General Conference in 1972, and came into force in 1975, for the identification, protection, conservation, presentation and transmission to future generations of the world cultural and natural heritage. Under this international legal instrument, sites are nominated for inclusion on the World Heritage List, either for their natural or cultural values, or a mixture of the two.

- **Priority Sites for Conservation**

Key Biodiversity Areas

A site identified as a conservation priority for one or more species based on the quantitative criteria used in the complementary approaches for identification of Alliance for Zero Extinction sites (AZEs), BirdLife Important Bird and Biodiversity Areas (IBAs), IUCN Freshwater KBAs and KBAs identified through the Critical Ecosystem Partnership Fund (CEPF) hotspot profiling process. These sites form the starting point for the list of sites to be endorsed using the new IUCN KBA Standard (2014).

Important Bird and Biodiversity Areas (IBAs)

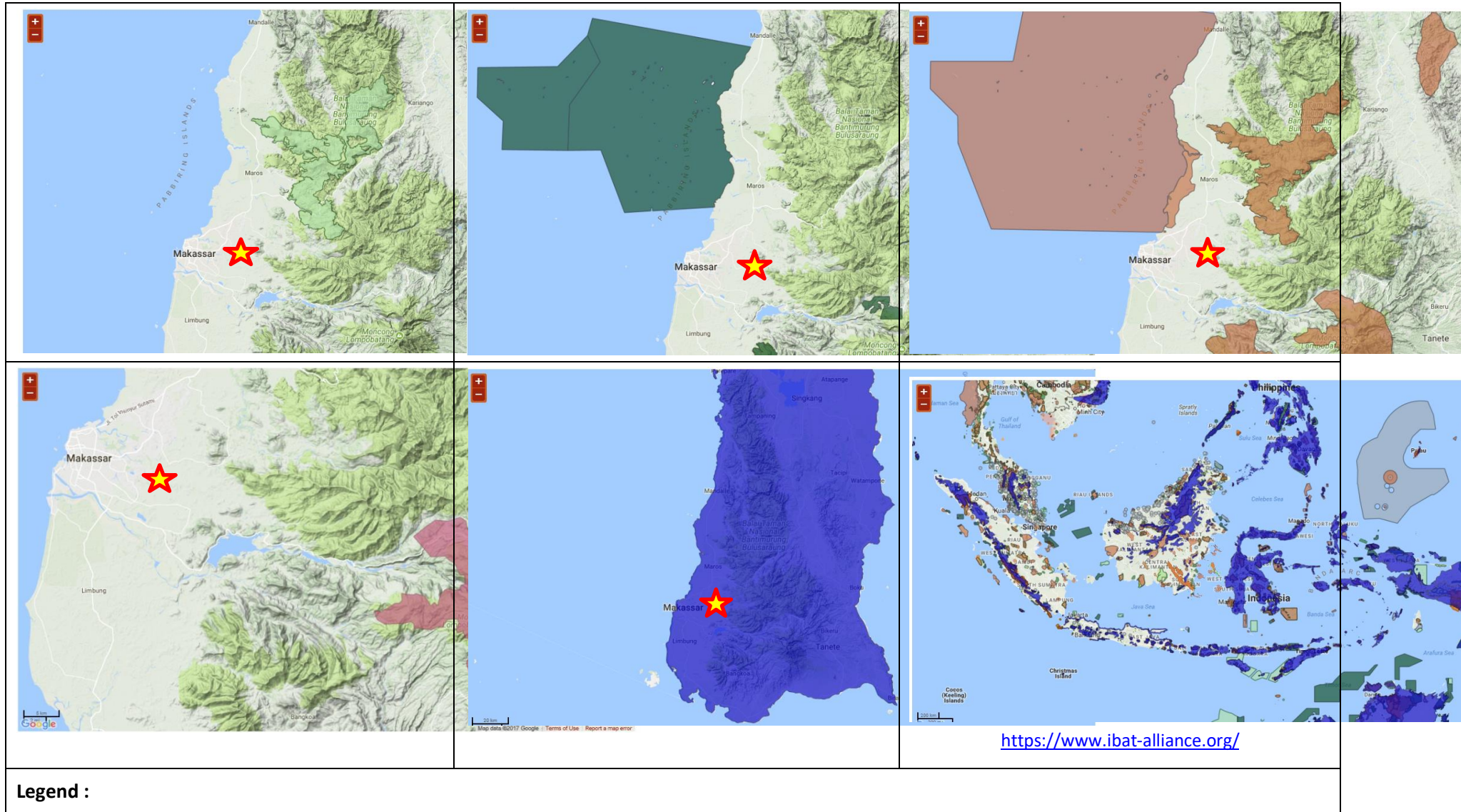
A site identified as a conservation priority for bird species based on four criteria: presence of globally threatened species; significant populations of restricted range species; a representative sample of biome-restricted species; important congregations of species. These sites along with other complementary approaches form the backbone of the Key Biodiversity Areas (KBAs) are also presented here.

- **Regions of Conservation Importance**

- Endemic Bird Areas**

Endemic Bird Areas (EBA) are regions of global conservation importance, identified by BirdLife International, where the distributions of two or more restricted-range bird species overlap. About 25% of all bird species have a 'restricted' range, i.e. they are restricted (endemic) to a very small area in global terms (defined as 50,000 km² or smaller). Half of all restricted-range species are already globally threatened or Near Threatened, while the other half remain forever vulnerable to the loss or degradation of habitat owing to the smallness of their ranges. The unique landscapes where these species occur, amounting to just 4.5% of the earth's land surface, are thus BirdLife International's priorities for broad-scale ecosystem conservation. The EBAs also support many of the world's more widespread bird species, are also important for the conservation of restricted-range species from other animal and plant groups, and are often particularly rich in human cultures and languages.

According to the IBAT survey result, the Tamangapa Final Disposal Area is located within the boundary of the Sulawesi Endemic Bird Area and Sulawesi Moist Forests ecoregion. The distance between the Final Disposal area and the Gunung Moncong Lompobattang IBA is approximately 40 km. This is a considerably large distance which may hinder wildlife mobilization from natural habitats, yet large birds such as raptors may occasionally be seen in the disposal area. As such, further biodiversity survey for bird species need to be conducted to identify any endangered species within the project location. In addition, the Tamangapa Final Disposal Area is not located in protected areas both national level and international level and priority sites for conservation. The complete IBAT survey results for the project location are presented below.



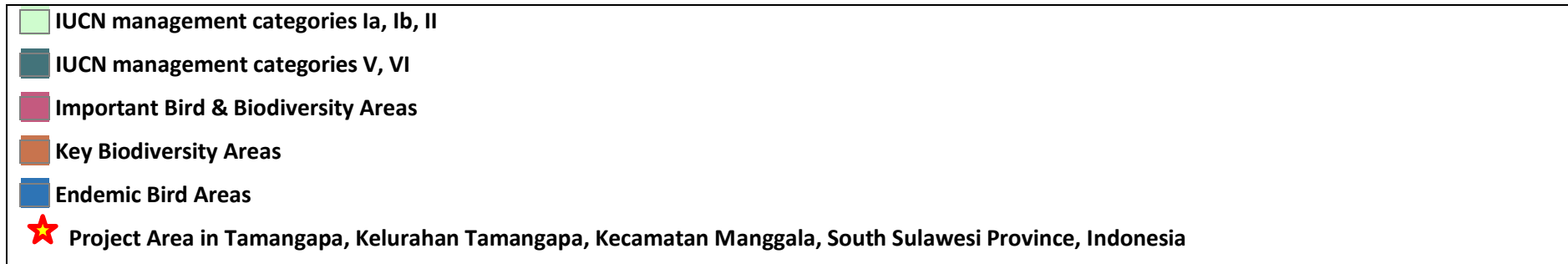


Figure 5-16 IBAT Survey Result for Project Location in regard to Protected Areas, Priority Sites for Biodiversity and Regions of Conservation Importance

Source: www.ibat-alliance.org (accessed August 18th 2017)

5.1.4.4 Possible Occurrence of Species within the Project Area and Surrounding

An IBAT survey was conducted to determine biodiversity within the Project Area and surroundings. According to the IBAT survey, the Project Area is located at the species grid cell No. 163181. The species listed in this grid are represented by possible occurrence of the species in the wider range of Tamangapa area and surroundings area. The IBAT results identify 18 species of amphibians, 272 species of birds, 1018 fishes species, 858 invertebrates species, 100 species of mammals, 51 plants species and 43 species of reptiles. Approximately 32 of the possible occurrence of the species within the species grid are considered as an endangered species according to the IUCN Redlist.

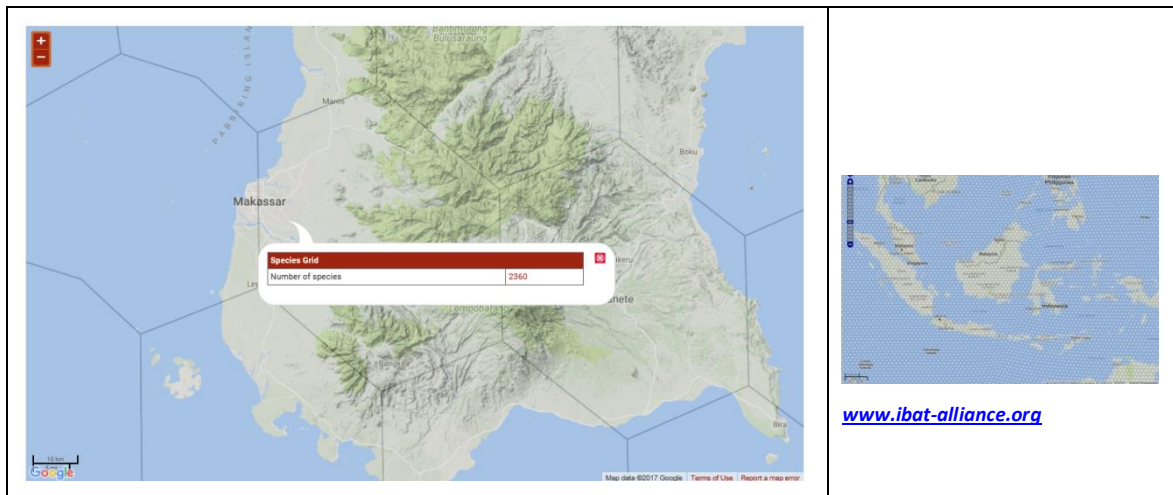


Figure 5-17 Species Grid within the Project Area and Surroundings

5.1.4.5 Potential of Threatened Wildlife Species in the Project Location Landscape

The list of threatened species are based on the IUCN Red List for categories Critically Endangered (CR) and Endangered as well as the Indonesian Government Regulation No. 7 of 1999 on Preservation of Flora and Fauna Species. Species endemism is also taken into consideration.

In total, nine (9) threatened species are recorded in the project location. Three (3) species are listed as CR and EN in the IUCN Red List, which are the Great Knot, Milky Stork, and Yellow-crested Cuckatoo. Four (4) species are nationally protected, which are the Knobbed Hornbill, Yellow-crested cockatoo, Spectral tarsier, and Salt-water crocodile. In addition, four (4) endemic species are found, which are the Knobbed Hornbill, Minahassa Masked-owl, Sulawesi Harpy Fruit Bat, and Sulawesi Giant Squirrel. The complete list of threatened species is listed in **Table 5-13** below.

Table 5-13 List of Threatened Species in the Project Location

Class	Order	Family	Species	Conservation Status		Endemic
				IUCN	National	
Aves	Bucerotiformes	Bucerotidae	Knobbed Hornbill (<i>Rhyticeros cassidix</i>)	VU	P	Endemic
	Charadriiformes	Scolopacidae	Great Knot (<i>Calidris tenuirostris</i>)	EN		
	Ciconiiformes	Ciconiidae	Milky stork (<i>Mycteria cinerea</i>)	EN		
	Psittaciformes	Cacatuidae	Yellow-crested Cockatoo (<i>Cacatua sulphurea</i>)	CR	P	
	Strigiformes	Tytonidae	Minahassa Masked-owl (<i>Tyto inexpectata</i>)	VU		Endemic
Mammalia	Chiroptera	Pteropodidae	Sulawesi Harpy Fruit Bat (<i>Harpyionycteris celebensis</i>)	VU		Endemic
	Primates	Tarsiidae	Spectral Tarsier (<i>Tarsius tarsier</i>)	VU	P	
	Rodentia	Sciuridae	Sulawesi Giant Squirrel (<i>Rubrisciurus rubriventer</i>)	VU		Endemic
Reptilia	Crocodylia	Crocodylidae	Salt-water crocodile (<i>Crocodylus porosus</i>)	LC	P	

There is a high probability that the above listed endangered and critical species will occur in the Project Area and surroundings. There is an opportunity for species to move into / out of the project area using natural corridor within the Project Area and surroundings, river and riparian area. Most of the Project Area and surroundings predominantly comprise of natural habitat with minor modified habitat.

5.1.4.6 Biodiversity Resources Summary

Most of the Project Area and surroundings are classified as Natural Habitat comprising of dryland and riparian zone with minor modified habitat. The nearest key biodiversity area is Gunung Moncong Lompobatang, which is located approximately 40 km from the project location. The project area is located in the Sulawesi Moist Forests ecoregion and Sulawesi Endemic Bird Area. Due to the nature of the landscape of the Project Area and surroundings, it can be confirmed that the Project Area footprint will not disturb any area of the Gunung Moncong Lompobatang IBA. However, it is expected that some mobile species such as mammals and birds may utilize the Project Area through the Natural Habitat corridor. Biodiversity resources summary of the Project Area is presented below.

Table 5-14 Biodiversity Resources Summary

Characteristics	Tamangapa Final Disposal Area Project Area
Type of Habitat	
Natural Habitat	Major Patch
Modified Habitat	Minor Patch
Biodiversity	
Amount of Threatened Species	Nine (9) species
Ecosystem of Concern	
Wetland	None
Dryland	Yes
Coastal	None
Significant Landscape	
Natural Feature	None
Significant Vista	None
Tourist Attraction	None
Endemic and/or restricted range	None
Highly threatened and/or	None

Characteristics	Tamangapa Final Disposal Area Project Area
unique ecosystems	
Key evolutionary process	None
Ecosystems services	None
Critical Habitat	None

5.2 Social, Economic & Cultural Baseline

5.2.1 Project Affected Community

The Environmental Impact Assessment (Amdal) conducted in 2007 identified two villages being impacted by the TPA Tamangapa, which are Tamangapa Village and Manggala Village. These two villages are directly impacted by Project activities due to their close proximity with the landfill, and a number of villagers being actively involved in some forms or other in the operation of the landfill. In particular, waste pickers and waste buyers as well as those settlements are directly adjacent to the landfill, such as those in Tamangapa Village are affected by the landfill.

Administratively both villages are urban villages (*Kelurahan*) within Manggala sub-district. Tamangapa village has 7 sub-villages or *Rukun Warga (RW)* and 34 neighborhood or *Rukun Tetangga (RT)*, while Manggala Village has 12 RW and 63 RT. The population of the impacted area is heterogeneous in terms of ethnicity, livelihood sources, and income levels, which will be detailed in the following sections.

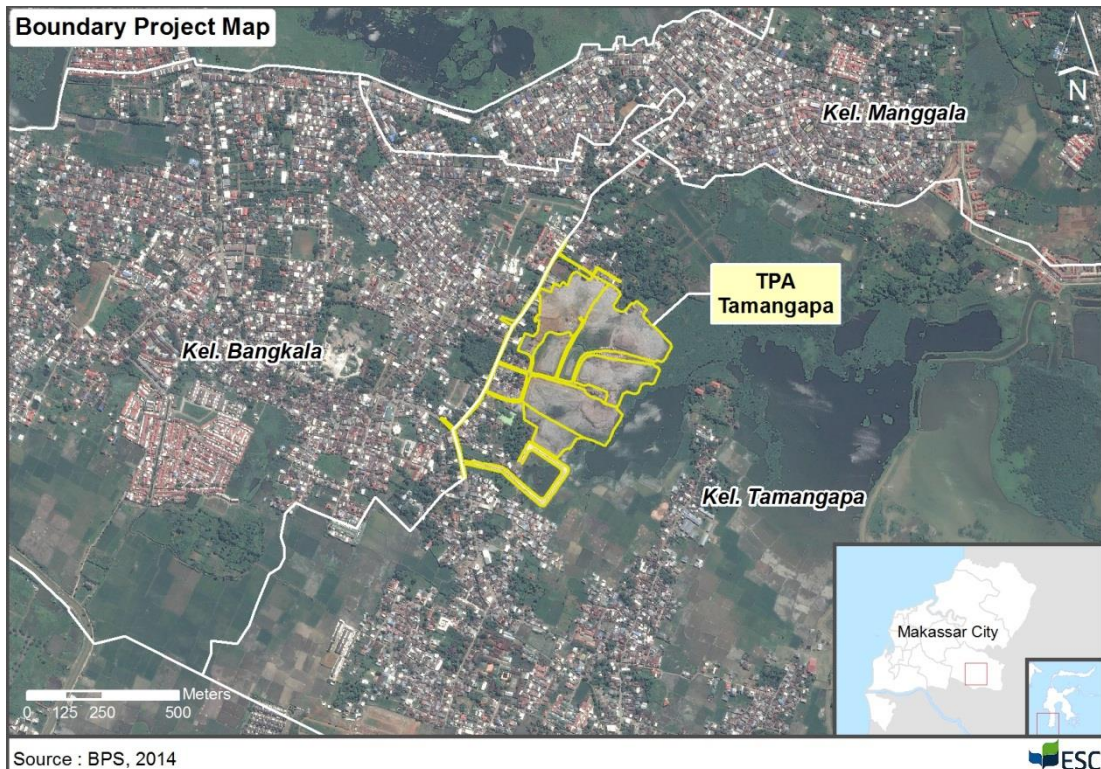


Figure 5-18 Map of Project Location

Tamangapa Village is more impacted by the Project than Manggala Village due to the location of the landfill and the impact of Project activities on local communities and livelihood. All cycles of project development from pre-construction, construction and operation will have impacts on Tamangapa Village.

5.2.2 Demography

Table 5-15 below shows the population of the two villages (*Kelurahan*) Tamangapa and Manggala among other villages in Manggala Sub-district and Makassar City. The population of Tamangapa is 11,743 or about 8% of total Manggala Sub-district population of 135,049, while Manggala Village has 20,530 residents or about 15% of the sub-district population. Manggala Sub-district makes up 9% of the total population of Makassar City.

Tamangapa Village has the largest area in the sub-district which is 7.62 km² followed by Manggala Village 4.44 km². The total Manggala Sub-district area is 24.14 km² making up 14% of the total Makassar City area. Despite it has the largest area, Tamangapa population density is the lowest that is 1,541 residents/ km² compared to the density of other villages in the sub-district. The population density of Manggala Village is 4,624 residents/ km².

In terms of households, Tamangapa has 2,567 households with average household size is 5 members similar to the average household member of Manggala Sub-district. Number of households in Manggala Village is 4,768 with average of 4 household members.

The demography data presented in the table below is consistent with the information obtained from communities and informants about Tamangapa and Manggala Villages. These areas are developing most recently with the increasing number of new housing areas and other business activities including the landfill activities that create multiplier effectson the local economy. Tamangapa Village borders with Gowa Regency that has easy access, high and continuous mobility of people between the Regency and Makassar City.

In terms of population growth (Table 5-16), the population data of 2014 and 2015 show that the population of Manggala Sub-district grew by 2.70% from 131,500 to 135,049 which is higher than Makassar City population growth (1.41%, from 1,429,242 to 1,449,401). Most recent developments and land availability for residential areas and businesses might be some of the reasons for the increased population growth in Manggala sub-district.

Table 5-15 Population Number of Affected Villages, Manggala Sub-District, 2015

No	Village	Area (Km)	Male	Female	Total	Sex Ratio	Number of Household	Density	Household Size
1	Borong	1.92	9,168	9,371	18,539	97.8	4,300	9,656	4
2	Bangkala	4.3	14,435	14,435	28,870	100.0	5,820	6,714	5
3	Tamangapa*	7.62	6,009	5,734	11,743	104.8	2,567	1,541	5
4	Manggala*	4.44	10,253	10,277	20,530	99.8	4,768	4,624	4
5	Antang	3.94	15,480	15,624	31,104	99.1	6,435	7,894	5
6	Batua	1.92	12,335	11,928	24,263	103.4	5,660	12,637	4
	Manggala Sub-District	24.14	67,680	67,369	135,049	100.5	29,550	5,594	5
	Makassar City	175.77	717,047	732,354	1,449,401	97.9	347,748	8,246	4

Source: *Manggala Sub-District In Figures 2016, Makassar Municipality In Figures 2016*

*Project affected villages

Table 5-16 Population Growth in Manggala Sub-District

Sub-district & City	2014	2015	Growth 2014-2015
Manggala Sub-district	131,500	135,049	2.70
Makassar City	1,429,242	1,449,401	1.41

Source: *Manggala Sub-District in Figures 2015 and 2016, Makassar Municipality in Figures 2016*

5.2.2.1 Population by gender

Sex ratio is used to see the composition of male and female population or in other words to see how many male population in every 100 female population. The Table 5-15 shows that the male population in Tamangapa Village is larger than female with a ration of 104.8 male to 100 female. In Manggala Village, the ratio is slightly lower with 99.8 male to 100 female. Sex ratio of Manggala Sub-district is 100.5, which is a higher sex ratio than Makassar City which has 97.9 male to 100 female population.

5.2.2.2 Population by age group

The grouping of population by age is aimed to figure out productive (15-64 year old) and non-productive (0-4 and >65 year old) population. The total number of productive and non-productive population is used to figure out Dependency Ratio, which means percentage of productive group of population will support how many percentage of non-productive population.

The Table 5-17 shows population number by age of Manggala Sub-district. Total productive population in the Sub-district is 96,461 and non-productive population is 38,588 with the Dependency Ratio 40, which means every 100 productive population in Manggala Sub-District support 40 non-productive population. Out of total Dependency Ratio 40, the productive age population economically supports 35.73% of on-productive young population and 4.28% of old population (Table 5-19). In comparison with other areas in Indonesia, the dependency ratio is quite low.

Table 5-17 Population Number by Age of Manggala Sub-district

Age	Male	Female	Non-productive Age	Productive Age	Dependency Ratio (%)
0 to 5	6,230	5,793	12,023		
5 to 9	5,925	5,542	11,467		
10 to 14	5,682	5,291	10,973		
15 to 19	7,778	7,835		15,613	
20 to 24	10,142	9,726		19,868	
25 to 29	7,326	7,049		14,375	
30 to 34	5,611	5,781		11,392	
35 to 39	4,435	4,652		9,087	40
40 to 44	3,816	4,046		7,862	
45 to 49	3,326	3,391		6,717	
50 to 54	2,454	2,428		4,882	
55 to 59	1,736	1,823		3,559	
60 to 64	1,488	1,618		3,106	
65+	1,731	2,394	4,125		
Total	67,680	67,369	38,588	96,461	

Source: Modified data from Manggala Sub-district in Figures, 2016

Table 5-18 Population Percentage by Age Group of Manggala Sub-District

Age Group	Population		Total	Percentage
	Male	Female		
0-14	17,837	16,626	34,463	25.52
> 65	1,731	2,394	4,125	3.05
15-64	48,112	48,349	96,461	71.43
Total	67,680	67,369	135,049	100.0

Source: Modified data from Manggala Sub-district in Figures, 2016

Table 5-19 Dependency Ratio of Manggala Sub-District

Dependency	Population (%)	%
------------	----------------	---

Ratio	Male	Female	
DR _{tot}	50.12	49.88	40.00
DR _{Young}	13.21	12.31	35.73
DR _{Old}	1.28	1.77	4.28

Source: Modified data from Manggala Sub-district in Figures, 2016

The population pyramid of Manggala Sub-district in Figure 5-19 below shows a relatively steep “Christmas tree” shape, an indication that the population has lower birth rate, which drops slightly in the past 15 years, low death rate and moderate life expectancy. It indicates that the young productive age population is high.

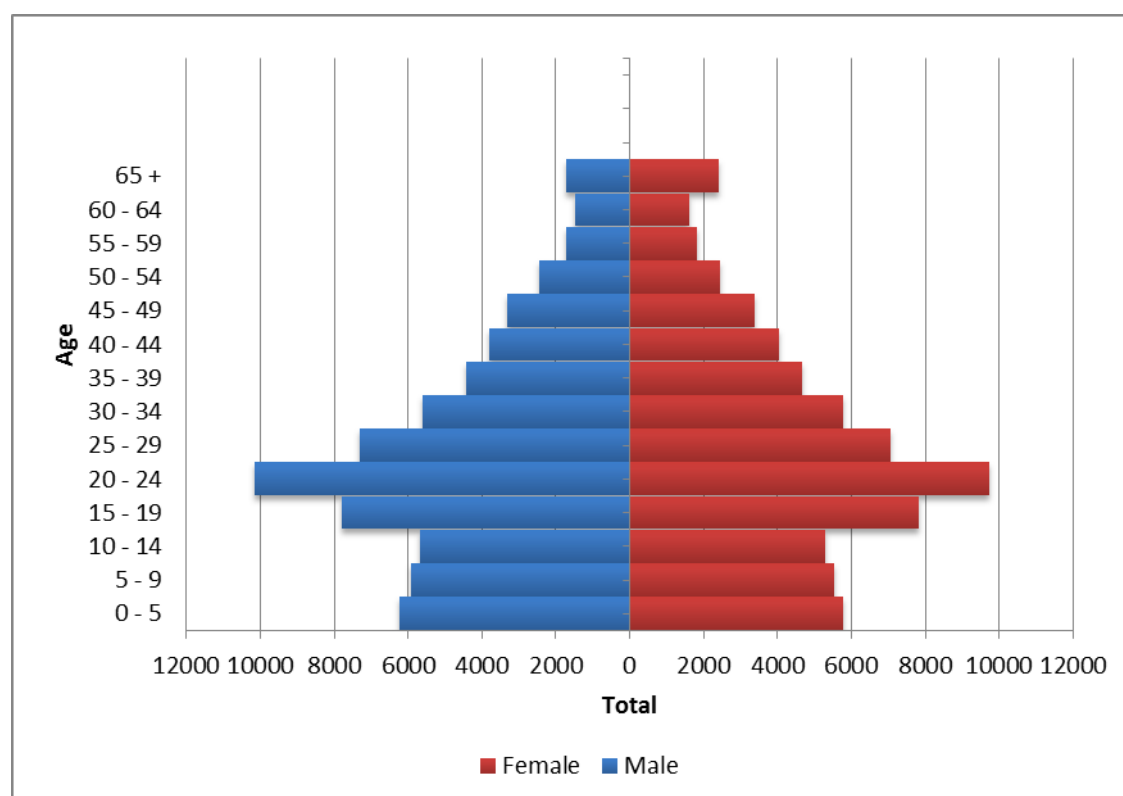


Figure 5-19 Population Pyramid of Manggala Sub-District

5.2.2.3 Surveyed Population

5.2.2.3.1 Community near TPA Tamangapa (Non-waste pickers)

Non-waste picker respondents are 43 people, consisting of 17 male (39.5%) and 26 female (60.5%) respondents. By religion, all of the respondents are Muslim. Majority of the respondents are Makassarese with 88.4%. The rests are 9.3% of Bugis, an ethnic majority group of South Sulawesi, and a small minority 2.3% of Javanese. By age, 23 respondents (53.5%) are 21 to 40 years old, 18 respondents (41.9%) are 41 to 60 years old, and 2 respondents (4.7%) are 61 to 80 years old. By family status, 24 respondents (55.8%) indicate being wife of the household head, 17 respondents (39.5%) are male head of households while one is widowed and one is a child (2.3% each).

By education, 37.2% non-waste picker respondents have education higher than junior high school. About 8.5% only completed junior high school and completed primary school. 7.0% of the non-waste picker respondents are illiterate or never go to school.

5.2.2.3.2 Waste Pickers

There is no firm and exact number of waste pickers who work in TPA Tamangapa. Landfill Office (*Kantor TPA*) registered 131 waste pickers with copy of family certificate as the basis for registration. However, the real number of waste pickers is several times higher than the registered ones. Interviews conducted to some informants who work in the landfill reveal that there are more than 400 waste pickers in TPA Tamangapa. Data produced by Yayasan Pabbata Ummi (Yapta-u), a non-governmental organization or NGO concerned with children and women protection, recorded the number of toddlers, children, adolescent and adult waste pickers in 2011-2012. The summary of the data is presented in the Table 5-20 below.

Table 5-20 Registered Number of Waste Pickers at Yapta-U

Categories	Number		Total
	Male	Female	
Toddler	135	155	290
Children 6 to 18 year old	306	208	514
Adolescent >18 year old	122	77	199
Adult	379	401	780
Total			1,783

Source: Data Keluarga Pemulung Dampungan Yayasan Pabbata Ummi (Yapta-U)

The number of waste pickers keeps changing because the waste pickers usually invite their families or relatives to come and work in the landfill as waste pickers. Moreover, new waste pickers come after public festive holidays such as for example, after Aidul Fitri. Similarly, the numbers wane before public holidays begin and during harvest time, as people change their activities depending on other needs and opportunities. This fact shows clearly that most people engaged in more than one livelihood activity which is often not reflected in generic studies.

Another concerned issue is that there are many children participating into waste picking activity. Percentage of underaged waste pickers is just slightly less than 50%.

In the survey, the total number of waste picker respondent is 93 people, consisting of 63 male (67.7%) and 30 female (32.3%). Majority of the respondents are Makassarrese - 77 people (82.8%) and Bugis - 10 people (10.8%), and the rests are Bantaeng, Kolaka and Malakaji with 2 people (2.2%) each. By religion, all of the respondents are Muslim. According to status in the family, the respondents consist of 53 men (57%) as head of households), 25 women (26.9%) as wife of the household), and 15 children respondents (16.1%). Age ranges of respondents are 21 to 40 years old - 56 people (60.2%), 41 to 60 years old - 18 people (19.4%), and 20 years old and below - 14 people (15.1%). 4 respondents are 61-80 years old, and 1 waste picker respondent is more than 81 years old.

5.2.2.3.3 Waste Buyers

No exact number of waste buyers in Makassar is currently available and neither for the area near TPA Tamangapa. From observation, there are more than 30 waste buyers around the landfill. Besides waster buyers, a waste bank institution is currently available and growing in Makassar City. In the interview with local stakeholders on waste management, local government and waste bank association, there are approximately 700 waste bank institutions in Makassar. However, this survey focus only on waste buyers around the landfill.

The social assessment survey is also conducted to 15 waste buyers or *pengepul* near TPA Tamangapa, of which 12 respondents or 80% are male and 3 respondents or 20% are female.

5.2.3 Local Economy

5.2.3.1 Locally Generated Revenue (PAD)

Makassar BPS data 2017 show that the Regional Revenue Budget in Makassar in 2016 is Rp. 971,859,753,606, an increase of 14.71% from the year 2015 when it was only Rp. 828,871,892,852.78. The Locally generated revenue (PAD) is mostly based on local taxes 21.41 % or Rp. 759,202,412,170 of total municipality revenues, followed by retribution 3.62% or Rp. 128,549,262,383. Overall, the source of local revenue is dominated by Balance Funds (*Dana Perimbangan*) at Rp. 1,992,747,630,282 or 56.19% of the total revenue. For more details, the development of Makassar PAD in years 2015 - 2016 is presented in Table 5-21.

5.2.3.2 Gross Regional Domestic Product

Gross Domestic Product (GDP) is one of indicators to see the economic progress of a region; it is defined as the total value-added of goods and services produced in a year in a region. The size of the Gross Domestic Product (GDP) of a region is determined by the potential economic resources owned. Based on the results of the calculation of the GDP for the year 2016, the value of GDP at current prices of Makassar City is about Rp 127,353 million. Makassar's economic development can be seen from the performance of the GDP (Gross Domestic Product), which can be illustrated in the economic fluctuations from year to year, as seen in Table below.

Table 5-22 shows that during 2013 and 2014, the value of the Makassar GDP based on current prices showed a significant growth, that in 2013-2014 the value of GDP grew by 11.98%. The GDP in 2015-2016 is lower that is 10.24%.

The industry that contributes the most to Makassar GDP in 2016 is Processing Industries with Rp. 25,758 million or 20.23% of the total GDP. Wholesale and retail trade, repair of cars and motorcycles contributes 19.06% or about Rp. 24,268 million to the Regency's GDP. The least contributing industries area Mining & Quarrying and Provision of Electricity and Gas that is 0 to 0.03% respectively. Water Supply, Waste Management, Waste and Recycling contribute about 0.21% or Rp. 263 million.

Table 5-21 Actual Revenues of Makassar Municipality Government by Sources of Revenues (thousand Rupiahs), 2015-2016

Description	Original Local Government Revenues (PAD)		Difference	Change (%)	Share (%)
	2015	2016			
Original Local Government Revenue	828,871,892,852.78	971,859,753,606.00	142,987,860,753.22	14.71	27.40
a. Local Taxes	635,647,206,877.06	759,202,412,170.00	123,555,205,292.94	16.27	21.41
b. Retribution	115,220,022,385.00	128,549,262,383.00	13,329,239,998.00	10.37	3.62
c. Income of local government owned company and management of separated regional government wealth	13,389,022,041.72	15,562,590,482.00	2,173,568,440.28	13.97	0.44
d. Other local revenues	64,615,641,548.00	68,545,488,571.00	3,929,847,023.00	5.73	1.93
Balance Funds	1,402,787,592,484.00	1,992,747,630,282.00	589,960,037,798.00	29.61	56.19
Other Legal Revenue	720,970,425,400.00	582,042,771,557.00	-138,927,653,843.00	-23.87	16.41
<i>Total</i>	<i>2,952,629,910,736.78</i>	<i>3,546,650,155,445.00</i>	<i>594,020,244,708.22</i>	16.75	

Source: Makassar Municipality in Figures, 2017

Table 5-22 Gross Regional Domestic Product at Current Prices by Industry in Makassar City (million rupiahs), 2013-2016

No	Industry	2013	2014	2015	2016	Industry Share to GRDP %
1	Agriculture, Forestry and Fisheries	516,568.80	591,916.70	663,715.90	741,770.80	0.58
2	Mining & Quarrying	1,702.00	1,679.10	1,592.00	1,417.70	0.00
3	Processing industry	17,656,461.30	20,380,661.70	23,133,803.00	25,757,654.80	20.23
4	Provision of Electricity and Gas	28,051.30	34,163.80	32,519.00	36,489.60	0.03
5	Water Supply, Waste Management, Waste and Recycling	243,216.50	240,798.80	252,232.60	263,059.50	0.21
6	Construction	14,566,890.40	16,929,629.40	19,585,347.60	21,865,347.70	17.17
7	Wholesale and Retail: Repair of Cars and Motorcycles	16,364,365.00	18,350,554.50	20,909,471.50	24,268,041.40	19.06

No	Industry	2013	2014	2015	2016	Industry Share to GRDP %
8	Transportation and Warehousing	2,236,462.10	2,577,267.70	2,969,115.90	3,276,564.30	2.57
9	Provision of accommodation, foods & drinks	2,092,316.90	2,384,264.80	2,671,179.90	2,878,592.70	2.26
10	Information and Communication	8,888,045.80	9,470,994.90	10,199,799.70	11,447,604.40	8.99
11	Financial Services and Insurance	5,371,784.10	6,043,673.70	6,834,525.00	7,694,316.50	6.04
12	Real Estate	3,532,853.20	4,244,600.50	4,944,278.20	5,384,955.90	4.23
13	Company Services	1,028,865.30	1,179,152.50	1,359,868.10	1,490,583.60	1.17
14	Administration, Defence and Compulsory Social Security	3,022,066.80	3,361,446.40	4,221,822.90	4,133,925.80	3.25
15	Educational Services	8,286,793.20	9,284,585.10	10,446,235.40	11,208,087.20	8.80
16	Health Services and Social Activities	2,333,209.00	2,737,060.30	3,092,320.40	3,502,580.50	2.75
17	Other services	2,193,806.40	2,580,527.60	2,991,353.50	3,402,179.40	2.67
	Total	88,363,458.10	100,392,977.50	114,309,180.60	127,353,171.80	100.00

Source: Makassar Municipality in Figures, 2017

5.2.3.3 Labor Force & Employment

Working Age or Productive Age Population is defined as the population aged between 15 and 65 years old. The working age population is made up of the labour force and the non labour force. The Labour Force consists of people working and those seeking work. Meanwhile, the non-labour force is made up of people in school, taking care of households, or those doing other activities besides paid employment.

There is no data available on the Municipality level on age distribution of the total population. Assuming a similar age distribution to the one of Manggala sub-district, the working age population of Makassar City is around 1 million. According to the 2015 employment data, there are a total of 539,160 people working or being unemployed. That means, roughly about 460,000 people or 46% of the productive age population are part of the non-labour force, while 54% are part of the labour force.

Table 5-23 Working Aged Population by Level of Education Attainment, Working and Unemployment, 2015

Level of Education	Working	Unemployment	Total (People)	Unemployment-Rate (%)
No Schooling	7,337	0	7,337	0.00
Not Completed Primary School	21,312	0	21,312	0.00
Primary School	58,761	1,918	60,679	2.69
Junior High School or equivalent	65,998	1,425	67,423	2.00
Senior High School or equivalent	157,647	30,461	188,108	42.72
Vocational Senior High School	35,381	15,720	51,101	22.05
Diploma 1-3 or equivalent	27,448	578	28,026	0.81
University	147,970	21,204	169,174	29.74
Total	521,854	71,306	593,160	12/ 100.00

Source: Makassar Municipality in Figures, 2017

Table 5-23 shows that the highest unemployed population is from those who attained Senior High School or equivalent at 30,461 people or 42.72%, followed by those who attained University degree at 21,204, 29.74% out of the total unemployment figure at 71,306 people. In total, 12% of the total labour force are unemployed.

By education, majority of the waste picker respondents - 53 people - did not complete primary school (57%), 11 respondents completed primary school but not completed junior high school (11.9%), 6 respondents completed junior high school (6.5%), and 8 respondents have higher education than junior high school (8.6%). The rest, or 15 waste picker respondents, are illiterate and

never go to school (16%). For the waste buyers on the other hand, the majority (33.3%) completed only primary school, 26.7% completed high school, and 20% did not go to school. Waste buyer respondent who completed diploma, bachelor degree, and junior high school is only 1 person or 6.5% for each level of education.

Of the total 71,306 unemployed, 5,705 are registered as job seekers (Table 5-24). The educational attainment of registered job seekers is similarly distributed to that of the total unemployed in the previous table, with the majority having completed Senior High School (SLTA) at 2,709 or 47.48% of the job seekers, followed by those with a Bachelor Degree (S1) of 1,784 people or 31.27%, Diploma 1-3 educated at 1,168 or 20.47%, Junior High School with 39 people or 0.68%, and those seeking a job with a Primary School education at 5 people or 0.09%.

Table 5-24 Registered Job Seeker Population by Education and Gender in Makassar 2015-2016

Educational Attainment	Male	Female	Total (People)	Percentage (%)
No Schooling	0	0	0	0
Not Completed Primary School	0	0	0	0
Primary School	4	1	5	0.09
Junior High School or equivalent	28	11	39	0.68
Senior High School or equivalent	15,39	1,170	2,709	47.48
Diploma 1-3 or equivalent	504	664	1,168	20.47
University	952	832	1,784	31.27
Total	3,027	2,678	5,705	100

Source: Makassar Municipality in Figures, 2017

The Minimum Salary in Makassar City in 2017 is at Rp. 2,504,500 based on the decision made by Workforce Dinas and Wage Council (*Dewan Pengupahan*) of Makassar City.

5.2.3.4 Livelihood and Economic Activities in the Project Affected Area

Types of livelihoods around the TPA Tamangapa area vary from farmers, farm workers, livestock breeders, industrial workers/craftsmen, civil servants, military and police, lawyers, and private sector employees. The livelihood data obtained from Manggala Village as in Table 5-25 shows that the nearly half are either retired civil servants (PNS/TNI/POLRI) at 25.85%, or active Civil Servants (PNS), Police and Military combined at 23.35%. Others are either private employees or employees of government owned enterprises at 10.99% and 10.23% respectively, or are involved in small and medium enterprises at 9.72%. The home industry sector share in livelihoods in Manggala village on the contrary is relatively low at 0.46%

Table 5-25 Types of Livelihood of Residents in Manggala Village

Village	Type of Work	Population		Total	%
		Male	Female		
Manggala Village	Farm Workers	292	201	493	2.99
	Civil Servant (PNS)	1,589	1594	3183	19.33
	Home Industry	35	40	75	0.46
	Street Sellers	144	146	290	1.76
	Cattlemen	5	5	10	0.06
	Mechanic	55	0	55	0.33
	Private Doctor	4	4	8	0.05
	Private Midwives	4	6	10	0.06
	Private Nurses	35	40	75	0.46
	Domestic Helpers	324	326	650	3.95
	Military (TNI)	198	66	264	1.60
	Police (POLRI)	266	132	398	2.42
	Retired Civil Servants(PNS/TNI/POLRI)	1,965	2,299	4,264	25.89
	Small and Medium Enterprise	790	811	1,601	9.72
	Lawyer	55	30	85	0.52
	Notary	15	5	20	0.12
	Trained village birth attendant (<i>Dukun Kampung Terlatih</i>)	4	6	10	0.06
	Alternative Medical Service	5	5	10	0.06
	Private Lecturers	499	550	1,049	6.37
	Big Entrepreneurs	57	55	112	0.68
Architects	65	45	110	0.67	
Artists	105	95	200	1.21	
Private employees	904	906	1,810	10.99	
Employees of Government owned Companies	805	880	1,685	10.23	
Total		8,220	8,247	16,467	100

Source: Manggala Village Profile 2016

No similar complete data is available from Tamangapa Village, but based on the brief profile of Tamangapa Village, 2016, the majority of the population are farmers and livestock breeders. This is consistent with the land use in Tamangapa Village with a considerable amount of agricultural land compared to other villages in the Manggala Sub-district.

For both villages, the extent of economic and livelihood contribution to the Manggala and Tamangapa villages from the landfill is not known. Note that waste pickers are not included in the

list of types of livelihood in Manggala Village Profile 2016. Presumably they are not listed as waste picking may not be perceived as an established livelihood activity or occupation and waste pickers are generally seen as people living below the poverty line. Another fact to mention is that households are generally engaged in several livelihood activities which may not be captured with such data collection.

Interviews with landfill officer and other stakeholders show that the landfill provides jobs and business opportunities for the people not only from Tamangapa and Manggala Villages, but also from other places, mainly as waste pickers, waste buyers and sellers. The interviews also show that comparing to the situation in early 1990s, TPA Tamangapa has significantly contributed to the economic development of the sub-district, especially Tamangapa Village. Data regarding from waste pickers assets, income and expenditure is available in the sub-section 5.2.3.5 that highlights some of the contribution of the landfill economically to the local community.

- Livestock in the Landfill

Livestock is one source of livelihood and revenues for the community in Tamangapa Village. There are approximately 1,000 cows daily that are roaming the grounds of the landfill. Some of the livestock stay in the landfill day and night and some are shepherded to and from the landfill from the nearby settlements which cause traffic congestions on the public roads. There are about 50 owners of livestock from TPA Tamangapa.

According to one of the livestock owners, the cows in the landfill are not the main livestock sale to the market, but they are treated as backup or reserve in case normal raised livestock is not enough to meet market demand.

Despite many livestock are let wandering the landfill for food, many cows were sometimes found dead presumably as the result of eating poisonous food waste. Herds of these cows create traffic congestion when they are shepherded to and from the landfill. No clear regulation is yet implemented in regards to livestock in the landfill.

5.2.3.5 Livelihood and Household Economy of Waste Pickers

5.2.3.5.1 Working hours

The landfill is open for waste pickers to work 24 hours every day. Generally, there are three shifts of waste pickers working in the landfill: the first shift is from 8 am to 4 pm, the second shift is from 12 noon to 9 pm, and the third shift is from 9 pm to 5am. The shifts are not regulated, but it is merely based on individual choice to work on their preferred hours. Usually, old or adult waste pickers work during day time while adolescents mostly work at night. Fitness, healthiness and gender of waste pickers are determining factors for their preferred work time. Female adolescents prefer to work in the landfill at night time so as to avoid the heat. As for the landfill operation, the dumping of waste from the city usually start around 4 pm every day and more wastes are transported to the landfill during night time.

Majority of waste picker respondents work in the landfill picking waste 7 days a week (77%), 11 respondents worked 6 days a week (11.8%) while the rest work 5, 4, and 2 days a week or 7.5%, 2.2%, and 1.1% respectively. In terms of duration of work, 82 respondents said that they work more

than 8 hours a day (88.2%), 5 respondents (5.4%) work 4-6 hours a day, the rest answered less than 4 hours a day and 1 waste picker responded not certain. 4 respondents did not answer.

Out of 93 respondents, 49 people (52.7%) spend less than 4 hours to do household works, 1 respondent (1.1%) spend 4-6 hours a day for household works. 43 respondents (46.2%) admitted that they do not spend time in a day for household works.

5.2.3.5.2 Income and Expenditure

▪ Income

Daily income of waster pickers vary from Rp. 21,000 to below Rp. 5,000,000. Majority of respondents (80 people or 86%) earn less than Rp. 100,000 per day, 8 respondents (8.6%) stated that they earn more than Rp. 100,000 per day, and 5 respondents (5.4%) did not answer. Those who earn lower than Rp. 100,000 consist of 27 respondents (29%) earning Rp. 61,000 to Rp. 80,000; 21 respondents (22.6%) earning Rp. 41,000 to Rp. 60,000; 20 respondents (21.5%) earning Rp. 21,000 to Rp. 40,000; and 7 respondents (7.5%) earning Rp. 81,000 to Rp. 100,000. 5 respondents (5.4%) said that they earn from Rp. 50,000 to Rp. 200,000 a day. Variety of daily incomes probably depend on number of hours that waste pickers spend in the landfill.

In terms of monthly income, majority of respondents said that they earn Rp. 1,000,000 to Rp. 5,000,000 per month (49 people, 52.7%), 4 respondents (4.3%) earn Rp. 5,000,000 to Rp. 10,000,000 and 3 respondents (3.2%) earn more than Rp. 10,000,000 per month. The rest are those who earn below Rp. 1,000,000, per month (33 respondents, 35.5%). 4 respondents (4.3%) did not answer.

▪ Other sources of income/livelihood

In regards to other sources of income, majority of respondents (83 respondents, 90.3%) answered that they have no other sources of income besides waste picking. The rest have additional livelihood such as private employees (3 respondents, 3.2%), day laborer, tailor, and driver, each 1.1%. 3 respondents (3.2%) did not answer.

Majority of respondents (90 people or 96.8%) said they do not have side jobs or sideincome in the landfill. Only 1 respondent (1.1%) sells food in the landfill, while 2 respondents (2.2%) did not answer. Similar trend can be seen in regards to seasonal works, only 1 respondent (1.1%) do farming works during farming season. Majority of respondents (83 people, 89.2%) do not have seasonal work. 9 respondents (9.7%) did not answer to the question.

The way waste pickers see the benefits of landfill to them was asked to respondents. 2 waste picker respondents see the landfill provide benefits to them, 1 respondent (1.1%) sees the landfill as the place to earn money without capital, another respondent sees the landfill as a free place to sell goods/food (no tax incurred). The rest (88 respondents, 94.6%) see no other benefits they can gain besides working as waste pickers, while 3 respondents (3.2%) did not answer.

▪ Expenditure

The expenditure of the waste pickers is seen from their expenses for nine basic groceries (*sembako*), rent, electricity, education, other expenses, and loan/debt.

Majority of waste picker respondents spend below Rp. 100,000 for nine basic groceries (*sembako*) (65.6%), 8 respondents spend Rp. 1,000,000 to Rp. 2,000,000, while 4 respondents spend from Rp. 100,000 to below Rp. 500,000 (4.3%) and 1 respondent (1.1%) spends Rp. 500,000 to Rp. 1,000,000. 5 respondents (5.4%) spend quite high more than Rp. 2,000,000 for *sembako*. 14 respondents (15.1%) who are children waste pickers do not spend for *sembako*.

Majority of respondents do not spend money for rent (65.6%) because they own houses. The rest pay rent monthly from Rp. 10,000 to Rp. 100,000 (4.3%) and majority pay monthly rent from Rp. 100,000 to Rp. 500,000 (28%), and 2.2% of respondents pay rent higher than Rp. 500,000.

The expenses for water ranges from Rp. 10,000 to 50,000 spent by 49 respondents (52.7%). The rest of the respondents spend Rp. 50,000 to Rp. 100,000 (13 people, 14%) and 7 respondents spend Rp. 100,000 to Rp. 500,000 (7.5%). 24 respondents (25%) do not pay for water.

In terms of electricity expenses, 32.3% of waste pickers pay electricity from Rp.10,000 to Rp. 50,000 and 29% pay electricity from Rp. 50,000 to Rp. 100,000 and 18.3% pay electricity from Rp. 100,000 to Rp. 500,000. Only 2.2 % pay electricity more than Rp. 500,000 and 18.3% do not pay for electricity.

Majority of respondents or 91.4% respondents do not spend money for education. The reason might be because they enjoy 12 years free education program by the government from primary school to high school. The rest 7.53% of respondents spend Rp. 20,000 to Rp. 600,000 for education. On a separate note, social survey found woman breadwinner, young mother (30 year old) waste picker who financially support her husband (35 year old) pursuing his higher education in local university.

Other expenses such as attending wedding, circumcision, traditional and religious events cost some money extra to daily needs. 39.8% respondents spend monthly Rp. 20,000 to Rp. 300,000 for other expenses allocation. However, 60.2% respondents do not have such these expenses.

The survey shows that 61.3% of respondents have debts that need to be paid and 38.7% have no debts. The debts become part of the respondents' monthly expenditure. Out of 61.3%, 28% have debts from Rp. 1,000,000 to Rp. 5,000,000 and 19.4% have debts Rp. 500,000 to Rp. 1,000,000. 2.2% respondent have the highest debt between Rp. 20,000,000 to Rp. 30,000,000.

The respondents get loans from formal institutions and individuals. The waste picker debtors loan money from bank 3.2%, financing institution 7.5%, and cooperation 14%. However, majority of the debtors borrow money from *rentenir* or loan shark, 18.3%. Some of the respondents borrow money from waste buyers 4.3%, which most of the time bind the waste pickers to sell their sorted waste to the waste buyers. The rest of sources of debts are from family, neighbor, and shop.

5.2.3.5.3 Assets of Waste Pickers

To know assets of waste pickers is important to understand whether or not any planned project of TPA Tamangapa will severely impact the waste pickers who are one of main stakeholders whose livelihoods depend on the landfill. The survey shows that majority of respondents have expertise on sorting out plastic, paper, metal, cups, bottles and other valuable goods from waste. Besides waste sorting expertise, 15.1% of the respondents said they have other skills, i.e. construction worker, handicraft, mechanic, cooking, handphone service, driving, and mason. However, 84.9% of respondent indicated that they have no other skill except waste picking skill.

When asked about previous occupation prior to working as waste pickers, majority of the respondents (72%) answered that they have no previous occupation, which means waste picking is their first occupation. The rest of respondents (28%) have previous work experience as fisherman, farmer, driver, mason, cook, and laborers.

Driving is important skill that provides livelihood opportunity. Having a driving license means by regulation the person has understanding and has capacity to drive properly according to the country regulation. The survey shows that out of 93 respondents, 68.8% said that they do not have driving

license, and the rest 31.2% have driving licenses for heavy vehicle, small car and motorcycle driving license.

In terms of physical assets, 44.1% of respondents said that they have no vehicle while the rest 55.9% have vehicles, i.e. bicycle (6.5%), motorcycle (still on leasing) 38.7%, and full ownership of motorcycle (10.8%).

In regards to land ownership, 83.9% of waste picker respondents answered that they do not have land and 2.2% did not answer the question. The remaining 13.9% of respondents have land, of which 7.7% own 81 m² to 150 m² and about 6.6 % own 1000 m² to 20000 m².

The survey asked supposition question to waste picker respondents on whether or not they are willing to work other type of occupation. Most of respondents (61.3%) answered willing to work on other type of occupation and 38.7% said not willing to work other occupation. In regards to type of works that the waste pickers willing to work, 39 respondents (41.9%) said do not have other type of works to do, 19.4% indicated that they are willing to work any type of occupation, while the remaining respondents identified types of work that they are willing to work, i.e. mechanic, laborer, selling, sewing, shop keeper, fisherman, farmer, sailing, security, driver, and car businesses.

- Housing conditions of Waste Pickers

The social survey indicates that more than half waste pickers (52.7%) own houses and 47.3% rent places to live. Waste pickers use water from multiple sources, i.e. PDAM (69.9%), wells (28%), river (1.1%), and other sources of water (1.1%). In terms of the distance to water source, almost half the respondents (47.3%) said water source is close 5 to 13 m or within their houses.

The survey shows that 54.8% waste pickers have owned electricity connection to their places and 45.2% respondents use their neighbors' electricity connection.

Majority of respondents (79.6%) indicated that they have sanitation facilities, bathroom and toilets in their houses while 20.4% indicated that they do not have such sanitation facilities. Waste pickers usually rent land from local land owners on which they build huts and become their place to live with very poor sanitation facilities.

The distance of respondents houses to public facilities varies as follows:

- Majority of respondents (83.8%) have close access to public transportation with distance of 3 to 500m, while about 16% have a distance of 1 to 10 km from their residence to public transportation.
- The distance to market facility varies among waste pickers. In general 39.78% respondents have access to public market in less than 1 km, while 56.99% respondents take 1 to 5km to public market. The rest 3.23% respondents did not answer the question.
- Majority of the respondents (65.59%) have close distance to public school that is within 500m. The rest live at a distance of 500m to 1km (19.35%) and 1-5km (9.68%) to public school. 5.38% did not answer the question.
- The distance between waste pickers' houses to community health center (Puskesmas) varies from below 500m (63.44%), 500 to 1km (10.75%), and 1 to 5km (22.58%). 3.23% did not answer the question.

5.2.3.6 Livelihood and Economy of Waste buyers

This section elaborates the result of the survey specific to waste buyers such as how long they have been as waste buyers, income, and their response on TPA Tamangapa development plan that impact

their business and livelihood. All of these waste buyers are small scale enterprises with income slightly higher than Rp. 200,000,000. The relationship between waste buyers and waste pickers is generally based on selling-buying transaction. However, based on interview with key informant, some waste buyers provide financing facilities to waste pickers where the waste pickers are obliged to pay the debt or loan to the waste buyers in the form of selling the picked waste to the loan provider. Waste buyers provide transportation to pick up waste from waste pickers in the landfill.

The survey shows that majority of respondents have been working as waste buyers in the past 5 years (53.33%). 2 waste buyers (13.33%) have been as waste buyers for 28 and 29 years, which indicates that they have started the business since the early opening and development of TPA Tamangapa.

More than half of waste buyer respondents (53.3%) rent land and storage facility for sorted waste while 46.7% have their own land and waste storage facility.

In terms of income, the highest monthly income earned by waste buyers is Rp. 12,000,000 by only 1 respondent (6.7%). Majority of waste buyer respondents (33.3%) earned Rp. 10,000,000 per month. The rest earned from Rp. 3,500,000 to Rp. 8,000,000.

The survey indicated that only 1 waste buyer respondent (6.7%) provided 1 unit of rented house to waste pickers. The rest 93.3% of waste buyers did not provide rented room or houses.

60% of waste buyer respondents did not have in-migrant waste pickers who work for them. The rest 40% of waste buyers have in-migrant waste pickers who work for them from 3 to 30 waste pickers. In regards to local waste pickers, 86.7% or 13 waste buyer respondents employ local waste pickers to work for them from 2 to 20 local waste pickers.

When the waste buyers were asked supposition question about the plan for new landfill development, 7 respondents (46.7%) answered that they will still continue their business while the rest answered that they are not sure (40%) whether or not to continue the business and 13.3% of the respondents said they will not continue the business. If offered new location for waste collecting businesses, 6 waste buyer respondents (40%) answered they are interested, 7 respondents (46.7%) answered not sure if they are interested, and 2 respondents (13.2%) answered not interested.

5.2.4 Public facilities

5.2.4.1 Market

Market is place where buyers and seller interact that allows transaction and exchange of goods and services. Manggala Sub-district has 6 shopping lots, 3 public markets and 6 mini markets that accommodate business and economic activities as shown in the Table 5-26 below. In Tamangapa Village, there are other facilities, i.e. slaughterhouse, leather processing house, and Landfill Tamangapa that provide economic revenues to the people.

Table 5-26 Market facilities in Manggala Sub-district

Village	Mall	Shopping lot	Public Market	Mini Market
Borong	-	1	-	1
Bangkala	-	-	-	1

Village	Mall	Shopping lot	Public Market	Mini Market
Tamangapa	-	-	-	1
Manggala	-	1	1	1
Antang	-	2	1	1
Batua	-	2	1	1
Sub-district		6	3	6

Source: Manggala Sub-District in Figures, 2016

5.2.4.2 Educational Facilities

According to Government Regulation or PP No 74/2008, minimum student-teacher ratio for primary school, junior high school and senior high school is 20:1. The Table 5-27 below shows that student teacher ratio for primary school in Manggala sub-district meets the national requirement. The ratio for Junior High School falls slightly below the requirement while for Senior high school, student-teacher ratio is far below the requirement.

Table 5-27 Number of School, Students and Teacher in Manggala Sub-District

Sub-district	Primary School (SD)				Junior High School (SMP)				Senior High School (SMA)			
	Schools	Student	Teacher	Student-Teacher Ratio	Schools	Student	Teacher	Student-Teacher Ratio	Schools	Student	Teacher	Student-Teacher Ratio
Manggala Sub-district	39	13,598	635	21.41	16	7,026	357	19.68	13	4,952	308	16.08

Source: Makassar Municipality in Figures, 2017

In terms of educational facilities, Table 5-28 shows that all level of education except higher education are available in Tamangapa Village including Islamic Boarding School which is located opposite to TPA Tamangapa site. Manggala Village also has all level of education even it has 2 higher educational institutions. Waste pickers in TPA Tamangapa send their children to schools near the landfill from primary school to senior high school. A local NGO, Yapta-U, runs a play group to help and stimulate the interests of the children of waste pickers to education and going to school.

Table 5-28 Education Institutions in Tamangapa and Manggala Village

Village	Pre School/ Kindergarten	Primary School	Islamic Boarding School	Junior High School	Senior High School	Higher Education/University
Tamangapa	5	5	1	2	2	-
Manggala	9	6	-	4	2	2

Source: Profile of Tamangapa Village, Profile of Manggala Village, 2016

5.2.5 Landuse

Land uses in Manggala Sub-district are dominant wetland (irrigated and non-irrigated) with 801 Ha area or 33.18% which is mostly used for paddy field, followed by other land uses by 737 Ha or 30.53%, and the smallest is marsh or swamp area with 73 Ha or 3.02% of the total Sub-district land area. Detailed figure of land uses is presented in the Table 5-29.

Table 5-29 Land Utilization in Manggala Sub-district

Sub-district	Land Use	Area (Ha)	Percentage
Manggala	Wet land (irrigated and non-irrigated)	801	33.18
	Dry Farm	411	17.03
	Yard	392	16.24
	Marsh	73	3.02
	Others	737	30.53
Total		2,414	100.00

Source: Makassar Municipality in Figures, 2017

The area of TPA Tamangapa is marsh area. Some portions of land eastward of the landfill were used for rice field previously. Due to pollution from the landfill, the land can no longer be used for agriculture. According to villagers, water in the polluted area is hot and acidic.

5.2.6 Social Culture

5.2.6.1 Ethnicities and Religion

The community in Tamangapa Village is heterogeneous consisting of many ethnicities from the Province of South Sulawesi as well as from other islands and provinces in Indonesia. Makassar is the main ethnic group in the Village beside other ethnic groups such as Bugis, Bantaeng, and Javanese. Similar to Tamangapa, Manggala Village is also heterogeneous and dominated by Makassar ethnicity. Other ethnic groups inhabit the Village are Bugis, Mandar, Sundanese, Javanese, Ambon, Minahasa, Timor, Buton, Muna, Alor, Acehnese, and others. There are no indigenous people in the survey area around the landfill as per IFC Performance Standard (PS 7).

Religion wise, majority of the population of Manggala Sub-District are Muslim. It is reflected in the number of worship facilities (Table 5-30) where there are 111 Mosques, 3 churches and 4 other religion facilities in the sub-district. In Tamangapa Village alone there are 20 Mosques while in Manggala Village, there are 13 Mosques, 1 Christian Church and 1 Catholic Church.

Table 5-30 Religion Facilities in Manggala Sub-District

Village	Mosque	Mushalla	Church	Temple	Vihara	Others	Total
Borong	16	-	-	-	-	2	18
Bangkala	23	-	-	-	-	1	24
Tamangapa	20	-	-	-	-	1	21
Manggala	13	-	2	-	-	-	15
Antang	23	-	1	-	-	-	24
Batua	16	-	-	-	-	-	16

Sub-district	111	0	3	0	0	4	118
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Source: *Manggala in Figures, 2016*

5.2.6.2 Culture and Social Process

Previous AMDAL (EIA) study of TPA Tamangapa on social aspect described that the social and cultural value of the community near TPA Tamangapa had not changed in their daily life. They still maintained and celebrated traditional events and practiced religion. Nevertheless, the participation of the community in customary events in the two villages decreased in the past decade most probably due to the community transition from rural community to urban community. Type of traditional events that are still maintained and celebrated are wedding ceremony, circumcision event, and other religious events.

In terms of social process, a social transition has taken place in the area around TPA Tamangapa. According to interview with local stakeholders, the area around the landfill was a dangerous and 'dark' area where many crimes took place and became hideout of criminals. After the government allocated the area in Tamangapa for landfill 1993, the area became open to migrants who seek for job opportunities and gradually eliminated crimes and changed the negative image of the area. The social process in TPA Tamangapa is created through social interaction and communication between local communities and in-migrant. This process takes place initially with social conflict such as suspicion, followed by the process of acculturation and assimilation, which eventually lead to accommodation among the people. External factors helped transformed the area such as the incoming business and people in-migration.

5.2.6.3 Cultural Heritage

Cultural and archaeology sites are historical relics and objects or historic buildings that are protected and maintained by the state or the regional government because they have priceless historical value, as with old mosques, temples, fortifications, traditional houses, tombs of kings, the tombs of heros, and other historical objects. The results of field survey indicate that there are no cultural relics and objects--historic buildings or sites in the form of cultural and archaeological sites in or near TPA Tamangapa.

5.2.6.4 Social Process of waste pickers

- Community relationship and participation in community activities

Majority of waste picker respondents indicated that the relationship and interaction among communities is good, 81.7% indicated 'alright' and 9.7% indicated normal or ordinary. Only 2.2% respondents indicated the relationship 'not that good'. 6.5% did not answer the question. The community around the Landfill or non-waste pickers by majority indicated that the relationship among communities is good. 95.3% indicated the community relationship is 'alright' and 2.3% said the relationship 'normal' or 'ordinary'. Only 1 non-waste picker respondent (2.3%) did not answer the question.

Community service (*Kerja Bakti*) or mutual cooperation (*gotong royong*) is still practiced in the social survey area. Among waste pickers, majority (64.5%) practice community service while 35.5% said that they do not participate in community service. Similarly, majority of non-waste picker respondents (76.7%) participate in community service and about one fourth (23.3%) of the respondent do not participate in the service.

The participation of waste pickers and non-waste pickers in customary events low, 53.8% waste pickers and 65.1% non-waste pickers indicated that they do not participate in customary or traditional events and activities. The rest, 46.2% waste pickers and 34.9% non-waste pickers participate in customary activities.

Both waste pickers and non-waste picker survey on participation in organization, shows that majority of them do not participate in organization (84.9% waste pickers and 95.3% non-waste pickers). Only 1.1% waste picker participates in organization and none from non-waste pickers. Nevertheless, in terms of aid from government and other organizations, 7.5% of waste picker and 7% of non-waste picker respondents said that they receive aid from organization and government. Majority of respondents 78.5% to 88.4% said they do not receive any aid or assistance from organization or government.

- Social Conflict

The area around TPA Tamangapa was known as dangerous area due to high criminal rate. The situation has changed gradually and currently becomes a lot more conducive. The result of the survey on social conflict among waste pickers shows that majority (53.8%) said that social conflict does not occur in the area. The rest of respondents said that social conflict frequently happens (4.3%) and rarely happen (31.2%). 10.8% waste picker respondent did not answer the question. Majority non-waste pickers (74.4) indicated that social conflicts do not happen and 20.9% of them said social conflict rarely happen. 4.7% respondents did not answer the question.

5.2.7 Public health

5.2.7.1 Health Facilities and Personnel

There is no public hospital available in Manggala Sub-district, but it has 4 units of community health center or *Puskesmas*, 4 units of auxiliary community health center (*Pustu*), as it is detailed in the Table 5-31. In terms of medical personnel, there are 237 health workers consists of 47 medical doctors, 71 nurses, 41 midwives, 12 pharmacist, and 66 other health personnel as shown in Table 5-32. Inside TPA Tamangapa, there is a *Pustu* that provides basic medical services to waste pickers and communities adjacent the landfill. The *Pustu* is open with limited time from around 8 in the morning to midday around 11 or 12 am. To improve health service, the local government of Makassar Municipality also introduced Telemedicine and Makassa Home Care Program, known as *Dottoro'tta*.

Table 5-31 Health Facilities in Manggala Sub-district

Village	Public Hospital	Community Health Centre (<i>Puskesmas</i>)	Auxiliary Health Centre (<i>Pustu</i>)	Maternity Clinic	Toddlers Health Service (<i>Posyandu</i>)	Pharmacy	Clinic
Borong	-	-	-	-	11	2	-
Bangkala	-	-	1	-	13	1	5
Tamangapa	-	1	2	-	19	1	4
Manggala	-	1	1	-	10	6	2
Antang	-	1	-	2	17	4	2
Batua	-	1	-	-	11	2	2

Sub-district	0	4	4	2	81	16	15
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Source: Manggala Sub-district in Figures, 2016

Table 5-32 Health Workers in Manggala Sub-district

Sub-district	Medical Doctor	Nurse	Midwives	Pharmacist	Other Health Personnel
Manggala	47	71	41	12	66

Source: Makassar Municipality in Figures, 2017

5.2.7.2 Prevalent Disease

The level of health condition of the people in Tamangapa and Manggala Villages can be seen from 10 prevalent diseases that occur in the two Villages (Table 5-33). Other Upper Respiratory Tract Acute (ISPA) is the top disease suffered by population in both villages, like in other places in Indonesia. In fact, ISPA is the top disease suffered by many people in Indonesia. Dermatitis and Diarrhea are among the diseases where waste might be the vector that causes the diseases.

Table 5-33 10 prevalent diseases in Tamangapa and Manggala Community Health Centre (Puskesmas)

No	Tamangapa		Manggala	
	Diseases	Frequency	Diseases	Frequency
1	Other Upper Respiratory Tract Acute (ISPA)	4,231	Other Upper Respiratory Tract Acute (ISPA)	537
2	Dermatitis	1,437	Fever	298
3	Arthritis	776	Hypertension	99
4	Febris	703	Dermatitis	83
5	Hypertension	684	Tooth Eruption Disorder	65
6	Diarrhea	637	Pulpitis	63
7	Gastritis	625	Gastritis	59
8	Vulnus	493	Periapical	48
9	Cephalgia	431	Diarrhea	44
10	Cough	358	Malgia	42

Source: 10 prevalent diseases in Tamangapa Community Health Centre, 2017, 10 Prevalent Diseases in Manggala Community Health Centre, 2017

5.2.7.3 Sanitation

a. Clean Water

Based on secondary data, the households in Manggala Sub-district have 4 main sources of drinking water that is from bottled water, Government's drinking water distribution company or PDAM, retailed drinking water, and pump (from wells). Some households use other sources of drinking

water. The Table 5-34 shows that number of households in Tamangapa Village who use drinking water from PDAM is 459, which is the lowest compared to other villages in the Sub-district. Majority of the people in Tamangapa either purchase drinking water from bottled water provider, retailed water or from other sources of drinking water. In regards to clean water, Table 5-35 below shows that households in Manggala Sub-district source clean water from PDAM, deep and shallow wells, and rainwater.

Table 5-34 Sources of Drinking Water for households in Manggala Sub-district

Village	Bottled Water (Air Kemasan)	Government Owned Drinking Water Provider (PDAM)	Retail Drinking Water (ledeng retail)	pump	Others
Borong	1,219	2,071	301	11	77
Bangkala	1,396	2,516	332	52	764
Tamangapa	813	459	233	20	669
Manggala	1,347	2,128	75	96	366
Antang	2,754	1,508	267	20	940
Batua	1,355	2,201	674	85	479
Sub-district	8,884	10,883	1,882	284	3,295

Source: Statistic of Manggala Sub-district, 2016

Table 5-35 Sources of Clean Water in Manggala Sub-district

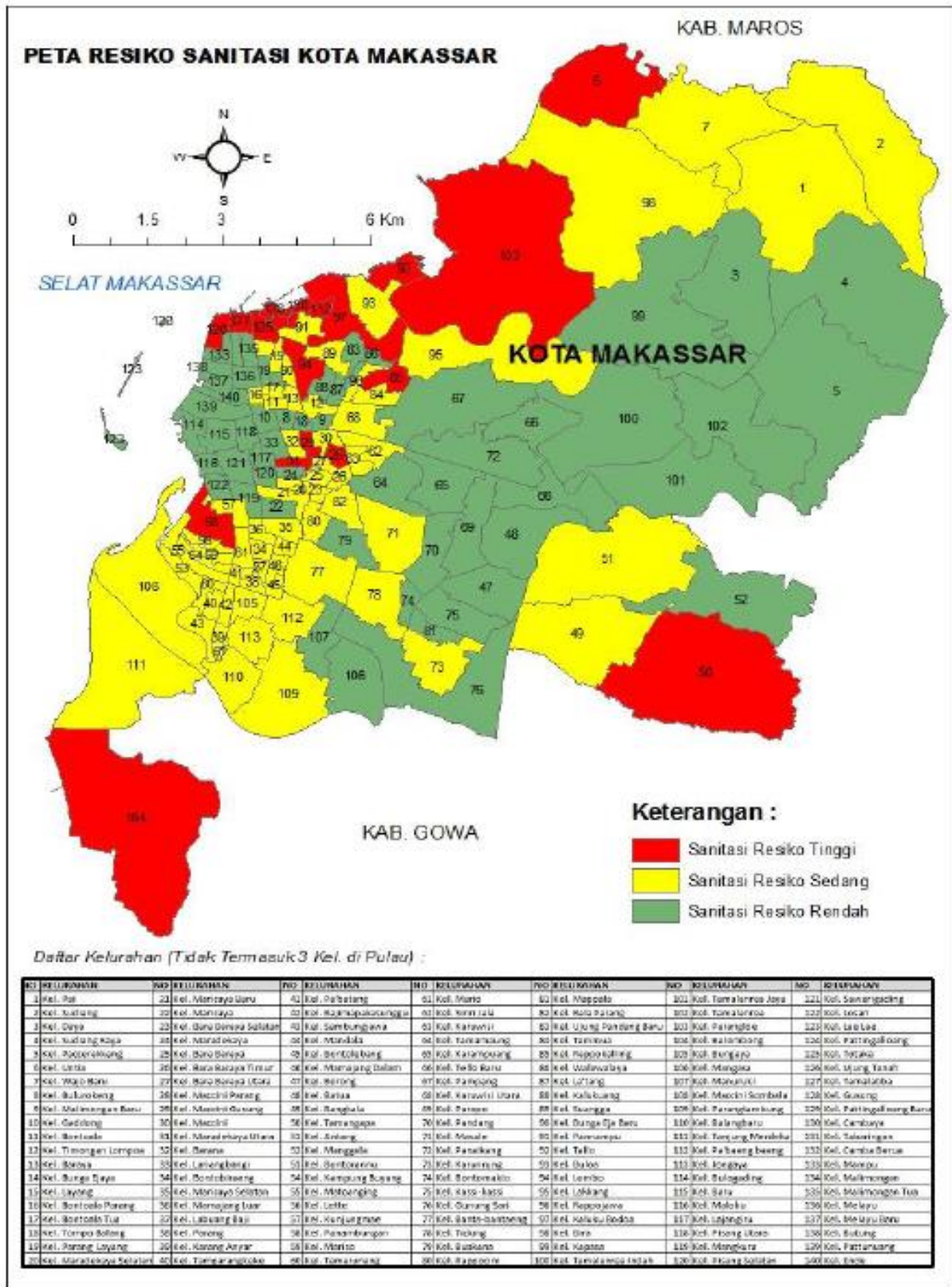
Sub-district	Number of Households	Number of checked households	Clean Water Distribution by PDAM	Deep Wells	Shallow Wells	Rainwater	Total
Manggala	26,372	22,364	15,908	70	6,483	10	22,471

Source: Sanitation White Book of Makassar Municipality, 2014

b. Domestic Waste and Toilet System

According to EHRA (Environmental Health Risk Assessment) survey carried out for Sanitation White Book of Makassar Municipality 2014, several ways of domestic waste handling were identified, i.e. transported by waste operator (40,9%), buried (1.4%), sorted and composted (0.01%), burned (6.1%), dumped to drainage (1.2%), dumped arbitrarily (1.8%), temporary dump site (47%), and others (1.6%).

The same survey shows that majority of population in Makassar have used flush toilet (89%), Toilet *cubluk* (6.46%), digging hole (0.07%), river/drainage/creek (1.42%), field/bush (2.80%), and plastic bags (0.11%).



Source: Sanitation White Book of Makassar Municipality, 2014

Figure 5-20 Sanitation Risk Map of Makassar

The result of EHRA assessment categorized Tamangapa Village as sanitation high risk village while Manggala Village was categorized as sanitation low risk as shown in the Figure 5-20.

5.2.7.4 Health of waste pickers

- Medical Facilities

If sick, majority of respondents of waste pickers and non-waste pickers, 90.3% and 86% respectively indicated that they go to *Puskesmas*. The respondents also visit other medical facilities if they get sick such as clinic and hospital. *Puskesmas* is the most visited place by both waste pickers and non-waste pickers because of its location, which is relatively closer to the respondents compared to other health facilities like public hospital.

- Chronic illness, and infectious diseases

In terms of chronic illness, majority of waste picker respondents (79.6%) said that they do not have chronic illness. Non waste picker respondents, 79.6% also indicated that they do not suffer from any chronic illness. The rest stated that they or people they know suffer from chronic illness such as asthma, heart disease, paralyze, stroke, and stomach ache.

In both cases, more than half of the waste pickers (50.5%) and non-waste pickers (60.5%) assert that they have not been suffering from any disease or illness in the past three months. The rest of respondents stated that they suffer from the following diseases in the past three months: high fever, diarrhea, sore, skin infection, headache, and asthma.

Majority of respondents, waste pickers (75.3%) and non-waste pickers (76.7%) said that there is no infectious diseases occur in the area. However, the rest indicate that infectious diseases that occur in the area are as follows: Dengue hemorrhagic fever, Flu, Skin infection, and Gastroenteritis.

Social survey numerator encountered a toddler (5 years old) who suffers Pleuritis Exudativa (*paru-paru bocor*) since his birth. The toddler was predicted by doctor will not live long and that he could survive only about few months after his birth. Fortunately, he can survive until now, but with very limited activities he can do. He has to stay at home while his parents go to work.

Not all waste pickers have health insurance, which put them in risk if they get sick. The main reason of not having health insurance is that they do not know how to get one. According to some source of information, since 2016, all waste pickers have health insurance, known as *Kartu Indonesia Sehat (KIS)*. In fact, some waste pickers still do not have KIS. In order to get one, he/she has to go through administration process such as to get a change of domicile letter from the village of his/her origin, which costs some money for them to produce such letter.

- Environmental health and cleanliness

In terms of surrounding environment health and cleanliness where the respondents live, majority of both waste pickers (46.2%) and non-waste pickers (34.9%) said that surrounding environment is slum and dirty. Only 16.1% of waste pickers viewed that their environment is beautiful and comfortable and 21.5% viewed their environment very clean. The rest of waste pickers expressed either they do not care of their environment (3.2%) or do not know the condition of their environment (6.5%). 6.5% of waste pickers did not answer the question.

Unsafe work environment in the landfill was noticed and identified during the survey such as waste pickers getting copper and other metal material from waste by using fire, which cause open burning, dust and air pollution that are harmful to their health and community.

5.2.8 Traffic & Transportation

5.2.8.1 Road

Road is the most important aspect for land transportation in supporting the economic activities. The road in Makassar City is classified into four types based on the road length which are National, Provincial, Regency and Highway. In 2016 according to BPS, the length of National road in Makassar City is 35.64 km, the length of road at Provincial level is 19,52 km, the length of road at Regency level is 2.977,5 km and the length of Highway is 17 km. Furthermore, road with good condition has the length of 1.989,02 km or equal to 66.8%. In addition, the road in Makassar City has moderate condition with the length of 400,77 km, road with light damage condition has the length of 442,81 km and road with heavy damage condition has the length of 144,9 km.

5.2.8.2 Land Transportation

In 2014, the number of vehicles in Makassar City is 36.852 units, comprises of passenger vehicle, bus vehicle, truck, pick-up, car tank, taxi, towing truck, and special vehicle. The number of passenger vehicle in 2014 is 509 units. The total number of heavy vehicle such as truck, towing truck, car tank and bus vehicle is 15.917 units. Overall, the number of vehicle in Makassar City in 2014 showed decrease in comparison to 2013 from 39.431 units to 36.852 units.

5.2.8.3 Air Transportation

Makassar City has air transportation infrastructure which is Sultan Hasanuddin International Airport. The airport has the first two runways of 3.100 m x 45 m and 2.500 m x 45 m. The airport is operated by PT. Angkasa Pura I. Facilities of the airport include a new passenger terminal with a capacity of 7 million passengers per year, an apron (aircraft parking plane) with a capacity of seven wide-bodied aircraft, a new runway along 3.100 meters x 45 meters, and taxiway. In total the Hasanuddin International Airport has the capacity of 9.623.337 passengers.

5.2.8.4 Sea Transportation

Makassar City has sea port infrastructure as transportation line to support economic activities. The number of callships in Makassar port in 2014 are divided into many different type of ships which are ocean, archipelago, special ship, local ship and other ship. The number of ships visiting Makassar port to the general dock and special dock are 6.119 ships and 374 ships, respectively.

5.2.9 Public Consultation, Participation and Information Disclosure

5.2.9.1 Stakeholders

- Influential Stakeholder

According to waste picker respondents, well known public figure or community leaders are religious leader or *Pak Imam* (11.8%) and head of village or *Lurah* (11.8%), followed by Head of the landfill (7.5%). The result is slightly different for non-waste picker who saw most well-known public figures are head of sub-districts or *Camat* and *Lurah* (25.6%). The percentage of those who do not know public figure is 18.3% of waste pickers and 7% of non-waste pickers.

Waste picker respondents did not identify any organization (NGO) who work within their area, but non-waste picker respondents (11.6%) identified that there is an active NGO working in the area around TPA Tamangapa. In fact, based on key informant interview, there is an NGO, namely Yapta-U

that concerns on children and women protection, which is further elaborated in the Local NGOs section below.

- The Role of stakeholder in communities

Waste picker respondents viewed community leaders as very helpful (31.2%), lower than 69.8% non-waste picker respondents who viewed public figures very helpful. The rest of waste picker and non-waste picker respondents viewed that the community leaders are less helpful (5.4% & 7%), not helpful (6.5% & 2.3%), and the respondents who do not know about whether or not the community leaders are helpful (19.4% & 4.7%). About 35% of respondents did not respond to the question.

In terms of issues and problems that are solved by community leaders, 28% of waste picker respondents and 14% of non-waste picker respondents viewed community leaders helpful in solving family matters. Other than family matters, land use and business are among the issues that are solved by community leaders. Almost half of waste pickers (44.1%) and 30.2% of non-waste pickers did not answer the question.

- Local NGOs

Non-Governmental Organizations (NGOs) play important roles to provide services to community and environment where sometimes government is unable to provide. In the early formation of TPA Tamangapa, very little attention was paid on children of waste pickers, their education, health and other aspects essential for their physical and psychological development.

Yayasan Pabbata Ummi (Yapta-U) was established in 1993 in response to the commencement of TPA Tamangapa operation in 1990s. The NGO was founded by a group of people who were concerned with children who live in the landfill and had no opportunity or had intention to go to school. The main focus of the NGO was to motivate children of waste pickers to go to school.

Currently, the NGO has three main focuses including education, health and population administration. An example of educational focused activity is that they created a playful environment to waste pickers' children by introducing schools and education. Many children became interested to go to school and in fact, some of them have already completed master degree. The NGO tried to educate the children that will subsequently make a change to their family and convey good messages to their families such as eradication of violence against children and women. The NGO also helped waste pickers in acquiring administration documents for accessing to governmental aid program. Yapta-U has partnered with a number of international organizations such as UNICEF, Plan, and ILO.

5.2.9.2 Project Socialization and Grievance Mechanism

- Public Consultation and dissemination

Majority of waste pickers (68.8%) and non-waste picker respondents (72.1%) have heard about the modernization and development of TPA Tamangapa. Oppositely, approximately 25% of both waste picker and non-waste picker respondents said that they never heard of the Project plan. Both waste pickers and non-waste picker respondents who have heard the Project plan indicated that the source of information about the Project plan mostly come from respondents' peers or friends (45.2% and 53.5% respectively) and from local government or landfill management office (18.3% and 7%).

In terms of project socialization, approximately 50% respondents said that that they have never participated in socialization of project development plan. Only 3.2% waste picker respondents and

4.7% non-waste picker respondents have participated in the project socialization. Majority of respondents, 47.3% of waste picker and 51.2% of non-waste picker said that they have never been consulted for the project development plan. Only 6.5% of waste pickers and 2.3% non-waste pickers said they have been consulted about the development plan of the landfill.

In regards to project socialization organizer, 15.1% of waste picker and 30.2% of non-waste picker respondents said that Landfill Management office carried out project socialization while majority of the respondents, 66.7% of waste pickers and 55.8% of non-waste pickers, did not give answer to the question.

- Grievance Mechanism

Dust and smell is the most complained issues by waste picker respondents (21.5%) and non-waste picker respondents (32.6%). Traffic condition is also complained as the result of the transportation of waste to the landfill as well as traffic congestion caused by herds of cows to and from the landfill. Majority of waste picker respondents (22.6%) and non-waste picker respondents (39.5%) directly conveyed complaint to landfill officers. Only about 2% of both respondents conveyed complaint through complaining service desk.

The handling and management of community complaints seem to be less effective as majority of waste picker respondents (25.8%) said that the complaints never been solved while majority of non-waste picker respondents (20.9%) said that the complaints never been responded. Only 1.1% of waste picker respondents viewed that complaints immediately solved and 10.8% said complaints immediately responded. Non-waste picker respondents (14%) viewed that complaints immediately responded. 53.8% of waste picker respondents and 30.2% of non-waste picker respondents did not answer the question.

Prior to the transfer of domestic waste management to the sub-district government, the Municipality Dinas of Park and Cleanliness provided complaining services desk to receive complaints from communities regarding domestic waste management. However, this service is no longer available as the domestic waste is managed by sub-district government. The complaint on domestic and municipal waste can be channelled through single number of emergency call of Makassar City that is 112, a free toll call number that serves all public services such as fire, disaster emergency response, police, and so forth.

5.2.9.3 Perception toward the Project

Waste picker and non-waste picker respondents were explained about TPA Tamangapa project development plan by enumerators, which might impact them positively and negatively. The survey showed that more than 90% of waste picker and non-waste picker respondents agree with the project development plan of TPA Tamangapa. Only 1 waste picker respondent disagree with the Project and about 4 % of waste picker and non-waste picker respondents did not answer to the question.

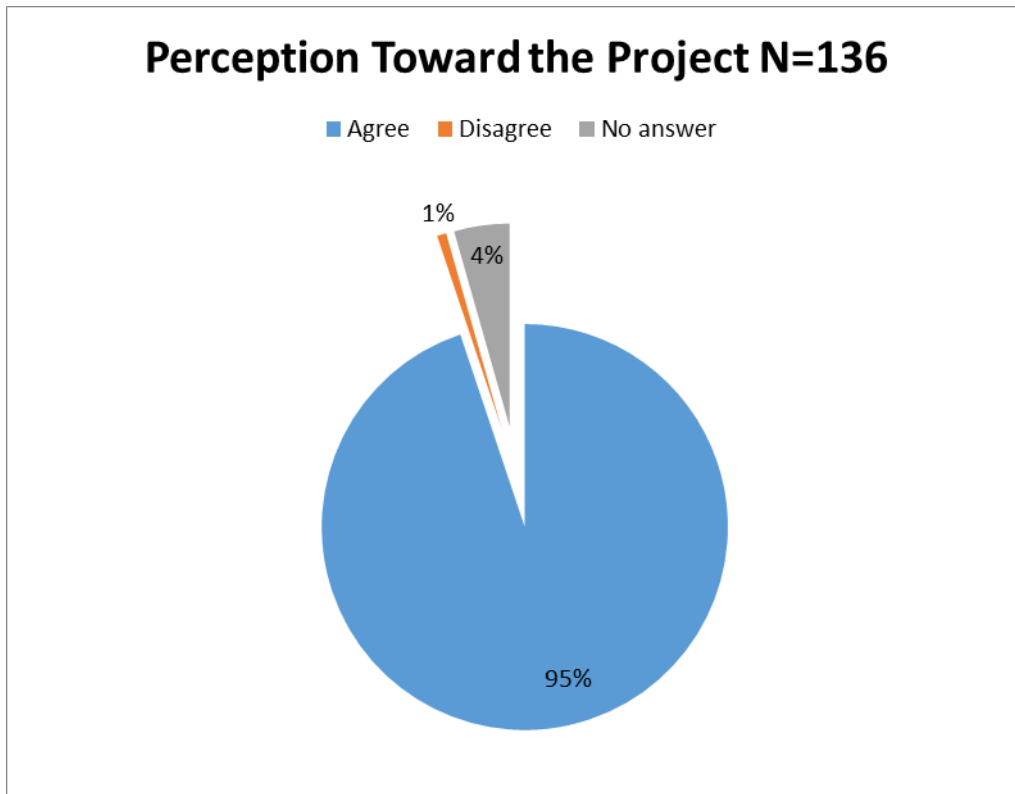


Figure 5-21 Waste Pickers Perception toward the Project

The followings are community's perception expectations toward the landfill development and modernization plan.

- Most of respondents expect that the development/modernization of landfill would be realized as soon as possible.
- The future new landfill should not prevent waste pickers to still do scavenging, but instead the landfill is expected to create better income to waste pickers and communities. Their livelihood should be taken care of.
- The development and modernization of landfill is expected to create local jobs opportunities.
- The future new landfill is expected to create better live and environment, reduce smell, flies and dust, eliminate slum image, reduce traffic jam, and improve land condition around the landfill.
- The future landfill should be developed with sufficient budget, clean, modern/advanced technology, so that waste can be processed and managed in a better way and give positive impact.

6 ENVIRONMENTAL & SOCIAL IMPACTS RELATED TO DEVELOPMENT OF SOLID WASTE MANAGEMENT PROJECTS (PRE-CONSTRUCTION, CONSTRUCTION, OPERATION, CLOSURE)

This chapter details the assessment of the main impacts associated with the Project and elaborates various World Bank Safeguard Policy requirements such as greenhouse gases, biodiversity, land acquisition and economic displacement, cultural heritage, and indigenous people.

6.1 Pre-Construction

The Planning Phase includes land acquisition activities, site studies and surveys, feasibility and design studies, and various planning activities for the construction and operation phases.

6.1.1 Land Acquisition and Economic Displacement

Rehabilitation and modernization of landfill will be implemented on the existing landfill area in Tamangapa Village of about 18.8 Ha, so no land acquisition is required. The Project is designed to accommodate current livelihood activities related to waste management in and around the Landfill including livestock activities that will be managed and regulated in a better way. No economic displacement takes place as the result of the Project activities. There is no need to develop a Land acquisition, Resettlement and Livelihood Restoration Plan at this point in time. For any future resettlement should the need arise, the ESMF sets out the basic guidelines to develop such a plan.

6.1.2 Cultural Heritage

Field surveys to date indicate that the Project location contains no tangible cultural relics or objects that are historic buildings or sites, or paleontological, cultural, or archaeological sites. As such, no impacts on cultural heritage are anticipated.

6.1.3 Community Perception

Community perception arises in the beginning of project plan or project pre-feasibility phase. If there is no clear and correct information disseminated to community and especially to potentially project impacted people, false rumours may spread that might negatively affect the project plan and lead to negative perception and even social unrest.

Currently, some people have been aware of the development plan of TPA Tamangapa, but some people thought that the landfill will be closed. In general, the PAP show agreement to the Project plan and expect that the project can be realized but without sacrificing their livelihood.

To manage community perception about project development plan, the Project components shall include a proper stakeholder engagement plan that includes proper public consultation and project information dissemination.

Grievance mechanism (GM) needs to be established to provide channel for PAP and community to convey their concerns, grievances, complaints, or even ask questions regarding the Project. The Grievance Mechanism will be catered in accordance with international standards that takes into account local culture and access to the GM.

6.1.4 Indigenous People

The project location is located in the Municipality of Makassar (previously known as Ujung Pandang), the biggest city in the eastern part of Indonesia and the fifth largest city in Indonesia. The City has been the melting pot of people from various ethnics in Indonesia, especially the ethnics of Eastern Indonesia, nonetheless, both, Makassarese and Bugis, represent the dominant ethnic groups in Makassar City. Tamangapa Village and Manggala Village where the Landfill is located also consist of population from various ethnicities who have already mixed and assimilated with the bigger Makassar urban community. In both villages, there are also no Indigenous Peoples who are claiming any land in the vicinity of the project as their traditional lands for cultural and ritual purposes.

Hence, in this respect, there are no impacts on indigenous people as described in the criteria of international standard, i.e. IFC PS 7 on Indigenous People.

6.1.5 Contamination of Land due to Poor Handling, Storage and Accidental Spill of Chemical and Petroleum Products from the Geotechnical Work

During planning phase of the project, site investigation works will be planned to study the subsurface conditions of the Project Area. The works are expected to commence during preliminary design of the project/structure. They include detailed geological-geotechnical, geophysical surveys, mapping, drilling and sampling of mainly core recovering boreholes, excavation of test pits and trenches, in-situ testing on the soil characteristics such as shear strength test, compressibility test, permeability tests, SPT tests etc. Soil samples will also sent to laboratory for testing on other parameters.

Potential negative impact of the geotechnical field work may occur due to the potential of oil & lubricant spill also the material/equipment leakage, particularly due to the drilling activities. There will be potential of change in soil chemistry causing soil quality degradation. Several procedures should be taken in order to minimize the impact to the soil and water by preventing potential cross contamination. Contaminated land contains substances that have an adverse effect on human health and environment. It becomes a problem in an agricultural land, or when the contaminated land is close to residential areas and water bodies. When petroleum products percolate into the soil, they have the potential to block the oxygen supply from the surface, thereby killing microorganisms in the soil. As soil becomes infertile, the agricultural crops may be damaged and production may decrease.

However, due to nature, duration and extend of geotechnical site investigation works which are temporary and at small scale, the impacts are expected to be temporary and not significant.

6.1.6 Contamination of Shallow Aquifer due to the Accidental Spill of Chemical and Petroleum Products from the Geotechnical Work

Specifically for this case, contamination of shallow aquifer are considered as the derived impact of the contaminated land. It can be occurred when the hazardous waste infiltrates into soil then be transported to shallow aquifer by runoff and groundwater. The impact of oil spills to groundwater depends on the quantity of the spill and the ground pathway to the shallow aquifer. Petroleum products are persistent and mobile. A small quantity of spilled oil could result in localized groundwater pollution. Due to its lower density than water, petroleum pollutant stays on the upper layer of the water body. During the rainy season, groundwater levels are shallower than during the dry season, thus the vertical travel time is shorter and the extent of a spill is more significant during

the rainy season. Sometimes, it can be carried by the water flow to contaminate downstream land area.

The chemical and petroleum product can percolate into shallow groundwater, but it is expected that the impact would be highly localized as the activities of geotechnical work will be temporary and it is expected that the contamination would degrade over time. As groundwater flow direction is not known at this stage, the most significant impact would be the dispersment of the pollutant to community wells. The impacted population will be the residents and construction workers who abstract water from polluted wells.

6.1.7 Surface Water Quality Degradation due to Spill of Petroleum and Chemical Product from the Geotechnical Work

During the drilling phase, petroleum products such as gasoline and diesel fuel are needed. Poor storage of these products has the potential to contaminate watercourses. At certain downstream points where water is abstracted for irrigation or as a drinking water source, it can cause health problems. Accidental release of oil and chemical products may not be a significant issue since the activities is temporary and relatively small scale which also can be managed by applies the procedure geotechnical work.

6.2 Construction Phase

In most of the Projects including the development of Municipal Solid Waste Disposal Area, significant environmental impacts, both negative and positive, usually occur during the Construction Phase.

6.2.1 Dust from the Site Clearing, Digging, Filling, Material Handling and Road Transportation

Dust emissions will be produced during the land clearing/preparation phase and during construction activities. Land clearing activities will produce dust fall which is classified as TSP. Cleared land will result in dust generation during all construction activities if not controlled. Any activity taking place on cleared land areas, such as material movement and site grading will generate dust. Dust will also be generated during material handling and transportation if the works are not managed well, and the impacts are beyond the landfill site i.e. along the roads that materials are transported. The dispersion of dust depends on wind magnitude and direction. Dust generation is expected to have the greatest impact during the dry season when there is less precipitation available to control dust.

The monitoring data in 2016 shows that dust concentration in the Project Area ranged from 11.48 $\mu\text{g}/\text{Nm}^3$ to 14.59 $\mu\text{g}/\text{Nm}^3$ and were relatively low compared to the National Dust Threshold Standard of 230 $\mu\text{g}/\text{Nm}^3$. The meteorology conditions were dominated by Northwesterly and Easterly wind direction with average wind speed of 4.4 knots for the last three years (2013-2015). Wind speed affects directly to the distance and duration of air pollutant dispersed.

Mobilization of materials and equipment activities during the construction phase has potential to cause air quality degradation and it is influenced by blown wind. Dust can be brought from friction of vehicle tire with the unpaved road. Intensity from vehicle movements increase the dust spread along the transportation route, especially on dry and unpaved area. During mobilization activities, sensitive receptors include people adjacent to the roads and potential to be exposed by dust penetration into upper respiratory system. Dust potentially affect visual of workers and road users that may properly cause incident/accident. Dust also affecte vegetation around the site through

which will be traversed by vehicles and especially vegetation adjacent to the cut and fill work. Dust will have significant impact to the vegetation according the type and in general can change in plant growth, increased transpiration, and permeability and blocked the stomata during photosynthesis process. Furthermore, dust can cause leaf fall and die because from lack of nutrition. It also potential to cause nearby buildings/properties dirty by the dust and if it's not managed properly can lead to public negative perceptive.

The risk of dust generation is increased by loss of vegetative cover, a loose, dry and smooth soil surface, large barren areas, equipment movement and strong winds. In construction, the most familiar result of dust generation is the receipt of complaints from community members living near the construction area. Air borne dust will cause predominantly visual nuisance temporary during construction. long-term exposure to construction dust and associated health impacts will not occur as the impact will stop when construction completes.

Clearly, dust is more an issue for construction activities in seasonally dry areas. Dust controls will focus on (1) stabilizing exposed surfaces and, (2) minimizing activities that potentially suspend dust particles. For heavily trafficked areas such as access roads to active construction areas and for disturbed areas (e.g. land clearing areas), wet suppression (watering), gravel or asphalt surfacing, and equipment and vehicles wash down areas will be employed as dust control measures as practical. PPEs are also required to workers, especially goggle/glasses to ensure visibility during construction activities.

Stabilization of disturbed sites upon completion of earthworks will be also important. Disturbed land areas will be stabilized through revegetation. Although the main objective of revegetation is to reduce water erosion, reducing wind erosion will be also important.

6.2.2 Emissions from Operation of Energy Power Diesel Generation for Construction Purposes, Vehicle and Commissioning of the ITF

Mobilisation and construction activities will associate to construction traffic, heavy equipment and machineries and other heavy vehicles such as tractors, graders, excavator, lorry, dump trucks and energy power diesel generation. These result in emissions of the fossil fuel combustion pollutants. The primary pollutants exsessed from this reaction comprise of CO, CO₂, SO₂, NO₂, N₂O, VOCs and HC.

After construction finish, there will be a commissioning activity of the ITF prior to the operation phase. The commissioning of the ITF such as anaerobic digesters and Refuse-Derived Fuel (RDF) production will also emit emissions from direct stack and fugitive associated with biological processes. Direct emissions can include bioaerosols, particulate matters/dust, ammonia, amines, VOCs, sulfides and odour.

The monitoring data in 2016 shows all of ambient air quality parameters comprising of SO₂, NO₂, CO and Pb were in compliance to the National Ambient Air Quality Threshold Standards of Government Regulation No. 41 Year 1999. The meteorology conditions were dominated by Northwesterly and Easterly wind direction with average wind speed was 4.4 knots for the last three years (2013-2015). Wind speed and wind direction affect the distance, extend and duration of air pollutant dispersed.

Sensitive receptors of air identified are adjacent dwelling at Tamangapa Village, Manggala Village and Bangkala Village, people who work nearby the construction area and workers working directly in each activities. However, construction activities are temporary so the impacts are identified temporary.

6.2.3 Odour from the Rehabilitation Work of Existing Landfill Cell

The rehabilitation works of old dumping and landfill cells potentially increase odour (H_2S) concentration in the ambient air. For the aims of further developments, civil works has potential to reopen the old dumping to be exposed and generates odour in to the ambient air. H_2S in the air will quickly break down into H_2O and SO but exposure to low concentrations of H_2S in the term will have an impact on respiratory health problems, headaches and chronic cough. H_2S is also known potential in the formation of acid rain. Thus, although the concentration of H_2S is still below the air quality standard but still need to be managed to avoid disruption of public health and high of H_2S concentrations can be toxic.

However, it should be noted that the detection value were already higher than the WHO standard of odour annoyance of 0.005 ppm. Due to this condition, its potentially impact the worker and the surrounding environment. This impact might be temporary and is expected not cause the serious damage if it exposure on short time. The odour impact is unlikely prevented but can be minimize by develop and implement a working plan to control and minimize odour.

6.2.4 Noise & Vibration Increase due to Construction Activities

Throughout construction all reasonable attempts will be made to comply with Minister of Environment Decree No 48/MENLH/11/1996 on Noise Standards for residential and natural areas and with local regulatory requirements (South Sulawesi Governor Regulation No. 69 of 2010). Measurements in Semester I 2016 indicate that the ambient noise levels in the Project area reach the maximum noise level at 64.1 dB(A), above the threshold standard for settlement areas and high enough to make additive noise an issue.

It should be noted that construction activities are generally in a fair distance to residential areas. The result of noise level measurement in Semester I 2016 in the nearby settlement reach the maximum noise level at 51.5 dB(A), below the threshold standard for settlement areas. While construction noise will be generated noise level will reduce to relevant guidance values at the nearest receptors.

Vibration may occur due to the civil works activities particularly construction of waste transfer stations, waste sorting and segregation facilities. Operation of construction equipment cause ground vibrations which spread through the ground and diminish in strength with distance. Building founded on the soil in the vicinity of construction site response to vibration. Ground vibration from construction activities very rarely reach the level that can damage the structures, but can achieve the audible and feelable ranges in buildings adjacent to the Project Area. Mitigation measure that can be implemented is by operating the earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible.

6.2.5 Surface Water Erosion due to the Construction Activities

Surface water erosion is an ongoing natural phenomenon. It can be accelerated or intensified if either the natural slope angle is increased, if the vegetative ground cover is removed or the surface is disturbed. Construction activities do all these. Potential targets of significant erosion are any areas with changes to natural topography and any cleared land surface. Access roads, including road embankments and road cuts and fills, and spoil piles are especially susceptible to erosion.

Impacted areas of surface water erosion are limited to those in close vicinity to the construction areas. Erosion is considered as the indirect impact from surface runoff. The surface water erosion will result in increased turbidity, downstream aquatic ecology deterioration (loss of biota and less of

biota production). This also impact the agricultural land located to the southeastern direction from the Project Area.

The two key principles of water erosion management are to sustain soil cover and hence to fence off erosion (erosion controls), and to control water quality through the reduction of sediment loads if erosion occurs (sediment controls). The first principle is a priority, since prevention is always better than cure. Erosion management will be part of construction design and construction water management. Consideration is given to the hydrological and geologic attributes of the Project area. For example, revegetation of temporarily disturbed areas as soon as possible minimizes the extent of disturbed land at any one time, significantly reducing total erosion. Erosion control and management of runoff during construction is well understood, and will be environmental performance criteria for the selected EPC Contractor.

6.2.6 Leachate Generation from the Rehabilitation of Old Dumping and Landfill Cell

Additional impact from the existing landfill, the rehabilitation of old dumping and landfill cell may also impact the water quality through leachate contamination. There are possibilities that the leachate will flows to the surface water bodies without prior treatments as there will be an activities of old dumping removal and replacement to the temporary dumping areas.

The baseline information taken during the RKL-RPL monitoring on Semester 1 & Semester 2 2016 shows that wastewater (leachate) were not effectively treated in the LTP (Leachate Treatment Plant). It is reported that the effluent parameters of water in the LTP were still higher than the threshold standards stated on Ministry of Environment and Forestry Regulation No. 59 Year 2016 including parameter of BOD₅, COD, TSS and N total. It is predicted that the activities of construction particularly rehabilitation of the old dumping and landfill followed by the construction of new facilities will have high impact on water quality. Leachate which flows to the surface water potentially causing additional impacts such as eutrophication and acidification of surface water and contamination of water supplies. However, this is the current issue as leachate is not handled properly at the existing landfill, so this is not considered additional impact arising from the project. When the leachate treatment plant is developed for the landfill, leachate will be collected and treated properly that will create positive long term impacts on water quality.

6.2.7 Solid Waste Generation due to Demolition Work and Construction

During construction phase, demolition and construction works will generate solid waste varies from bricks, scrap wood, metals and concrete. Domestic solid waste will also be produced, most likely in the form of food waste, plastic and food packaging, from workers during construction. Waste, especially domestic waste, will be generated continuously during the months of construction period. As the project location is located in landfill, non-hazardous solid waste can be disposed directly to landfill unloading area. Prior to disposal, solid waste shall be separated at source where possible, to minimize contamination and maximize potential for reuse and recycling of materials.

Demolition and construction work has potential to produce hazardous solid waste, such as contaminated soil due to oil spill, oily rags, container of petroleum based product, wall paint can and spill cleanup materials from oil and fuel spills. When then generation of hazardous solid waste is unavoidable, it shall not be disposed directly to landfill. Mitigation measure that can be applied include the installation of temporary hazardous waste storage within the site to be further collected regularly by licensed third-party.

6.2.8 Release of Litter due to the Rehabilitation of Old Dumping and Landfill Cell

Normally, the rehabilitation of old dumping and landfill cells involves landfill mining activity. The old dumping will be excavated and temporarily transferred to the designated area while the construction of environmental facilities is being conducted in the old cell. The release of litter is potentially occurred due to wind, vehicles and vermin, where it will contribute to transmission of diseases and adversely affecting wildlife and neighbouring communities. However, as the project site is on an existing landfill, litter associated impacts are existing impacts so further impacts from project is not significant.

6.2.9 Biodiversity and Habitat

There is potential that landfill construction can negatively impact biodiversity and habitat condition, which can be achieved through land clearing and habitat loss. As described in the baseline, the project area is located near a natural vegetation area.

However, there may not be any significant impact on biodiversity and habitat due to landfill construction. Considering that the landfill is already located at a relatively dense human settlement area, there may not be a lot of wildlife to speak of in the vicinity of the project area. Therefore, the impact magnitude of landfill construction on biodiversity and habitat may be very minor or none.

6.2.10 Workforce and Construction Activities Impacts on Host Communities

Labor recruitment for construction phase may possibly cause positive and negative impacts. The positive impacts as the results labor recruitment is potential increase of local economy and community's income. This positive impact can be managed and implemented through identification of local goods and services that can be procured locally and by encouraging project's contractors to use qualified local goods and services provider.

Potential negative impacts as the result of labor recruitment is social jealousy between migrant and local workers, potential conflict with local community, increased crime rate, disease, cultural clash. These potential impacts can be managed through a number of measures, i.e. to organize and implement local cultural induction to migrant workers and to organize health and safety induction to all workers; create communication forum that consists of project and community representation and to establish and disseminate grievance mechanism to affected communities. The communication forum serves as one of the tools to solve any issue arise as the result of project activities.

Other source of social impact resulted from project activity during the construction phase is the mobilization and demobilization of equipment, materials, and personnel during civil works activities. Negative impact might possibly take place which is community negative perception and social tension. To avoid and mitigate the impact, the Project will develop and implement proper transportation management plan that includes the usage of material cover during material transportation and/or perform dust control by spraying water on the streets and roads when mobilization is performed, especially during particular hot day (dry season) twice a day (noon and afternoon), as well as identify preferred timing for heavy vehicles to avoid peak hours. Socialization about the mobilization and demobilization activities will be carried to affected communities and dissemination and implementation of Project's Grievance Mechanism.

Installation of Intermediate Treatment Facilities (ITF) - Installation of equipment / advanced technology options (anaerobic digesters and refuse-driven fuel production) may potentially raise

negative community perception as they do not understand whether or not the technology post health impact on them. Proper consultation and socialization of the technology with its positive and negative impacts will be carried out to potentially impacted communities including the timing and operational schedule. Grievance mechanism will be put in place and disseminated to affected communities should the community have complaints on technology.

6.2.11 Economic Impacts

During the construction phase, the operation of heavy equipment and machineries in the landfill will take place intensively. The existence of livestock in the landfill can disrupt construction works. A ban or restrictions on the areas where cattle can graze in the landfill may be applied, and this may have economic consequences for livestock owners.

Economic consequences may also be experienced by waste pickers and waste buyers who depend on landfill income sources. During construction (and operation) there will be changes to the access and systems of waste handling, which may affect the livelihoods of these groups. On the other hand, construction work that requires the mobilization of labor can also have a positive impact on the economy of local population if access to construction works is opened to them, in particular to waste pickers.

6.2.12 Traffic Increase during the Construction Activities

Impact on traffic & transportation during the construction phases that may occurs: (1) additional traffic due to the mobilization and demobilization of equipment, materials and personnel during civil work activities and (2) temporary traffic disruptions due to access road rehabilitation activities during the demolition works.

Materials delivery for construction of the project will utilize the existing road corridor and will utilize local roadways closer to the project components. Project activities have the potential to result in increased traffic on existing roadways. Indirect impact of the traffic increase will related to the public/pedestrian safety issue and the noise increase. This has the potential to result in significant impacts to the existing road systems if unmitigated.

6.2.13 Community Health & Safety

Construction activities will give impact to the community health and safety issue. There is one possible impact identified that will disrupt the community surrounding the project footprint which is vector disease (flies, rats, etc.) due to the civil work. The civil work will specifically cover the activities of rehabilitation/remediation works of old dumping and landfill cells (including access roads). The old dumping and landfill cells may become the nest of all vectors such as flies, rats, etc. The pile of wastes in the landfill facilities will become the source for vectors to grow. In addition, uncontrolled dumping or landfill attracts rats, flies, and other insects that can transmit diseases. If the number of vectors are abundance or not well managed, it will lead to diseases for the surrounding community on the project footprint.

Furthermore, those vectors might affect the community in term of health and safety which is known as vector borne diseases such as such as malaria, dengue, schistosomiasis, human African trypanosomiasis, leishmaniasis, Chagas disease, yellow fever, Japanese encephalitis and onchocerciasis. According to WHO, Vector-borne diseases are illnesses caused by pathogens and

parasites in human populations⁸. The risk of vector borne disease will be greater by the low awareness of this issue by the community and improper mitigation.

The community in the surrounding environment is at risk of vector borne diseases due to the civil work of rehabilitation/remediation of old dumping and landfill cells. Thus, Integrated Vector Management (IVM) should be implemented to avoid and mitigate risk to the community. Referring to WHO, IVM is a rational decision-making process for the optimal use of resources for vector control. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. The ultimate goal is to prevent the transmission of vector-borne diseases such as malaria, dengue, Japanese encephalitis, leishmaniasis, schistosomiasis and Chagas disease⁹.

As such by implementing IVM, the risk to the community health and safety of vector borne disease can be reduced or eliminated. To the greater extent, there are five elements that may become the key factor for success in implementing IVM as stated in the following:

- Advocacy, social mobilization, regulatory control for public health and empowerment of communities;
- Collaboration within the health sector and with other sectors through the optimal use of resources, planning, monitoring and decision-making;
- Integration of non-chemical and chemical vector control methods, and integration with other disease control measures;
- Evidence-based decision making guided by operational research and entomological and epidemiological surveillance and evaluation; and
- Development of adequate human resources, training and career structures at national and local level to promote capacity building and manage IVM programmes.

The following measures are recommended to prevent, minimize, and control accidents and injuries at waste management facilities during civil work for rehabilitation/remediation works of old dumping and landfill cells (including access road) as stated below:

- Conduct socialization on vector borne diseases to the surrounding community;
- Conduct vector control on regular basis;
- Provide community grievance mechanism;
- Provide health care support for surrounding community; and
- Appoint officer and collaborate with local health agency to control and monitor vector borne disease

6.2.14 Occupational Health & Safety

The civil work for rehabilitation/remediation works of old dumping and landfill cells (including access road) will give impact to the workers working on the project site. It is known that construction activities are classified as high risk activities in term of occupational health and safety. The occupational health and safety risks that may interfere the workers include:

⁸ <http://www.who.int/mediacentre/factsheets/fs387/en/> (accessed on August 29th, 2017)

⁹ http://www.who.int/neglected_diseases/vector_ecology/ivm_concept/en/ (accessed on August 29th, 2017)

- Workplace incident/accident;
- Lost time injury which will decrease productivity;
- Lack of training that may lead to an increased risk of accidents moreover fatality;
- Failure to equip workers with PPE that will lead to workplace incident/accident;
- Injuries and/or fatalities related to:
 - Falls from heights due to improper installation and use of formwork/ scaffolding/ stairways / railings;
 - Falling materials;
 - Inappropriate use and maintenance of heavy construction machinery and equipment;
 - Carrying heavy loads;
- Exposure to air pollution, noise, other harmful substances;
- Ergonomic; and
- Potential flame or explosion due to methane gas generated from the degradable waste in the landfill if there is improper ventilation during hot works or works within confined space etc.

The above identification of occupational health and safety issues are the risks to the workers during construction activities. Lack of comprehensive understanding of occupational health and safety requirement for construction activities may cause fatality. Thus, a project must have a proper Environmental and Social Management System (ESMS) in place in accordance with Indonesian Laws and Regulations and International Standard. The effective implementation of ESMS through socialization and capacity building of each ESMS elements for both contractor and workers will create a safety culture as measure to eliminate fatality on the construction site.

Besides, the effective implementation of ESMS will avoid any occupational ill covering serious and fatal diseases, physical effects on skin, breathing, hearing, mobility and functioning, and psychological effects on mental wellbeing. Therefore, the occupational health and safety risk will greatly reduce by implementation of ESMS.

The following measures are recommended to prevent, minimize, and control accidents and injuries at waste management facilities during civil work for rehabilitation/remediation works of old dumping and landfill cells (including access road) as stated below:

- Provide workers with appropriate protective clothing, gloves, respiratory face masks and slip resistant shoes for waste transport workers and hard soled safety shoes for all workers to avoid puncture wounds to the feet. For workers working near loud equipment, equip them with noise protection facilities. For workers working near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of safety helmets;
- Conduct socialization and safety induction prior project commencement regarding occupational health and safety and ESMS;
- Provide orientation training to all new workers;

- Conduct safety briefing prior conducting work on daily basis;
- Provide barricade in any place such as gutter, holes, pit;
- Provide safety signage on the construction site;
- Provide training regarding to risk assessment, SOP, WI, other related occupational health and safety related issues;
- Provide grievance mechanism for all workers; and
- Conduct monitoring and performance measurement on occupational health and safety.

6.3 Operation Phase

Impacts of municipal solid waste disposal during operation are largely related to air quality and odor, noise generation, water quality, and visual impacts.

6.3.1 Vehicular Emissions from Waste Collection & Transport; and Waste Receipt, Unloading, Processing & Storage

In accordance to the development of the Municipal Solid Waste Facilities and the improvement of the waste transportation services, there will results the increase of vehicular emissions. It include the emissions of the additional mobilization and demobilization of waste pick-up trucks and personnel during the waste transport activities. As well as the typical emissions of the fossil fuel combustion, it will excess some pollutants in the ambient air such as CO, CO₂, SO₂, NO₂, VOCs and HC.

The monitoring data in 2016 shows all of ambient air quality parameter comprise of SO₂, NO₂, CO and Pb were in compliance to the National Ambient Air Quality Threshold Standards of Government Regulation No. 41 Year 1999. The meteorology conditions were dominated by Northwesterly and Easterly wind direction with average wind speed was 4.4 knots for the last three years (2013-2015). Wind speed will affects the distance and time of air pollutant dispersed. The sensitive receptor of emissions from vehicle are adjacent dwelling of the waste transport route also the workers.

6.3.2 Air Emission and Odour from Waste Collection & Transport; Waste Receipt, Unloading, Processing & Storage; ITF Operation; and Landfilling

Generally the municipal solid waste will emmit dust, bio-aerosols, and odors. It will impact the nearby communities particularly who lives nearby the waste transportation route and the workers. Bioaerosols are particular concern to workers health and have been identified as source of reduced pulmonary function and increased respiratory disease for those in immediate proximity to waste sweeping and collection activities.

Once solid waste is dumped into the landfill it will be subjected to series of reactions. Initially the waste is aerobically and the main reaction products are carbon dioxide gas and water. This stage takes several days to week. With the progress of degradation, the oxygen is depleted and the degradation converted into anaerobic. As waste decompose in the landfill, landfill gases will be generated due to the anaerobic degradation of the organic fraction of the waste. Gas will start to be given off within few weeks of the waste deposition and will continue to be emitted even after the site closure. The main components of the landfill gas are methane and carbon dioxide. Both of methane and carbon dioxide are GreenHouse Gases (GHG's), which contribute to global warming phenomena. In addition, the methane gas is a potentially flammable and explosive gas for a

concentration of 15% of the air volume. Furthermore, some of the gases that can be produced as a result of anaerobic degradation are hydrogen sulfide and ammonia.

Baseline ambient air quality data on 2016 shows that all of the parameter on ambient air include the parameter of SO₂, NO₂, CO, H₂S, NH₃, Pb and TSP were still lower than the threshold value in accordance to the standards for air quality by Sulawesi Selatan Governor Regulation No. 69 of 2010 and Indonesian Government Regulation No. 41 of 1999 on Air Pollution Control. However, it should be noted that the H₂S gas content in the ambient air in nearby settlement were detected from 0.0088 to 0.0098 ppm. This values were still well within the quality standard set at 2 ppm and so will not have an impact on humans or other living environments. However, this concentration values are already exceed the odour detection threshold of 5 ppb (7 µg/m³; WHO, 1981). Concentrations that substantially exceed the odour detection threshold can result in annoying and discomforting physiological symptoms of headache and nausea (Amoore, 1985). The odour annoyance may impact the communities live at the nearby settlements areas of Manggala Village, Tamangapa Village and Bangkala Village.

6.3.3 Noise & Vibration Increase from the Waste Receiving, Unloading, Dumping and Pushing

The noise level and vibration increase is likely to occur during the waste receiving, unloading, dumping and operational pushing activities which specifically come from the truck traffic, loading equipment (e.g., cranes, wheeled loaders), stationary compactors, balers, grinders, and other treatment and conveyance systems. Data from the Report of Strategi Sanitasi Kota Makassar 2016 (Makassar City Sanitation Strategy) shows approximately 91 dump truck and 160 arm roll truck were utilized for transporting waste from the 414 TPS (temporary disposal) widespread all over makassar city to the TPA Tamangapa. Inside the TPA Area, there were heavy equipment machinery including 5 units bulldozer and 5 units excavator/backhoe operate daily.

Measurements in Semester I 2016 indicate that the ambient noise levels in the Project area reach the maximum noise level at 64.1 dB(A), above the threshold standard for settlement areas and high enough to make additive noise an issue. Due to the condition of noise level which already higher than the threshold standards, the further development of TPA Tamangapa is likely to have moderate to high impact for noise and vibration within the Project Area. Noise increase may affect local residents at the three villages adjacent to the TPA Tamangapa area (Manggala Village, Tamangapa Village and Bangkala Village) also the workers in the TPA Tamangapa.

6.3.4 Surface Water Quality Degradation due to Leachate Contamination

The surface water quality is likely to be decreased due to contamination from leachate. Landfill leachate contains dissolved constituents derived from the interstitial water of the disposed waste as well as its degradation products. It also may contain some suspended solids, including pathogens. If not collected and treated, leachate can migrate from the landfill and causes: (1) Direct contamination to soil; (2) Groundwater contamination through infiltration; and (3) Surface water contamination trough water flows to the water body.

Result measurement from the RKL-RPL monitoring conducted in Semester I & II Year 2016 for leachate water and wastewater effluent from wastewater treatment plant shows the typical condition of leachate were having contamination of BOD₅, COD, TSS and Nitrogen. The ratio of BOD/COD were lower than 1 which indicates that most of the pollutant on the wastewater can't be degraded biologically.

Additional contamination of leachate in the surface water will degrade the surface water quality. Degradation of surface water will impact the aquatic biota in the river also the communities utilize the surface water for several purposes such as drinking water source, irrigation and fisheries. The most impacted communities are anticipated to be the villages located downstream of the TPA Tamangapa Area.

6.3.5 Hazardous Waste Generation from the Landfill Operation

Government of Indonesia categorizes waste as hazardous waste if the waste material has one or more of the following characteristics: explosive, ignitable, reactive, infectious, corrosive, and/or toxic. Government Regulation No 101 of 2014 (GR 101/2014) on Hazardous Waste Management lists the wastes which are considered as hazardous waste.

Several aspects of landfill operation may generate hazardous waste in the process, i.e. sludge from leachate collection and treatment, soot from landfill gas capture, as well as oil/fuel spill from heavy equipment workshop and operation of supporting facilities. Although sludge and soot from landfill is not listed as hazardous waste in GR 101/2014, both sludge and soot are derived from a mix of municipal solid waste which may unknowingly contain hazardous materials. Hazardous constituents in landfilled waste can potentially migrate from the landfill in leachate or gas phase and therefore the sludge and soot must be treated as hazardous waste as well. Meanwhile the operation of heavy equipment during operation phase may pose the risk of oil/fuel spill in the workshops which is listed as hazardous waste category 2 in the regulation. Overfills, vehicle accidents, and tank failures can lead to releases of oil or fuel to the environment.

Improper hazardous waste handling has the potential to release organic and inorganic pollution into the environment. Releases of pollutants can impact human beings through various pathways including direct inhalation of dust, pathogens and gases, direct ingestion of contaminated water and ingestion of crops contaminated with polluted irrigation water. This potentially impact the workers in the TPA. For rivers, streams and irrigated areas, poor leachate treatment potentially damaging the river ecosystems. This impact will unlikely occur if it managed properly and the company provide the designated hazardous waste temporary storage area and corporate with license contractor to treated this waste.

6.3.6 Release of Litter during the Operation of Landfill

During operation phase of landfill, potential release of litter most likely occurs due to due to wind, vehicles and vermin during the waste collection and transportation from waste source to landfill, waste unloading in landfill and waste placement and tipping in landfill cell. Litter will contribute to transmission of diseases and adversely affecting wildlife and neighboring communities. Given the dominated wind direction were comes from the northwesterly and easterly direction, the most impacted communities will be the resident of Tamangapa Village and Bangkala Village.

6.3.7 Visual Impact from the Waste Collection, Transport, and Landfilling

Potential of visual impact usually occurs during the waste collection and transportation and landfill operation. Poorly handling of waste collection and transportation will disturb the visual of communities along the collection route from the service coverage area to landfill. Furthermore, landfill operation will include waste tipping in designated cell. Without being properly managed as sanitary landfill which includes application of cover soil (daily cover, intermediate cover and final capping) and development of buffer zone, waste tipping activity will be exposed to the surrounding area and will attract the pest, particularly flies. Besides increasing the chance of disturbance on

worker and community health, it will also negatively affect the visual impact to the local surrounding and passerby. Sensitive receptors include workers and people living nearby the TPA Tamangapa Area. This impact is considered as inevitable and will result in an alteration to the existing landscape.

6.3.8 Aquatic Biota

There is potential that landfill operation can negatively impact aquatic biota condition, which can be achieved through leachate pollution.

Leachate will inevitably disrupt aquatic life through promoting acidic pH and heavy metals. In addition, this mixture usually has high biological oxygen demand (BOD), which would quickly de-oxygenate water. Oxygen depletion, together with high acidity and toxicity, would create a harsh environment for major aquatic species.

This may be an issue in TPA Tamangapa as it is located near connected water bodies. Although the area surrounding the TPA Tamangapa is densely populated, the landfill may be the only place that produces leachate in the area. Therefore, the effect of leachate pollution may be significant.

6.3.9 Biodiversity and Habitat

There is potential that landfill operation can negatively impact biodiversity and habitat, which may occur due to poor management. Poor management in landfills have been reported in other areas where it caused a sudden surge of species population (Osterback et al. 2015). A study in California's Monterey Bay have identified the rise of the Western gull population due to increased food waste, which subsequently endangers the population of steelheads as the balance between predator and prey becomes imbalance.

There may not be any significant impact on biodiversity and habitat due to landfill operation. In the case of the TPA Tamangapa, the landfill vicinity is already dense with human population. Therefore, there may not be a lot of wildlife to speak of in the area. Subsequently, the impact magnitude of landfill operation towards biodiversity and habitat would be very minor or none.

6.3.10 Traffic Disruption due to the Operational Activities

Impact on traffic and transportation during operation phases that may occur include (1) additional traffic due to mobilization and demobilization of waste pick-up trucks and personnel during the waste transport and (2) traffic disruption due to waste transport activities.

Transport route should be well planned and informed to the local community to mitigate any impact on traffic and transportation. The traffic management plan should be developed and implemented to ensure minimal traffic disruption. Waste transport vehicles in the Project area will only be permitted to use the roads and required to operate at specified speeds. Barriers will be installed around the demolition works area to prevent spreading of dust to local community. Traffic signage must be installed to avoid any accident.

6.3.11 Community Health & Safety

The community health and safety risk from operational phase are identified in the leachate collection and treatment activities. The activity will give impact to increase on water borne diseases due to contamination of un-treated leachate in the water bodies. Leachate is liquid that has dissolved or contained environmentally harmful substances that may then enter the environment. In this context, leachate is a liquid that drains from dumping of municipal solid waste or landfill

facilities. The water that passed through the solid waste became contaminated; it contains many organic chemical. The physical appearance of leachate when it emerges from a typical landfill site is a strongly odoured black, yellow or orange coloured cloudy liquid. The smell is acidic and offensive and may be very pervasive because of hydrogen, nitrogen and sulfur rich organic species such as mercaptans.

The leachate from the collection and treatment facilities may contaminate surface water which is Tallo River and groundwater if it is not properly managed. Once the surface water and groundwater are contaminated by leachate, it will be difficult or have the least possibility to be used for consumption and other use. It will increase risks to the community who consume the water contaminated leachate which lead to pose of water borne diseases. Water borne disease is a disease caused by various bacteria, viruses, and protozoa. The types of water borne diseases include diarrhea, gastrointestinal illness, etc.

As such, leachate treatment plant must be maintained and operated in proper manner following the Standard Operational Procedure (SOP). Moreover, frequent monitoring on surface water and groundwater must be conducted to monitor the water quality in accordance with local and national Indonesian Laws and Regulations.

6.3.12 Occupational Health & Safety

During the operational phase, re-employment of waste pickers in landfills will give risks to the waste pickers or workers itself. It is due to lack of knowledge on occupational health and safety and site condition. The occupational health and safety risks that may interfere the waste pickers include:

- Incident/accident during waste picking activities;
- Lack of socialization and training that may lead to an increased risk of accidents moreover fatality;
- Failure to equip waste pickers with PPE that will lead to incident/accident such as injured by the sharp and heavy waste materials and risk being killed or severely injured by moving equipment;
- Injuries and/or fatalities related to:
 - Falls or slip or trip;
 - Carrying heavy loads;
 - Falling from height (top of pile of wastes);
- Exposure to odour, noise, toxic substances, pathogen, other harmful substances;
- Ergonomic; and
- etc.

There is no firm and exact number of waste pickers who work in TPA Tamangapa. Landfill Office registered 131 waste pickers with copy of family certificate as the basis for registration. If the number of waste pickers rising up, proper management must be implemented to avoid any fatality on the landfill facilities. The waste pickers may increase occupational health and safety risk for themselves due to low awareness of health and safety issues. Waste pickers may have injuries from temporary to permanent due to unsafe working environment in the landfill facilities. Moreover, they are not equipped with personal protection equipment to protect themselves from any harmful working environment.

6.3.13 Community Perception

A number of activities during operational phase might potentially cause positive and negative impact on waste pickers and community.

Reemployment of waste pickers to sort waste in the landfill will potentially bring about positive impact on the waste pickers. This is the case because majority of the waste pickers expect that the development of landfill should not prevent them from scavenging. In fact, waste picking is the main source of income and livelihood to majority of waste pickers currently working in the landfill. The reemployment of waste pickers should be communicated and consulted with relevant stakeholders. Any complaints and issues regarding the reemployment of waste pickers can be channelled through existing Grievance Mechanism. The Project is expected to further develop local economy through waste management industry. More business opportunities will be created around the Project location in Tamangapa and surrounding villages adjacent to TPA Tamangapa.

The operation of TPA Tamangapa is also expected to strengthen social cohesion of the community around the landfill between waste pickers and surrounding communities and between local community and in-migrants. This positive impact is expected to take place throughout operational period.

Mobilization and demobilization of filling materials during operational phase might potentially pose negative community perception. To mitigate this impact, proper transportation management should be implemented and socialized to affected communities. Grievance Mechanism will be implemented effectively to accommodate and follow up community complaints and build trust from the community on the whole process of landfill operation including the transportation of filling material. The most impacted communities as the result of mobilization and demobilization are those in Tamangapa Village and other communities living near the main road used for filling material transportation.

6.3.14 Economic impacts

In the operational phase, landfill management activities will resume normally. The presence of waste pickers working in landfills, as well as cattle relying on feed there, will be largely determined by policies made by landfill managers. If the presence of waste pickers and livestock is still permitted, local people can continue to benefit economically from the landfill area. It is probable that the livestock will be banned from roaming freely and only allowed in restricted areas if at all. Mitigations such as feedlots drawing on organic waste from the landfill will mean changes but not necessarily cause significant economic impacts on the livestock owners. If no grazing or waste picking is allowed, it will have a negative impact on their economy. One alternative livelihood solution for wastepickers is to recruit and train some waste pickers to assist operational workers managed by landfills, such as compost or plastic processing, operating dump trucks, and / or through the formalization of recycling activities. It is notable at Aie Dingin landfill that the wastepickers are locals, not migrants, and have established homes as assets, which would not be impacted by changes at the landfill .

6.4 Closure Phase

6.4.1 Excess Emission from Landfill

Data from the Makassar's Solid Waste Management Plan Report 2016 shows the predicted solid waste generation that will be dumped to the TPA Tamangapa were at 9,808,472 tons at the end of year 2036 which mostly comprise of approximately 66% rotting garbage which can be biologically degraded. Landfill gas (LFG) is a natural by product of the decomposition of organic material in landfills. LFG is composed of roughly 50 percent methane (the primary component of natural gas), 50 percent carbon dioxide (CO₂) and a small amount of non-methane organic compounds.

Those excess emission will be regularly emitted during the operation of the landfill, the post closure, until all of the constituents are degraded. Emission of the landfill gas should be managed to minimize the ambient air quality degradation not only during the operation of the landfill but continuously after the closure and post-closure phase.

As described in the previous analysis of landfill gas emission during the operation phase, the excess emission particularly odour annoyance may impact the communities live at the nearby settlements areas of Manggala Village, Tamangapa Village and Bangkala Village.

6.4.2 Decreased Erosion Rate due to the Closure Phase

The closure of landfill through final capping with soil cover and revegetation will reduce the volume of run-off through infiltration and decrease the erosion rate. To optimize the positive impact on this issues; several mitigation measures that can be applied through the closure plan in accordance to the Ministry of Public Work Regulation No. 3 Year 2013.

6.4.3 Surface Water Quality Improvement due to the Landfill Closure

Closure and post closure planning should take place as early as possible which specifies the necessary environmental objectives and controls also the future land-use. The Ministry of Public Work Regulation No. 3 Year 2013 stated that the land use for post closure of the landfill should be green open space and should revegetated with non-food crops.

During the landfill closure, there will be a compaction and covers the open dumping. Rain water precipitation to the ground then run-off to the dedicated drainage systems and flows to the nearby water bodies. Due to the decrease of leachate generation, the surface water quality will gradually improve. It will have the positive impact on surface water quality also indirect impact on the aquatic biota in the river.

6.4.4 Visual Impact

Land utilization after landfill closure is designated as open green space as stipulated in Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management Paragraph 70 Article (1). Landfill closure will involve revegetation of the dumping site after final capping is being conducted. Therefore, revegetation will positively impact the visual of landfill surrounding area. Vegetation in landfill must be maintained regularly by conducting pruning and fertilization every 3 months and watering plants, especially during dry season.

6.4.5 Biodiversity and Habitat

Decommissioning of the TPA Tamangapa will impact positively on the biodiversity and habitat. Closure activities that will positively impact biodiversity and habitat are revegetation and rehabilitation. The landfill closure will bury all food waste that may drive pests into the landfill. In addition, revegetation of fast-growing species such as grass and cover crops will contribute to the betterment of the wildlife habitat. In addition, the final aim for the TPA rehabilitation, this will inevitably contribute to biodiversity and habitat restoration.

6.4.6 Potential of Landslide during the Closure Phase

The potential of landslides during the closure phase is likely to occur due to the unstabilized waste dumping, high moisture levels, and over-steep slopes. As the area in South Sulawesi including the Project Area were considered as the non-earthquakes prone area which can potentially causes landslide; it is unlikely that there will be high impact as long as closure plan implemented in accordance to the design criteria.

6.4.7 Occupational Health & Safety

Cell capping is the activities to close the landfill facilities through heavy work. It involves engineering and restoration layer using heavy equipment and machineries. During the closure and after use of landfill facilities, cell capping will give occupational health and safety risk to the workers during the activities. The occupational health and safety risks that may interfere the workers include:

- Workplace incident/accident;
- Lost time injury which will decrease productivity;
- Lack of training that may lead to an increased risk of accidents moreover fatality;
- Failure to equip workers with PPE that will lead to workplace incident/accident;
- Injuries and/or fatalities related to:
 - Falls from heights due to improper installation and use of formwork/ scaffolding/ stairways / railings;
 - Falling materials;
- Inappropriate use and maintenance of heavy construction machinery and equipment;
- Carrying heavy loads;
- Exposure to air pollution, noise, other harmful substances;
- Ergonomic; and
- etc.

The above identification of occupational health and safety issues are the risks to the workers during cell capping activities. Lack of comprehensive understanding of occupational health and safety requirement for closure of landfill or cell capping activities may cause fatality. Thus, a project must have a proper Environmental and Social Management System (ESMS) in place in accordance with Indonesian Laws and Regulations and International Standard. The ESMS must include the Standard Operational Procedure (SOP) for Closure and After Use Phase. The Working Instruction (WI) as the derivative of the SOP must clearly describe the steps to properly conduct closure or cell capping. The effective implementation of ESMS through socialization and capacity building of each ESMS elements for both contractor and workers will create a safety culture as measure to eliminate fatality during closure phase.

Besides, the effective implementation of ESMS will avoid any occupational ill covering serious and fatal diseases, physical effects on skin, breathing, hearing, mobility and functioning, and psychological effects on mental wellbeing. Therefore, the occupational health and safety risk will greatly reduce by implementation of ESMS particularly elements for closure phase.

6.4.8 Work Termination and Decreased Local Economy

The closure of landfill will affect waste pickers and other stakeholders whose livelihood and income depend on the landfill. It will also decrease local business revenue although it is expected by the time the landfill is closed other business activities have grown around the project area. To mitigate the impact of landfill closure on waste pickers, waste buyers and other impacted stakeholders, proper consultation and socialization of the landfill closure plan will be made at the latest 6 months prior to the closure of the landfill. Early announcement and socialization is preferred to give the affected stakeholders time to prepare and transition from their current profession. Where possible, the Project should help the affected stakeholders such as to disseminate information about new work or business opportunities.

6.5 Impacts & Mitigation Measures Matrix

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
Pre-Construction Phase			
Investigation, design and analysis of investments in equipment or technology	No impact	N/A	N/A
Dissemination of information regarding project activities to waste-pickers and potentially affected peoples	Negative perception and/or social tension	Community perception	Stakeholder engagement plan that includes public consultation and proper dissemination of information to affected communities. Establish Grievance Mechanism at PIU level.
Site investigations (including soil, water, air, noise, odour, biodiversity, etc.) also topographic and geotechnical surveys	Potential contamination from drilling investigations	Soil & Water Quality	Develop and implement drilling management plan. Properly store chemicals and hazard substances in sheltered area and provide kerb or secondary containment to prevent spillage.
Coordination between related institutions	No impact	N/A	N/A
Construction Phase			
Labour recruitment activities and re-organization of livestock and wastepicker access	Increase in community's income (labor for civil works activities), temporary economic spinoff effects	Workforce & Construction Activities Impacts on Host Communities	Identification of goods and services that can be provided by local suppliers. Encourage contractors to use qualified local goods and services providers.
	Negative impact on livelihoods	Economy	Employment, training, access arrangements for pickers; and feedlots or controlled grazing areas.
	Social jealousy between migrant workers with local workers	Workforce & Construction Activities Impacts on Host Communities	Provide initial training for jobs that do not require highly skill set to the locals and waste pickers in order to encourage them to be involved in the construction. Give priority in employing local workers.

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			<p>Establish and disseminate grievance mechanism to affected communities.</p> <p>Create communication forum that consists of project and community representation.</p>
	Potential for migrant labor conflict with local community; crime, disputes, cultural, disease	Workforce & Construction Activities Impacts on Host Communities	<p>Organize and implement local culture induction to migrant labor.</p> <p>Conduct and implement health and safety induction to all workers.</p> <p>Organise regular worker gathering events to enhance bonding among workers.</p> <p>Establish and disseminate grievance mechanism to affected communities.</p> <p>Create communication forum that consists of project and community representation.</p>
Mobilization and demobilization of Equipment, Materials, and personnel during civil works activities	Negative perception and/or social tension	Community perception	<p>Develop and implement transportation management plan that includes usage of material cover during material transportation and/or perform dust control by spraying water on the streets & roads when mobilization is performed during a particular hot day (dry season) twice a day (noon and afternoon).</p> <p>Stakeholder engagement plan that include public consultation and Proper dissemination of information regarding mobilization and demobilization.</p> <p>Establish Grievance Mechanism at PIU level.</p>
	Increase of dust concentration (TSP) in the air	Air Quality	<p>Stabilizing exposed surfaces.</p> <p>Minimizing activities that potentially suspend dust particles.</p> <p>Apply dust control measures such as water spraying for heavily transport areas such as access roads to active construction areas, disturbed areas (e.g. land</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			<p>clearing areas), wet suppression (watering), gravel or asphalt surfacing, and equipment wash down areas etc.</p> <p>Apply water to excavation areas, soil loading/unloading areas and unpaved roads; Create a wheel wash at entrances to public roads or exit of the landfill construction site; Locate material stockpiles as a far as practicable from and downwind of air sensitive receivers (community); Implement speed controls on-site; Ensure that the cab of all soil storage trucks is covered with tarpaulins; Water spraying regularly for dusty static construction areas/ materials/ operations; Controlling lorries and barges loading capacity to avoid spillage. Cover soil stockpiles with erosion control blankets; Use hoarding to attenuate winds and therefore reduce likelihood of wind-blown dust; To apply good practise in construction in sequencing the construction works in phases that minimise scatter impacts that are difficult to control.</p>
	Noise	Noise	<p>Maintain site roads in good condition to reduce noise and vibration from vehicle movements.</p> <p>Utilize the vehicle that has pass the emission test.</p> <p>Scheduling vehicle movement to avoid accumulated noise from vehicles.</p> <p>Adopt good practice for construction site –regular maintenance of vehicles and machinery proper training to operators.</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
	Traffic congestion and site access disruption	Traffic & Transportation	<p>An evaluation of the transport route should be undertaken to mitigate any impact on traffic and transportation.</p> <p>The traffic management plan should be developed and implemented to ensure minimal traffic disruption. The traffic management plan should minimum include transport routes and movement schedule and timing to avoid crowded roads and pick hours.</p> <p>Trucks and construction vehicles in the Project area will only be permitted to use the construction access roads and required to operate at specified speeds.</p>
Civil works for rehabilitation/remediation works of old dumping and landfill cells (including access roads)	Litter	Litter	Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility.
	Noise	Noise	<p>Construction of buffer zones in the construction area.</p> <p>Adopt good practice for construction site –regular maintenance of vehicles and machinery and proper training to operators.</p> <p>Sequencing the phasing construction works in controlled areas to minimize noise.</p> <p>Sequencing construction activities to prevent high combined noise levels during resting hours of the community such as early morning, nap time, and evening.</p>
	Odour	Odour	<p>Develop and implement a working plan to control and minimize odour.</p> <p>Provide temporary cover at the controlled construction site where relevant to minimize prolonged odour nuisance to workers and community.</p> <p>Spray landfill odour control chemicals at designated</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			construction sites during the mining of waste from the landfill.
	Leachate	Water Quality	<p>Recirculate the generated leachate to the old dumping and/or landfill cells.</p> <p>Sequencing the construction work on the existing landfill cells at controlled area at different point of time to reduce leachate spill beyond the landfill area.</p> <p>Provide temporary drains to divert runoff from construction site to other discharge land/rivers/water bodies to prevent additional leachate from runoff contributing into the landfill.</p> <p>Where waste mining works are carried out that leachate needs to be removed from waste, discharge back the leachate into the existing landfill to prevent other surface waterbodies pollution.</p> <p>Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016).</p>
	Disease vectors (flies, rats, mosquitos etc.)	Community Health and Safety	<p>Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016).</p> <p>Construction sites and nearby community should be fumigated regularly to control vectors.</p> <p>Remove any pooled water in less than a week as the Aedes mosquito eggs can develop into adult mosquitoes in less than a week in optimal conditions.</p> <p>Empty any receptacles located on-site that have the purpose of storing water at the end of each day;</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			<p>Any receptacles which can catch and hold rainwater should be stored in an undercover tool storage area or waste storage area;</p> <p>Any free hanging tarpaulins on-site should be taught to prevent water containment.</p> <p>Implement a good practice of waste management at construction site, store food waste and construction materials properly to control rats and flies.</p>
	Health and safety issue of the construction workers	Occupational Health and Safety	<p>Provide full PPEs to workers.</p> <p>Conduct health and safety training and induction to staff on regular basis.</p> <p>Conduct daily safety induction before work start.</p> <p>Provide sufficient training to workers and operators to ensure proper operation of equipment and machineries.</p> <p>Implement good practice of construction, regular maintenance of vehicles, equipment and machineries to ensure their functions, safety and efficiency.</p> <p>Purchase incident/accident insurance as minimum and medical insurance to all workers.</p> <p>Regular medical check up to all workers, especially on sickness that are associated with landfill working environment.</p> <p>Provide or encourage workers to include fresh milk and green tea in their daily portion to increase immune system to work in toxic working environment.</p>
	Surface and ground water pollution	Water Quality	<p>Implement the landfill rehabilitation plan.</p> <p>Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			<p>compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016).</p> <p>Implement proper hazardous waste and hazard substances storage and management at construction site. Hazardous waste and hazard substances shall be stored at concrete area with roof and kerb/secondary containment kerb to prevent spillage to waterbodies.</p>
Demolitions works	Temporary traffic disruption due to access road rehabilitation activities	Traffic & Transportation	Implement the Traffic Management Plan.
	Increase of dust concentration (TSP) in the air	Air Quality	<p>Installation of barriers around demolition works area to minimize dust.</p> <p>Stabilizing exposed surfaces.</p> <p>Spraying water regularly at dusty demolition areas, maintain a minimum moisture content during demolition works.</p>
	Noise	Construction & Demolition Waste Generation	<p>Installation of noise barriers around demolition works area to minimize noise.</p> <p>Restrict noisy demolition works during day hours to avoid resting hours.</p>
	Construction waste	Construction & Demolition Waste Generation	<p>Construction waste to be disposed accordingly. General construction waste can be disposed into the existing landfill.</p> <p>Segregate hazardous waste for proper storage and collected by licensed hazardous waste collectors.</p>
	Decrease of water quality due to demolition debris	Water Quality	Assign designated waste storage area within demolition site to store general waste that are

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			disposed into the landfill. Proper storage of hazardous waste from demolition with shelter, concrete floor and kerb/secondary containment.
Construction of the new landfill cell	Increased dust concentration (TSP) in the air	Air Quality	Regular water spraying to reduce dust. Operate wheel wash at entrances to public roads or exit of the landfill construction site for all construction vehicles; Locate material stockpiles as far as practicable from and downwind of air sensitive receivers (community); Cover soil stockpiles with erosion control blankets; Use hoarding to attenuate winds and therefore reduce likelihood of wind-blown dust; To continuously implement good practice in construction in sequencing the construction works in phases that minimise scatter impacts that are difficult to control and proper handling and transportation of construction materials.
	Noise generated by civil works activities	Noise	Installation of barriers around civil works area to minimize noise and not doing any construction works at night.
	Biodiversity decrease due to loss of habitat	Biodiversity & Habitat	Limit the construction area according to the planned DED.
Construction of waste transfer stations, waste sorting and segregation facilities	Increased dust concentration (TSP) in the air	Air Quality	Develop and implement a working plan to control and minimize construction dust and particles/odour and implement dust control measures as discussed above where applicable.

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
	Noise and vibration generated by civil works activities	Noise and Vibration	<p>Installation of barriers around civil works area to minimize noise and not doing any construction works at night.</p> <p>Operating the earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible.</p> <p>Adopt good practice for construction site –regular maintenance of vehicles and machinery and proper training to operators.</p> <p>Sequencing the phasing construction works in controlled areas to minimize noise.</p> <p>Sequencing construction activities to prevent high combined noise levels during resting hours of the community such as early morning, nap time, and evening.</p>
	Surface water runoff & erosion	Water Quantity & Erosion	<p>Minimizing land disturbance.</p> <p>Managing ground cover, cover expose soil by soil erosion control blanket.</p> <p>Provide temporary drains to divert runoff from construction site to other discharge land/rivers/water bodies.</p> <p>Proper handling of waste to avoid spillage.</p>
Construction of environmental protection facilities including new leachate treatment facilities, installation of landfill gas collection systems	Impacts from residual construction material run-off	Water Quality	<p>Minimizing land disturbance</p> <p>Managing run-on to disturbed areas</p> <p>Managing drainage within disturbed areas</p> <p>Managing ground cover</p> <p>Managing runoff and sediment exiting disturbed areas</p>

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
	Temporary traffic disruption due to access road rehabilitation activities	Traffic & Transportation	Implement the Traffic Management Plan
	Noise	Noise	Installation of barriers around construction works area to minimize noise and not doing any construction works at night
	Decrease of water level due to changes in operational schedules	Water Quantity	Managing run-on to disturbed areas Managing drainage within disturbed areas
Installation of Intermediate Treatment Facilities (ITF) - Installation of equipment / advanced technology options (anaerobic digesters and refuse-driven fuel production)	Impacts from residual construction material run-off	Water Quality	Minimizing land disturbance Managing run-on to disturbed areas Managing drainage within disturbed areas Managing ground cover Managing runoff and sediment exiting disturbed areas
	Temporary traffic disruption due to access road rehabilitation activities	Traffic & Transportation	Implement the Traffic Management Plan
	Negative perceptions of new technology and its potential impacts on human health	Community perception	Proper consultation with and dissemination of information to local communities on health impacts, and input to timing/operational schedule Establish and implement Grievance Mechanism at PIU level.
	Air quality impact due to commissioning of the ITF	Air Quality	Utilize the equipment that has met design criteria so that the air quality emission is below the applicable standards.
Implementation Phase			
Re-employment of waste pickers in land	Negative perception / social tension	Community	Proper consultation with and dissemination of information to local communities on employment

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
fills and re-organisation of livestock used to grazing in landfill		perception	options, alternatives and timing. Establish and implement Grievance Mechanism at PIU level.
	Re-employment of waste pickers in land fills and re-organisation of livestock used to grazing in landfill	Re-employment of waste pickers in land fills and re-organisation of livestock used to grazing in landfill	Re-employment of waste pickers in land fills and re-organisation of livestock used to grazing in landfill
	Occupational health and safety of the workers	Occupational Health and Safety	Provide waste pickers with appropriate protective clothing, gloves, respiratory face masks and slip resistant shoes and hard soled safety shoes to avoid puncture wounds to the feet. For waste pickers near loud equipment, include noise protection. For waste pickers near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of hard hats; Conduct socialization regarding occupational health and safety matter to all waste pickers; Provide safety signage on the landfill site; Provide barricading in the landfill facilities; Provide training regarding to the use of PPE, other related occupational health and safety related issues; Provide grievance mechanism for waste pickers; and Conduct monitoring on waste pickers occupational health and safety issues. Provide medical insurance to waste picker as part of the employment benefit.

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			Provide/encourage waste pickers to have regular medical check up.
Waste collection and transport	Visual impact	Visual impact	Covering the vehicle during waste transport. Providing vehicle wheels washing bay at the exit of the landfill. Scheduling waste transportation hours to avoid heavy traffic and peak hours.
	Litter	Litter	Covering the vehicle during waste transport
	Air emission generation including dust, bio-aerosol, and vehicle emission	Air Quality	Establishing frequent waste collection schedules Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions
	Odour	Odour	Minimize the odor emissions by covering the vehicle during waste transport and installation of green barriers between the public roads and the MSW access road
Waste receipt, loading, and unloading	Litter	Litter	Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility
	Air emission generation including dust and bio-aerosol	Air Quality	Develop and implement a standard operation procedure to control and minimize emission of dust and bio-aerosol during loading/unloading
	Noise and vibration generated from trucks, loading equipment (crane and wheeled loaders), stationary compactor, etc.	Noise and Vibration	Develop and implement traffic management plan to ensure minimal traffic disruption. Installation of barriers around loading/unloading area to minimize noise.
Mobilization and demobilization of filling materials	Negative perception and/or social tension	Community perception	Develop and implement transportation management plan that includes usage of material cover during material transportation and/or perform dust control by spraying water on the streets & roads when mobilization is performed during a particular hot day

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			(dry season) twice a day (noon and afternoon) Stakeholder engagement plan that include public consultation and Proper dissemination of information to impacted communities about project operation and mobilization and demobilization of filling materials Establish and implement Grievance Mechanism at PIU level.
	Increased dust concentration (TSP) in the air	Air Quality	Develop and implement traffic management plan
	Noise	Noise	Utilize the vehicle that has pass the emission test
	Traffic congestion and site access disruption	Traffic & Transportation	Implement the traffic management plan
	Increasing turbidity in surface water from filling material that fell during mobilization	Water Quality	Develop and implement transportation management plan that includes usage of material cover during material transportation and/or perform dust control by spraying water on the streets & roads when mobilization is performed during a particular hot day (dry season) twice a day (noon and afternoon)Conduct the application of speed limit
Landfill cell operation	Litter	Litter	Intall wind fencing upwind of the tipping area to reduce the wind strength as it crossess the facility
	Leachate generation	Water Quality	Minimize the daily exposed working face and use perimeter drains and landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste. Prevent run-on of precipitation into the active area

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
			of the landfill Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016)
	Gas emission	Air Quality	Include landfill gas collection system designed and operated in accordance with the applicable national requirements
Leachate collection and treatment	Decreasing level of water quality due to contamination in the water body from untreated leachate	Water Quality	Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016) Regular monitoring of effluent quality to ensure leachate treatment plant operates well
	Aquatic biota disturbance due to contamination in the water body from untreated leachate	Aquatic Biota	Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016)
	Increase on water borne diseases due to the contamination of un-treated leachate in the water bodies	Community Health & Safety	Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016)
	Hazardous waste from the sludge generation	Hazardous waste	Collect hazardous waste in the TPS B3 and dispose the hazardous waste through the licensed hazardous waste disposal
Landfill gas capture Operation of ITF Facilities - advanced technology (anaerobic digesters and refuse driven fuel production) composting, WtE	Emission of bio-aerosols such as CH4 H2S	Air Quality	Include landfill gas collection system designed and operated in accordance with the applicable national requirements
	Increase of Odour (H2S) contaminant	Odour	Application on technical approach such as installation of solid waste cell, which will accommodate the city

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
	in the ambient air		waste generation to be compacted and covered with soil in the daily basis.
	Ambient air quality decrease due to generation of CO2	Air Quality	Include landfill gas collection system designed and operated in accordance with the applicable national requirements
	Increase of Odour (H2S) contaminant in the ambient air	Odour	Application on technical approach such as installation of solid waste cell, which will accomodates the city waste generation to be compacted and covered with soil in the daily basis.
	Hazardous waste from the soot	Hazardous Waste	Collect hazardous waste in the Hazardous Waste Temporary Storage and dispose the hazardous waste through the licensed hazardous waste disposal
Heavy equipment workshops and operation of supporting facilities	Hazardous waste generation from oil/fuel spill	Hazardous Waste	Applied the ERP for oil spill
	Surface water quality impact due to the contamination of wastewater from truck/vehicle wash	Water Quality	Direct the wastewater from truck/vehicle wash to the drainage channel
Closure & After- use			
Cell capping and closure	Occupational health & safety during cell capping works	Occupational Health & Safety	PPE Utilization for workers; conduct safety induction before work start
	Leachate generation	Water Quality	Channeling and treating the leachate to the Leachate Treatment Plant before discharging to the water bodies
	Landfill gas emission	Air Quality	Include landfill gas collection system designed and operated in accordance with the applicable national requirements

Source of Impact	Possible Impacts	Aspect	Proposed Impact Management Measures
	Landslide occurrence due to unstable waste pile	Landslide	Applied the landfilling method as stated in the design criteria and conduct the soil cover compaction
	The closure of landfill for waste pickers and waste collector activities, work termination	Work Termination & Decreased Local Economy	Proper socialization/dissemination of landfill closure to affected communities prior to the closure as well as dissemination of information other jobs/business opportunities
Landscaping	Positive visual impact due to changes of landscape	Visual Impact	Provide top soil layer as part of permanent capping layers for greenery.
	Biodiversity enhancement from revegetation at landfill area	Biodiversity	Application of cover components that are consistent with post closure use and local climatic condition
	Decreasing run-off	Water Quantity & Erosion	Final capping layer shall include impermeable layers such as membrane to prevent infiltration into the landfill. Runoff from the landfill catchment after proper final capping is clean runoff and shall be diverted to receiving waterbodies. Capping shall be designed with proper sloping level (minimum 3%) and geo drains if necessary for runoff to flow.
Monitoring	No impact	N/A	N/A
Afteruse	Increasing area for green open space	Change of Land Use	Monitoring arrangements on the utilization of green open space as part of the closure plan

6.6 Cumulative Impact

The latest revision of PS 1 to be enacted on 1 January 2012, states that *“Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project’s area of influence.”* It goes on to state that area of influence encompasses *“cumulative impacts that result from the incremental impact on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.”*

Thus for the purposes of this assessment, cumulative impacts are defined as the incremental impact of the project after mitigation, considered in the context of other projects and activities in the area, from the perspective of the sensitive receptors identified during Makassar’s SWM impact studies.

An assessment of cumulative impacts is an analysis of contribution of impacts from the proposed development onto the existing impacts from other projects, or incremental impacts that are also being contributed by other developments in the vicinity, or areas or resources used or directly impacted by the project, from the existing, planned or reasonable defined developments at the time the risks and impacts identification process is conducted.

It is known that there will be no other planned development in the vicinity of the landfill that is developed at the same time of the landfill rehabilitation and upgrading. As such, there is no cumulative impacts expected from other developments.

Another aspect of cumulative impacts is incremental impacts on top of the existing baseline impacts. The project site is currently an open dumping ground with no proper designed sanitary landfill which has already caused significant impacts to the environment and the community. With the rehabilitation and upgrading of the landfill, there will be temporary cumulative impacts during construction stage. However, the impacts are expected temporary and not significant, so cumulative impact is insignificant. When the construction is completed, the landfill conditions will be improved in terms of its layout, operation standards, and associated facilities to control leachate and other pollutants that create significant positive impacts. Hence, there is no cumulative impacts expected during operation stage.

The potential temporary cumulative impacts during construction are identified as follows:

- Noise and air pollution from emissions during construction: As existing landfill has generated methane and carbon dioxide from waste degeneration and noise and emissions from trucks and machineries that are currently operating the landfill, additional noise and emissions from vehicles and machineries operating during construction are considered cumulative noise and air pollution impacts. Noise and air pollution sensitive receptors are mainly community in the vicinity of the landfill and waste pickers. These impacts are localised and short-term during the construction hours. Noise level will reduce quickly by distance in the open and wide site and polluted air will be dispersed quickly to the ambient air;
- Traffic increase: a number of traffic increase will occur during the construction stage due to material transportation, workers movement and machineries deployment. This will cause incremental traffic impact that cause traffic congestion, more frequent traffic jams, and potentially risk of traffic incident/accident. Traffic impact receptors are the nearby community and road users.

The above cumulative impacts cause the same consequences to the environment and the community as discussed in the earlier chapter on impacts during construction. Other than that, the rest of impacts during construction are not considered cumulative impacts. Either the impacts have existed on the landfill itself, such as impacts from odour, surface water erosion, leachate generation, community health & safety etc rather than from construction, or other impacts from construction such as workforce/community, economic, occupational health & safety etc are new impacts from the

development. Another impact from construction is waste generation that is considered very minor impact, as the landfill itself is a dumping ground for wastes.

7 PUBLIC CONSULTATION & GRIEVANCE MECHANISM

7.1 Public Consultation

Public discussions are required as one of the conditions for financing the projects by the WB, for the projects to be sustainable depending of the characteristics of the project. Public consultations are also required as part of the environmental impact assessment (AMDAL) process for the Government of Indonesia. A public consultation for Makassar TPA Tamangapa has already been conducted as a legal requirement for the previous AMDAL process. The public consultations included open forum meetings where members of the project, local government, environmental consultants, community representatives, NGOs and other project stakeholders were invited to hear a presentation of the project by the local government and open discussion and feedback involving all parties present. A summary of the public consultations conducted under the AMDAL are provided in **Appendix 4**.

As a continuation of the WB project Feasibility Studies, a further round of public consultation was held on 10th 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 will be incorporated in the ESIA process and the discussion results will be taken into account in the final documents.

A summary of both public consultations and presentation documents is provided in **Appendix 4**.

7.2 Grievance Mechanism

The Project has developed a grievance mechanism which must be implemented at the project construction inception phase and maintained throughout the life of the project. The Grievance mechanism is designed to allow community, workers, stakeholders to report incidence, issues, grievances to the project and have these properly recorded, responded to, and where necessary action and settlement conducted to follow due process in line with the laws regulations and standards of the Gol and WB.

The Grievance Mechanism are presented in **Appendix 5**.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Overview

The EIA Study carried out for the TPA Tamangapa has focused on the assessment and mitigation of the potential impacts associated with the construction and operation of the landfill rehabilitation, upgrading and expansion project. This ESMP covers the management and monitoring of environmental and social indicators of TPA Tamangapa at Manggala Subdistrict, around 14 km to the east of Makassar city center.

Makassar, the capital of South Sulawesi, with a population of 1.7 million people generates an average of 4,495 m³/day of waste, of which around 68% are organic. A total of 143 Kelurahan within 14 Kecamatan are serviced by the existing TPA Tamangapa.

The existing waste facility operates with 6 cells that will be rehabilitated, upgraded and expanded to accommodate anticipated growing future waste volumes and to comply with Indonesian waste regulations.

The following section contains a framework of ESMP for TPA Tamangapa. One of the key outputs is mitigation measures and monitoring to be undertaken in order to ensure that environmental and social impacts are minimised and residual impacts comply with regulatory requirements and follow the best practice. An ESMP is developed with two key components:

- A Environmental and Social Management Plan to provide framework for comprehensive management of the project implementation, including construction and operation; and
- A Monitoring Plan to monitor environmental and social risk and impact indicators during construction and operation stages.

The ESMP is developed based on the WB Environmental and Social Management Framework (INDONESIA: Improvement of Solid Waste Management to Support Regional and Metropolitan Cities) and the existing EIA documents prepared for the same project. It is a living document that is prepared during the feasibility study stage that detailed design and operation of the landfill is not available. The plan needs to be updated on regular basis commensurate with the specific design, planning and implementation of the project and aligned to and adjusted in accordance with any further future EIA studies.

8.2 Objectives

The objectives of the ESMP are as follows:

- To provide management framework that will be adopted at management level during project implementation;
- To provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- To monitor the performance of the construction and operation works and the effectiveness and timely implementation of mitigation measures;

- To ensure the construction and operational works are in compliance with regulatory requirements, standards and government policies; and
- To undertake remedial action if unexpected problems or impacts arise.

8.3 The ESMP Organisation Chart

The proposed ESMP organization and lines of communication with respect to environmental and social protection works for construction and operational stages are prepared for construction and operation stages in order to set up management committee to implement the ESMP. The flowchart of ESMP coverage and evaluation cycle is shown in Figure 8-1. The organisation chart and communication flows are presented in Figure 8-2 and Figure 8-3, respectively.

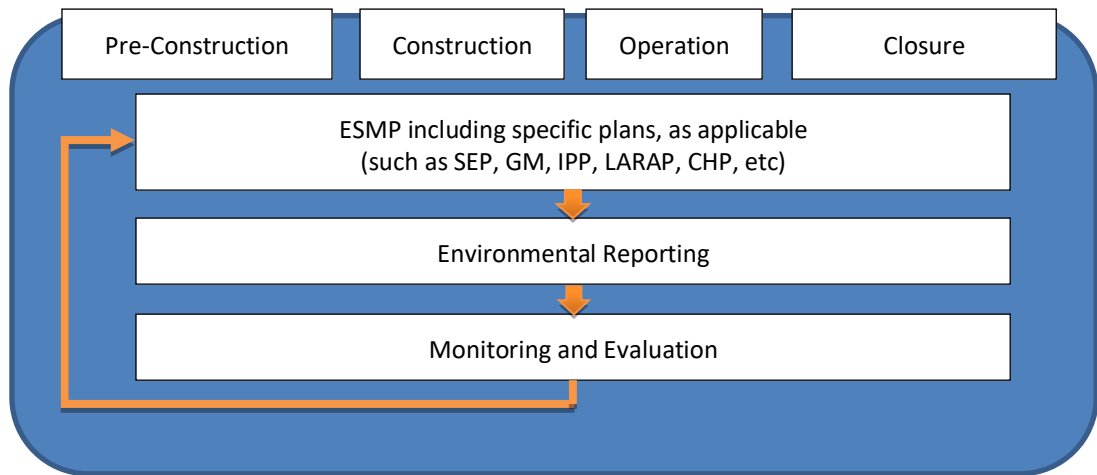


Figure 8-1 ESMP coverage and Evaluation Cycle

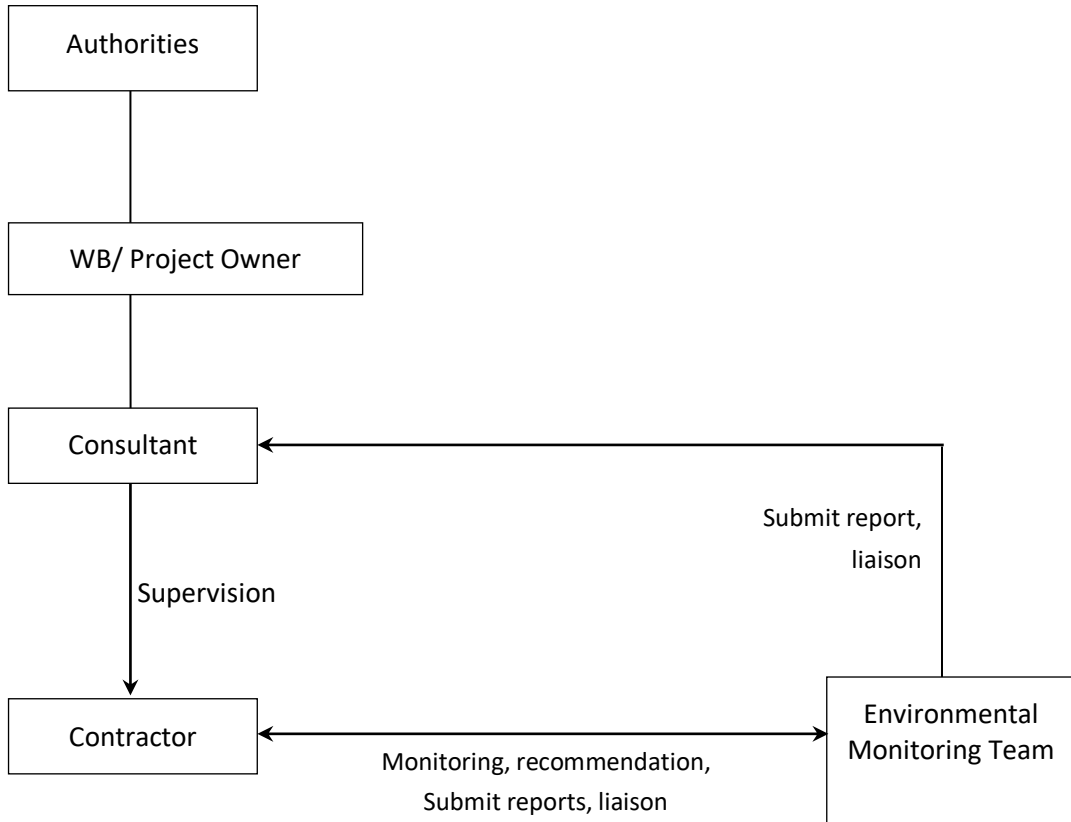


Figure 8-2 Organisation Chart for Construction Stage

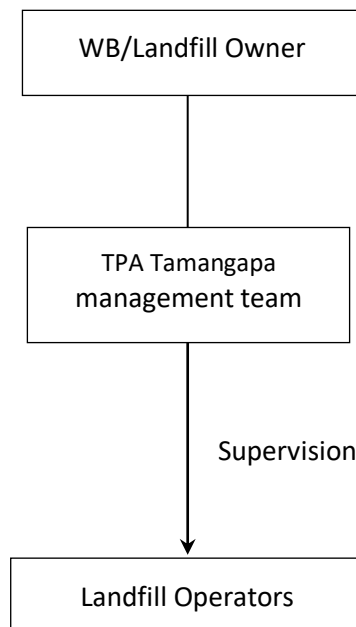


Figure 8-3 Organisation Chart for Operation Stage

The roles and responsibilities of the various parties involved in the ESMP and the organisations' responsible for implementing the ESMP are outlined below.

8.3.1 Construction stage

The Consultant

The term "Consultant" refers to the organization that is responsible for overseeing all the construction works undertaken by various contractors and will act on project owner's behalf. The Consultant will represent the project owner to manage the project and give instruction to contractors during construction. The Consultant should ensure that the construction works are performed by the contractors in accordance with the specification and contractual requirements. The consultant should:

- Monitor the contractors' compliance with contract specifications, including the implementation of the environmental and social mitigation measures and ensure their effectiveness, and other aspects of the environmental and social audit programme;
- Coordinate with WB/Project Owner's Environmental Engineers to monitor the implementation of environmental and social monitoring programme by an Environmental Team and ensure that the requirements in the environmental and social monitoring programme are fully followed;
- Participate in the site monitoring activities undertaken by the Environmental Team;
- Comply with the agreed Event / Action Plans in the event of any exceedance;
- Adhere to the procedures to carry out complaint investigation.

The Contractor

The term "Contractor" refers to all construction contractors and sub-contractors working onsite at any one time.

The contractors play a very important and active role as a key party in environmental and social protection during construction stage. The Contractor shall be responsible for all impacts on the environment which result from his construction activities. Such impacts include any form of pollution affecting those outside the site boundary. The Contractor shall also be responsible for ensuring the health of the public and workers who may be affected by his construction activities.

The Contractor should have an environmental team comprising of sufficient workers and one EHS officer for the duration of the construction, solely for the purpose of environmental and social control and maintenance only. This team of workers shall not be employed to work as part of the construction team.

Roles of the Contractors when working with different parties are as follows:

- Work under the relevant contract scopes and other tender conditions;
- Corporate with the Environmental Team to carry out monitoring, laboratory analysis, site inspection and reporting of the monitoring and environmental and social monitoring results;
- Provide necessary assistance to the Environmental Team in carrying out monitoring works and the implementing the environmental monitoring programme;

- Participate in the required site audits undertaken by the Environmental Team and undertake any corrective actions instructed by the Consultant;
- Provide information/advice to the Environmental Team regarding work activities which may contribute or continuously create adverse environmental conditions;
- Submit mitigation measure proposals in case of exceedances of Action and Limit levels in accordance with the Event/Action Plans;
- Implement measures to reduce impact where Action and Limit levels are exceeded;
- Adhere to the procedures to carry out complaint investigation.

8.3.2 Operation stage

Landfill Management Team

The Landfill Management Team should oversee all activities carried out during the operation of the landfill and carry out regularly monitoring to ensure limited environmental and social impact caused. The Team's roles are:

- Monitor the contractors' compliance with contract specifications, including the implementation of the landfilling of waste into the landfill in a proper manner and environmental and social mitigation measures during operation to ensure the environmental and social impacts are controlled;
- To carry out water quality monitoring regularly ensure the leachate treatment plant is operated well and the water quality comply with the discharge limit;
- To report to authorities and propose Action Plans in the event of any exceedance;
- To follow up with action plans' implementation to address the issues;
- Adhere to the procedures to carry out complaint investigation.

The Landfill Operator

A Landfill Operator will carry out landfill operation activities for the landfill after completion of construction. Responsibilities of the operators are as follows:

- To carry out landfilling activities in a proper manner;
- To implement all mitigation measures proposed in the EIA for operation to make sure that the environmental and social impacts are controlled during operation;
- To operate the leachate treatment plant and ensure the working performance of the plant;
- To cooperate with and provide necessary assistance to the Landfill Management Team to carry out monitoring, laboratory analysis, site inspection and reporting of the monitoring and environmental and social monitoring results;
- To provide information/advice to the Landfill Management Team regarding work activities which may contribute or continuously create adverse environmental and social conditions;
- Submit mitigation measure proposals in case of exceedances of Action and Limit levels in accordance with the Event/Action Plans;
- Implement measures to reduce impact where Action and Limit levels are exceeded;
- Adhere to the procedures to carry out complaint investigation.

8.4 ESMP Actions - ESMS

The ESMP actions in the following sections have been developed specifically for use at the TPA Tamangapa. The ESMP actions have been produced to address potential issues based upon discussions, desktop studies, previous complaints, and from site visit observations.

Environmental issues that require environmental and social management plans based upon the potential impacts of Project activities are:

- Air quality and Odour
- Biodiversity and Aquatic Biota
- Climate Change/Greenhouse Gas Emission Reduction (Gas collection and flaring/power, or (crude) composting)
- Cultural Heritage and Chance Find Procedure
- Emergency Response and Preparedness Plan
- Grievance Mechanism
- Indigenous Peoples
- Economic Impacts on Wastepickers and Livestock owners
- Labor and Working Conditions including Occupational Health and Safety
- Landscaping/Visual Impact
- Noise, Vibration
- Soil Quality
- Solid Waste Management
- Stakeholder Engagement (Public Consultation and Information Disclosure)
- Traffic and Transportation
- Wastewater management
- Water Quality

Each of the environmental and social management plan is in general structured as follows:

- Objectives
- Management strategies
- Monitoring plan
- Responsibilities
- Frequency
- Monitoring and reporting
- Corrective actions

8.4.1 Air Quality and Odour Management Plan

The main emission parameters to be managed are dust (particulate matter), sulphur oxides, and nitrogen oxides from waste collection vehicles, heavy construction equipment and machineries, and heavy landfill operation equipment, and GHG Methane emissions from waste heaps/cells, as well as gas flaring and bio aerosols.

8.4.1.1 Objectives

The objective of the Air Quality and Odor Management Plan is to minimise the impacts from the landfill rehabilitation, upgrading and expansion project as well as landfill operation to air quality that ensure compliance with the relevant provisions of South Sulawesi Governor Regulation No 69/2010

on Standard and Criteria of Environmental Damage, Government Regulation No 41/1999 on Air Pollution Control and Minister of Environment Decree No 50/1996 on Odour Level Threshold.

8.4.1.2 Management Strategies

The performance objectives above are achieved by 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.

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.

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.

8.4.1.3 Monitoring Plan and Reporting

Air quality and odour monitoring plan will be undertaken by landfill management at established monitoring sites and near sensitive receptors that may include dust, vehicle emission and odour on 6 monthly basis during construction, operation and closure stage. All scheduled monitoring shall be reported to related agencies every 6 months, or as and when required.

The threshold limit value of ambient air is outlined in South Sulawesi Governor Regulation No 69/2010 on Standard and Criteria of Environmental Damage, Government Regulation No 41/1999 on Air Pollution Control and Minister of Environment Decree No 50/1996 on Odour Level Threshold.

8.4.1.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- No complaints related to air quality and odour management;
- Waste collection schedules and route are followed and maintained;
- All mitigation measures of air quality and odour controls are implemented where relevant during the construction and operation stages;
- Air quality and odour monitoring is undertaken according to established schedule.
- Air quality and odour monitoring result comply with the Indonesian Laws and Regulation.

8.4.2 Biodiversity and Aquatic Biota

8.4.2.1 Objective

The objective of Biodiversity and Aquatic Biota Management Plan is to mitigate biodiversity and habitat issues, especially during any future expansion that affects areas of non-disturbance and high biodiversity, and to maintain disturbance on aquatic biota. At this stage, disturbance to biodiversity and habitat is minimal, considering that the landfill is already located at a relatively dense human settlement area. Meanwhile, the aquatic biota condition will likely be impacted by leachate pollution in the nearest surface water.

8.4.2.2 Management Strategies

The performance objectives above are achieved by the following management strategies:

During construction stage:

- Avoid contamination from drilling during construction;
- Conduct land clearing based on the project design and refrain from opening areas outside the designated boundary; and

- Conduct greening surrounding the area of the waste facility with fast-growing species or local species, such as Acacia and bamboo species, which are available and can be used in the waste facility.

During operation stage:

- Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards (Minister of Environment and Forestry No. 59 Year 2016).

8.4.2.3 Monitoring Plan and Reporting

Aquatic biota monitoring plan will be undertaken by landfill management at established monitoring sites and near sensitive receptors on 6 monthly basis during construction, operation and closure stage. All scheduled monitoring shall be reported to related agencies every 6 months, or as and when required.

Any implementation of the Biodiversity Management, or the emergence of any other Biodiversity issue, is carefully documented and reported periodically, and any other reports under this ESMP to lenders.

Any complaints as to the management of Biodiversity or Biodiversity issues are forwarded to the landfill management as soon as practical. Complaints, and any actions arising from a complaint, will be recorded in a grievance register to be maintained by site management.

8.4.2.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Contamination of site is avoided.
- Construction plans and implementation are being continuously monitored.
- No disturbance on aquatic biota abundance level in the river.
- Aquatic biota monitoring is undertaken according to established schedule.

8.4.3 Economic impacts on wastepickers and livestock owners

8.4.3.1 Objectives

The objective of Economic Impact Management Plan is to minimize negative effects on livelihoods of affected people and ensure that no parties are impoverished as a result of project activities.

8.4.3.2 Management Strategies

The management strategy is to provide alternative activities and arrangements that allow for waste-pickers and livestock owners to continue the productive activities related to the landfill, with adjustments that meet the technical and safety requirements of the landfill/project. The following management strategies are planned:

During construction stage:

- Fencing and feedlots as alternative locations for livestock;
- Employment of waste pickers in construction activities;
- Redevelopment or creation of areas where waste sorting can be carried out formally or informally.

During operation stage:

- Fencing and feedlots as alternative locations for livestock;
- Employment of waste pickers in landfill operation activities;
- Redevelopment or creation of areas where waste sorting can be carried out formally or informally.

8.4.3.3 Monitoring Plan and Reporting

Monitoring of livestock and waste-picker activity will be done on a weekly basis through observation and community engagement, and on a six monthly basis during construction and initial operations, using targeted purposive sampling for interviews, FGDs or surveys, to be determined with stakeholder input. Baseline economic data serves as a reference for changes in economic activities and incomes.

All scheduled monitoring shall be reported to related agencies every 6 months, or as and when required.

8.4.3.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Landfill operations are working smoothly and according to standards;
- Number of incidences involving waste pickers and cattle;
- Stable income levels of sample of waste picker households; and
- Proportion of wastepickers and livestock owners accessing support for mitigation of economic impacts.

8.4.4 Climate Change and Greenhouse Gas Emissions

8.4.4.1 Objectives

The objective of Climate Change and Greenhouse Gas Emissions Management Plan is to minimize greenhouse gas emissions from the landfill which would contribute to climate change.

8.4.4.2 Management Strategies

The management strategy of minimizing greenhouse gas emissions and climate is to limit the production of methane (CH₄) and carbon oxides (CO_x) by the following management strategies:

During construction stage:

- Conduct greening surrounding the area of the waste facility to capture greenhouse gases.

During operation stage:

- 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.

8.4.4.3 Monitoring Plan and Reporting

Methan gas (CH₄) monitoring will be undertaken by accredited laboratorium and supervised by landfill management at 6 (six) established sampling points (as outlined in Minister of Public Work Regulation No 03/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management) on 6 monthly basis.

All scheduled monitoring shall be reported to related agencies every 6 months, or as and when required.

Any complaints as to the management of onsite methane gas production and fuel consumption efficiency are recorded and all records are maintained by management.

8.4.4.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Landfill gas collection system is working smoothly and according to standards;
- Fuel consumption efficiency in line with project activities;
- Methan gas production is being monitored regularly; and
- Greening is established surrounding the waste facility.

8.4.5 Cultural Heritage and Chance Find Procedure

Physical cultural resources are sites, areas, objects, or artifacts having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural, religious, or spiritual significance to a religious group, ethnic group and/or the wider public or nation. These include movable or immovable objects, sites, and structures, groups of structures, and natural features and landscapes. As examples: sacred landmarks, sacred burial sites or human remains, pilgrimage sites or routes, fossils, rock drawings, ancient structures, and places of worship.

Consistent with World Bank Operational Principles, the Project is sensitive to both tangible (cultural sites, graves and gravesites, religious structures) and intangible (traditional folklore, songs, etc.) cultural heritage settings of its location. If Cultural Property/Physical Cultural Resources are found, the Project will conduct a Cultural Heritage study of the Project site and any affected surrounding communities and develop a Cultural Heritage Plan.

To date, need for a Cultural Heritage Plan has not been indicated. The Project does apply a Chance Find Procedure to ensure that any cultural heritage accidental findings during Project implementation can be dealt with in accordance with Gol regulations and World Bank Operational Manual.

8.4.5.1 Objectives

There is always the potential for earthworks or infrastructure development to inadvertently expose archeological relics or other items of tangible cultural heritage. The objective of the Chance Finds Procedure is to ensure in such cases compliance with:

- Law No 11 of 2010 on Cultural Heritage (UU No 11/2010 tentang Cagar Budaya);
- World Bank Operational Manual OP/BP 4.11; and indirectly
- UNESCO Convention for Protection of World Cultural and Natural Heritage of 1972.

The UNESCO Convention is the foundation for international and national agreements and legislation requiring signatories to adopt policies for, among other purposes the protection and conservation of cultural and natural heritage. A Chance Finds Procedure as described below is the basic first step in protection and conservation of newly discovered tangible cultural heritage, in accordance with all three of the regulatory references above.

8.4.5.2 Management Strategies

The two keys to an effective Chance Finds Procedure are:

1. Supervising personnel must have been trained to understand what a cultural heritage “find” is and looks like, and implement the Procedure immediately upon a discovery.
2. Site management must know exactly who in the Government Authorities is to be notified.

If any person discovers a physical cultural resource, such as archeological sites, historical sites, remains, and objects, or a cemetery and/or individual graves during excavation or construction, the Proponent, through the employee or contractor supervisor onsite, shall:

1. Stop all construction activities in the vicinity of the chance find.
2. Delineate conservatively the discovered site or area.
3. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until responsible local authorities take over.
4. Notify the local authorities immediately (within 24 hours).
5. Responsible local authorities are in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings be performed by archeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, including aesthetic, historic, scientific or research, social, and economic values.
6. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance), and or some combination of conservation, preservation, restoration, and salvage.
7. Implementation of the authorities’ decision concerning management of the finding shall be communicated in writing by relevant local authorities.
8. Construction works may resume only after permission is granted by responsible local authorities concerning safeguarding the physical cultural resource.

Any conflicts, disputes, or complaints with respect to management of Cultural Heritage issues or Chance Finds actions that arise are to be investigated immediately by senior management and corrective action devised and implemented as necessary.

8.4.5.3 Monitoring Plan and Reporting

Any implementation of the Chance Finds Procedure, or the emergence of any other Cultural Heritage issue, is carefully documented and reported in the periodic monitoring and evaluation reports, and any other reports under this ESMP to lenders.

Any complaints as to the management of Cultural Heritage or Chance Finds issues are forwarded to the Head of Landfill Management as soon as practical. Complaints, and any actions arising from a complaint, will be recorded in a grievances register to be maintained by site management.

8.4.6 Emergency Response and Preparedness

8.4.6.1 Objectives

The objectives of Emergency Response and Preparedness Plan is to prepare TPA Tamangapa personnel for potential accidents and emergency situations that may arise during the Project.

8.4.6.2 Management Strategies

To achieve the above objectives, TPA Tamangapa prepares procedures to prevent, mitigate, and respond to the following emergency situations:

- Fires, explosions;
- Rainstorms, flooding, and other unexpected extreme weather conditions;
- Earthquakes;
- Chemical spillage or leakage;
- Accidents as a result of equipment failure.

The following actions are undertaken to implement the above management strategies:

During Construction

- Require the contractor to develop or provide Emergency Response and Preparedness Plan to mitigate the impacts of accidents and emergency situations during construction.

During Operation

- Prepare Emergency Response and Preparedness Plan to mitigate the impacts of accidents and emergency situations during operation;
- Undertake emergency procedures training at inductions;
- Arrange appropriate drills for various departments;
- Set emergency contact hierarchy and communication protocol.

8.4.6.3 Monitoring Plan and Reporting

Landfill management should conduct monthly inspection to the project site and ensure the site to have proper recordkeeping and documentation. The inspection shall include:

- Training
- Fire fighting equipment checking

- Site condition
- Observation of ERP implementation
- Periodic emergency drills
- Compliance with applicable regulatory and corporate requirements

Any emergency occurrences are reported immediately through proper communication protocol and hierarchy.

All relevant parties at the project site including contractor and operator should report to the landfill management related to the implementation of ERP, which includes training undertaken, emergency drill conducted and fire fighting equipment.

8.4.7 Grievance Mechanism

A formal mechanism shall be established for efficiently and effectively recording and resolving disputes or grievances related to Project design, planning and implementation, and impacts (refer to Appendix 5).

8.4.7.1 Objectives

The objectives of the Grievance Mechanism are to:

- Provide Project affected people with straightforward and accessible avenues for making a complaint or resolving a dispute that may arise during the course of the Project;
- Ensure that appropriate and mutually acceptable corrective actions are identified and summarily implemented to address complaints;
- Verify that complainants are satisfied with the outcomes and corrective actions taken;
- Avoid the need to resort to judicial or pre-judicial proceedings; and
- Ensure that the needs of those most vulnerable within the project proponent Project vulnerable communities, such as the elderly, women and children, are also considered in the grievance procedure.

8.4.7.2 Management Strategies

The Grievance Mechanism, and procedures for accessing it, shall be clearly communicated to the affected communities, and shall utilize the most widely used media or technologies in these areas. For example, text messaging from mobile phones, or, for areas where mobile phone use is low, and post-office service is not available, creation of village-level hubs for information relay. Care shall be taken to ensure that the methods or technologies used are sensitive to the needs and customs of women and marginalized groups, including indigenous peoples.

The Grievance Mechanism shall contain a clear path for grievances to be handled and responded to. The person(s) managing the grievance process will be responsible for:

- Relaying grievances to the appropriate person or unit;
- Where the content of the grievance is unclear, seeking more information;

- Assigning a time frame for responding to the grievance, and reminding the responsible unit when the deadline is near;
- Following-up on grievance response, especially for issues that cannot be resolved immediately (e.g., requiring changes in Project activity or coordination with other stakeholders);
- Responding to the source of the grievance, best done in writing or at least recorded in writing. Where necessary and/or appropriate, the response shall be officially raised with or witnessed by the community or village leader;
- Manage documentation of grievances and grievance responses, within the Project document management system.

As part of the Environmental and Social Safeguard document and the World Bank Operational Safeguards, the Project has developed Grievance Mechanism (GM) as an integral part of Project Stakeholder Engagement Plan. A Standard Grievance Registration Form and Standard Grievance Close-Out Form are shown below.

Standard Grievance Registration Form

Date of receipt		Time when complaint occurred		Receipt no	
Responsible department					
Individual in charge		Place where complaint occurred			
Individual filing complaints					
Name		Contact information	Address		
Nationality			Tel. no		
Age			Fax. No		
Gender			Mobile phone		
Note			e-mail		
Stakeholder		Shareholder		Customers	
		Partners		Contractors	
		Regulatory agencies		Mass media	
		Local government		NGO	
		Local communities		Other	
Details of complaints					
Requests made by individuals filing complaints		Discuss the issue		Simply need to know	Want a response
		Want an improvement		Want an understanding	Want an investigation
		Want an apology		other	

Expected cause	
Process and results of response	

Standard Grievance Close-Out Form

Grievance Close-Out	
<p>I/We, _____, who instituted Receipt # _____ agree that this grievance has been resolved to our satisfaction on this date _____. We renounce all future claims concerning this issue.</p>	
Names	Signatures
<p>TO BE COMPLETED BY COMPLAINANT</p> <p>Settlement:</p> <p>Name of TPA Tamangapa Representative: _____.</p> <p>Witnessed by: _____ (Name and Title of Local Official)</p> <p>Date: _____.</p>	
<p>We, the TPA Tamangapa Representative and _____ (Name and Title of Local Official) state that the claimant(s) _____ who instituted Receipt # _____ have refused on this date _____ to sign a grievance close-out. The claimant(s) have been informed that the project considers the grievance to have been appropriately addressed according to the project’s grievance mechanism. The claimants have also been informed of their right to pursue the grievance in civil court.</p> <p>Name of TPA Tamangapa Representative: _____.</p> <p>Witnessed by: _____ (Name and Title of Local Official)</p> <p>Date: _____.</p> <p style="text-align: center;">TO BE COMPLETED BY COMPLAINANT</p>	

8.4.7.3 Monitoring Plan and Reporting

Any complaints as to the management of Grievance Mechanism issues are forwarded to the Head of TPA Tamangapa as soon as practical. Complaints, and any actions arising from a complaint, will be recorded in a complaints register to be maintained by site management as part of the Grievance

Mechanism. In general, grievances registered against the mechanism/procedure itself will require attention of senior management.

Suspension of grievance processing because of a complaint concerning the Grievance Mechanism itself is not practical. Rather, senior management should investigate the issue immediately and take corrective action as necessary. Of course, corrective action may affect the management of grievances within the process and grievances previously handled, in addition to future grievances.

Date Of Grievance Log Updated		XX/XX/XXX								
Date Reported (dd/mm/yy)	Receipt Number	Name of Complainant	Address or Settlement	Brief Description	Assigned to	Admissible (Y/N)	Valid/Invalid w/ Summary Description Why	Date of Response	Corrective Action	Date of Closeout (dd/mm/yy)

8.4.8 Indigenous Peoples

No Indigenous Peoples have been identified being impacted by the landfill nor has any indigenous peoples groups laid traditional use claims onto any of the Project land, current and land of future plans. Should for any future project expansion, claims arise or peoples self-identify as Indigenous, the ESMF would be used and guidelines applied accordingly.

No Management is required at this point. Any future expansion of the TPA Tamangapa shall apply the ESMF IP screening assessment to determine if IP are affected by the Project. The screening will consider expert advice and consult local communities to confirm IP status.

8.4.9 Labor and Working Condition and Occupational Health and Safety

8.4.9.1 Objectives

The objective of Labor and Working Condition is to follow guide set forth in this following ILO Conventions and Government of Indonesia Labor related regulation which are:

FOUR CORE CONVENTIONS	RATIFIED BY GOI
<ul style="list-style-type: none"> ▪ ILO Convention 87 on Freedom of Association and Protection of the Right to Organize ▪ ILO Convention 98 on the Right to Organize and Collective Bargaining 	<ul style="list-style-type: none"> ▪ In Force since 09 Jun 1998 ▪ In Force since 15 Jul 1957

FOUR CORE CONVENTIONS	RATIFIED BY GOI
<ul style="list-style-type: none"> ▪ ILO Convention 29 on Forced Labor ▪ ILO Convention 105 on the Abolition of Forced Labor 	<ul style="list-style-type: none"> ▪ In Force since 12 Jun 1950 ▪ UU-19-1999
<ul style="list-style-type: none"> ▪ ILO Convention 138 on Minimum Age (of Employment) ▪ ILO Convention 182 on the Worst Forms of Child Labor 	<ul style="list-style-type: none"> ▪ UU-20-1999 ▪ UU-01-2000
<ul style="list-style-type: none"> ▪ ILO Convention 100 on Equal Remuneration ▪ ILO Convention 111 on Discrimination (Employment and Occupation) 	<ul style="list-style-type: none"> ▪ UU-80-1957 ▪ UU-21-1999
<ul style="list-style-type: none"> ▪ Other ILO Conventions 	<ul style="list-style-type: none"> ▪ Ratified by GOI
<ul style="list-style-type: none"> ▪ ILO Convention 155 on Occupational Safety and Health 	
<ul style="list-style-type: none"> ▪ ILO Protocol 155 of 2002 to the Occupational Safety and Health Convention 	
<ul style="list-style-type: none"> ▪ ILO Convention 162 on Asbestos 	
<ul style="list-style-type: none"> ▪ ILO Convention 174 on Prevention of Major Industrial Accidents 	
<ul style="list-style-type: none"> ▪ ILO Declaration of Fundamental Principles and Rights at Work 	
<ul style="list-style-type: none"> ▪ ILO 2006 Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy 	
<ul style="list-style-type: none"> ▪ ILO Convention No. 81 Concerning Labour Inspection In Industry And Commerce 	<ul style="list-style-type: none"> ▪ UU- 21-2003
<ul style="list-style-type: none"> ▪ ILO Convention No.106 regarding Weekly Rest 	<ul style="list-style-type: none"> ▪ UU-03-1961
<ul style="list-style-type: none"> ▪ UN Conventions 	<ul style="list-style-type: none"> ▪ Ratified by GOI
<ul style="list-style-type: none"> ▪ Convention Against Torture and other Cruel, Inhuman, or Degrading Treatment or Punishment 	<ul style="list-style-type: none"> ▪ UU-05-1998
<ul style="list-style-type: none"> ▪ UN Universal Declaration of Human Rights 	
<ul style="list-style-type: none"> ▪ UN International Covenant on Economic, Social, and Cultural Right 	
<ul style="list-style-type: none"> ▪ UN Convention on the Rights of Child 	<ul style="list-style-type: none"> ▪ Keppres-36-1990
<ul style="list-style-type: none"> ▪ UN Convention on the Elimination of All Forms of Racial Discrimination 	<ul style="list-style-type: none"> ▪ UU-29-1999
<ul style="list-style-type: none"> ▪ UN Convention on the Elimination of All Forms of Discrimination against Women 	<ul style="list-style-type: none"> ▪ UU-07-1984
<ul style="list-style-type: none"> ▪ UN Convention on the Rights of Persons with 	<ul style="list-style-type: none"> ▪ UU-19-2011

FOUR CORE CONVENTIONS	RATIFIED BY GOI
Disabilities	
<ul style="list-style-type: none"> ▪ UN Optional Protocol to the Convention on the Rights of Persons with Disabilities 	

Which essentially is:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

8.4.9.2 Management Strategies

The performance objectives above are achieved by the following management strategies:

- Accommodate different employment status of worker working at TPA Tamangapa during their employment.
- Accommodate worker's rights to form and joins workers' organization.
- Protect the safety and health of TPA Tamangapa workers.
- Develop procedures in hiring workers;
- Ensure workers are equipped with relevant skills and safe and healthy working environment during construction and operation by implementing mitigation measures proposed as follows:
 - Provide initial training for jobs that do not require highly skill set to the locals and waste pickers in order to encourage them to be involved in the construction.
 - Give priority in employing local workers.
 - Provide full PPEs to workers.
 - Provide sufficient training to workers and operators to ensure proper operation of equipment and machineries.
 - Establish and disseminate grievance mechanism to affected communities. Organize and implement local culture induction to migrant labor.
 - Conduct and implement health and safety induction to all workers.
 - Organise regular worker gathering events to enhance bonding among workers.
 - Create communication forum that consists of project and community representation.
 - Purchase incident/accident insurance as minimum and medical insurance to all workers.
 - Regular medical check up to all workers, especially on sickness that are associated with landfill working environment.

8.4.9.3 Monitoring Plan and Reporting

During the construction and operational phase, landfill management in coordination with contractor will conduct monitoring and establish as stated in the following:

- Conducted inspection on regular basis to monitor following aspects:

- PPE Usage
- Signage
- Emergency Response and Preparedness Implementation
- OHS Programs Implementation
- Housekeeping
- etc.

Inspection will be used as part of monitoring program. Inspection will be conducted by Landfill Management on regular basis. Landfill Management will develop checklist to be used during the inspection. The data from the inspection will be assessed to identify gaps and form actions to address gaps in responsible manner.

- Accident and Incident Recording, Reporting and Investigation System

This system will record incidents and accidents at workplace both onsite and management office. In addition, the system will identify roles and responsibilities for recording, reporting and investigating incidents and for corrective action planning on regular basis.

- Contractor Database

The database will record a summary of their scope of work, business origins, the results of auditing programmes, their respective positions; training received, PPE given and the conformance status related to management plans implementation on regular basis.

- Workers Feedback Mechanism

The worker feedback mechanism will log all grievances, issues and concerns raised by workers during construction and operations on regular basis. The system will also include areas to record information on measures to address issues, timeframes and personnel responsible.

The Occupational Health and Safety should follow Law No. 13 of 2003 and Work Safety Act No. 1 of 1970.

8.4.10 Landscaping/Visual Impact

8.4.10.1 Objectives

The objective of this plan is to minimize significant landscape change of landfill activities and its subsequent visual impact.

8.4.10.2 Management Strategies

The management strategy is to camouflage and/or screening the landfill by use of camouflage and/or screening the landfill expansion through:

During Construction Stage:

- Gradual closure and rehabilitation of waste;
- Establishment of an environmental buffer zone to minimize visual impacts;

During Operation Stage:

- Cover waste-containing vehicles to minimize visual impact; and
- Provide top soil as part of the final capping layers for greenery on the landfill after capping

During Closure Stage:

- Conduct revegetation on areas that already undergo closure by following similar vertical stratification of the vegetation around the project area.

8.4.10.3 Monitoring Plan and Reporting

Any implementation of the landscape/visual management, or the emergence of any other landscape/visual issue, is carefully documented and reported periodically, and any other reports under this ESMP to lenders.

Any complaints as to the landscape/visual management or issues are forwarded to the Director of the waste facility as soon as practical. Complaints, and any actions arising from a complaint, will be recorded in a grievance register to be maintained by site management.

8.4.10.4 Performance Indicators

Management of landscape and visual impacts is measured by the visibility of landfill activities from the residential area.

8.4.11 Noise and Vibration

8.4.11.1 Objectives

The objective of noise and vibration management plan is to minimise noise and vibration impacts from the construction and operation of the project.

8.4.11.2 Management Strategies

The performance objectives above are achieved by the following management strategies:

During Construction Stage: Maintain site roads in good condition to reduce noise and vibration from vehicle movements.

- Utilize the vehicle that has pass the emission test.
- Schedule vehicle movement to avoid accumulated noise from vehicles.
- Adopt good practice for construction site –regular maintenance of vehicles and machinery and proper training to operators.
- Construction of buffer zones in the construction area.
- Sequencing construction activities to prevent high combined noise levels during resting hours of the community such as early morning, nap time, and evening.
- Installation of noise barriers around demolition works and around civil works area to minimize noise and not doing any construction works at night.
- Operating the earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible.

During Operation Stage:

- Develop and implement traffic management plan to ensure minimal noise disturbance from waste transportation activity.
- Utilize the vehicle that has pass the emission test.
- Preventive maintenance of vehicle and heavy equipment in the landfill.

8.4.11.3 Monitoring Plan and Reporting

Noise and vibration monitoring plan will be undertaken by landfill management at established monitoring sites and near sensitive receptors on 6 monthly basis during construction and operation stage. All scheduled monitoring shall be reported to related agencies every 6 months, or as and when required.

The noise and vibration standard should ensure compliance with the relevant provisions of Minister of Environment Decree (Kepmen LH) No 48 of 1996 on Noise Standards and Kepmen LH No 49 of 1996 on Vibration Standards.

The noise standards to be observed are:

FACILITY ENVIRONS / SENSITIVE RECEPTORS	NOISE LEVEL DB(A)
Facility / Vicinity	
Houses and Residential Areas	55
Offices and Commercial	65
Green Open Space	50
Industrial	70
Sensitive Receptors	
Hospitals	55
Schools	55
Religious Buildings	55

Vibration standards to be observed are:

Standards of Vibration Levels for Comfort and Health

FREQUENCY (HZ)	VALUE OF VIBRATION LEVEL, IN MICRON (10 ⁻⁶ METER)			
	NO DISTURBANCE	DISTURBANCE	DISCOMFORT	PAIN
4	< 100	100 – 500	> 500 – 1,000	> 1,000
5	< 80	80 – 350	> 350 – 1,000	> 1,000
6.3	< 70	70 – 275	> 275 – 1,000	> 1,000
8	< 50	50 – 160	> 160 - 500	> 500
10	< 37	37 – 120	> 120 - 300	> 300
12.5	< 32	32 – 90	> 90 - 220	> 220
16	< 25	25 – 60	> 60 - 120	> 120
20	< 20	20 – 40	> 40 - 85	> 85
25	< 7	17 – 30	> 30 - 50	> 50
31.5	< 2	12 – 20	> 20 - 30	> 30
40	< 9	9 – 15	> 15 - 20	> 20
50	< 8	8 – 12	> 12 - 15	> 15
63	< 6	6 – 9	> 9 - 12	> 12

Standards of Mechanical Vibration Levels Based on Damage / Impact Potential

VIBRATION		FREQUENCY (HZ)	VIBRATION PEAK, MM/SECOND			
PARAMETER	UNIT		CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
- Vibration	mm/sec	4	< 2	< 2 – 27	> 27 – 140	> 140
Velocity	mm/sec	5	< 7.5	< 7.5 – 25	> 25 – 130	>130
- Frequency	Hz	6.3	< 7	< 7 – 21	> 21 – 110	> 110

VIBRATION		FREQUENCY (HZ)	VIBRATION PEAK, MM/SECOND			
PARAMETER	UNIT		CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
		8	< 6	< 6 – 19	> 19 – 100	> 100
		10	< 5.2	< 5.2 – 16	> 16 – 90	> 90
		12.5	< 4.8	< 4.8 – 15	> 15 – 80	> 80
		16	< 4	< 4 – 14	> 14 – 70	> 70
		20	< 3.8	< 3.8 – 12	> 12 – 67	> 67
		25	< 3.2	< 3.2 – 10	> 10 – 60	> 60
		31.5	< 3	< 3 – 9	> 9 – 53	> 53
		40	< 2	< 2 – 8	> 8 – 50	> 50
		50	< 1	< 1 - 7	> 7 – 42	> 42

Note:

Category A : Not causing damage

Category B : Possible plaster cracks (cracking/plaster coming off load-bearing walls (in special cases).

Category C : Possible damage to load-bearing wall structure

Category D : Damage to load-bearing walls

Standards for Mechanical Vibration Levels Based on Building Types

CLASS	TYPE OF BUILDING	VELOCITY OF VIBRATION (MM/SEC)			ON FLAT PLANE ON TOP FLOOR
		ON FOUNDATION			FREQUENCY COMBINATION
		FREQUENCY			
		< 10 HZ	10-50 HZ	50-100 HZ *)	
1	Building for commercial purposes, buildings for industries, and buildings for similar purposes	< 10	20 - 40	40 – 50	40
2	Housing compounds and buildings of similar design and uses	5	5 - 15	15 – 20	15
3	Structures that by nature are sensitive to vibration, unlike Nos. 1 and 2, and that have a high cultural value, such as preserved buildings	3	3 - 8	8 – 10	8.5

Note: *For frequencies above 100 Hz, values set forth in the column must be used

Standards for Shock Vibration Levels

CLASS	TYPE OF BUILDING	MAXIMUM VIBRATION VELOCITY (MM/SEC)
1	Designated ancient building with a	2

CLASS	TYPE OF BUILDING	MAXIMUM VIBRATION VELOCITY (MM/SEC)
	high historical value	
2	Buildings with existing damage, cracks on walls being visible	5
3	Buildings in good technical condition, with slight damage such as cracking plaster	10
4	“Strong” building (for example: industrial buildings made of concrete or steel)	10 -40

8.4.11.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Nil complaints relating noise or vibration nuisance
- Conformance with Kepmen LH No 48 of 1996 on Noise Standards and Kepmen LH No 49 of 1996 on Vibration Standards.

8.4.12 Soil Quality

8.4.12.1 Objectives

The objectives of this plan are to determine baseline conditions and limit pollution and deterioration of the soil from harmful substances (fuel, oil, etc.) and processes which may lead to increased erosion.

8.4.12.2 Management Strategies

- Stringent on-site pollution control measures will be applied during the construction and operation phase to prevent soil contamination from oil and fuel.
- Condition of vehicles and equipment will be periodically checked.
- Equipment and vehicles will be regularly maintained in line with manufacturers' recommendations.
- Any spills will be contained and cleaned up.
- All vehicles will carry absorbing pads.
- Protective equipment and trays will be used when refuelling or changing oil on vehicles and equipment.
- Designated areas will be defined for the storage of fuel, lubricants, coolants, paint, solvents, etc.

8.4.12.3 Monitoring Plan and Reporting

Any complaints as to the management of soil quality will be directed to the management as soon as practical. Complaints and any actions arising from a complaint are recorded in a grievances register to be maintained by site management. All scheduled monitoring is reported or as required by environmental regulator.

8.4.12.4 Performance Indicators

During the ESHIA studies baseline groundwater conditions will be established and will provide a benchmark from which to measure soil quality performance of the facility.

8.4.13 Solid Waste Management Plan

The main nonhazardous solid wastes likely to be produced on-site during construction stage from worker's activity, such as food leftovers, food packaging, sawdust, office paper, and warehouse/shipping waste packaging.

8.4.13.1 Objectives

Ensure compliance with the relevant provisions of Law No 32 of 2009 on Environmental Protection and Management and Government Regulation No 81 of 2012 on Domestic Waste. Minimize waste generation by developing strategies for management and disposal of all waste produced in accordance with the principles of avoidance, reduction, reuse, recycling, and proper disposal. Manage waste in a manner that is sustainable and sensitive to the environment.

8.4.13.2 Management Strategies

The performance objectives above are achieved by the following management strategies. Components of waste streams are separated at source where possible, to minimize contamination and maximize potential for reuse and recycling of materials. Waste will not be stored at sites where it could contribute to the generation of contaminated runoff. Waste storage on-site will generally be organized by the head contractor. Waste management orientation will form part of the on-site induction process.

The following actions are undertaken to implement the above management strategies:

- Organize regular waste collection to minimize excessive waste storage.
- Audit locations of waste storage to ensure that the above strategies are being carried out.

8.4.13.3 Monitoring Plan and Reporting

Any complaints as to the management of on-site waste are forwarded to the Director of TPA Tamangapa as soon as practical. Complaints and any actions arising from a complaint are recorded in a complaints register maintained by site management. Use ESF-ESI04-04 Waste Disposal Record to maintain documentation of waste generation, storage, and disposal.

8.4.13.4 Performance Indicators

Nil complaints about waste storage and removal.

8.4.14 Stakeholder Engagement (Public Consultation and Information Disclosure)

The Project shall plan and institute a proper mechanism for conducting public consultation, disclosure of information, and other discussions as needed with relevant stakeholders (Annex 4). A

Stakeholder Engagement Plan (SEP) shall be developed by the Project to ensure proper organizing and documentation of outreach events.

Stakeholder engagement is designed to meet National legislation as follows:

- Law No 23/2009 regarding Environmental Protection and Management. Article 5 of the Law stipulates that communities are:
 - Equally entitled to a good and healthy environment;
 - Entitled to information about potential environmental impacts; and
 - Entitled to exercise a role in the framework of environmental management (including decision making and ongoing discussions).
- Government Regulation No 27/2012 regarding Environmental Permit, Article 9 states that within ten working days after public announcement of proposed activities, impacted and interested members of community have the right to suggest, express opinions, and provide input relating to the planned activities.
- Environmental Minister Regulation No 17/2012 regarding Guidance on Community Engagement in Environmental Impact Analysis and Environmental Permit Process. Article 2 of the regulation highlights the basic principles for engagement includes: transparent and comprehensive information sharing; equality among the involved parties; problem resolution based on justice and wisdom; and coordination, communication and cooperation among the involved parties. Detail guidance on community engagement is provided in the attachment to the regulation.

8.4.14.1 Objectives

Consultation and disclosure comply with the Disclosing Information and Engaging Stakeholders (E3) element of the ESMS.

Consultation with stakeholders should begin at the earliest possible moment in the Project design phase, so as to avoid and minimize undesired impacts or risks to communities and other stakeholders, and to maximize positive benefits and the solicitation of stakeholder input. Consultations are expected to continue into the Project Implementation and Decommissioning Phase.

Issues that the stakeholder engagement should cover are:

- Timely and appropriate information distribution on planned project design, planning and implementation with regards to upgrade/rehabilitation and expansion of existing waste facilities.
- Timely and appropriate information distribution to land acquisition affected communities and possible livelihood compensation payments/measures
- Concerns over new technology's impact on community health
- Future employment opportunities for waste pickers
- Tensions caused by temporary migrant workers during construction
- Mobilization and demobilization of construction equipment/filling material
- Waste receipt, loading and unloading of trucks/waste transportation vehicles

8.4.14.2 Management Strategies

- Consultations shall be carry out with all identified stakeholder groups at important stages of project development, such as pre-construction, prior to construction, during implementation and prior to decommissioning.

- Consultations with women and marginalized groups shall utilize appropriate communication techniques and approaches. Such consultations shall be conducted with or supported by local Civil Society Organizations (CSO), universities, or other organizations accustomed to convening and managing consultations with women and marginalized groups in the Project areas.

The SEP shall be applied to ensure proper organizing and documentation of outreach events conducted at the kecamatan and village levels, with participants selected based on the socio-economic-cultural characteristics of the Project's areas of influence, and on the nature and locations of proposed Project facilities and activities. The general framework for consultation and disclosure is:

- Identify and map Project stakeholders:
- Open dialogue and continue engagement during all Project phases.
- Consult with Indigenous Peoples, if applicable.
- Consult with attention to gender considerations.
- Promote capacity building for Project stakeholders with training and workshops.
- Manage information disclosure with transparency and sensitivity.
- Maintain detailed records of all aspects of consultation and disclosure.
- Grievance Mechanism process implementation is of great importance.

The Project shall develop a Stakeholder Engagement Plan. Project's stakeholder database and engagement plan shall be updated regularly in accordance with Project progress.

Standard Stakeholders Database

PROVINCIAL AND REGENCY									
NO	NAME	POSITION	INSTITUTION	CONTACT NUMBER	EMAIL	ADDRESS	WEBSITE	AIMS/ INTEREST	CATEGORY
1									
2									

Standard Stakeholder Engagement Plan for the Project

LEVEL/CATEGORY	STAKEHOLDERS	TAMANGAPA KEY CONTACT	ENGAGEMENT ACTIVITIES	ISSUES/ INTEREST	WHEN/ FREQUENCY
International/National/ [provincial/Regency/Village Govt/INGOs/NGOs/Academic/Business/Media, etc.	E.g. Governor, Regent	E.g. Com/Pub Rel Manager, Director	E.g., Face to Face Meeting	Land acquisition	As required

8.4.14.3 Monitoring Plan and Reporting

Consultation and disclosure activities must be thoroughly documented, including written notes/minutes of all meetings, numerous photographs of all meetings, and signed attendance

sheets at every meeting. Wherever practical, all meetings should be recorded in full with video equipment.

Any complaints as to the management of consultation and disclosure and related issues are forwarded to the Director of TPA Tamangapa as soon as practical. Complaints, and any actions arising from a complaint, will be recorded in a complaints register to be maintained by site management as part of the Grievance Mechanism.

Standard Register of Past Stakeholder Engagement

DISCLOSURE ACTIVITY	LOCATION	DATE OF MEETING	INDIVIDUAL, GROUPS/ ORGANIZATIONS CONSULTED	KEY ISSUES	COMPANY RESPONSE	DOCUMENTATION	REPORT BACK

Issues and disruptions that arise during consultation and disclosure meetings must be handled by the TPA Tamangapa staff member in charge. Assistance from civil and law enforcement officials attending such meetings should be forthcoming; if not, this becomes a part of the issue requiring corrective action.

Consultation and disclosure activities will be suspended, in cases where serious complaints, demonstrations, or disruptions arise. TPA Tamangapa management will investigate the situation immediately and decide on, and implement, corrective action as necessary.

8.4.15 Traffic and Transportation

The traffic and transportation management plan (TTMP) is to be developed by the EPC contractor for construction and by landfill management for the operation stage.

8.4.15.1 Objectives

The TTMP will minimize traffic disruption to manage and mitigate the following aspects during construction;

- Dust concentration
- Traffic congestions
- Site access disruption
- Noise and Vibrations

The TTMP for the implementation phase will ensure that traffic disruption, dust concentration and noise and vibration of waste trucks receipt, loading and unloading and for mobilizing and demobilizing of filling material is minimized. The TTMP for implementation also contains the waste collection schedule optimized with increased frequency.

8.4.15.2 Management Strategies

8.4.15.2.1 Management for Dust

Utilize vehicles that have passed the emission test. During dry season, wet road, wet vehicle to reduce dust accumulation.

8.4.15.2.2 Management for Traffic Congestions

Timing of trucks during morning and afternoon hours to avoid conjection at peak traffic periods and noise impact to local residence along the transport routes at night.

8.4.15.2.3 Management for Noise and Vibrations

Trucks/vehicle are not operated at night. Avoid running large/heavy vehicles at high speed and/or along minor roads.

8.4.15.3 Monitoring Plan and Reporting

Any complaints as to the management of on-site waste are forwarded to the Head of TPA Tamangapa as soon as practical. Complaints and any actions arising from a complaint are recorded in a complaints register maintained by site management.

8.4.15.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- No grievances from the community with regards to traffic/noise/dust.
- Ensure traffic schedules are being implemented and complied with.

8.4.16 Leachate and Groundwater

8.4.16.1 Objectives

The objective of Leachate Management is to minimise the impact of leachate discharge from leachate treatment plant, which is generated from landfill operation activity. It also aims to ensure the compliance with of Law No 32 of 2009 on Environmental Protection, Minister of Environment and Forestry Regulation No P.59/menlhk/Setken/Kum.1/7/2016 on Leachate Threshold Value from Final Disposal Activity and Government Regulation No 82/2001 on Management of Water Quality and Water Pollution Control.

8.4.16.2 Management Strategies

The performance objectives above will be achieved by the following management strategies:

During construction stage:

- Recirculate the generated leachate to the old dumping and/or landfill cells while leachate treatment plant is being repaired;
- Ensure separation between drainage and leachate collection;
- Improve the leachate collection system from all dumping cells and ensure it connects to the leachate treatment plant;

- Improve leachate treatment plant that minimize operating costs and potential for breakdown/failure of expensive/sensitive equipment, and maximize leachate treatment and discharge water quality to conform with Indonesia laws and regulations discharge standards and World Bank international guidelines and best practice;
- Install flowmeter to monitor leachate discharge in established monitoring point;
- Install groundwater monitoring well in the upstream and downstream of landfill;
- Install fencing to increase safety around LTP area; and
- Develop standard operation procedure for Leachate Treatment Plant.

During operation stage:

- Ensure all leachate generated from the cells are diverted to leachate treatment plant;
- Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards;
- Conduct preventive maintenance for leachate treatment plant unit;
- Conduct regular training for landfill operators regarding SOP of leachate treatment plant.

8.4.16.3 Monitoring Plan and Reporting

Regular monitoring for leachate management plan will be conducted by landfill operators at established monitoring point with the following details:

During operation stage:

- Record leachate effluent discharge and pH on daily basis;
- Monitor leachate effluent quality every month;
- Monitor groundwater quality from monitoring well every 3 months.

During operation stage, the result for scheduled monitoring should be reported to related agency every 3 months.

During closure stage:

- Monitor leachate effluent quality 4 times every year;
- Monitor groundwater quality from monitoring well 4 times every year.

During closure stage, the result for scheduled monitoring should be reported to related agency every 6 months.

Threshold limit value for leachate effluent is outlined in Minister of Environment and Forestry Regulation No P.59/menlhk/Setken/Kum.1/7/2016 on Leachate Threshold Value from Final Disposal Activity while standard for groundwater quality is outlined in Government Regulation No 82/2001 on Management of Water Quality and Water Pollution Control.

The leachate and groundwater quality should be analysed in accredited laboratory. The report should include daily effluent discharge and pH, daily processed waste in landfill, climatology data (rainfall and temperature), ground water analysis (including sampling point) and leachate effluent quality analysis (including sampling point).

8.4.16.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Groundwater and leachate quality regular monitoring is conducted according to the schedule;
- Groundwater and leachate quality meet Government of Indonesia standards and regulation;
- Result of regular monitoring is submitted to related agencies;
- Record of landfill operator training;
- Availability of SOP for leachate treatment plant.

8.4.17 Surface Water Quality

8.4.17.1 Objectives

The objective of Surface Water Quality is to minimise the impacts to surface water quality from landfill operations; ensure compliance with the relevant provisions of Law No 32 of 2009 on Environmental Protection and Government Regulation No. 82 of 2001.

8.4.17.2 Management Strategies

The performance objectives above are achieved by the following management strategies:

During construction stage:

- Implement proper hazardous waste and hazard substances storage and management at construction site. Hazardous waste and hazard substances shall be stored at concrete area with roof and kerb/secondary containment kerb to prevent spillage to waterbodies.
- Stringent on-site pollution control measures will be applied during the construction and operation phase to prevent soil contamination from oil and fuel.
- Condition of vehicles and equipment will be periodically checked.
- Any spills will be contained and cleaned up.
- All vehicles will carry absorbing pads.
- Protective equipment and trays will be used when refueling or changing oil on vehicles and equipment.
- Designated areas will be defined for the storage of fuel, lubricants, coolants, paint, solvents etc with concrete floor, roof and kerb/secondary containment to prevent spillage

During operation stage:

- Divert wastewater from vehicle wash to leachate treatment plant;
- Ensure all leachate generated from the cells are diverted to leachate treatment plant; and
- Maintain the effectiveness of the leachate treatment plant in order to ensure that effluent of LTP is in compliance with the quality standards.

8.4.17.3 Monitoring Plan and Reporting

Regular monitoring for surface water management plan will be conducted by landfill operators at established monitoring point in water body every 3 months. The monitoring result will be compared against threshold limit value as stipulated in Government Regulation 82/2001 on Management of Water Quality and Water Pollution Control.

8.4.17.4 Performance Indicators

Following indicators shall be monitored to assess efficiency of the ESMP:

- Surface water quality monitoring is conducted according to the schedule;
- Surface water quality doesn't decrease and still comply with the Government of Indonesia standards and regulation;
- Result of regular monitoring is submitted to related agencies.

8.4.18 Livestock

8.4.18.1 Objectives

The objective of Livestock Management Plan is to prevent livestock (cattles, goats, etc.) from entering the landfill area in order to ensure safety for both the livestock and the landfill operation.

8.4.18.2 Management Strategies

The performance objectives above are achieved by the following management strategies:

During Construction Stage:

- Install fence around the construction boundary;
- Divert the livestock to temporary grazing area nearby the landfill site.

During Operation Stage:

- Provide alternatives for livestock grazing:
 - Build a stall feeding area near waste sorting area or composting area dedicated for organic waste only to ensure that the livestock do not consume inorganic waste that can be harmful; or
 - Open a new grazing area nearby the landfill site;
- Install fence at the landfill perimeter and facilities (e.g. leachate treatment plant, composting area, etc.);
- Inform the community on prohibition for livestock to enter landfill area and alternative grazing options.

8.4.18.3 Monitoring Plan and Reporting

Any implementation of the livestock management, or the emergence of any other livestock issue, is carefully documented and reported periodically, and any other reports under this ESMP to lenders.

Any complaints regarding livestock will be directed to the management as soon as practical. Complaints and any actions arising from a complaint are recorded in a grievances register to be maintained by site management.

8.4.18.4 Performance Indicator

Management of livestock is measured by the absence of livestock within landfill except areas where livestock is allowed.

8.5 Budget

There will not be additional budget for mitigation measures as mentioned above as it will be included in the main Project's budget. The only additional budget identified is to conduct the environmental monitoring plan regularly and measuring device, which is presented in the Table below.

No.	Activity/Action Plan	Estimated Budget (USD)	Remarks
1	Environmental Monitoring	30,000/year	This number is estimated lump sum for hiring independent environmental consultant to conduct environmental monitoring report annually.
2	pH meter	400	To monitor leachate effluent on daily basis.
3	Flow meter (1 unit)	700	To monitor leachate effluent on daily basis.

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APPENDIX 1

**Indonesian Laws and Regulations
for Solid Waste Management**

APPENDIX 1 – INDONESIAN LAWS AND REGULATIONS FOR SOLID WASTE MANAGEMENT

No.	Regulation	Summary	Requirement
National Level – Solid			
1.	Minister of Environment and Forestry Regulation No 59/2016 on Leachate Threshold Limit Value for Waste Final Disposal Activity	This regulation sets the threshold limit value for effluent of leachate treatment plant and the obligation to monitor groundwater and leachate effluent regularly from waste final disposal activity.	<p>Key requirements stipulated:</p> <ul style="list-style-type: none"> A. All waste final disposal activities must have Environmental Permit. B. All leachate generated must be treated in leachate treatment plant (LTP) and meet threshold limit value before being discharged to the environment. C. Leachate effluent must be monitored at least once every month in an accredited laboratory. D. Monitoring well must be installed in the upstream and downstream of final disposal. E. Groundwater must be monitored at least once every three months and following the parameters as shown in the Appendix of this regulation. F. Report to the regent/mayor, copy to governor, minister and related institutions at least once every 3 months regarding leachate discharge and pH, daily waste input, climatology data, groundwater analysis and leachate analysis.
2.	Government Regulation Number 101 Year 2014 about Hazardous Waste (B3) Management.	This regulation focuses on Determination of B3 waste, B3 Waste Reduction, B3 Waste Storage, B3 Waste Collection, Transport of B3 Waste, Utilization of B3 Waste, Waste Treatment B3, B3 Waste Landfill, Dumping (Disposal) of B3 Waste, Exemption of B3 waste, Transboundary	<p>The regulation stipulates:</p> <ul style="list-style-type: none"> A. Determination of B3 waste; B. B3 Waste Reduction; C. B3 Waste Storage; D. B3 Waste Collection; E. Transport of B3 Waste;

No.	Regulation	Summary	Requirement
		<p>movement of B3 waste, Environmental Pollution Control and/or Environmental Damage and Recovery Environmental Functions, Emergency Response System in B3 Waste Management, Coaching, Supervision, Financing and Administrative sanctions.</p>	<p>F. Utilization of B3 Waste; G. Waste Treatment B3; H. B3 Waste Landfill; I. Dumping (Disposal) of B3 Waste; J. Exemption of B3 waste; K. Transboundary movement of B3 waste; L. Environmental Pollution Control And/or Environmental Damage and Recovery Environmental Functions; M. Emergency Response System in B3 Waste Management; N. Coaching; O. supervision; P. financing; and Q. Q. Administrative sanctions.</p>
3.	<p>Minister of Public Work Regulation No 03/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management</p>	<p>This regulation focuses on the planning for, and implementation of, holistic municipal solid waste (MSW) master plan solutions at a regional or local level and covers the general planning of MSW services, landfill infrastructure design standards, the provision of MSW processing/disposal facilities and the closure/rehabilitation of landfills.</p>	<p>This regulation aims to:</p> <ol style="list-style-type: none"> Realize the implementation of waste infrastructure which is effective, efficient, and environmentally sound; Increase the coverage of waste management services; Improve public health and environmental quality; Protect water resources, land, and air pollution as well as climate change mitigation; and Making waste as a resource. <p>General plan implementation of waste infrastructure includes:</p> <ol style="list-style-type: none"> Master plan; Feasibility studies; and Technical planning and waste management <p>General planning for the implementation of waste infrastructure</p>

No.	Regulation	Summary	Requirement
			<p>for big and metropolitan cities consists of:</p> <ol style="list-style-type: none"> a. Master plan; and b. Feasibility study. <p>Waste management activities include:</p> <ol style="list-style-type: none"> a. Sorting, at least for 5 types of waste; <ul style="list-style-type: none"> - Waste containing hazardous and toxic materials; - Degradable waste; - Waste that can be reused; - Waste that can be recycled; and - Others. b. Performance sorting: <ul style="list-style-type: none"> - Every person at the source; - Management of residential areas, commercial areas, industrial areas, special areas, public facilities, social facilities, and other facilities; and - The regency/city. c. Waste Container: <ul style="list-style-type: none"> - Given a label or mark; - Differentiated materials, shape and/or colour of the container; and - Using a container that covered with lid. d. Waste collection, consists of: <ul style="list-style-type: none"> - Direct individual system; - Indirect individual system; - Direct communal system; - Indirect communal system; and - Street sweeping.

No.	Regulation	Summary	Requirement
			<p>Means of waste collection:</p> <ul style="list-style-type: none"> - Motorcycle cart waste; - Hand cart waste; and/or - Bicycle cart waste. <p>e. Waste transportation, with:</p> <ul style="list-style-type: none"> - Dump truck/tipper truck; - Arm-roll truck; - Compactor truck; - Street sweeper vehicle; and - Trailer. <p>f. Waste treatment, include;</p> <ul style="list-style-type: none"> - Compaction; - Composting; - Recycling of waste materials; and - Turning waste into energy sources. <p>g. Final waste processing is done using:</p> <ul style="list-style-type: none"> - Control landfill methods; - Sanitary landfill methods; and/or - Environmentally friendly technology. <p>Household waste, similar household type waste and waste residues can be disposed of to landfill until 2025. After 2025 only residue that can be disposed of to landfill.</p>
4.	Minister of Environment Regulation No 17/2012 on Community Involvement in Environmental Impact Assessment and	This regulations outlines the procedures of community involvement throughout environmental impact assessment and environmental permit process. Community	<p>Community can be involved through:</p> <ul style="list-style-type: none"> • For project which required AMDAL → public announcement, feedback submission, public consultation prior to Terms of Reference (<i>Kerangka Acuan ANDAL</i>)

No.	Regulation	Summary	Requirement
	Environmental Permit Process	involvement aims to inform community, particularly project affected people, about the proposed project. Thus, community can give feedback regarding the project and involve in decision-making process to decide project's eligibility to the environment.	<p>preparation and involvement as AMDAL Appraisal Comission.</p> <ul style="list-style-type: none"> For project which requires UKL-UPL → public announcement, feedback submission and announcement after issuance of environmental permit. <p>Public announcement is informed through newspaper and public bulletin board.</p>
5.	Minister of Environment Regulation No 13/2012 on Guidelines for Implementation of Reduce, Reuse and Recycle through Waste Bank	This regulation provides guidelines on implementation of 3R activities through waste banks, including requirements of waste banks, mechanism of waste banks, implementation of waste banks, institutional arrangement of waste banks and integration of extended producer responsibility (EPR) into waste banks.	<p>Waste Bank is a place to collect and segregate the waste that can be reused/recycled that have economic value.</p> <p>Extended Producer Responsibility, hereinafter abbreviated as EPR is a strategy that was designed in order to integrate the environmental cost into the whole process of production of the goods until the product can no longer be used so that the environment becomes part of the cost component of the market price of the product.</p> <p>The scope of this regulation include:</p> <ol style="list-style-type: none"> Waste Bank requirements; Mechanism of action of the Waste Bank; Implementation of the Waste Bank; and Who implementing the Waste Bank. <p>Waste Bank requirements may include:</p> <ol style="list-style-type: none"> Construction of buildings; and Management system of Waste Bank.

No.	Regulation	Summary	Requirement
			<p>Mechanism of action of Waste Bank referred to in include:</p> <ol style="list-style-type: none"> a. Waste segregation; b. Delivery of waste to the Waste Bank; c. Weighing waste; d. Recording/archiving; e. Proceeds from sales of delivered waste put into savings books; and <p>Revenue sharing between savers and Waste Bank management.</p>
6.	Minister of Public Work Regulation No 19/2012 on Regional Spatial Arrangement Guideline around Final Waste Processing Facility	This Ministerial Regulation aims to realize the spatial arrangement area around the landfill that is more orderly and controlled.	<p>Article 2</p> <p>(1) This Ministerial Regulation is intended as a reference for the government District / municipality, waste management, and community</p> <p>In the arrangement of space around the landfill area.</p> <p>(2) This Ministerial Regulation aims to realize spatial arrangement area around the landfill that is more orderly and controlled.</p> <p>(3) The scope of this Ministerial Regulation shall include:</p> <ol style="list-style-type: none"> a. Determination of area around TPA; b. Determining the distance of subzona in the area around TPA; and c. Technical provisions of spatial arrangement of the area around TPA.
7.	Minister of Environment Regulation No 16/2012 on Guidelines for Preparation of Environmental Impact Assessment	This regulation specifies the ways to prepare Environmental Impact Assessment which an AMDAL document consists of: (a) the Terms of Reference, (b) an Environmental Impact Statement (ANDAL) and (c) an Environmental	<p>This permit specifies the ways to prepare Environmental Impact Assessment which an AMDAL document consists of:</p> <ol style="list-style-type: none"> 1. the Terms of Reference; 2. an Environmental Impact Statement (ANDAL); and

No.	Regulation	Summary	Requirement
		Management Plan and Environmental Monitoring Plan (RKL-RPL).	<p>3. an Environmental Management Plan and Environmental Monitoring Plan (RKL-RPL).</p> <p>The document must be prepared by a certified AMDAL consultant. As part of the AMDAL documents, an activities plan must be prepared and publicly announced. The public must be given 10 business days to provide feedback on the activities plan. The AMDAL will be evaluated by the AMDAL Evaluation Commission (Komisi Penilai AMDAL) established at the relevant level of government, which will issue a recommendation to that government.</p>
8.	Minister of Environment Regulation No 5/2012 on Activities Requiring Environmental Impact Assessment	This regulation focuses on type of business and/or activity that required to have Environmental Impact Assessment.	<p>There are 14 types of businesses are required to have an environmental impact analysis (annex I Lh Candy No. 5 of 2012), including:</p> <ol style="list-style-type: none"> 1. Multi Sector 2. Defense 3. Agriculture 4. Fisheries and Marine 5. Forestry 6. Transportation 7. Satellite technology 8. Industrial 9. Public works 10. Housing and residential areas 11. Energy and mineral resources 12. Tourism Sector 13. Nuclear energy 14. Hazardous waste management

No.	Regulation	Summary	Requirement
			<p>Type of business or activity shall be determined based on the significant potential environmental impacts analysis, and uncertainty of technological capabilities available to cope with the negative impacts that will arise.</p>
9.	<p>Government Regulation No 81/2012 on Waste Management of Household Waste and Similar Household Type Waste</p>	<p>This regulation focuses on preserving environmental standards through the management of waste as a resource. The regulation allows for targets to be set for waste reduction, emphasizes waste segregation at source and requires consideration to be given to recycling and reuse in the design of products and packaging.</p>	<p>Government Regulation includes:</p> <ol style="list-style-type: none"> a. Policy and strategy of waste management; b. Implementation of waste management; c. Compensation; d. Development and application of treatment technology; e. Information system; f. Role of communities; and g. Training. <p>Implementation of waste management includes waste reduction and waste handling. Waste reduction includes reduce, reuse and recycling. Waste handling includes segregation, collection, transportation, treatment and final disposal.</p>
10.	<p>Government Regulation No 27/2012 on Environmental Permit</p>	<p>This regulation focusses on every business and/or activities that are required to have EIA or UKL-UPL obliged to have the Environmental Permit.</p>	<p>Article 1:</p> <ol style="list-style-type: none"> a. Environmental permit is a permit given to the parties conducting business and/or activities that required environmental impact assessment or UKL-UPL in the framework of Environmental Management and Protection as a prerequisite for obtaining permits of business and/or activities; b. Environmental Impact Assessment (EIA) is a study of the significant impact of a business and/or activities planned to

No.	Regulation	Summary	Requirement
			<p>the environment that required for the decision making process on the implementation of business and/or activities;</p> <p>c. Environmental Management Effort and Environmental Monitoring Effort or UKL / UPL, is the management and monitoring of business and/or activities that do not have a significant impact to the environment that necessary for the decision making process on the implementation of business and/or activities.</p> <p>Article 2:</p> <p>a. Every business and/or activities that are required to have EIA or UKL-UPL obliged to have the Environmental Permit;</p> <p>b. Environmental Permit obtained through phases of activities that include:</p> <ul style="list-style-type: none"> - making of Amdal and UKL-UPL; - EIA assessment and examination of UKL-UPL; and - Application and issuance of Environmental Permit
11.	Minister of Home Affairs Regulation No 33/ 2010 on Guidelines for Waste Management	This regulations describes guidelines on waste management, including local government responsibilities, institutional arrangement, incentives and disincentives, cooperation and partnership, waste service retribution, compensation, community involvement, monitoring and development, reporting and financing aspect.	<p>a. The local government have to develop plan of waste reduction and waste management;</p> <p>b. Providing incentives and disincentives;</p> <p>c. Cost recovery (Retribution);</p> <p>d. The local government can do cooperation between local governments or partnering with business entities in waste management; and</p> <p>e. Provision of compensation to the community as the negative impact of the final processing of waste.</p>
12.	Minister of Environment Regulation No 18/ 2009 on Obtaining Permits	This regulation describes the types of B3 waste management activities for which permit is	The types of B3 waste management activities for which permit is required are:

No.	Regulation	Summary	Requirement
	for Storage, Treatment and Disposal of Hazardous Waste	required.	<p>a. transportation; b. temporary storage; c. collection; d. utilization; e. treatment; and f. stockpiling.</p> <p>A B3 waste producer may not conduct B3 waste collection item c. Permit for collection item c may only be granted if: a. B3 waste utilization technology is available; and/or b. a cooperation contract is entered into with parties undertaking B3 waste treatment and/or stockpiling. It is required that the cooperation contract item b stipulate the obligations of the respective parties in the eventuality of environmental pollution. Utilization item d may be:</p> <p>a. a primary activity; or b. a non-primary activity.</p>
13.	Law No 32/2009 on Protection and Management of the Environment	This regulation focuses on environmental protection and management defining the planning, utilization, control, maintenance, supervision and law enforcement. The provision for environmental protection in general is regulated by this regulation.	<p>Article 12:</p> <p>a. The utilization of natural resources carried out based on Environmental Management and Protection Plan (<i>Rencana Perlindungan dan Pengelolaan Lingkungan Hidup</i> or PPLH); b. In the case Environmental Management and Protection Plan referred to in paragraph (a) has not been arranged, the utilization of natural resources carried out based on the carrying capacity and the capacity by paying attention to:</p> <ul style="list-style-type: none"> - Sustainability of the processes and functions of the environment; - Sustainability of environmental productivity; and

No.	Regulation	Summary	Requirement
			<ul style="list-style-type: none"> - Safety, quality of life, and well-being of society. <p>Article 13:</p> <ol style="list-style-type: none"> a. Control of pollution and/or environmental damage done in the framework of environment conservation; b. Control of pollution and/or damage to the environment as referred to in paragraph (a) shall include prevention, countermeasures and recovery; and c. Control of pollution and/or damage to the environment as referred to in paragraph (a) shall be implemented by the Government, local government, and the person in charge of the business and/or activity in accordance with the authority, roles, and responsibilities of each. <p>Article 20:</p> <ol style="list-style-type: none"> a. Determination of environmental pollution measured through environmental quality standards; b. Environmental quality standards include: <ul style="list-style-type: none"> - Water quality standards; - Waste water quality standards; - Sea water quality standard; - Ambient air quality standard; - Emission standards; - Interference standards, and - Another quality standard in accordance with the development of science and technology. c. Every person is allowed to dispose the waste into the environment with the following requirements: <ul style="list-style-type: none"> - Meet environmental quality standards; and - Permission of the Minister, governor or mayor in

No.	Regulation	Summary	Requirement
			accordance with the authority.
14.	Law No 18/2008 on Waste Management	The first comprehensive national waste law for Indonesia, establishing the principles for public SWM services, providing incentive and disincentive mechanisms, defining how responsibilities for SWM are shared between the various levels of government, facilitating community-based SWM systems and private sector participation in SWM and setting out the penalties for disobeying the law.	<p>Waste management aims to improve public health and environmental quality and treat waste as a valuable resource.</p> <p>Waste managed under this Act includes household waste, similar household type waste and specific waste. Management of household waste consists of waste reduction and waste handling.</p>
15.	Minister of Public Works Regulation No 21/2006 on National Policy and Strategy of Waste Management System Development (KSNP-SPP)	This regulations outlines National Policy and Strategy of Waste Management System Development (KSNP-SPP) as guidelines for arrangement, implementation and development of environmental friendly solid waste management system.	<p>Based upon the Minister of Public Works regulation (21/PRT/M/2006) the Government of Indonesia issued a new guideline Law in 2008 which outlines the Solid Waste Management responsibilities for the local governments.</p> <p>The tasks of the Government of Indonesia and the local governments are to ensure that waste management is implemented in a proper manner, based upon environmentally sound management practices and in line with the objective of the Law.</p> <p>Key guideline components in the Law are the implementation of activities/programs that concentrate on the 3R approach.</p> <p>Focusing on generation, collection and disposal, the Law proposes a number of activities/programs to be implemented, including:</p> <ol style="list-style-type: none"> a. Public awareness; b. Institutional strengthening; c. MSW collection improvement; and d. Improved disposal, recovery and reuse.

No.	Regulation	Summary	Requirement
MUNICIPALITY LEVEL – PADANG			
16.	Padang City Regional Regulation No 21 of 2012 on Solid Waste Management	This regulation describes the various aspects of solid waste management in Padang City including rights and obligations, permit, waste reduction and waste handling, incentive and disincentive, cooperation, retribution for waste services, financing and compensation, community role, grievance mechanism, prohibition, dispute resolution, supervision and development, reporting, as well as sanction.	<ul style="list-style-type: none"> • The local government is required to prepare a masterplan for solid waste management that will be the basis for preparing the strategic plan, along with national and provincial policy and strategy in solid waste management. • Implementation of solid waste management by the local government consists of waste reduction, i.e. limitation of waste generation, waste recycling, waste reuse; and waste handling, i.e. sorting, collection, transportation, treatment, and final processing. In conducting waste management services, the local government may apply retribution fee based on applicable regulation. • All enterprises in waste transportation, treatment, and final processing must obtain permit from the mayor. • The local government acts as facilitator, supervisor, and assessor for individual, institution, and enterprise in conducting waste management. • The local government is required to finance the implementation of waste management, as well as provide compensation to people imposed to negative impacts from final processing activities. • The local government is required encourage community role in waste management, and the community has the right to raise complaints to related institutions in return.

APPENDIX 2

The World Bank Safeguards Policies

APPENDIX 2 - THE WORLD BANK SAFEGUARD POLICIES

Policy	Key Requirements
OP/BP 4.01 – Environmental Assessment	The Bank requires environmental assessment of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable and thus to improve decision making. For this reason, the Bank requires the environmental assessment of these projects, environmental and social risk assessment, public participation in decision making.
OP/BP 4.04 – Natural Habitats	The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats.
OP 4.09 – Pest Management	In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank
OP/BP 4.10 – Indigenous Peoples	For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the project by the affected Indigenous Peoples.
OP/BP 4.11 – Physical Cultural Resources	The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process.
OP/BP 4.12 – Involuntary Resettlement	This policy is aimed to minimize resettlements, assist the population exposed to involuntary resettlement, hamper decreasing of their income and living standards, compensate for the damages occurred during their resettlement, loss of their source of income and residence. Resettlement planning and policy description is required.
OP/BP 4.36 – Forests	The management, conservation, and sustainable development of forest eco-systems and their associated resources are essential for lasting poverty reduction and sustainable development, whether located in countries with abundant forests or in those with depleted or naturally limited forest resources. The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical natural habitats.
OP/BP 4.37 – Safety of Dams	The Bank distinguishes between small and large dams. Small dams are normally less than 15 m in height. This category includes, for example, farm ponds, local silt retention dams,

Policy	Key Requirements
	and low embankment tanks. For small dams, generic dam safety measures designed by qualified engineers are usually adequate.
OP/BP 7.60 – Projects in Disputed Areas	Projects in disputed areas may raise a number of delicate problems affecting relations not only between the Bank and its member countries, but also between the country in which the project is carried out and one or more neighboring countries. In order not to prejudice the position of either the Bank or the countries concerned, any dispute over an area in which a proposed project is located is dealt with at the earliest possible stage.
OP/BP 7.50 – Projects on International Waterways	This policy applies to the following types of international waterways: (a) any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states, whether Bank members or not; (b) any tributary or other body of surface water that is a component of any waterway described in (a) above.

APPENDIX 3

**Technical Standards for Sanitary
Landfill**

APPENDIX 3 - TECHNICAL STANDARDS FOR SANITARY LANDFILL

Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management	World Bank Sanitary Landfill Siting and Design Guidance
<p>General Requirement</p> <ol style="list-style-type: none"> 1. Waste treatment in landfill must include 4 (four) main activities, including waste segregation, waste recycling for non-organic waste, composting for organic waste and landfilling 2. Landfill must be equipped with buffer zone and operated as sanitary landfill for metropolitan city and controlled landfill for moderate/small size city. 3. Procedure of Landfill Planning must comply following requirements: <ol style="list-style-type: none"> a. Availability of landfill's operational expense (OPEX). b. Waste must be reduced through 3R activity prior entering the landfill. c. Only municipal solid waste is allowed to enter the landfill, any hazardous waste must be treated according to the regulation. d. In a city with limited available land, it is necessary to develop regional landfill and establish the institution to manage the landfill. 4. Any livestock activity which using the waste in landfill as livestock feed is not allowed. <p>Technical Requirement</p> <ol style="list-style-type: none"> 1. Selection of landfill location must meet the requirements as stated in SNI 03-3241-1994 on Landfill Location Selection Procedure. 2. Landfill planning must consider the following aspects: <ol style="list-style-type: none"> a. City and regional spatial plan, land use and utilization plan of closed landfill. b. Economic capacity of local government and community in deciding the most appropriate technology in landfill. c. Physical and geological condition of the site, such as topography, soil type, soil porosity, groundwater level, surrounding surface water, tidal condition, wind, climate and rainfall in order to decide the landfilling method. d. Existing road network development plan in order to decide landfill access road. e. Any landfill in hilly area must consider 	<ol style="list-style-type: none"> 1. Adequate land area and volume to provide sanitary landfill capacity to meet projected needs for at least 10 years, so that costly investments in access roads, drainage, fencing, and weighing stations are justifiable. For siting purposes, land area requirements shall be estimated based on the landfill cell area required (typically for a depth of 10-25 meters; a final solid waste density of 800-1,000 kg/cubic meter, and a minimum soil to refuse ratio of 1: 6), as well as about 2-4 hectares for the receiving area, 2-4 hectares for the leachate treatment and/or evaporation ponds, and additional 10% land for a landscaped buffer zone. 2. Preferably, a site accessible within 30 minutes travel time (a function of road and traffic conditions) is to be sought, even if it means buying land, because of the need to avoid adversely affecting the productivity of collection vehicles. At distances greater than 30 minutes travel, for collection operations to be economic, investment in either large capacity collection vehicles (5 tonnes per load or greater) or transfer stations with large capacity vehicles (20 tonnes or greater) would be necessary. 3. If transfer stations are required, the landfill should be accessible within 2 hours of travel time (one-way) by transfer trucks from the transfer station. Otherwise, for longer distances, transfer by rail or barge directly to the landfill site needs to be considered. Siting of rail or barge transfer sites within the refuse collection area may be difficult. Double handling by truck transfer and by rail or barge transfer units should be avoided because of costs. 4. Accessible from a competent paved public road which has an adequate width, slope, visibility and construction to accommodate the projected truck traffic. To minimize landfill development costs, the requirement for new access road construction generally should be less than 10 km for large landfills serving metropolitan areas and less than 3

Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management	World Bank Sanitary Landfill Siting and Design Guidance
<p>landslide possibility.</p> <ol style="list-style-type: none"> 3. A landfill must comply with the environmental requirements as follow: <ol style="list-style-type: none"> a. A sanitary landfill is required for cities of a big and metropolitan while a controlled landfill is required for cities of a moderate/small size. b. Must be equipped with leachate control to avoid pollution on soil, groundwater and surface water c. Must be equipped with leachate gas and odour control to avoid air quality pollution, fire or smoke and Green House Gas (GHG) emission d. Must be equipped with disease vector control. 4. Landfill facilities and infrastructure to support the above mentioned requirements are as follow: <ol style="list-style-type: none"> a. Public facility: access road, office/security post, drainage and fence b. Environmental protection facility: impermeable lining, leachate collection system, leachate treatment plant, landfill gas vent, buffer zone and cover soil c. Supporting facilities: weighbridge, clean water utilities, electricity utilities, workshop and garage d. Operational facilities: heavy equipment and soil truck <p>Landfill Siting</p> <p>Landfill siting must consider the following aspects:</p> <ol style="list-style-type: none"> 1. Spatial Plan 2. The site should not be within an area with geological formations of sandstone, limestone and porous dolomite and within a seismically active area prone to earthquake, landslides, floods 3. The site should not be in a hydrogeologically vulnerable area or where the ground water depth is at least 4 meters and the nearest surface water is 100 m. 4. Minimum distance with an airport is 1,500 m – 3,000 m. 5. Low rainfall with the low wind speed and dominant wind doesn't direct to settlement area. 6. The slope of the landfill should not exceed 20% 	<p>km for small landfills serving secondary cities.</p> <ol style="list-style-type: none"> 5. A gently sloped topography, preferably amenable to development of sanitary landfill by the Cell (Bund) method, with slopes which minimize the need for earthmoving to obtain the correct leachate drainage slope of about 2%. 6. Groundwater's seasonally high table level (i.e., 10 year high) is at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development. A minimum depth of 1 meter of relatively impermeable soils above the groundwater's seasonable high level exists (preferably, less than 10-9 meters/second permeability when undisturbed). If these criteria is not met, use of impermeable clay and/or plastic liners may be required to protect groundwater quality. 7. Availability on-site of suitable soil cover material to meet the needs for intermediate (minimum of 30 cm depth) and final cover (minimum of 60 cm depth), as well as bund construction (for the Cell method of landfill). Preferably, the site would have adequate soil to also meet daily cover needs (usually a minimum of 15 cm depth of soil). However, daily cover needs can be alternatively met by using removable tarps, other relatively inert materials (i.e., compost residuals), or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day. For purposes of siting, assume that at least 1 cubic meter of daily, intermediate, and final compacted soil cover is needed for every 6 cubic meters of compacted refuse. In most developing countries with highly organic wastes and warm climates, compacted refuse (after one year of natural consolidation and decomposition within warm and wet climates) achieves a density of 800-1000 kg/cubic meter. 8. None of the areas within the landfill boundaries are part of the 10-year groundwater recharge area for existing or pending water supply development. 9. No private or public drinking, irrigation, or livestock water supply wells within 500 meters downgradient of the landfill boundaries, unless alternative water supply sources are readily and economically

Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management	World Bank Sanitary Landfill Siting and Design Guidance
<p>7. The site should not be within productive land and protected zone, such as protected forest</p> <p>8. Community acceptance</p> <p>Site Plan</p> <p>Site plan of sanitary landfill and controlled landfill must consider the following items:</p> <ol style="list-style-type: none"> 1. Site optimization 2. There should be adequate distance between the site and public road. It can be arranged by fencing the landfill with green belt, while functioning as buffer zone. 3. Leachate treatment plant should be placed in the lower level to create gravitational leachate flow. 4. Operational landfill road must be adjusted to cell sequence. <p>Landfill Facilities and Infrastructure</p> <ol style="list-style-type: none"> 1. General facilities <ol style="list-style-type: none"> a. Access road should be able to facilitate waste truck from two directions, width 8 m with 2 – 3% slope direct to drainage, class 3 road type, axle road 10 ton and 30 km/hour vehicle speed. b. Operation road, consists of operational road during waste filling (temporary), operational road surrounding the landfill (permanent) and operational road connecting each facilities (permanent). c. Supporting buildings, such as office, car wash, warehouse and workshop d. Drainage to collect run-off from deposit waste e. Fencing f. Landfill nameplate 2. Environmental Protection Facilities <ol style="list-style-type: none"> a. Bottom liner <ul style="list-style-type: none"> • Bottom liner must be impermeable with coefficient less than 10^{-6} cm/second by using either compacted clay (30 cm x 2) or geomembrane (1.5 – 2 mm). • Must be equipped with leachate collection system. b. Leachate Collection and Treatment System <ul style="list-style-type: none"> • Leachate collection pipe consists of primary and secondary pipe. • Leachate treatment plant, several technology alternatives in Indonesia are as follow: <ol style="list-style-type: none"> ○ Alternative 1: anaerobic pond, 	<p>available and the owner(s) gives written consent to the potential risk of well abandonment.</p> <ol style="list-style-type: none"> 10. No environmentally significant wetlands of important biodiversity or reproductive value are present within the potential area of the landfill cell development. 11. No known environmentally rare or endangered species breeding areas or protected living areas are present within the site boundaries. If this criteria is not met, alternative habitats of comparable quality for relocation of the species would need to be available. 12. No significant protected forests are within 500 meters of the landfill cell development area. 13. No open areas of high winds, otherwise windblown litter will not be readily manageable. 14. No major lines of electrical transmission or other infrastructure (i.e., gas, sewer, water lines) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible. 15. No underlying limestone, carbonate, fissured or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit above sensitive groundwaters. 16. No underlying underground mines which could be adversely affected by surface activities of landfilling, or minable resources which could be rendered less accessible by landfilling, unless the owner(s) gives explicit consent. 17. No residential development within 250 meters from the perimeter of the proposed landfill cell development. 18. No visibility of the proposed landfill cell development area from residential neighborhoods within 1 km. If residents live within 1 km of the site, landscaping and protective berms would need to be incorporated into the design to minimize visibility of operations. Curving of the access road is recommended to avoid visibility of the active portions of the landfill from the main road.

Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management	World Bank Sanitary Landfill Siting and Design Guidance
<p>facultative pond, maturation pond and biofilter</p> <ul style="list-style-type: none"> ○ Alternative 2: anaerobic pond, facultative pond, maturation pond and wetland ○ Alternative 3: Anaerobic Baffled Reactor (ABR) with aerated lagoon ○ Alternative 4: Coagulation-flocculation stage, sedimentation, anaerobic pond or ABR ○ Alternative 5: Coagulation-flocculation stage, sedimentation I, aerated lagoon, sedimentation II. <ul style="list-style-type: none"> ● Effluent quality standard must follow the applicable regulation. <p>c. Gas collection system</p> <ul style="list-style-type: none"> ● Gas vent should be installed in sequence starting from bottom layer of waste and can be connect to leachate collection pipe. Gas vent should be HDPE pipe with diameter 150 mm surrounded by gabion channel with diameter 400 mm and filled with crushed stone with diameter 50-100 mm. gas vent height will depend on waste layer height (add 50 cm in each waste layer). Vent pipe on the final layer must be equipped with iron pipe diameter 150 mm. Distance between each vent pipe ranged from 50 – 70 m. ● In sanitary landfill, gas pipe must be collected and transferred to gas flaring unit. ● Several options of gas collection system; horizontal vent (to catch gas flow within particular waste layer or cell), vertical vent (to direct the gas flow upward) and final vent (installed after the completion of final waste layer, can be connected to gas flaring system or other gas collection facility). <p>d. Cover soil</p> <ul style="list-style-type: none"> ● It must be used to control litter, fire hazard, odour, disease vector, and leachate production. ● Cover soil should be permeable type. ● Sanitary landfill requires daily cover while controlled landfill required periodically cover. ● The width of daily cover ranged from 10-15 cm, intermediate cover ranged from 30-40 cm and final cover ranged from 50-100 cm. ● Slope of daily cover should be adequate to flow the run-off from the top soil. It should 	<ol style="list-style-type: none"> 19. No perennial stream within 300 meters downgradient of the proposed landfill cell development, unless diversion, culverting or channeling is economically and environmentally feasible to protect the stream from potential contamination. 20. No significant seismic risk within the region of the landfill which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures, otherwise side slopes may need to be adjusted to be gentler than the maximum of 2.5:1. 21. No fault lines or significantly fractured geologic structure within 500 meters of the perimeter of the proposed landfill cell development which would allow unpredictable movement of gas or leachate. 22. No siting within 3 km of a turbojet airport and 1.6 km of a piston-type airport. For sites located more than 3 km and less than 8 km from the nearest turbojet airport (or more than 1.6 km and less than 8 km from the nearest piston-type airport), no consideration is to be given unless the aviation authority has provided written permission stating that it considers the location as not threatening to air safety. 23. No siting within a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, must be amenable to an economic design which would eliminate the potential for washout. 24. Avoid siting within 1 km of socio-politically sensitive sites where public acceptance might be unlikely (i.e., memorial sites, churches, schools) and avoid access roads which would pass by such culturally sensitive sites.

Minister of Public Work Regulation No. 03/PRT/M/2013 on Implementation of Waste Infrastructure in Household and Similar Household Type Waste Management	World Bank Sanitary Landfill Siting and Design Guidance
<p>not be more than 1:3 to avoid erosion.</p> <ul style="list-style-type: none"> • Final cover must be layered with top soil and must be planted with vegetation. • If cover soil is unavailable, several alternatives can be used as substitute; biodegradable liners, compost, tarpaulin or biodegradable membrane. • If cover soil is limited, the cover soil or tarpauline can be re-used for the next layer. <p>e. Buffer zone f. Groundwater monitoring well</p> <p>3. Supporting Facilities</p> <ul style="list-style-type: none"> a. Weighbridge b. Clean water utilities c. Workshop/garage, min. space for 3 vehicles <p>4. Operational facilities</p> <ul style="list-style-type: none"> a. Heavy equipments 	

APPENDIX 4

**Public Consultation & Disclosure
Documents**

APPENDIX 4 - PUBLIC PARTICIPATION & DISCLOSURE DOCUMENTS

Public consultation is part of the process in a project development to obtain inputs from stakeholders in improving the project. The purpose of the public consultation is to:

- present draft reports and assessments to ensure fulfillment of environmental and social aspects, in accordance with the applicable laws and legislation;
- obtain feedback from stakeholders to improve these reports and to assess the extent of how a project can be implemented; and
- obtain feedback about the role of the parties in the implementation of a project.

At various stages of the due diligence and assessment process, the public is being consulted by the government and the consultants to inform them about the planned project activities and its potential impacts, risks and benefits, allow for questions to be posed and answered, as well as consult the public to receive feedback and concerns. Feedback and concerns received will feed into project planning and implementation, while grievances will be addressed separately by using a grievance resolution mechanism discussed in a separate section below.

The following document provides a brief discussion of the stages that have already been carried out and those still planned and the type of consultation that was implemented.

SCREENING

In August 2017, environmental and social consultants were dispatched to the site as part of the initial scoping and screening to understand the extent of the project baseline, site condition, and current operation of the facilities. Only a select group of project stakeholders and community representatives were approached during this stage and informed about the project intentions and following planned stages.

SOCIAL AND ENVIRONMENTAL FIELD SURVEYS

During the site visits, environmental and social teams went to the site to start their detailed investigations and the gathering of primary data. In the process of gathering these data, a number of people were approached, either through key informant interviews or by filling in questionnaires. The people approached are all relevant stakeholders of the project, some are project affected communities, others are interested parties in the project. The field surveys have been documented, the perception of affected community is being included in the social baseline chapter of the E&S Safeguards document.

DRAFT E&S SAFEGUARDS DOCUMENT

After the completion of draft E&S Safeguards document, its result has been presented through public consultation in October 2017 to selected representatives of the local affected communities and other key stakeholders who have an interest in, or influence on, the project planning and implementation. The public consultation consists of presentations on the document and the opportunity for the attending participants to ask questions and voice their concerns and suggestions. These concerns and suggestions have been recorded together with the participants list and minutes of meeting. Documentation of public consultation is presented in the section below.

AMDAL/UKL&UPL

Where an Amdal or UKL & UPL is required for the proposed project works (upgrade/extension of the facilities), a Public Consultation will take place.

Community and stakeholder involvement is also invited during the approval process for the UKL-UPL documents, through consultation with UKL-UPL Technical Team. Input and suggestions from the related stakeholders will be used to improve the UKL-UPL documents for approval.

STAKEHOLDERS

Stakeholders have been identified using maps, existing EIA/Amdal documents and by talking to different government agencies and other relevant non-governmental organisations. The list of stakeholders that have been approached and were invited to events as part of the public consultation process can be seen in section below.

DISCLOSURE OF INFORMATION

After the E&S Safeguards document is finalized, it will be published on the WB website. Materials that are presented in public consultations are presented in this appendix.

Several public consultations have been done for TPA Tamangapa. The first public consultation was conducted in 2007 as part of AMDAL process. The second public consultation for TPA Tamangapa Development Plan was conducted in 10th October 2017 after preparation of E&S Safeguards document. Further details on each public consultation are described as follow.

1. Public Consultation during TPA Tamangapa AMDAL Preparation

The following information provides a summary of the public consultations and public awareness activities undertaken as part of the legal requirements for the TPA Tamangapa AMDAL process. All information has been taken from the KA ANDAL and ANDAL Documents (2007) as follow.

- **AMDAL Announcement, date - 1st October 2007**
 - The project area impacted communities, NGOs, project Stakeholders, and environmental representatives, were invited to submit suggestions, opinions, concerns and responses regarding the advertised TPA Tamangapa Development Plan from 1st October until 1st November 2007, in accordance with Bappeddal Decree No. 8 Year 2000 regarding Community Involvement and Open Information on the AMDAL Process.
 - Newspaper Announcement, date – 10th October 2007
 - The communities, NGOs, project Stakeholders, and environmental representatives, input is accepted and is considered for AMDAL document preparation.
- **Public Consultation and Interviews with the communities for during the ANDAL studies**
 - Total Interviewees: 300 at Kelurahan Manggala and Kelurahan Tamangapa;
 - 70% of the community respondents support the proposed development of TPA Tamangapa;
 - Approximately 82% of the respondents reported 'disturbing odour' from the TPA; and
 - Approximately 18% of respondents stated that wastewater discharge from TPA polluted the water bodies/supplies.

2. Public Consultation for the Proposed Rehabilitation and Extension of TPA Tamangapa Makassar

A public consultation for the proposed rehabilitation and extension project of TPA Tamangapa Makassar was conducted on Tuesday, 10th October 2017 at the office of TPA Tamangapa. Public consultation was attended by about 25 people of Project Affected People; waste pickers, livestock owner, waste collector (*pengepul*) and surrounding community. Public consultation was also attended by the representatives of *Dinas Lingkungan Hidup Makassar* and consultant representatives to present the proposed project and the result of environmental and impact assessment.

The following provides a summary of the public consultation proceedings:

- Manggala Village strongly supports TPA Tamangapa rehabilitation and development plan.
- Community's main concerns regarding current condition in landfill are odour, leachate discharge and traffic congestion due to garbage trucks queue. They hope that landfill improvement can be done immediately, thus any problem in landfill which disturb community will be solved.
- The project is expected to not just focus on landfill's technical aspect, but also non-technical aspect. The project should prioritize local community when labours are needed. It should also consider waste pickers who relies heavily on landfill as their main livelihood. The livestock owner should also be taken into account as they graze their cattle in landfill on daily basis.
- Community hope that they don't have to pay waste service retribution anymore as compensation to the disturbance caused by landfill operation.
- Furthermore, community hope that the project will not just give positive impact on waste management, but also to the community empowerment, particularly to the children who can't go to school.
- Representative of *Dinas Lingkungan Hidup* informed that any approach in this project, both on technical and non-technical aspect, will be conducted based on the local conditions of Makassar.



Figure 1 Public Consultation on 10th October 2017

Complete documentation, both from AMDAL Preparation and Proposed Development Plan, can be found in the following sections.

TPA TAMANGAPA AMDAL PREPARATION
PUBLIC ANNOUNCEMENT
(2007)



PEMERINTAH KOTA MAKASSAR
**DINAS PENGELOLAAN LINGKUNGAN HIDUP
DAN KEINDAHAN**

Jalan Jenderal Urip Sumoharjo No. 8 ☎ (0411) 457001 Makassar

PENGUMUMAN AMDAL

NO. 668/2006/DPUMK/X-12007

Berdasarkan Keputusan Kepala BAPEDAL Nomor 8 Tahun 2000 tentang Keterlibatan Masyarakat dan Keterbukaan Informasi Dalam Proses AMDAL maka dalam rangka persiapan Penyusunan Analisis Mengenai Dampak Lingkungan Hidup (AMDAL) **Rencana Pengembangan TPA Mangapa Kota Makassar**, disampaikan kepada masyarakat yang berkepentingan (masyarakat terkena dampak dan pemerhati lingkungan) untuk memberikan saran, pendapat dan tanggapan atas kegiatan dimaksud.

Saran, pendapat, dan tanggapan secara tertulis disampaikan ke:

1. Dinas Pengelolaan Lingkungan Hidup dan Keindahan Kota Makassar (Sekretariat Komisi Penilai AMDAL Kota Makassar)
Jl. Urip Sumoharjo No. 8, Telp/Fax (0411) 457 001 Makassar.
2. CV. Mutahir Jl. A.P. Pettarani II No.4 Telp.(0411) 447 964

Penyampaian saran, pendapat dan tanggapan terhitung mulai tanggal **Oktober sampai 1 Nopember 2007**.

Saran, pendapat, dan tanggapan yang dilengkapi identitas akan diterima dan dipertimbangkan dalam penyusunan AMDAL.

Demikian pengumuman ini disampaikan secara luas agar masyarakat mengetahuinya.

Makassar, 1 Oktober 2007



Drs. H. BURHANUDDIN, MS
Pangkat: Pembina Utama Muda
NIP: 010 142 661

Pengumuman Amdal yang Dimuat pada Koran Harian Fajar
pada hari Rabu tanggal 10 Oktober 2007

PENGUMUMAN AMDAL

No.669/906/DPLHK/X/2007

Berdasarkan Keputusan Kepala BAPEDAL No.8 Tahun 2000 tentang Keterlibatan Masyarakat dan Keterbukaan Informasi Dalam Proses AMDAL maka dalam rangka persiapan Penyusunan Analisis Mengenai Dampak Lingkungan Hidup (AMDAL) Rencana Pengembangan TPA Tamangapa Kota Makassar, disampaikan kepada masyarakat yang berkepentingan (masyarakat terkena dampak dan pemerhati lingkungan) untuk memberikan saran, pendapat dan tanggapan atas kegiatan dimaksud.

Saran, pendapat, dan tanggapan, secara tertulis dilengkapi identitas disampaikan ke:

1. Dinas Pengelolaan Lingkungan Hidup dan Keindahan Kota Makassar (Sekretariat Komisi Penilai AMDAL Kota Makassar)
Jl. Urip Sumoharjo No. 8, Telp/Fax (0411) 457 001 Makassar
2. CV. Mutahir Jl. A.P. Pettarani II No.4 Telp. (0411) 447 964

Penyampaian saran, pendapat dan tanggapan terhitung mulai tanggal 1 Oktober s/d 1 Nopember 2007.

Demikian pengumuman ini disampaikan secara luas agar masyarakat mengetahuinya.

Makassar, 1 Oktober 2007

Ttd

 Kepala Dinas PI HK Kota Makassar

TPA TAMANGAPA AMDAL PREPARATION
SOCIAL QUESTIONNAIRE
(2007)

Daftar Pertanyaan

STUDI AMDAL RENCANA PENGEMBANGAN TPA TAMANGAPA

DINAS PENGELOLAAN LINGKUNGAN HIDUP DAN KEINDAHAN KOTA MAKASSAR

Kota : Makassar
Kecamatan :
Kelurahan :
RW :
RT :

Pewawancara :
Hari/Tanggal :

MAKASSAR, 2007

A. IDENTITAS RESPONDEN

- 1. Nama :(L/P)
- 2. Umur :Tahun
- 3. Pendidikan
 - a. Tuna Aksara
 - b. SD Tamat,
 - c. SLTA
 - d. SD Tidak Tamat
 - e. SLTP
 - f. AK/PT
- 4. Agama
 - a. Islam
 - b. Katolik
 - c. Protestan
 - d. Hindu/Budha
 - e. Konghucu
 - f. Lainnya

B. ASPEK SOSIAL EKONOMI

- 1. Mata Pencaharian Utama
 - a. Pegawai Negeri/TNI/Polri
 - b. Karyawan Swasta
 - c. Petani
 - d. Pensiunan PNS/TNI/Polri
 - e. Buruh Bangunan
 - f. Jasa (Pete-Pete/Taxi/Becak)
 - g. Jasa Warung/Kios
 - h. Pemulung
- 2. Penghasilan keluarga rata-rata per bulan: (Berdasarkan No. 1)
 - a. Pendapatan Suami : Rp.....
 - b. Pendapatan Istri : Rp.....
 - c. Pendapatan Sampingan : Rp.....
 - Jumlah : Rp.
- 3. Pengeluaran keluarga rata-rata per bulan :
 - a. Makanan/Minuman : Rp.
 - b. Rumah Tangga : Rp.
 - c. Kesehatan : Rp.
 - d. Sosial (Selamatan , Arisan dll) : Rp.
 - Jumlah : Rp.

C. STATUS PEMILIKAN TANAH/RUMAH

(Hanya responden Bermukim Disekitar Lokasi)

- 1. Sudah berapa lama Bapak/Ibu. Bermukim atau menempati Tanah/Rumah ini.
 - a. < 10 tahun
 - b. > 10 tahun
- 2. Status tempat tinggal (Rumah):
 - a. Hak Milik
 - b. Sewa,
 - c. Lainnya.....
- 3. Rumah dibangun sejak tahun(.... tahun)
- 4. Kualitas bangunan rumah
 - a. Permanen (Tembok)
 - b. Semi permanen

D. SOSIAL BUDAYA

- 1. Menurut Bapak/Ibu, apakah di sini masih ada kegiatan yang dilakukan secara kerja sama atau gotong royong oleh warga ?
 - a. Ya, ada
 - b. Tidak ada
- 2. Jika Ada ! kegiatan apa saja ?
 - a. Kerja bakti membersihkan lingkungan
 - b. Memperbaiki Masjid atau Sarana Keagamaan lainnya

- c.
- d.
- 3. Menurut Bapak/Ibu, apakah masih ada adat-istiadat atau kebiasaan di kelurahan ini yang dilakukan oleh warga ?
 - a. Ya, ada
 - b. Tidak ada (ke. p7)
- 4. Jika Ada, adat-istiadat atau kebiasaanan apa saja ?
 - a.
 - b.
 - c.
- 5. Menurut Bapak/Ibu, apakah di sini masih ada pertemuan-pertemuan antar kelompok masyarakat di kelurahan ini ?
 - a. Ada
 - b. Tidak ada
- 6. Jika Ada , pertemuan-pertemuan apa saja yang dilakukan ?
 - a.
 - b.
 - c.
- 7. Jika tidak ada, apa sebabnya ?
 - a.
 - b.
- 8. Menurut Bapak/Ibu, jenis tindakan kriminal atau kejahatan apa saja yang pernah atau sering terjadi di wilayah ini ? dan kelompok mana yang sering lakukan !
 - a.
 - b.
- 9. Menurut pandangan Bapak/Ibu, kriteria utama apa yang dominan dalam menentukan status sosial masyarakat (diurut menurut kriteria utama)
 - a. Pendidikan (.....)
 - b. Ekonomi (.....)
 - c. Pekerjaan (.....)
 - d. Kekuasaan (.....)

E. SIKAP DAN PERSEPSI MASYARAKAT

- 1. Apakah Bpk/Ibu mengetahui, akan ada Rencana pengembangan/perluasan TPA Tamangapa?
 - a. Ya, Mengetahui
 - b. Tidak Mengetahui
- 2. Jika mengetahui, dari mana bapak memperoleh informasi tentang rencana tsb. ?
 - a. Pemerintah Kota/Kecamatan/Kelurahan
 - b. Media Cetak Harian Fajar
 - c. Ketua RW/RT
 - d. Sesama Anggota Masyarakat
 - e. Papan Pengumuman dilokasi rencana kegiatan
- 3. Bagaimana Pendapat Bpk/Ibu tentang rencana pengembangan/perluasan TPA tersebut?
 - a. mendukung
 - b. tidak mendukung
 - c. terserah pemerintah kota
- 4. Jika Mendukung, Apa alasannya !
 - a.
 - b.
 - c.
 - d.

- c.
- d.
- 3. Menurut Bapak/Ibu, apakah masih ada adat-istiadat atau kebiasaan di kelurahan ini yang dilakukan oleh warga ?
 - a. Ya, ada
 - b. Tidak ada (ke. p7)
- 4. Jika Ada, adat-istiadat atau kebiasaanan apa saja ?
 - a.
 - b.
 - c.
- 5. Menurut Bapak/Ibu, apakah di sini masih ada pertemuan-pertemuan antar kelompok masyarakat di kelurahan ini ?
 - a. Ada
 - b. Tidak ada
- 6. Jika Ada , pertemuan-pertemuan apa saja yang dilakukan ?
 - a.
 - b.
 - c.
- 7. Jika tidak ada, apa sebabnya ?
 - a.
 - b.
- 8. Menurut Bapak/Ibu, jenis tindakan kriminal atau kejahatan apa saja yang pernah atau sering terjadi di wilayah ini ? dan kelompok mana yang sering lakukan !
 - a.
 - b.
- 9. Menurut pandangan Bapak/Ibu, kriteria utama apa yang dominan dalam menentukan status sosial masyarakat (diurut menurut kriteria utama)
 - a. Pendidikan (.....)
 - b. Ekonomi (.....)
 - c. Pekerjaan (.....)
 - d. Kekuasaan (.....)

E. SIKAP DAN PERSEPSI MASYARAKAT

- 1. Apakah Bpk/Ibu mengetahui, akan ada Rencana pengembangan/perluasan TPA Tamangapa?
 - a. Ya, Mengetahui
 - b. Tidak Mengetahui
- 2. Jika mengetahui, dari mana bapak memperoleh informasi tentang rencana tsb. ?
 - a. Pemerintah Kota/Kecamatan/Kelurahan
 - b. Media Cetak Harian Fajar
 - c. Ketua RW/RT
 - d. Sesama Anggota Masyarakat
 - e. Papan Pengumuman dilokasi rencana kegiatan
- 3. Bagaimana Pendapat Bpk/Ibu tentang rencana pengembangan/perluasan TPA tersebut?
 - a. mendukung
 - b. tidak mendukung
 - c. terserah pemerintah kota
- 4. Jika Mendukung, Apa alasannya !
 - a.
 - b.
 - c.
 - d.

- c.
- d.
- 3. Menurut Bapak/Ibu, apakah masih ada adat-istiadat atau kebiasaan di kelurahan ini yang dilakukan oleh warga ?
 - a. Ya, ada
 - b. Tidak ada (ke. p7)
- 4. Jika Ada, adat-istiadat atau kebiasaanan apa saja ?
 - a.
 - b.
 - c.
- 5. Menurut Bapak/Ibu, apakah di sini masih ada pertemuan-pertemuan antar kelompok masyarakat di kelurahan ini ?
 - a. Ada
 - b. Tidak ada
- 6. Jika Ada , pertemuan-pertemuan apa saja yang dilakukan ?
 - a.
 - b.
 - c.
- 7. Jika tidak ada, apa sebabnya ?
 - a.
 - b.
- 8. Menurut Bapak/Ibu, jenis tindakan kriminal atau kejahatan apa saja yang pernah atau sering terjadi di wilayah ini ? dan kelompok mana yang sering lakukan !
 - a.
 - b.
- 9. Menurut pandangan Bapak/Ibu, kriteria utama apa yang dominan dalam menentukan status sosial masyarakat (diurut menurut kriteria utama)
 - a. Pendidikan (.....)
 - b. Ekonomi (.....)
 - c. Pekerjaan (.....)
 - d. Kekuasaan (.....)

E. SIKAP DAN PERSEPSI MASYARAKAT

- 1. Apakah Bpk/Ibu mengetahui, akan ada Rencana pengembangan/perluasan TPA Tamangapa?
 - a. Ya, Mengetahui
 - b. Tidak Mengetahui
- 2. Jika mengetahui, dari mana bapak memperoleh informasi tentang rencana tsb. ?
 - a. Pemerintah Kota/Kecamatan/Kelurahan
 - b. Media Cetak Harian Fajar
 - c. Ketua RW/RT
 - d. Sesama Anggota Masyarakat
 - e. Papan Pengumuman dilokasi rencana kegiatan
- 3. Bagaimana Pendapat Bpk/Ibu tentang rencana pengembangan/perluasan TPA tersebut?
 - a. mendukung
 - b. tidak mendukung
 - c. terserah pemerintah kota
- 4. Jika Mendukung, Apa alasannya !
 - a.
 - b.
 - c.
 - d.

**PERTANYAAN UNTUK TOKOH MASYARAKAT
RENCANA PENGEMBANGAN/PERLUASAN AREAL TPA TAMANGAPA**

I. PERSEPSI/SIKAP

1. Bagaimana pendapat Bapak/Ibu terhadap rencana perluasan areal TPA Tamangapa?

2. Sejak diketahui bahwa akan diperluas TPA tersebut, apakah pernah terjadi protes dari masyarakat ??

a. Pernah

b. Tidak Pernah

Jika Pernah, Apa sebabnya ??

3. Bagaimana pendapat Bpk/Ibu mengenai sikap masyarakat terhadap perluasan areal TPA tersebut ?

4. bagaimana pendapat bapak/ibu terhadap TPA Tamangapa saat ini

TPA TAMANGAPA AMDAL PREPARATION
DOCUMENTATION
(2007)



Wawancara dengan Warga Sekitar TPA-Sampah Tamangapa



Pengambilan Sampel Air Limbah TPA-Sampah Tamangapa

TPA TAMANGAPA DEVELOPMENT PLAN
PUBLIC CONSULTATION
(10 OCTOBER 2017)

- Invitation from *Dinas Lingkungan Hidup*
 - Minutes of Meeting
 - Attendance List
 - Feedback Forms
 - Presentation Materials



PEMERINTAH KOTA MAKASSAR DINAS LINGKUNGAN HIDUP

Jalan Jenderal Urip Sumoharjo No. 8 ☎ (0411) 457 001
Websitr : www.blhdmakassar.info



Makassar, 6 Oktober 2017

Nomor : 005/ 2568 /DLH//X/2017
Lampiran : 1 (satu) Lembar
Perihal : **UNDANGAN**

K e p a d a

Yth. Daftar Undangan Terlampir
di-
M a k a s s a r

Dengan hormat, kami mengundang Bapak / Ibu/ Saudara (i) untuk mengikuti Acara " **Konsultasi Publik Rencana Pengembangan TPA Tamangapa**" yang akan dilaksanakan pada :

Hari / Tanggal : Selasa, 10 Oktober 2017
Pukul : 10.00 Wita – Selesai
Tempat : Ruang Rapat Kantor UPTD TPA Tamangapa
Jl. Borong Jambu Tamangapa Makassar

Mengingat pentingnya acara tersebut, dimohon kehadiran Bapak / Ibu/ Sdr (i) tepat waktu.

Demikian undangan ini disampaikan dan atas kehadiran Bapak / Ibu/ Sdr (i) diucapkan terima kasih.


PLT. KEPALA DINAS
DINAS
LINGKUNGAN HIDUP
Drs. ABDUL AZIS HASAN, Msi
Pangkat : Pembina Tingkat I
NIP. 19600925 198003 1 007

Tembusan :

1. Walikota Makassar sebagai Laporan
2. Kepala Badan Pengelola Keuangan dan Aset Kota Makassar
3. Kepala Inspektorat Kota Makassar
4. Peringgal

6 2568 /DLH/X/2017
Oktober 2017

DAFTAR UNDANGAN

1. KEPALA KECAMATAN MANGGALA
2. LURAH TAMANGAPA
3. LURAH MANGGALA
4. DANRAMIL KECAMATAN MANGGALA
5. KAPOLSEK KECAMATAN MANGGALA
6. DIRUT. PD. RUMAH POTONG HEWAN
7. WARGA SEKITAR TPA
8. PEMULUNG / PENGEPUK
9. PEMILIK HEWAN TERNAK SEKITAR TPA

BERITA ACARA

Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa di Kelurahan Tamangapa, Kecamatan Manggata, Kota Makassar, Provinsi Sulawesi Selatan

Pada hari ini Selasa, tanggal Sepuluh bulan Oktober tahun Dua Ribu Tujuh Belas, bertempat di Ruang Rapat Kantor UPTD TPA Tamangapa, Jl. Borong Jambu Tamangapa Makassar telah dilakukan *Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa di Kelurahan Tamangapa, Kecamatan Manggata, Kota Makassar, Provinsi Sulawesi Selatan.*

Konsultasi publik dihadiri oleh 25 orang yang terdiri dari (daftar hadir terlampir):


- Pengepul sampah: 7 orang
- Pemulung: 8 orang
- Masyarakat sekitar: 8 orang
- Peternak: 2 orang

Konsultasi publik ini diawali dengan pemukaan oleh Bapak Ayyub selaku Kepala Bidang Persampahan Dinas Lingkungan Hidup Kota Makassar yang dilanjutkan dengan presentasi oleh konsultan penyusun studi kelayakan mengenai Rencana Pengembangan TPA Tamangapa. Rangkuman konsultasi publik adalah sebagai berikut:

- a) Atas nama Pemerintah Kota setempat dalam hal ini Kelurahan Manggala sangat mendukung untuk kegiatan Rencana Pengembangan TPA Tamangapa.
- b) IPL eksisiting dan landasan sebaiknya segera dipercepat untuk perbaikannya, mengingat di musim hujan dan pencemaran lingkungan terhadap air tanah sudah sangat mengganggu lingkungan di sekitar TPA.
- c) Pendekatan-pendekatan sistem yang komprehensif, baik teknis maupun non teknis pelaksanaannya akan disesuaikan dengan kondisi setempat di Kota Makassar.
- d) Harapan masyarakat terhadap pengembangan TPA Tamangapa ini akan memberi dampak positif kepada masyarakat sekitar termasuk anak-anak pemulung yang putus sekolah.

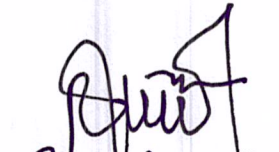
Demikian Berita Acara Konsultasi Publik ini dibuat untuk dapat ditindaklanjuti sebagaimana mestinya. Masukan dari lembar SPT, notulensi, dan daftar hadir merupakan satu kesatuan dari Berita Acara ini.

Kelurahan Tamangapa



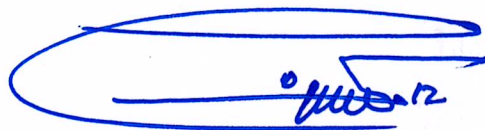
(Kha. Pasy 19)

Kelurahan Manggala



(Rusni M. SE)

Kecamatan Manggala



(Ansther Umar)



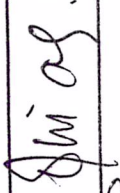







Dinas Lingkungan Hidup Kota Makassar











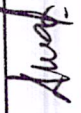






(Ayyub Saahudin)

**DAFTAR HADIR RAPAT KOORDINASI PERSIAPAN
ACARA KONSULTASI PUBLIK RENCANA PENGEMBANGAN TPA TAMANGAPA**

HARI/ TANGGAL : Selasa Tanggal 10 Oktober 2017
 Pukul : 10.00 Wita - selesai
 Tempat : Ruang Rapat Kantor UPTD TPA TAMANGAPA Jl. Borong Jambu TAMANGAPA MKS

NO	NAMA	JENIS KELAMIN (L/P)	INSTANSI	TANDA TANGAN
1	Hj. Masriati,	P	Pengepul	1 
2	DE HINDO	P	Pengepul	2 
3	Nasaria	P	Masyarokat	3 
4	Ayudina	P	Masyarokat	4 
5	Rosma	P	Perwakilan	5 
6	DE TEMPO	L	PENGEPUL	6 
7	Tunni	P	Perwakilan	7 
8	HARTATI	P	Perwakilan	8 
9	HAR	L	MASYARAKAT	9 
10	USMAN	L	ket RT-02 / Peroy	10 

NO	NAMA	JENIS KELAMIN (L/P)	INSTANSI	TANDA TANGAN
11	SYAMSUL ALAM	L	Pengumpul	11 
12	Spamadi Md.	L	Pengumpul	12 
13	Anshar Umar	L	Kel. MGI	13 
14	SALAIMAN	L	Penyumpul	14 
15	SATHIR	L	- > L	15 
16	Aspi Aul.	L	mesyarakat	16 
17	SABRI	L	MAS XARAT	17 
18	Rusniyah	P	Kel. Manggul	18 
19	H. Hozoh	L	DCH	19 
20	ANUSYARAN	L	TANJUNGPADA	20 
21	Bia.	P	pemukun	21 
22	KCA	L	PEMULAKS	22 
23	ROSWANATI	P	P. MULUNG	23 
24	H. POLE	L	PETERNAK	24 
25	SULTAN. Y	L	PETERNAK	25 

LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

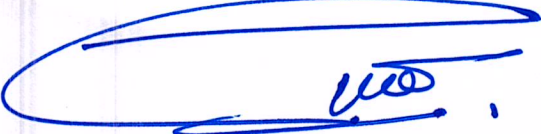
Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	:	ANOTAR UMAR.	
Desa/Instansi	:	Kel. Tamangapa	
Umur	:	45 Tahun	Jenis Kelamin : <u>Pria</u> / Wanita

SARAN/MASUKAN/TANGGAPAN :

- ⇒ Sosialisasi rutin dan berkelanjutan
- ⇒ yg secepatnya di aplikasikan / direalisasikan.
- ⇒ agar sdah pemberdayaan masyarakat lokal.

Makassar, 10 Oktober 2017


(Anotar Umar)

LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

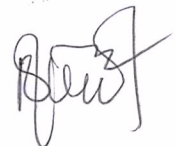
Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	: RUSNIAH		
Desa/Instansi	: Kel. MANANGAPA		
Umur	: 53 Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

- Mengenai TPA kedepan agar sebagai warga yg berkeketatan dg TPA ini ada 3 kel. yakni :
 1. Tamangapa
 2. Manggata
 3. Biring Rannay
- Menakuti 3 kelurahan yg berdomisili di wilayah TPA agar ada pemukiman di Manggata, juga jangan Dampaknya yg didapat yaitu BANYAK yg TIDAK SEDAP, tapi ada sisi yg positif yg membawa keuntungan.
- Bagaimana Klu kami di Silit TPA TDR usaha di libatkan pembayar Retribusi Sampah.

Makassar, 10 Oktober 2017



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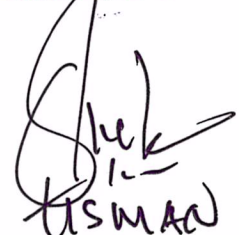
LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN
Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	: USMAN		
Desa/Instansi	: kel RT		
Umur	: 34 Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

- kembalikan kesterilan lingkungan di sekitar TPA
- Di upayakan agar TPA bisa di kelola dng baik supaya bau nya tidak mengganggu warga sekitar TPA
- Masyarakat Sekitar TPA bebas Pertribusi Sampah.

Makassar, 10 Oktober 2017


USMAN

LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN
Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	:	TIAN		
Desa/Instansi	:	KEC. MANGGATA		
Umur	:	Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

① PERUBAHAN ALAT PERAT,
SPX BS MEMPERCEPAT
SAMPAH YG DR MOBIL
AGAN TRUK TERJADI
ANTREAN YG BS TAWA.

② MASALAH LUMBUH AIR LAMPING
YG DI BELAKANG, MUDAH BERSER
BS DI PERCEPAT KR JALAN.

Makassar, 10 Oktober 2017

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LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN


Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	:	ROSMA			
Desa/Instansi	:	Kel. Tamangapa / Pamulang			
Umur	:	38 Tahun	Jenis Kelamin	:	Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

Saran
mau ~~pe~~ ka peker jaan yg layak.
Cub hat anak saya iku mamuluu
Bukan karena tidak tau tapi
katna terpaasi

Makassar, 10 Oktober 2017

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LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	:	H. Hurdah	Jenis Kelamin	:	Pria / Wanita
Desa/Instansi	:	DLH.			
Umur	:	46. Tahun			

SARAN/MASUKAN/TANGGAPAN :

1. TPAK mendukung program pemerintah di lain pihak tetap memperhatikan nasib pemulung.

Makassar, 10 Oktober 2017

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LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

**Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan**

Nama	: Agustina		
Desa/Instansi	: Tamangapa		
Umur	: 23 Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

Dengan adanya perencanaan program di atas saya berharap bukan hanya teknis saja yang di sentuh tapi Non- teknis juga agar masyarakat di sekitar TPA juga tidak ragu saja tapi, ada perubahan & kemudahan dan masyarakat itu sendiri.

Makassar, 10 Oktober 2017

(
Agustina

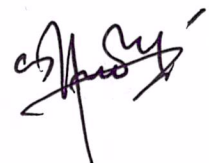
LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN
Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	: Syamadi md.		
Desa/Instansi	: Kelurahan Tamangapa		
Umur	: 47 Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

Penambahan alat berat supaya tidak ada lagi terjadi penumpukan sampah.

Makassar, 10 Oktober 2017

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LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	: Nahania		
Desa/Instansi	: Masyarakat		
Umur	: 41 Tahun	Jenis Kelamin	: Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

1. SARAN :

Kalau program kinerja ter capai, kami mohon -
libatkan masyarakat pemung dan setempat
di prioritas kan.

2. MASUKAN :

Kalau TPA mau di jadikan kota baru
kami minta supaya ada pembangunan Tama Bae
sehingga peberja sukses dan penerang yang berale
Fitra, bisa dapat menyzasahkan wahat v nye
datang p membaca di taman bae ter sebut dan
tidak kehilangan informasi dan kami
minta supaya di libatkan masy dalam perencanaan
teranga herja atau dakt vlag sukses dan di
perikan sosialisasi ke masy dan anah v nery
TAMANGAPA - Kalau bisa jngn m anah
turun kes tempat sukses bisa di harang
kan ke taman bae

Makassar, 10 Oktober 2017

(Quas)

LEMBAR SARAN, PENDAPAT, DAN TANGGAPAN

Konsultasi Publik Rencana Pengembangan Tempat Pemrosesan Akhir (TPA) Tamangapa
di Kelurahan Tamangapa, Kecamatan Manggata,
Kota Makassar, Provinsi Sulawesi Selatan

Nama	:	SABRI			
Desa/Instansi	:	KAMPUNG BUBUS			
Umur	:	40 Tahun	Jenis Kelamin	:	Pria / Wanita

SARAN/MASUKAN/TANGGAPAN :

* SEBAIRNYA LANDASAN PENONTRANGAN DI COR BIAN
MIDAR ADA KEMACETAN DI MUSIM DEBUHUJAN

Makassar, 10 Oktober 2017



(SABRI)

KONSULTASI PUBLIK

DALAM RANGKA RENCANA PENGEMBANGAN TPA TAMANGAPA

Kelurahan Tamangapa, Kecamatan Manggala,
Kota Makassar, Provinsi Sulawesi Selatan

Makassar, 10 Oktober 2017

Outline

- Program Pengelolaan Sampah
- Rencana Kegiatan
- Analisis Dampak Lingkungan dan Sosial
- Rencana Mitigasi

Program Pengelolaan Sampah

Program Pemerintah dalam Pengelolaan Sampah (1)

- **Program 100-0-100** (100% akses air minum aman, 0% pemukiman kumuh, 100% akses sanitasi layak) oleh Kementerian PUPR ditargetkan untuk tercapai pada 2019
- Hanya 70% dari penduduk kota yang memiliki akses layanan pengumpulan sampah
- Hanya 55% dari sampah domestik perkotaan yang ditangani di TPS atau TPA
- **Tingkat pengumpulan sampah domestik di berbagai kota sangat bervariasi**

Program Pemerintah dalam Pengelolaan Sampah (2)

- Peraturan Kementerian PU No. 21 Tahun 2006 mewajibkan semua TPA *open dumping* ditutup atau ditingkatkan menjadi TPA *sanitary landfill* pada tahun 2011
- Undang-Undang No. 18 Tahun 2008 tentang Pengelolaan Sampah mewajibkan semua pemerintah daerah untuk menutup TPA *open dumping* pada tahun 2013
- Saat ini kebanyakan TPA belum menggunakan sistem *sanitary landfill*

Program Peningkatan Pengelolaan Sampah

- Kota-kota di Indonesia perlu meningkatkan kinerjanya untuk dapat mencapai target kebijakan pengelolaan sampah
- Bank Dunia melalui Kementerian Pekerjaan Umum dan Perumahan Rakyat sedang melaksanakan **program berskala nasional dan terukur untuk meningkatkan kinerja pengelolaan sampah**

Komponen Program

Komponen 1 Pengembangan Lembaga dan Kebijakan	Analisis lembaga dan studi strategis pada pemerintah nasional (seperti KLHK, Kementerian PUPR, Kementerian ESDM, Kemendagri) untuk mendukung perubahan kebijakan, perencanaan, dan pembangunan kapasitas untuk mendukung sektor persampahan
Komponen 2 Dukungan Perencanaan & Pembangunan Kapasitas Terintegrasi bagi Pemerintah Daerah & Masyarakat	Memberikan asistensi teknis kepada kota/kabupaten di Indonesia untuk meningkatkan perencanaan dan pelaksanaan pelayanan pengelolaan sampah (sekitar 50 kota)
Komponen 3 Infrastruktur Sampah pada Kota Terpilih	Mendukung konstruksi infrastruktur besar dan kompleks termasuk teknologi pengolahan lanjutan (sekitar 10 kota) serta investasi bertahap yang lebih kecil (20 hingga 30 kota) yang disesuaikan dengan kapasitas kota
Komponen 4 Implementasi Dukungan dan Asistensi Teknis	Memberikan dukungan teknis, saran, dan pelatihan kepada Unit Pengelolaan Program di tingkat nasional, provinsi, dan kabupaten sesuai kebutuhan

Komponen 3: Infrastruktur Sampah pada Kota Terpilih

- Pembiayaan investasi perlu disesuaikan untuk kota-kota dengan kapasitas pengelolaan, teknis, dan finansial yang berbeda
- Kota-kota dikelompokkan sebagai berikut:

Kelompok 1 – Investasi Sistem Besar dan Kompleks	Kelompok 2 – Investasi Pengelolaan Sampah Bertahap	Kelompok 3 - Tidak Ada Investasi
<ul style="list-style-type: none"> ○ Kota-kota dengan kapasitas dan dana yang cukup tinggi untuk mengelola dan menjaga pengoperasian sistem dan investasi pengelolaan sampah yang besar dan kompleks. 	<ul style="list-style-type: none"> ○ Kota-kota dengan kapasitas dan dana yang tidak cukup untuk mengelola dan menjaga pengoperasian pengelolaan sampah yang kompleks. Peningkatan kapasitas lebih baik dilakukan melalui investasi bertahap yang lebih kecil. 	<ul style="list-style-type: none"> ○ Kota-kota dengan kapasitas dan dana yang tidak cukup untuk mengelola pengoperasian pengelolaan sampah yang kompleks. Tidak menunjukkan komitmen yang cukup untuk meningkatkan sistem.

TPA Tamangapa

- TPA Tamangapa berlokasi di Kelurahan Tamangapa, Kecamatan Manggala, Kota Makassar dengan luas area sebesar 16,86 Ha.
- Telah beroperasi sejak tahun 1993. Jumlah sampah dari Kota Makassar yang masuk ke TPA setiap hari adalah 1.200 ton.
- Terletak \pm 14 km dari tengah kota dan kurang dari 1 km dengan perumahan penduduk.



Rencana Kegiatan

Komponen dari Kegiatan Pengembangan TPA

- Rehabilitasi sel pembuangan eksisting
- Pembangunan sel pembuangan dengan sistem saniter (*sanitary landfill*)
- Pembangunan/perbaikan instalasi pengolahan lindi (IPL)
- Pembangunan sistem penanganan gas TPA melalui pembakaran
- *Material Recovery Facility* (MRF)
- Pembangunan/perbaikan fasilitas penunjang
- Fasilitas Pengolahan Sampah Antara (*Intermediate Treatment Facility*) (ITF)
- Spesifikasi Alat Berat
- Petunjuk operasional dan pemeliharaan TPA
- Perencanaan keuangan (meliputi Biaya Investasi dan Biaya Operasional & Pemeliharaan)

Beberapa Prinsip Dasar Desain

- Lokasi IPL di titik yang rendah agar dapat memanfaatkan gaya gravitasi untuk mengalirkan lindi
- Pengoperasian TPA yang lebih tertata dan efektif untuk memaksimalkan kapasitas penampungan sampah di TPA
- Penutupan sel pembuangan sampah eksisting yang terbuka dengan lapisan tanah. Penutupan sel tersebut bertujuan agar sel masih dapat digunakan sebagai area pembuangan sampah yang lebih terkontrol.
- Jalan akses ke TPA diarahkan melalui ITF untuk mendorong pemanfaatan ITF.
- Peletakan fasilitas penunjang yang dapat meningkatkan efisiensi arah lalu lintas di dalam TPA.
- *Detailed Engineering Design* (DED) yang memenuhi dengan Peraturan/Pedoman terkait TPA (PerMen PU No. 03/2013 dan praktik yang sesuai dengan kondisi di Indonesia
- Desain yang dibuat agar dapat menempatkan fasilitas perlindungan lingkungan yang sekiranya dapat mengganggu estetika (seperti sel pembuangan sampah dan IPL) di area yang sejauh mungkin dengan pemukiman penduduk

Rehabilitasi TPA

- Pembentukan kembali tumpukan sampah eksisting untuk menstabilkan tumpukan tersebut dan memaksimalkan kapasitas penampungan sampah
- Pelapisan dan penutupan sel yang telah penuh
- Menyelidiki opsi pelapisan untuk sel eksisting
- Sistem pengumpulan lindi dan drainase air permukaan

Opsi Sistem Pelapisan dan Penutupan Sel

*Compacted Clay Liner
(CCL)*



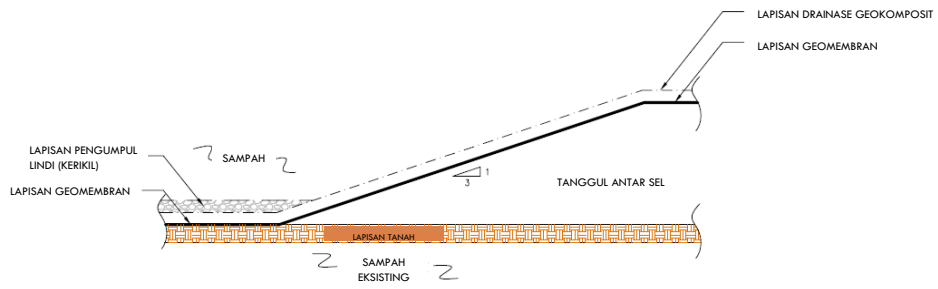
*Geosynthetics Clay Liner
(GCL)*



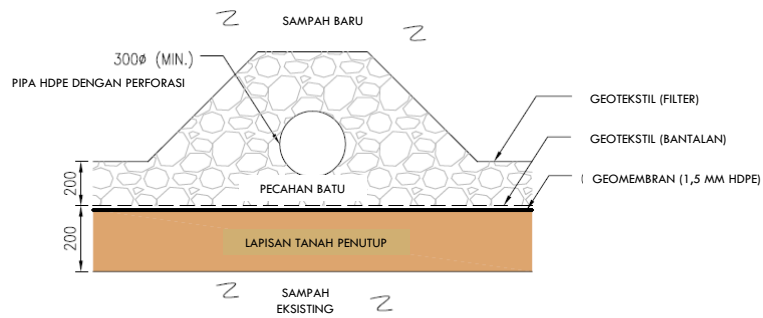
*Geomembrane Liner
(GM)*



Tipikal Penampang Sistem Pelapis dan Pengumpul Lindi

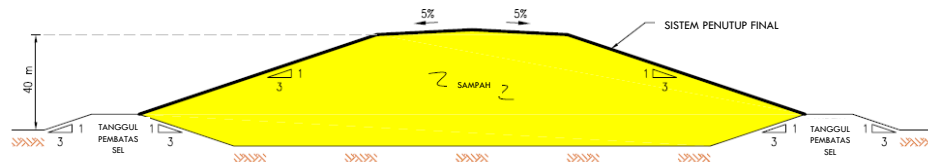


Tipikal Detil Sistem Pengumpulan Lindi

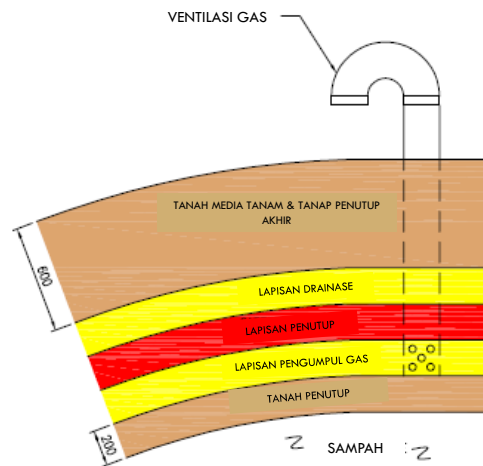


SISTEM PELAPISAN DAN PENGUMPULAN LINDI
(DI ATAS SAMPAH EKSTING)

Tipikal Pengaturan Penutup Final

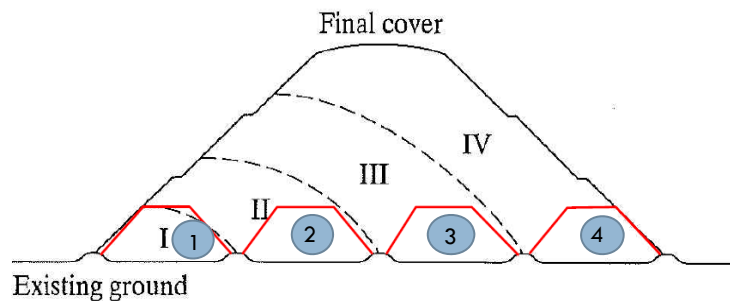


Tipikal Sistem Penutup Final



SISTEM PENUTUPAN FINAL – OPSI A

Discrete Cells versus “Area” Landfill



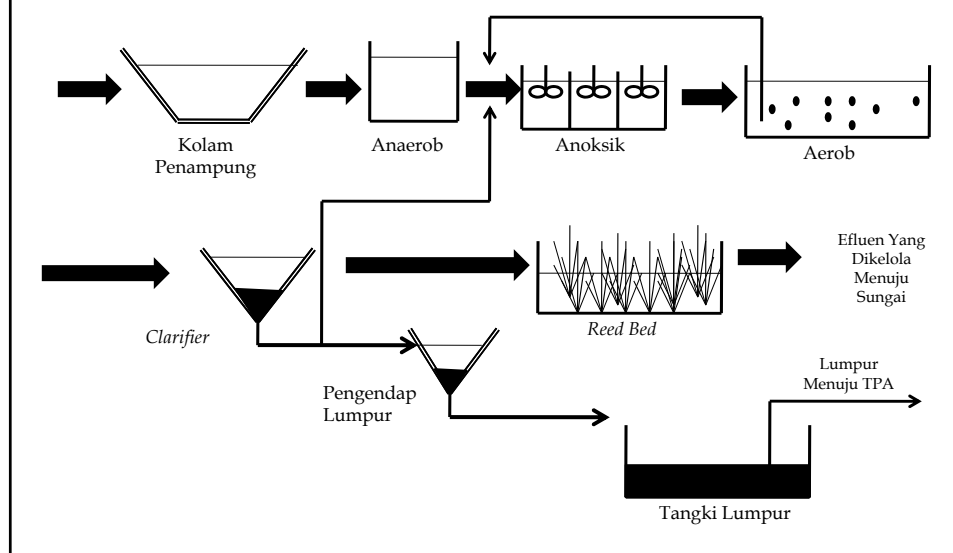
- ▣ To size LTP ESC have assumed contiguous landfill cells to maximise airspace

Instalasi Pengolahan Lindi (IPL)

- ▣ Sistem yang murni menggunakan proses biologi pasif membutuhkan area yang luas untuk memenuhi persyaratan efluen PU (> 50 Ha = tidak dapat dilakukan)
- ▣ Sistem biologi dengan bantuan mekanis yang mudah dioperasikan dapat menghasilkan efluen yang memenuhi standar PU dengan luas lahan yang wajar, contoh $\pm 2,8$ Ha untuk TPA Tamangapa
- ▣ Untuk dapat memenuhi standar yang lebih ketat, seperti $BOD_5 < 100$ mg/l, dibutuhkan penyisihan amonia/pengolahan tersier (kimiawi) – membutuhkan operator berketerampilan tinggi, biaya investasi tambahan sekitar 20% - 100% dan biaya operasional dan pemeliharaan sebesar 100% - 200%

Oleh karena itu, ESC mengajukan pengolahan mekanik-biologi

Proses Pengolahan Lindi



Analisis Dampak Lingkungan dan Sosial

Tahap Pra-Konstruksi

Kegiatan	Dampak Potensial
Sosialisasi Kegiatan	Persepsi negatif dan/atau ketegangan sosial
Survey Geoteknik	Kontaminasi tanah Kontaminasi air tanah dangkal Kontaminasi air permukaan

Tahap Konstruksi

Kegiatan	Dampak Potensial
<ul style="list-style-type: none"> • Penerimaan tenaga kerja • Mobilisasi dan demobilisasi peralatan, material, dan tenaga kerja • Penyiapan lahan • Pembongkaran bangunan • Pembentukan kembali, pelapisan dan penutupan sel sampah eksisting • Pembangunan sel sampah baru dan sistem pengumpulan lindi • Peningkatan fasilitas penunjang 	<ul style="list-style-type: none"> • Peningkatan pendapatan masyarakat dan perekonomian lokal • Kecemburuan sosial • Potensi konflik • Keluhan masyarakat • Peningkatan debu • Peningkatan kebisingan dan getaran • Peningkatan kebauan • Peningkatan polusi kendaraan • Erosi air permukaan • Lepasnya sampah yang tertiuip angin • Produksi sampah domestik dan konstruksi • Gangguan pada flora dan fauna • Gangguan kesehatan dan keamanan masyarakat • Kepadatan lalu lintas dan gangguan akses ke TPA • Isu terkait kesehatan dan keamanan pekerja

Tahap Operasi

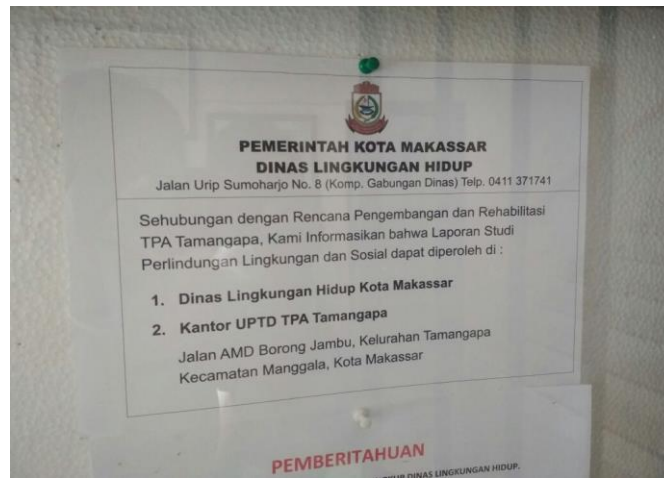
Kegiatan	Dampak Potensial
<ul style="list-style-type: none"> Penerimaan pemulung di TPA sebagai tenaga kerja Pengumpulan dan pengangkutan sampah Penerimaan dan pembongkaran sampah Mobilisasi tanah penutup Pengoperasian sel penimbunan sampah Pengoperasian sistem pengumpulan dan pengolahan lindi Pengoperasian penangkapan dan pengolahan gas TPA Pengoperasian fasilitas penunjang 	<ul style="list-style-type: none"> Persepsi negatif/ketegangan sosial Peningkatan kesempatan kerja dan bisnis (peningkatan perekonomian local) Peningkatan kekompakan masyarakat Peningkatan lingkungan kerja untuk pekerja TPA Keluhan masyarakat Peningkatan debu Peningkatan kebisingan Peningkatan kebauan dan polusi udara Peningkatan polusi kendaraan Penurunan kualitas air permukaan Gangguan biota air Produksi lumpur Lepasnya sampah yang tertiuip angin Produksi sampah domestik dan konstruksi Gangguan estetika Gangguan pada flora dan fauna Gangguan kesehatan dan keamanan masyarakat Kepadatan lalu lintas dan gangguan akses ke TPA

Tahap Penutupan

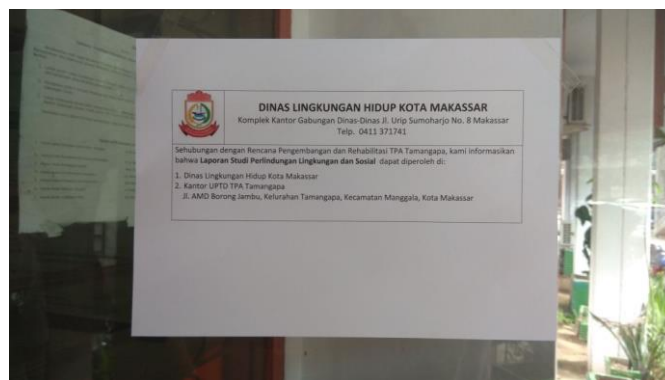
Kegiatan	Dampak Potensial
<ul style="list-style-type: none"> Pelapisan akhir sel dan penutupan TPA Revegetasi Pemantauan TPA 	<ul style="list-style-type: none"> Isu kesehatan dan keselamatan pekerja Pelepasan tenaga kerja dan penurunan perekonomian local Produksi gas TPA berlebih Penurunan laju erosi Perbaikan kualitas air permukaan Perbaikan estetika Pemulihan habitat flora dan fauna

TERIMA KASIH

DOCUMENTATION OF E&S SAFEGUARD DOCUMENT DISCLOSURE



Public Announcement at Dinas Lingkungan Hidup Makassar



Public Announcement at Dinas Lingkungan Hidup Makassar



Public Announcement at TPA Tamangapa



DINAS LINGKUNGAN HIDUP KOTA MAKASSAR

Komplek Kantor Gabungan Dinas-Dinas
Jl. UripSumoharjo No. 8 Makassar Telp. 0411 371741

Sehubungan dengan Rencana Pengembangan dan Rehabilitasi TPA Tamangapa, kami informasikan bahwa Laporan Studi Perlindungan Lingkungan dan Sosial dapat diperoleh di:

1. DinasLingkunganHidup Kota Makassar
2. Kantor UPTD TPA Tamangapa
Jl. AMD Borong Jambu,
Kelurahan Tamangapa,
Kecamatan Manggala, Kota Makassar

Pemuda Flamboyan Diserang dan Dipanah di Jalan Nuri

MAKASSAR, BKM -- Nahas dialami pemuda bernama Kalang (20). Warga Jalan Flamboyan ini menjadi sasaran penusukan serta dipanah orang tak dikenal (OTK). Peristiwanya berlangsung di Jalan Nuri, Rabu malam (25/10) sekitar pukul 22.00 Wita.

Akibat luka yang dideritanya, korban dilarikan ke Rumah Sakit Bhayangkara untuk mendapat perawatan medis. Anggota Polsek Mariso dan Polsek Mamajang yang mendapat laporan kejadian tersebut langsung bergerak ke lokasi. Saat polisi tiba, pelaku sudah kabur dan korban dibawa ke RS.

Kepada petugas, salah seorang

rekan korban bernama Pitta memberi keterangan. Menurut dia, sebelum kejadian ia bersama Kalang baru saja keluar dari rumah korban di Jalan Flamboyan. Ketika melintas di Jalan Nuri, tepat di perbatasan antara wilayah hukum Polsek Mariso dan Mamajang, tiba-tiba datang sekelompok anak muda yang tak dikenal.

Sebagian diantara mereka lalu menghadang motor korban yang berboncengan dengan Pitta. Ada pula yang menyerang dari belakang.

Pada saat itu Pitta terjatuh dan nyaris terkena senjata tajam. Sementara Kalang ditusuk pada bagian belakangnya dengan anak

panah. Setelah itu para pelaku langsung melarikan diri. Warga yang melihat Kalang terluka dan terkapar di pinggir jalan, kemudian melarikannya ke rumah sakit.

Kasat Reskrim Polsek Mariso AKP Awaluddin mengemukakan, pelaku yang menyerang dan menusuk korban bersama temannya diduga kawanan begal. Indikasinya, mereka beraksi secara berkelompok dengan menggunakan benda tajam dan anak panah. Mereka diperkirakan hendak merampas HP milik korban.

"Sejumlah saksi yang tinggal di Jalan Nuri, mengakui kalau lokasi kejadian seting dijadikan tempat aksi sekelompok pengendara motor yang tidak diketahui iden-

titasnya. Laporan diterima. Kasusnya penyelidikan," ujar dia. **(jul/rus)**



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APPENDIX 5

Grievance Mechanism

APPENDIX 5 - GRIEVANCE MECHANISM

1. GENERAL

A Grievance mechanism is being established for potentially affected communities to receive and facilitate resolution of affected communities' concerns and grievances about the project's environmental and social management performance.

The complaint system allows community members to raise issues or complaints at village to Padang city or national level. The project has designated contact numbers for complaints via phone-calls and short text message (SMS) systems. There are designated staff members at the local government (*Dinas*) responsible for following-up on complaints and ensuring that they are handled adequately.

Where Indigenous Peoples (IPs) are concerned, the facilitators under project will ensure that grievance redress mechanisms are developed in culturally appropriate ways in close collaboration with the relevant group(s).

At the national level a online 'hotline' system exists called Lapor! which allows the community to submit anonymous or with name complaints and suggestions online to the government. The complainant receives a tracking number with which the status of the complaint can be tracked. Note that the GM described below applies to the Landfill facility only.

2. PURPOSE AND OBJECTIVES

The project proponent seeks to minimize potential negative impacts arising from the Project and to operate strictly according to regional, national and international good practice guidelines. Nevertheless, it is inevitable that queries and grievances will arise throughout the different project phases. The World Bank and Government of Indonesia recognize that systematic, professional, rules-based procedures for handling grievances and appeals are essential to minimize and manage risks. The dual goals of properly managing grievances are to maintain accountability to stakeholders and risk reduction.

The objectives of the Grievance Mechanism are to:

- Provide Project affected people with straightforward and accessible avenues for making a complaint or resolving a dispute that may arise during the course of the Project;
- Ensure that appropriate and mutually acceptable corrective actions are identified and summarily implemented to address complaints;
- Verify that complainants are satisfied with the outcomes and corrective actions taken;
- Avoid the need to resort to judicial or pre-judicial proceedings; and
- Ensure that the needs of those most vulnerable within the project proponent Project vulnerable communities, such as the elderly, women and children, are also considered in the grievance procedure.

3. SCOPE

This Grievance Mechanism guides the landfill authorities in regard to receiving and managing external grievances from landfill operation affected communities and other interested and concerned parties throughout the operational phase of the landfill.

4. GUIDELINES & STANDARDS

4.1 Relevant National Regulations

A number of national laws and regulations urge community participation and involvement in maintaining, managing, and monitoring the environment including affected communities and other stakeholders. The relevant laws and regulations are as follows:

- Head of BAPEDAL Decree No 8/2000 on Disclosure of Information on the AMDAL Process. This decree highlights the protection of community from the impacts of business operation, community participation and open communication in the preparation of environmental impact assessment.
- Law No 23/2009 on Environmental Protection and Management concerning community rights which includes: equal entitlement to a good and healthy environment; entitlement to information about potential impacts; and entitlement to play a role in the framework of environmental management.
- Minister of Environment Regulation No 09/2010 on Procedures of Complaint and Complaints Handling due to Allegations of Environmental Pollution and/or Damage. This decree outlines the procedures to raise complaints to related institutions and obligations and procedures in handling the complaints for related institutions.
- Government Regulation No 27/2012, Article 9 (paragraph 4) of Government Regulation of Republic of Indonesia Number 27/2012 regarding Environmental Impact Assessment, states that within ten working days of the date of the announcement of proposed activities, interested members of the community have the right to suggest, express opinions and provide input regarding the planned activities.
- Ministry of Environment Regulation No 17/2012 on Guidance of Community Engagement in the Environmental Impact Assessment and Environmental Permitting Process.

4.2 International Guidelines

International guidelines, standards and best practices regarding to Grievance Mechanism are as follows:

- World Bank requirements for Grievance Redress Mechanism: OP 4.01 Environmental Assessment, OP 4.10 Indigenous Peoples and OP 4.12 Involuntary Resettlement all require the establishing of a mechanism that addresses grievances by affected groups and people. The World Bank defines the grievance redress mechanism as a process by which

"...queries or clarifications about the project are responded to, problems that arise out of implementation are resolved and grievances are addressed efficiently and effectively. Both Indigenous Peoples and Involuntary Resettlement Policies have mandatory Grievance Redress requirements. Both policies require affordable and accessible procedures for third-party settlement of disputes arising from project implementation. Such grievance mechanisms should take into account the availability of judicial recourse and community and traditional dispute settlement mechanisms."

World Bank further stresses that affected people are not facing any barriers when expressing grievances.

- United Nations Human Rights Council, 2011, published a report in 2011 on the lessons learned on the principles relevant to effective company stakeholder grievance mechanisms, which are
 1. **Legitimate:** a mechanism must have clear, transparent and sufficiently independent governance structures to ensure that no party to a particular grievance process can interfere with the fair conduct of that process;
 2. **Accessible:** a mechanism must be publicized to those who may wish to access it and provide adequate assistance for aggrieved parties who may face barriers to access, including language, literacy, awareness, finance, distance or fear of reprisal;
 3. **Predictable:** a mechanism must provide a clear and known procedure with a timeframe for each stage and clarity on the types of process and outcome it can and cannot offer, as well as a means of monitoring the implementation of any outcome;
 4. **Equitable:** a mechanism must ensure that aggrieved parties have reasonable access to sources of information, advice and expertise necessary to engage in a grievance process on fair and equitable terms;
 5. **Rights-compatible:** a mechanism must ensure that its outcomes and remedies accord with internationally recognized human rights standards;
 6. **Transparent:** a mechanism must provide sufficient transparency of process and outcome to meet the public interest concerns at stake and should presume transparency wherever possible; non-state mechanisms in particular should be transparent about the receipt of complaints and the key elements.

5. DEFINITIONS

Dispute	A disagreement or conflict between two parties, with respect to this document, a dispute between individuals or a group within project affected communities and the landfill authorities and its representatives. A dispute may be legal, in form of a claim/demand or assertion of rights. A dispute between the the landfill authorities and external stakeholders including community members requires mediation. A grievance mechanism addresses such situation in helping to mediate and support resolution.
Grievance or Complaint	A concern or complaint raised by an individual or a group within project affected communities. Both concerns and complaints can result from either real or perceived impacts of the landfill operational activities, and may be filed in the same manner and handled with the same procedure. The difference between responses to a concern or to a complaint may be in the specific approaches and the amount of time needed to resolve it.
Project affected community	The communities who live within the project area of influence and who are affected directly or indirectly by Project activities.
Stakeholders (External)	Individuals or group(s) of people affected by the Project or those who have interests or/can influence the activities of the Project.
Vulnerable Groups of People	Key individuals and groups that may be differentially or disproportionately affected by the business activity because of their disadvantage or vulnerable status such as the youth, elders, minority ethnic group, women.
Resolution	The action of solving a problem, dispute, or contentious matter, or in this respect a

	grievance. Resolution is the act of addressing a problem.
--	---

6. GRIEVANCE MANAGEMENT AND PROCEDURE

6.1 Grievance Identification

Grievances concerning Project activities may arise from many different sources. Possible sources of grievance information may include:

- Individuals approaching landfill personnel on their own;
- Individuals voicing complaints during regular liaison visits to villages;
- Media outlets;
- Stakeholder requests;
- Community organizations;
- Waste-picker / recycling groups;
- Waste buyers and sellers
- Government officials;
- Contractors / Subcontractors;
- Jealousy of others if one does not receive a benefit.

Informal channels of communication such as personal conversation, hearsay, or community rumors may alert personnel to a possible grievance in the nearby communities. In these cases, the nearest Grievance Contact travels to the source of the information and investigates the validity of the possible grievance. If there is an actual grievance involved and the claim is deemed valid by the GRU Field Officer, he or she initiates the grievance procedure by filling out a Grievance Management Form and making an appropriate notation in the grievance log. If there is no actual grievance or the grievance can be solved on the spot, the GRU Field Officer records the investigation. This helps to keep the grievance mechanism transparent and accessible.

Although grievances cannot be generalized, some typical community grievances can occur in most cases. The table below illustrates typical grievances.

Table 1 Types of Grievances Typically Encountered

Examples	Complainant(s)	Type of Grievances
A landfill authority (or a contractor/subcontractor) truck damaging a community member’s fence; a one-time disrespectful encounter between a the project proponent employee and a community member	An individual or family	Relatively minor and one-time problems related to the project proponent operations
Livestock getting loose/injured	An individual or family or small	Relatively minor but repetitive

Examples	Complainant(s)	Type of Grievances
or killed because the project construction contractors or Dinas landfill operators fail to close gates	group of people	problems related to the project proponent operations
Landfill construction and/or operation related road traffic raising dust and/or wind-blown waste that settles on clothes hung out to dry	Multiple individuals, families, or larger groups	Relatively minor but repetitive and widespread problems
Landfill rehabilitation/extension construction vibration allegedly causing structural and/or aesthetic damage to building	Community groups, nongovernmental or community-based organizations, or local governments	Significant and larger repetitive problems
Landfill operations adversely impacting a community's water supply (leachate), making it unsafe for drinking, livestock, and/or irrigation	Community groups, nongovernmental or community-based organizations, or local governments	Major claims that the project proponent activities have resulted in significant adverse impacts on larger populations of people
Dinas landfill operation noncompliance with its own policies; failure to follow guidelines for adequate consultation to achieve prior and informed consent; inadequate resettlement and compensation of affected populations	Nongovernmental organizations, community groups or community-based organizations, or local governments	Major claims over policy or procedural issues

6.2 Grievance Tracing and Resolution Mechanism (GTRM) - Step by Step Procedure

The Dinas Landfill Tracing and Resolution Mechanism (GTRM) provides a process for resolving grievances expeditiously, effectively and in a transparent manner. The GTRM is triggered at the instance a community complaint is received by the landfill authorities.

Figure 8-2 below shows the general overview of the community grievance tracking and resolution process which is outlined in more detail in the following section.

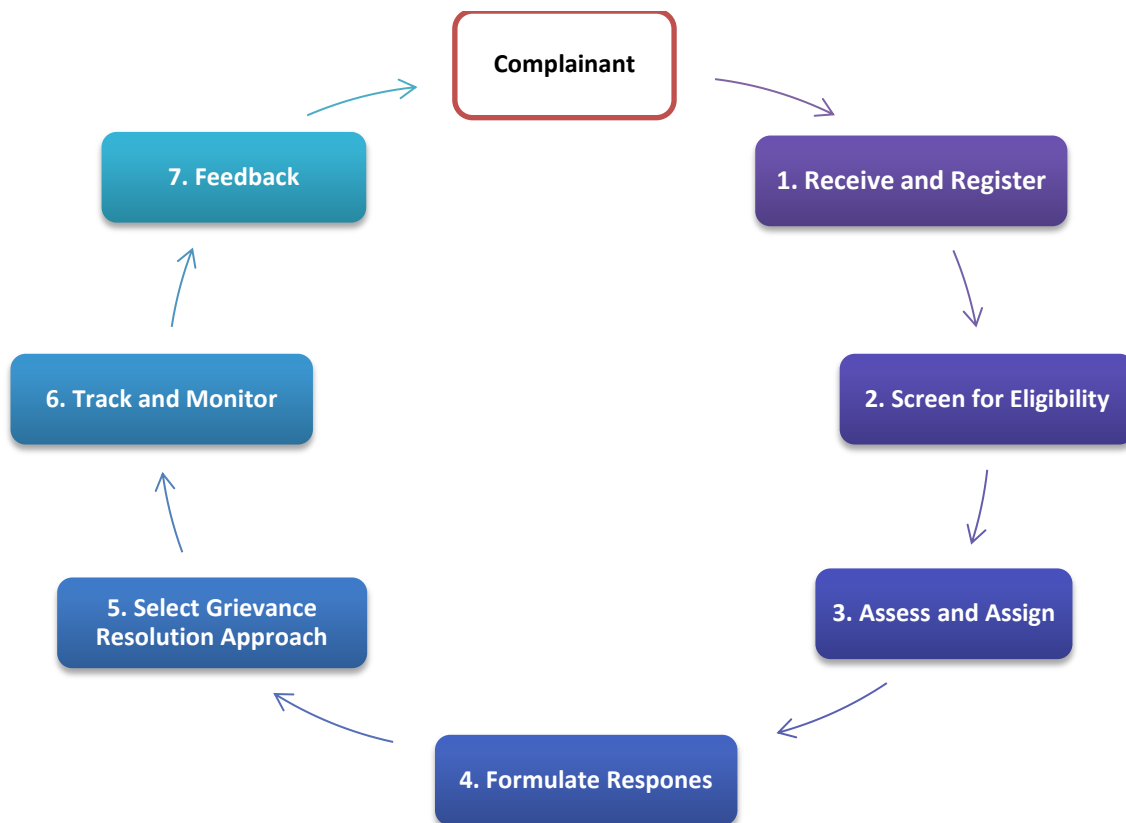


Figure 1 Community Grievance Tracking and Resolution Process

Step 1 - Receiving and Registering a Grievance

Receiving and registering complaints is a simple process in which local people can approach the landfill authorities about concerns directly and, if necessary, anonymously or through third parties. Reception procedures are most effective if they are convenient, culturally appropriate, simple to understand, and easy to use.

In general, grievances are communicated to the landfill authorities through three primary channels:

- Oral communications, such as to Community Representative or to the project proponent on-site Project teams (including contractors);
- Written communications to the Dinas Community Relation Officer or GRU Field Officer or Manager; these include grievances registered with the Village head (*Kepala Desa*) or other third parties such as the community advisory board which is formed to bridge between the project proponent and community;
- Inferred understanding of a grievance (e.g. on-going problems raised during visits to program sites by program staff, independent monitors, NGOs, supervision teams, media, government officials, etc.) or alert of grievances via direct public action (e.g. protest).

Within one day of the original receipt of the grievance, the GRU Field Officer gives written notice to the complainant confirming receipt of the grievance and detailing the grievance investigation and reconciliation process. The GRU Field Officer provides contact information to the complainant to facilitate further communication. A tentative timeline for resolving grievances is also provided.

In case, inputs and decisions are required by other units/departments within the landfill authorities the GRU Field officer shall forward the registered complaint to the Grievance Committee.

Step 2 - Screening for Eligibility

This step determines whether a complaint is eligible for inclusion in the grievance mechanism. A complaint can be categorized as grievance, if it meets the following criteria:

- Time limit: Grievances can only be submitted within one year from the date of the incident to be admissible;
- Evidence: Any physical evidence associated with the grievance should still be visible during a site investigation conducted by a GRU Field Officer;
- Records: where possible and as appropriate, the complainant should provide a verifiable record of transactions associated with the grievance.

If the grievance meets the criteria, complaints are recorded using the grievance form (see *Appendix B*). GRU Field Officer will document the verbal and written complaints. The grievance and action form records the following information:

- i) who reports the complaint;
- ii) who received the complaint (field representative or employee);
- iii) situation of the reception and answer of the responder;
- iv) the date the complaint was received and recorded;
- v) the nature of the complaint;
- vi) information of proposed corrective action;
- vii) date of response (verbal and written) provided to the complainant;
- viii) corrective actions taken, by whom and, when, and
- ix) the date the complaint was closed out (see *Appendix C Close-Out Form*).

Step 3 - Assess the Grievance

During the assessment, the GRU Field Officer and/or the GRU team gathers information about the case and key issues and concerns and helps determine whether and how the complaint may be resolved. The data and information include:

- Photographic and/or physical evidence of grievance where possible.
- Witness statements from community leaders and witnesses, where possible.
- Witness statements from landfill authorities personnel, if appropriate.

Step 4 - Formulate a Response

The system for responding to the complainant specifies who communicates and how. In some cases, it may be appropriate that feedback be provided by the GRU Field officer or another team member responsible for the assessment accompanied by the GRU Manager of the grievance procedure. The Dinas Project manager may participate in feedback, depending upon the seriousness of the complaint.

A written response for every grievance is prepared within 14 days by the Grievance Resolution Unit.

The response is delivered verbally before the written copy is provided to the Complainant. The complainant is asked to sign and date the complaints log and action form to confirm receipt of the Project response.

Step 5 – Further Escalation - Grievance Committee or Legal Avenue

If the complainant is not satisfied with the response delivered by the GRU the grievance will be escalated to the Grievance Committee.

If still unsolved, the GRU Manager will escalate the grievance resolution to the next appropriate level. The final resolution is found by legal counsel. The Indonesian jurisdiction shall apply.

6.3 Track and Monitor Grievance

Grievances need to be tracked and monitored as they proceed through the system. Effective tracking and documentation accomplishes several goals:

- Providing assurance that a specific person is responsible for overseeing each grievances – from receipt and registration to implementation;
- Promoting timely resolution;
- Informing all concerned (the complainant and appropriate the project proponent personnel) about the status of the case and progress being made toward resolution;
- Documenting the project proponent’s response and outcome(s) to promote fairness and consistency;
- Recording stakeholders’ response(s) and whether additional research or consultation is needed.

The GRU team of the landfill authorities establishes a centralized grievance log and tracking system. This data base allows for all registered grievances to be tracked and retrieved as and when necessary. The landfill authorities’ performance in managing and closing out grievances is reviewed as part of internal and external monitoring.

A Grievance Form accompanies each grievance for ease of information transfer. Information from Grievance Forms is entered into the central data base managed by the GRU Team.

6.4 Feedback

Once a grievance has been resolved, the complainant shall be invited to give feedback about the resolution process and asked to indicate their level of satisfaction with the mitigation measures once such measures have been implemented. In all cases, the aggrieved must be aware of the outcome of his / her complaint. If the complainant is anonymous, information on resolution of the complaint shall be posted in the relevant village bulletin boards.

6.5 Public Disclosure of Grievance Procedure

The landfill authorities utilize various ways to publicly disclose this Grievance Mechanism and to create community-level awareness of the grievance procedure. The public disclosure of grievance management and procedure is conducted through:

- Direct communication during consultation, community meetings, and elders meetings;
- Dinas representative assigned at the Community Center;
- Third parties such as the Community Advisory Board;
- Printed materials such as Dinas newsletters, leaflet, brochure that provide key facts about the procedure;
- Displays on the Dinas' announcement billboards, public places such as market, community hall, Mosques, Churches; and
- Dinas website.

The public disclosure of the grievance procedure is made in Bahasa Indonesia and where required, in the local language.

6.6 Timeline

The Landfill authorities through its GRU team aims to resolve complaints at each level within 7 days. However, depending on the nature of the complaint, a longer timeline may be agreed upon with the complainant. If an agreeable solution is reached, the complainant is asked to sign and date the complaints log and agreed actions form to confirm receipt of an agreement with the landfill authorities response.

The GRU Team informs the complainant, if more time is required to implement appropriate actions. The GRU Team, however, assumes responsibility for ensuring all actions are implemented to close out the complaint.

In sum, depending on the nature of the complaint, the complaint may be addressed at a maximum within 21 days in the following order (at 7 days intervals): (1) staff level (GRU Field Officer and Manager); (2) Grievance Committee; and finally (4) BOD level.

6.7 Grievance Log

The Grievance Log contains a record of the person responsible (assigned to) for an individual complaint, and records dates for the following events:

- Date the complaint was reported;
- Date the Grievance Log updated;
- Date information on proposed corrective action sent to complainant (if appropriate);
- Date the complaint was closed out;
- Date response was sent to complainant.

Informal complaints and criticisms, written or oral, made against the Dinas project staff are recorded in the same way as formal grievances and complaints against the project proponent as a company. In the case of serious grievances, the issue is tracked and dealt with as the project proponent Management sees fit. The Grievance Log Form is attached in Appendix D.

6.8 Monitoring and Reporting

The GTRM database is an indicative complaint handling and grievance resolution registry. Periodically (bi-annually) the database is monitored to assess GRU performance and to identify any systemic or recurrent causes for grievance. Where systemic or recurrent grievances are identified, the landfill authorities will implement pro-active measures to resolve these issues. Any grievances that were not resolved within an appropriate timeframe will also be further investigated with the goal of arriving at immediate resolution.

The GRU Field Officer will be responsible for:

- Providing the relevant Manager with a weekly report detailing the number and status of complaints and any outstanding issues to be addressed; and
- Monthly reports, including analysis of the type of complaints, levels of complaints, and actions to reduce complaints.

The GRU Manager reports monitoring results half-yearly to the head of DKP.

The GR mechanism is reviewed together with the review of the Stakeholders Engagement Plan (SEP).

6.9 Key Performance Indicators (KPI)

Proposed KPI for Grievance mechanism:

- Number of grievances received
- Number of grievances resolved
- Number of days needed to process a grievance
- Number of satisfied people with a grievance resolution

6.10 Roles and Responsibilities

Following table outlines suggested roles and responsibilities of the landfill authorities related to Grievance Mechanism.

Roles

The Project Proponent / Position Within The Project Proponent	Role
Head of Dinas Lingkungan Hidup	Part of Grievance Committee
Head of Environmental Law Compliance and Enforcement Section	Proposed as GRU Manager (Grievance Coordinator)
Head of Waste Management and Cleanliness Section	Part of Grievance Committee
Head of Environmental Compliance Sub-section	Part of Grievance Committee
Head of Environmental Enforcement Sub-section	GRU Database Administrator
Head of Waste Management Sub-section	Part of Grievance Committee
Head of Technical Operational Unit (UPTD) of Final Disposal Site	GRU Field Team/Officer (Grievance Contact)
All Dinas Lingkungan Hidup members	Informal grievance recipient

Responsibilities

Grievance Resolution Unit (GRU)	The focal point for grievance resolution facilitating the overall processing of grievances. The GRU receives, records, registers complaints and decides on the resolution of a grievance or the escalation of the grievance to the Grievance Committee or if necessary helps to initiate any legal procedures.
GRU Manager/ Grievance Coordinator	Head of the GRU who oversees the facilitation of grievance resolutions. S/he is also to oversee the allocation of necessary resources for the Project's grievance mechanism.
Grievance Contact GRU Field Team/Officer/	The Grievance Contact is responsible for receiving and for acknowledging receipt of any grievance and for delivering a response to the complainant, regardless of who initially received the complaint. S/he is also to obtain contextual data and other crucial information regarding aggrieved parties. In the project proponent context, this function is held by Redress Unit (GRU) Field Team/Officer.
Grievance Committee	A group consisting of Head of Dinas Lingkungan Hidup, Head of Waste Management and Cleanliness Section, Head of Environmental Compliance Sub-section and Head of Waste Management Sub-section. All of whom are involved in handling more serious grievances.
Landfill authorities	Local Sanitation Authorities, Dinas Lingkungan Hidup, where the Project is located.

The following chart shows the hierarchical setting of the Grievance Tracing and Resolution Mechanism (GTRM) personnel.

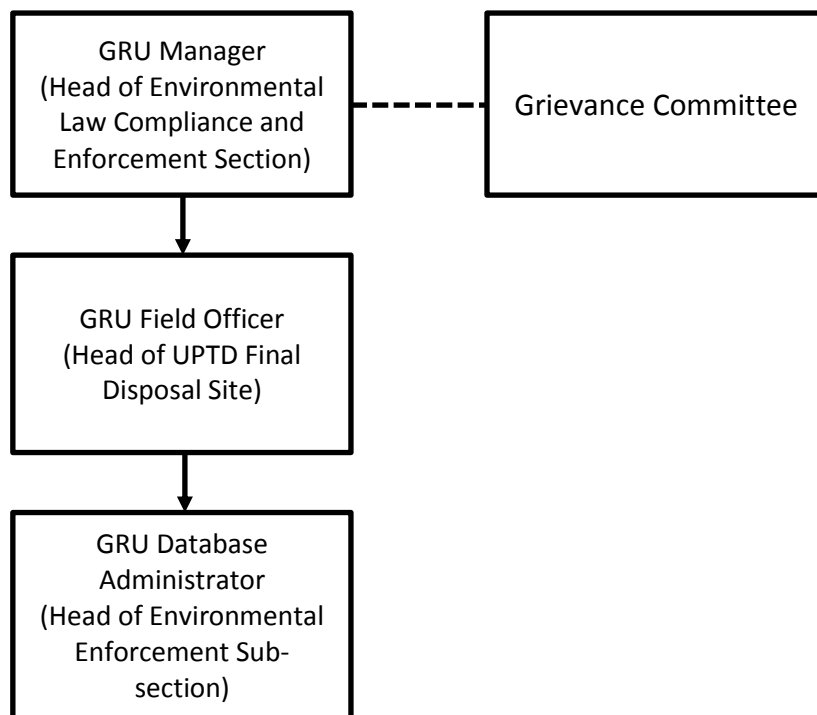


Figure 2 Hierarchical Setting of Grievance Tracing and Redress Mechanism Personnel

6.10.1 Grievance Resolution Unit Manager

The Grievance Redress Unit (GRU) Manager oversees the allocation of necessary resources to ensure that grievance tracking and resolution mechanism are implemented in accordance with relevant national and regional laws and regulations and in line with international guidelines . The GRU Manager also serves as focal point for resolution of community complaints and grievances and facilitates the overall processing of grievances, such as:

- logging and acknowledging receipt of grievances,
- delegating responsibility for redress,
- coordinating the GRU field team fact-finding mission,
- facilitating decisions on resolution actions with aggrieved parties,
- closing out grievances,
- tracking and monitoring of all grievances, and
- generating reports of grievance activities.

The GRU Manager has to ensure that the Project’s Grievance Mechanism is well publicized to target communities and stakeholders. In more serious cases of grievances that cannot be resolved directly, the GRU Manager involves the Grievance Committee for input from its members.

6.10.2 Grievance Resolution Unit Field Team/Officer (Grievance Contact)

GRU Field Officers are designated as points of contact between the project and external stakeholders. They are reporting to the GRU Manager.

The responsibilities of the GRU Field Officers are:

- Publicizing the Grievance Mechanism in project affected communities and communicating its purpose and how to use it;
- Being proactive in attempting to mitigate grievances before they become serious enough to become a formal complaint/dispute;
- Obtaining contextual data about a grievance from the aggrieved parties, community members, as well as through first hand observational data (fact finding);
- Receiving grievance directly from stakeholders;
- Assisting the GRU Manager (Grievance Coordinator) in logging grievances in the Grievance Log or database. ;
- Assisting the GRU Manager in evaluating grievances;
- Assisting in identifying appropriate corrective action;
- Communicating with stakeholders who have lodged grievances, advising them on status and eventually informing them of the decision taken;
- Assisting in tracking the status of all grievances; and
- Maintaining dialogue with external stakeholders on grievances received and how these are being resolved

6.10.3 Grievance Committee

The Grievance Committee is responsible to address grievances which cannot be resolved directly by GRU Field Officers and the GRU Manager. The Grievance Committee is composed of representatives from local government dinas, and where necessary, from project stakeholders and community representatives and legal authorities.

Personnel involved in the Grievance Committee includes:

- Head of Dinas Lingkungan Hidup
- Head of Environmental Law Compliance and Enforcement Section
- Head of Waste Management and Cleanliness Section
- Head of Environmental Compliance Sub-section
- Head of Environmental Enforcement Sub-section
- Head of Waste Management Sub-section
- Head of Technical Operational Unit (UPTD) of Final Disposal Site

The committee meets monthly or at the discretion of the GRU Manager to review and address any complaint that requires their inputs.

6.10.4 Project Personnel

All project personnel such as Dinas staff, as well as private sector contractor and/or subcontractors employees are informed about the Grievance Mechanism and if approached by community members for a grievance obliged to report this grievance to the GRU Field Officer or Manager in a timely manner. It is every project personnel's responsibility to report grievances, and to ensure that these are filed correctly with the GRU Field officer and/or GRU Manager so that it can be dealt with through the designated process.

6.11 Training

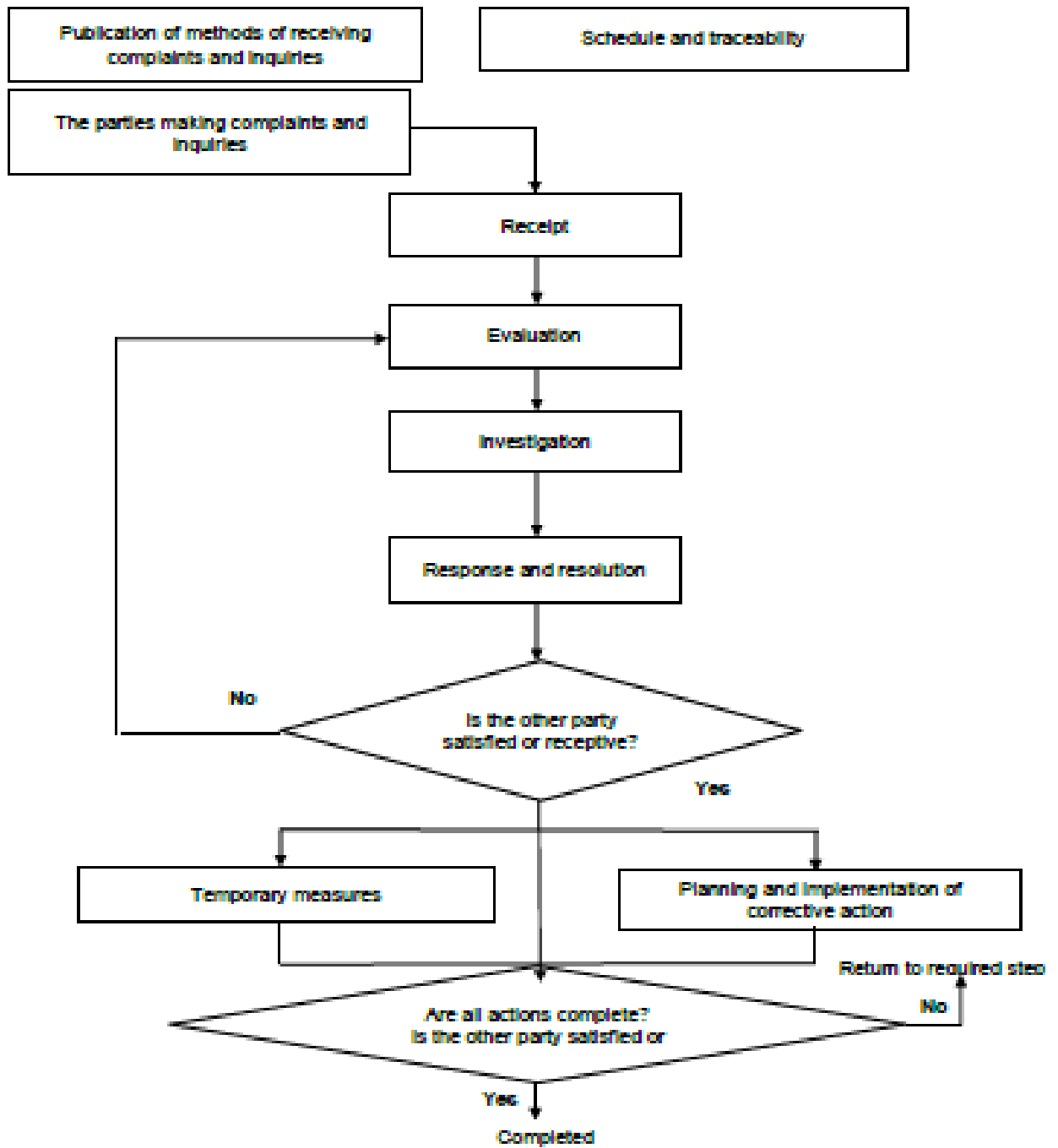
The landfill authorities provides training for personnel involved in documenting and managing external stakeholders' grievances.

Position	Training	Timing
Grievance Resolution Unit (GRU) Field Officers and Manager	How to deal with Grievances and how to manage grievance mechanism and processes. Training of Trainers (ToT) to provide training about grievance procedures to any staff at any facility, supply chain, contractors, as well as to community Data entry to database	At the beginning of the position assignment or two months after assignment and first training has been attended.
All Dinas Lingkungan Hidup project staff including contractors	Learn about the grievance procedure	At induction and regularly
Project affected communities	Learn about the grievance procedure	When updated or new and then Yearly/half yearly

LIST OF APPENDICES

- APPENDIX A : GENERAL FLOW FOR RESPONDING TO COMPLAINTS AND INQUIRIES
- APPENDIX B : FORMAT FOR RECEIVING COMPLAINTS AND INQUIRIES (SAMPLE)
- APPENDIX C : CLOSE OUT FORM
- APPENDIX D : GRIEVANCE LOG

APPENDIX A: GENERAL FLOW FOR RESPONDING TO COMPLAINTS AND INQUIRIES



APPENDIX B: FORMAT FOR RECEIVING COMPLAINTS AND INQUIRIES (SAMPLE)

Complaints/Inquiries Slip

(to be filled out by the individual receiving complaints/inquiries)

Date of receipt		Time when complaint occurred		Receipt no	
Responsible department		Place where complaint occurred			
Individual in charge (Grievance Contact)					
Individual filing complaints					
Name		Contact information	Address		
Nationality			Tel. no		
Age			Fax. No		
Gender			Mobile phone		
Note			e-mail		
Stakeholder		Donor		Customers	
		Partners		Contractors	
		Regulatory agencies		Mass media	
		Local government		NGO	
		Local communities		Other	
Details of complaints (include e.g. date of incident, location, names of attached evidence, general description)					
Requests made by individuals filing complaints					
		Discuss the issue		Simply need to know	Want a response
		Want an improvement		Want an understanding	Want an investigation
		Want an apology		other	
Expected cause					
Process and results of response					

APPENDIX C: CLOSE OUT FORM

GRIEVANCE CLOSE-OUT

I/We, _____, who instituted Receipt # _____ agree that this grievance has been resolved to our satisfaction on this date _____. We renounce all future claims concerning this issue.

Names

Signatures

TO BE COMPLETED BY COMPLAINANT

Settlement:

Name of GRU Representative: _____.

Witnessed by: _____ (Name and Title of Local Official)

Date: _____.

We, the GRU Representative and _____ (Name and Title of Local Official) state that the claimant(s) _____ who instituted Receipt # _____ have refused on this date _____ to sign a grievance close-out. The claimant(s) have been informed that the project considers the grievance to have been appropriately addressed according to the project's grievance mechanism. The claimants have also been informed of their right to pursue the grievance in civil court.

Name of GRU Representative: _____.

Witnessed by: _____ (Name and Title of Local Official)

Date: _____.

TO BE COMPLETED BY COMPLAINANT

APPENDIX 6 – SOCIAL SURVEY PHOTOGRAPHS



Daily activities in the Landfill



Food seller in Tamangapa Landfill



One of two spots of waste picking activities in the Landfill



Waste dumping activities at the landfill



Young female waste picker in front of food seller truck



Waste pickers who work at night sorting waste at the landfill



The condition of the Road near Tamangapa Landfill



Herds of cows to and from landfill that cause traffic congestion in several roads in Tamangapa



The office of NGO Yapta-U near the entrance of Tamangapa Landfill