

Sanitation GHG Emissions Research

Description of Services

1. About KIAT

Kemitraan Indonesia Australia untuk Infrastruktur (KIAT) is a partnership between the Government of Australia (GOA) and Government of Indonesia (GOI) to support sustainable and inclusive economic growth through improved access to infrastructure for all people in Indonesia. KIAT works with government partners, multilateral development banks (MDBs) and civil society providing technical assistance to improve infrastructure policy, planning and delivery. KIAT also works with sub-national governments to improve the quality of infrastructure spending and planning.

Through its work with central and sub-national governments, KIAT is working towards five End of Facility Outcomes (EFOs):

1. Improved policies and regulations for infrastructure development.
2. High quality projects prepared for financing by GOI, MDBs or the private sector.
3. High quality infrastructure delivery, management, and maintenance by GOI.
4. Infrastructure policies, design and delivery are more inclusive for women and people with disabilities.
5. Improved policy, planning and design results in lower-emission, more climate-resilient infrastructure.

The focus of KIAT is on the following areas: Water and Sanitation; Transport; Gender Equality, Disability and Social Inclusion (GEDSI); and Infrastructure Funding and Financing (IFF). KIAT is also expanding its infrastructure activities in the areas of climate change, urbanisation and private sector participation.

2. Background

This activity will inform Government of Indonesia (GOI) national estimates of greenhouse gas (GHG) emissions from the domestic wastewater sector in Indonesia. GHG emission estimations will be determined through direct measurement of GHG emissions from a variety of sanitation technologies and processes, both on-site and off-site. The activity will also provide initial recommendations for sanitation regulations, management practices, and technologies that can reduce GHG emissions, while supporting safely managed and sustainable sanitation services for all. Strong stakeholder engagement throughout the activity will ensure that recommendations are appropriate for the Indonesian context, and that GOI stakeholders acknowledge the final GHG emissions estimates. The datasets and methods developed to produce the national sector estimates will inform the formulation of sanitation emissions policies and benchmarking both in Indonesia and globally.

Indonesia's sanitation sector is potentially a major contributor to the country's total GHG emissions, however, these emissions are currently poorly understood, with emissions from the generation and management of human waste largely unaccounted for in Indonesia's Nationally Determined Contributions. Stronger accounting of these emissions, and improved understanding of how they can be reduced, will contribute to GOI's efforts to mitigate GHG emissions in order to meet its Paris Agreement commitments to combat the

climate crisis. In the Long-Term Strategy for Low Carbon and Climate Resilience 2050 (Indonesia LTS-LCCR 2050), Indonesia has committed to reducing GHG emissions from WWTPs.

Previous studies have measured significant emissions of methane (CH₄) and nitrous oxide (N₂O) from domestic faecal sludge and wastewater systems, primarily in high-income countries. Onsite sanitation systems, especially those that contain waste in wet, anaerobic conditions, are believed to emit significant quantities of methane. Studies on this in low and middle-income country contexts are scarce, with no studies completed in the Asia Pacific region, and few studies include N₂O measurements. Decentralised systems also contribute to GHG emissions, however, limited research exists to date. Centralised systems are known to emit CH₄ and N₂O in varying quantities from both sewers and treatment processes, influenced by factors such as chemical oxygen demand, dissolved oxygen levels, and treatment methods.

In Indonesia, as of 2022, according to the Joint Monitoring Programme, 83.6% of the rural population and 91.5% of the urban population has an 'at least basic' level of sanitation service. Much of this service coverage does not meet the Sustainable Development Goal (SDG) criteria for 'safely managed' services, with only 7.25% of the population achieving this service level, indicating significant risks along the sanitation chain, and significant disposal of unmanaged waste into the environment. A large proportion of the Indonesian population is reliant on onsite systems (80%), including many assumed to be 'uncontained' tanks, with one in ten facilities discharging untreated waste directly into the environment, and only 17% emptied (Odagiri et al., 2021). Previous studies have estimated GHG emissions from domestic wastewater treatment and discharge in various regions of Indonesia. These studies project significant CH₄ and N₂O emissions, but there are limitations in terms of peer-review and reliance on default IPCC values. These studies predominantly use calculations based on estimates rather than direct on-site measurements, emphasising the need for site-specific data tailored to Indonesia's context.

Stronger accounting of GHG emissions from sanitation systems, and improved understanding of how they can be reduced, will contribute to the GOI's efforts to mitigate GHG emissions in order to meet its Paris Agreement commitments to address the climate crisis. In the Long-Term Strategy for Low Carbon and Climate Resilience 2050 (Indonesia LTS-LCCR 2050), Indonesia has committed to reducing GHG emissions from wastewater treatment plants. To support this commitment, factors influencing GHG emissions from wastewater treatment plants and mitigation measures need to be explored across Indonesia's diverse geographical, climatic, and socio-economic conditions. Developing emission factors specific to Indonesian conditions is essential for accurate GHG estimation and reduction efforts.

This Activity will collect empirical data on GHG emissions from key types of sanitation systems in Indonesia, and produce national GHG emission estimates, developing a methodology that can be used for repeat measurements in the country and potentially applied in other countries. Indonesian stakeholders will build capacity to measure and benchmark GHG emissions from sanitation. This research effort will generate recommendations for reducing GHG emissions from sanitation services through adjustments to sanitation regulations, management practices, and technologies. Engagement with government stakeholders on research design, data interpretation, and development of recommendations is expected to build interest, buy-in and legitimacy of the findings. The activity will contribute to the global evidence base on GHG emissions from sanitation systems in other low and middle-income countries, providing the first estimates available in the Asia Pacific.

3. Objectives

The long-term goal of this activity is to reduce the Indonesian sanitation sector's GHG emissions through improved awareness and understanding of sanitation sector GHG emissions and more effective management of sanitation services in Indonesia.

The main expected outcomes of this activity are:

- By **February 2026**, the Ministry of Public Works and Housing (MPWH), the Ministry of Environment and Forestry (MoEF), and Bappenas are aware of and acknowledge the level of GHG emissions emitted nationally from sanitation systems and value this evidence as the basis for future efforts related to target setting and climate financing.
- By **February 2026**, the Ministry of Public Works and Housing (MPWH), Bappenas, select city and district level governments and development partners are aware of and have ownership of research findings on emissions, and initial policy recommendations, management practices and technologies that can contribute to reduced GHG emissions.
- By **February 2026**, key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, will have access to datasets, methods and skills that improve emissions benchmarking, measurements and responses to support low-emissions and safely managed sanitation.

The objectives of the Activity are:

- Develop methods for measuring GHG emissions from various sanitation related technologies and processes, take direct measurements of emissions from a representative sample of technologies and processes, and develop a dataset that can be used to improve sanitation emissions benchmarking and estimations (e.g. determine emissions factors) as well as emissions reduction options.
- Make estimations of the GHG emissions emitted nationally in Indonesia from the generation and management of human waste under present-day conditions and under future sanitation development scenarios.
- Garner interest and attention from key GOI stakeholders in the research, collect inputs from key stakeholders in the design and implementation of the research, and engage constructively on the research findings to maximise impact.

4. Activity Description

4.1. Approach

The Activity involves bringing together diverse sanitation, climate change and GHG emissions research expertise to design and implement an ambitious program of research to fill a critical evidence gap in Indonesia and globally. It is expected to be implemented by a team comprising of internationally recognised research institutions engaged in research on sanitation in low and middle- income contexts, inclusive of one or more Indonesian research institutions.

The Activity comprises an inception phase and three components:

1. **Mobilisation and inception** – The Contractor will conduct a range of foundational activities to provide a strong basis for an effective program and establish stakeholder buy-in, including research design, stakeholder mapping and ethics approval.

2. **Component 1 – Emissions data collection:** The Contractor will collect primary data on the emission of CH₄, N₂O, CO₂ from processes and activities related to the generation and management of human waste at different scales (onsite, decentralised and centralised), including accounting for variations in design, environmental and operational conditions.
3. **Component 2 – National estimates:** Drawing on primary data collected from component 1 and available secondary data related to sanitation, the Contractor will develop a replicable methodology for estimating total levels of GHG emissions nationally from different segments of the sanitation sector under present-day conditions and under future sanitation development scenarios.
4. **Component 3 – Policy engagement:** The Contractor will engage key stakeholders throughout components 1 and 2 to understand existing knowledge and attitudes on emissions from sanitation and lead participatory processes to co-develop policy recommendations on sanitation regulations, management practices and technologies that are most likely to reduce GHG emissions while also reducing public health risks.

5. Detailed Activity Tasks

Tasks to be conducted by the Contractor are outlined below. Under each component, a series of key tasks are described. These are indicative tasks to meet the objectives. The Contractor shall elaborate and outline additional tasks that may be required to meet the activity objectives and outcomes in the Technical Proposal. The main activities of the Contractor will include but are not limited to:

5.1. Tasks Related to Mobilisation and Inception

The inception phase will comprise research contracting and planning, ethics approval as well as foundational tasks in stakeholder mapping, gaining support and endorsement from key stakeholders, and researcher training. The Contractor should develop an internal training and capacity building plan to be delivered during the Activity for project staff in emissions measurement, and research leadership and partnership, aiming to provide equal capacity building opportunities for women and men. A detailed plan for all three components shall be prepared, and an advisory group of key relevant stakeholders established. Key risks will be identified and mitigation strategies initiated. In addition, a range of key required outputs shall be prepared, including Inception Report, Fraud Control Strategy, Operations Manual, MEL Framework/Plan and a GEDSI Action Plan.

5.2. Tasks Related to Activity Implementation

Component 1: Emissions data collection

The objectives of Component 1 are to develop methods for measuring GHG emissions from various sanitation collection and treatment technologies and processes, take direct measurements of emissions from a representative sample, and develop a dataset that can be used to improve sanitation emissions benchmarking and estimations (e.g. determine emissions factors).

The Contractor should propose whether certain GHG emissions will be determined from direct on-site measurements, laboratory measurements, or calculations from secondary data. The Contractor should propose a framework for sanitation collection and treatment technologies to be sampled, including type of technology and sample locations, which are to be agreed with key stakeholders during the Inception phase. Typically, common systems (e.g. onsite sanitation) should be sampled more intensively (i.e. the proportion of sampling should roughly match the proportion of systems in use). For centralised systems, both Jakarta and Palembang should be included in the sample locations. See Appendix A for a summary of current systems in Indonesia. Treatment plant utilisation rates should also be included as a consideration. The Contractor should clarify

analytical boundaries for centralised, decentralised, onsite and faecal sludge treatment systems and their respective liquid and sludge streams, including their ultimate disposal or re-use. Capacity building activities will be incorporated into the methodology development and implementation, as noted in the capacity building plan prepared during inception.

Task 1.1 Methods, sampling and data collection for on-site sanitation systems

On-site sanitation includes sanitation facilities at the household level that collect human waste in pits, septic tanks, *cubluku*s, or holding tanks. GHG assessments are to include;

1. CH₄, N₂O and CO₂ emitted through the containment of waste in containment units.
2. Embedded carbon from the construction of the facility.

Sampling should represent the key technologies, designs and conditions found in different locations in Indonesia. On-site sanitation systems should be chosen to represent different climatic zones, socioeconomic zones (e.g. rural/urban and varying income levels), hydrologic conditions (i.e. varying depths of groundwater table), and soil conditions in Indonesia.

Measurement of GHG emissions from on-site sanitation systems should be completed a minimum of two times over the research period to account for seasonal variations in rainfall and temperature (if sampling is done in an area where seasonal rainfall does not follow a clear wet-dry season pattern, additional sampling may need to be taken). Measurements should be undertaken over a 24-hour period on a day with weather typical for that season to account for daily variations in emissions. The change in GHG emissions due to changes in management or practices or operational parameters (e.g. before/after emptying at different period) should also be measured.

Measurements should clearly document the nature of the containment units from which data is being collected. This should include 1) the type of influent, 2) materials and conditions of the walls, bottom and top of the containment structure, 3) physical features (e.g. presence of vent pipes and outlets), 4) number of users, and 5) spatial dimensions of the containment unit.

Care must be taken to prevent harm and maintain the safety of the data collection team, householders and the general public including managing risks associated with ignition of flammable gases, inhalation of toxic gases, exposure to pathogens, and disruption of sanitation services to vulnerable households. Permission must be obtained from householders and community leaders.

Task 1.2 Methods, sampling and data collection or estimations for unmanaged waste

Unmanaged waste includes toilets that discharge waste to open drains or onto land, effluent from containment units that discharge to open drains or onto land, and defecation without a toilet (open defecation). Direct toilet and effluent discharge or open defecation into bodies of water (e.g. streams, rivers, ponds, lakes, ocean, etc.) are not part of the activity scope. GHG assessments are to include;

1. CH₄ emitted from drains and land receiving waste directly from toilets and effluent from containment units.
2. CH₄ emitted from the practice of open defecation.

Measurement of GHG emissions from unmanaged waste should be completed a minimum of two times over the research period to account for seasonal variations in rainfall and temperature (if sampling is done in an

area where seasonal rainfall does not follow a clear wet-dry season pattern, additional sampling may need to be taken). Sampling/estimates should account for the heterogeneity in unmanaged waste conditions.

Task 1.3 Methods, sampling and data collection for decentralised wastewater treatment systems

Decentralised wastewater treatment systems include neighbourhood scale (30-50 household Sanimas systems) and area-based wastewater treatment facilities (e.g. serving 400 households or more). GHG assessments are to include;

1. CH₄, N₂O and CO₂ emitted through the containment, processing and treatment of the wastewater by technologies such as communal septic tanks, anaerobic baffled reactors, anaerobic filters, waste stabilisation ponds, constructed wetlands, Imhoff tanks, rotating biological contractors, sludge drying beds, moving bed biofilm reactors, and sequencing batch reactors where present.
2. Dissolved CH₄ in effluent from treatment processes.
3. CO₂ emitted through energy used to operate wastewater treatment and disposal systems.
4. Embedded carbon from the construction of the system.

Sampling should represent the key common technologies found in different locations in Indonesia. Decentralised systems should also be chosen to represent different climatic zones and different socioeconomic zones (e.g. rural/urban and varying income levels) in Indonesia. Measurement of GHG emissions from treatment processes should take into account seasonal variations in rainfall and temperature (if sampling is done in an area where seasonal rainfall does not follow a clear wet-dry season pattern, additional sampling may need to be taken). Measurements should account for dynamic loading during treatment, including peak loads and base flows. Time and resources permitting, the change in GHG emissions due to changes in management, practices or operational parameters should be measured.

Measurements should clearly document the nature of the system units from which data is being collected. This should include 1) the type of influent, 2) materials and conditions of the walls, bottom and top of the system units, 3) physical features (e.g. presence of vent pipes and outlets), 4) number of users, and 5) spatial dimensions of the system units.

Task 1.4 Methods, sampling and data collection for decentralised faecal sludge treatment systems (IPLTs)

Decentralised faecal sludge treatment systems (IPLTs) include equipment, vehicles, and facilities for collecting, receiving and treating faecal sludge that are transported from on-site sanitation facilities. GHG assessments are to include;

1. CH₄, N₂O and CO₂ emitted through the containment, processing and treatment of faecal sludge and effluent by technologies such as anaerobic baffled reactors, anaerobic filters, waste stabilisation ponds, constructed wetlands, Imhoff tanks, rotating biological contractors, sludge drying beds, moving bed biofilm reactors, and sequencing batch reactors where present.
2. Dissolved CH₄ in effluent from treatment processes.
3. CO₂ emitted through energy used to operate sludge and effluent treatment and disposal systems.
4. CO₂ emitted through equipment and vehicles used to empty and transport sludge to treatment facilities.
5. Embedded carbon from the construction of the system.

Sampling should represent the variety of technologies found in different locations in Indonesia. Decentralised systems should also be chosen to represent different climatic zones and different socioeconomic zones (e.g. rural/urban and varying income levels) in Indonesia. Measurements of GHG emissions from treatment

processes should be completed a minimum of two times over the research period to account for seasonal variations in rainfall and temperature (if sampling is done in an area where seasonal rainfall does not follow a clear wet-dry season pattern, additional sampling may need to be taken). Measurements should account for dynamic loading during treatment, including peak loads and base flows. Time and resources permitting, the change in GHG emissions due to changes in management, practices or operational parameters should be measured.

Task 1.5 Methods, sampling and data collection for centralised city wastewater collection and treatment systems

Centralised city wastewater collection and treatment systems are sewer networks and facilities for managing wastewater at a city scale. GHG assessments are to include:

1. CH₄ and CO₂ emitted in wastewater collection and conveyance systems, including in sewers (especially rising mains) and pumping stations.
2. CH₄, N₂O and CO₂ emitted through the processing and treatment of wastewater and faecal sludge at treatment facilities, including aeration tanks, anaerobic treatment processes, waste stabilisation ponds, activated sludge processes, nitrification-denitrification processes, and sludge treatment where present.
3. Dissolved CH₄ in effluent from treatment processes.
4. CO₂ emitted through energy used to operate wastewater collection (e.g. pumping), treatment and disposal systems.
5. Embedded carbon from the construction of the system.

Sampling should represent the key common technologies found in different cities in Indonesia and include centralised systems in Jakarta and Palembang. Wastewater treatment plants should also be chosen to represent different climatic zones in Indonesia. Measurements of GHG emissions from treatment processes should be taken 2-3 times to account for seasonal variations in rainfall and temperature. Measurements should account for dynamic loading during treatment, including peak loads and base flows. Time and resources permitting, the change in GHG emissions due to changes in management, practices or operational parameters should be measured.

Task 1.6 Documentation, data collation and analysis

The Contractor will document and share the overall methodology and approach to data collection, sampling and estimation. The empirical data from Tasks 1.1-1.5 will be assembled in an accessible format, disaggregated by technology, segments of the sanitation chain, treatment process and locations. Analyses will be conducted to examine variation in emissions for different technologies and conditions, potential drivers for variation, study limitations and draw conclusions. The Contractor will also prepare journal manuscripts to be submitted for peer-review in internationally reputable journals, led or co-authored by Indonesian researchers with attention to building writing and publishing capacity. The Contractor will also prepare a policy summary of findings, and a Technical Note describing replicable methods for measuring emissions from the generation and management of human waste and for producing national estimates. All tasks in this component are required to comply with DFAT and KIAT communication protocols and policies.

Component 2: National estimates

The objective of Component 2 is to estimate the national Indonesian GHG emissions emitted from the generation and management of human waste under present-day conditions and under future sanitation development scenarios.

Task 2.1 Develop a model-based methodology

The Contractor will develop a model-based methodology(s), based on refinement of existing methods and/or development of novel methods, for accurately estimating national emissions by drawing on the primary data collected in Component 1 and available secondary data on sanitation infrastructure, flows of human waste, dynamics of biological processes, and sanitation emissions in Indonesia. It is recommended that the Contractor begins developing this methodology concurrently with Component 1 so it is clear what data will need to be collected. The methodology(s) that the Contractor develops should propose an approach for accounting for the dynamic flows of human waste (e.g. the change in emissions as a containment unit is progressively filled then emptied), aggregating results, and categories of emissions that will be reported. It is recommended that emissions are reported across different modes of sanitation service delivery to support policy recommendations on service delivery options.

Task 2.2 Consultation with stakeholders

The Contractor will consult with key stakeholders (see Component 3) to engage on the proposed model-based methodology and to determine plausible future sanitation development scenarios to model. These should include scenarios in which higher proportions of the national population are connected to centralised wastewater treatment systems, and scenarios in which higher proportions of on-site sanitation systems are fully sealed and regularly emptied.

Task 2. National emissions estimates

The methodology for estimating emissions should be replicable so that estimates can be made in other low and middle-income countries and follow on studies in Indonesia. The Contractor will develop appropriate outputs (e.g. visual PowerPoint report or similar), with the national estimates to facilitate sharing of findings with relevant stakeholders, supported by associated evidence as well as a policy summary. The Contractor will also prepare a relevant journal manuscript to be submitted for peer-review in internationally reputable journals, lead or co-authored by Indonesian researchers with attention to building writing and publishing capacity. All tasks in this component are required to comply with DFAT and KIAT communication protocols and policies.

Component 3: Policy engagement

The objectives of Component 3 are to garner interest and attention from key GOI stakeholders in the research, collect inputs from key stakeholders in the design and implementation of the research, and disseminate findings of the research to maximise impact.

Task 3.1 Establishment of Research Advisory Group

The Contractor, with inputs from KIAT and DGHS, will form a research advisory group comprised of key relevant stakeholders and meet with them on a regular (minimum 6 monthly, but more frequently on commencement of the research) basis to obtain advice on different stages of the Activity.

Task 3.2 Stakeholder mapping, consultation and engagement

The Contractor will carry out stakeholder mapping to identify key relevant stakeholders (specific staff and departments, including representation from female and male staff members) amongst target ministries for obtaining essential secondary data and gaining inputs on design and implementation of the research, as well as interpretation of the research findings. These stakeholders should be consulted with and updated throughout the research process, including in the formation of policy recommendations on regulations, management practices and technologies through workshops.

The Contractor will consult with the MoEF, Bappenas, and city and district-level government stakeholders on research questions, sampling decisions and methodologies for collecting emissions data and producing national estimates in alignment with the National GHG Inventory System (SIGN-SMART).

The Contractor will also consult with climate financing bodies (e.g. Green Climate Fund), the Ministry of Finance, and MoEF about the information required to successfully obtain climate financing for sanitation sector improvements, and explore potential for carbon credits.

The Contractor will consult with key national stakeholders to assess the status of sanitation services in Indonesia and identify primary issues and ongoing efforts to improve sanitation. This should include qualitative methods such as interviews, focus group discussions or workshops. The Contractor will also share available data and knowledge on sanitation and emissions in Indonesia and globally with the stakeholders.

Task 3.4 Policy, legal and regulatory review and political economy analysis

The Contractor will conduct a policy, legal and regulatory review and political economy analysis concerning sanitation investment decision-making, technology selection, regulation, standards, and service delivery arrangements to support reduced emissions.

Task 3.5 Co-design of policy recommendations and reporting

The Contractor will co-design policy recommendations to reduce emissions and public health risks, involving national government ministries, selected district government, sanitation authorities/service providers/LG units (eg PDPAL Jaya, sanitation UPTDs), development partners and civil society organisations, drawing on emerging findings from the data collection on emissions.

To complement the policy recommendations, based on components' 1, 2 and 3, the Contractor will prepare a report that describes sanitation regulations, management practices, and technologies that can reduce greenhouse gas emissions and public health risks that are practical to implement in the Indonesian context, and the legal and policy implications of these.

Task 3.6 Develop and implement communication strategy

The Contractor will develop and implement a communications strategy to develop appropriate, tailored outputs that present the research findings and recommendations and engage on them with a diverse audience (national and local government officials, non-government organisations, academics, and the general public). Such outputs include and go beyond the technical deliverables and may include PowerPoint presentations, blogs and other communications materials. All tasks in this component are required to comply with DFAT and KIAT communication protocols and policies.

Tenderers are requested to closely consider the Contract Standard Terms and Conditions, noting title to all Intellectual Property rights in, or in relation to, Contract Material shall vest upon its creation to DFAT. If required by DFAT, the Contractor must bring into existence, sign, execute or otherwise deal with any document which may be necessary to enable the vesting of such title or rights to DFAT.

The Consultant should provide and hand over any models where relevant including excel based (or other program used) files (including the passwords) of the relevant models to KIAT and a nominated GOI agency covering relevant analysis and calculations. The file / program should be open for any changes / revision as required by the user. It should be accompanied with a manual / guidance on how to conduct data entry, process and analysis of the model. The Consultant will hold a session(s) to present the step-by-step process in developing the model with the key stakeholders. KIAT will have the rights to share the model with respective parties including DFAT.

6. Deliverables

The Contractor will submit to KIAT over the assignment period, the following key deliverables in 'draft' and 'final' editions:

6.1. Management and Operations Reports

1. **Inception Report.** Provide an updated scope of works, list of deliverables, work plan, risk register, staff assignment schedule, including the results of initial stakeholder consultations, preliminary thinking regarding a MEL Plan, and GEDSI entry points to be monitored and measured throughout the Activity.
2. **Fraud Control Strategy.** Undertake a Fraud Risk Assessment and develop an associated Fraud Control Strategy within one month of commencement in compliance with the Commonwealth Fraud Control Framework. Further information can be found under Section 8.
3. **Bi-lingual Operations Manual.** At a minimum, this will need to outline the approach to:
 - a. HR
 - b. Financial Management
 - c. Procurement
 - d. Occupational Health, Safety and Security
 - e. Information technology and data management systems and related policies
 - f. Risk management including social safeguards
 - g. Administration
 - h. Travel

Further information can be found under Section 8.

4. **Monitoring, Evaluation, and Learning (MEL) Framework/Plan.** To be integrated with the overall KIAT approach to performance and reporting, and should describe at least the following information:
 - a. An approach to setting and reviewing 6-monthly performance targets, in line with the KIAT approach to managing Activity Performance.
 - b. A limited number of key questions and/or indicators used to communicate key aspects of implementation and/or results, with all relevant data disaggregated by female, male, female living with a disability, and men living with a disability.
 - c. The approach to monitoring the relevant GEDSI entry points and actions as identified in the inception report.

- d. The schedule of all main MEL-related reports.
- e. An operational workplan for all MEL-related tasks, including resource requirements as relevant.

The MEL framework should be prepared in reference to general KIAT MEL guidance and will be discussed and agreed with KIAT Performance Team during the inception phase. All subsequent data collection, analysis, and reporting should follow the agreed framework.

5. Progress Reporting (Monthly and Six Monthly)

- **Monthly Snapshots (monthly):** Monthly snapshot reports (in a format to be agreed with KIAT) should provide a summary of work progress during the previous month, any key challenges requiring attention from KIAT, a summary of the work program for the next month and updated expenditure forecasts.
 - **Progress Reports (every 6 months):** Six monthly progress reports (in a format to be agreed with KIAT) will outline the activities which have been completed in the last six months, results presented to GOI counterparts and responses provided by GOI counterparts, progress against the agreed activity outcomes, any GEDSI-related interventions and results, and any proposed actions to be taken to improve the effectiveness or efficiency of implementation over the next 6-month period. Progress reports will also include a summary of progress against each of the 6-monthly performance targets and the relevant indicators as per the MEL Framework, as well as a proposed workplan (as an annex) for the next 12 months (with the second 6-month period considered as indicative).
6. **Handover Plan.** Develop a Handover Plan within six months of activity commencement which includes all actions to be taken to ensure that the outcomes or benefits of the activity extend beyond the completion of the contract. This includes but is not limited to the functions to be performed to hand over contract material, supplies, information, documents, and other materials to KIAT and/or relevant GOI partner(s).
7. **Activity Completion Report (ACR):** The Activity Completion Report (in a format to be agreed with KIAT) should summarise and synthesise relevant information produced or collected over the life of the Activity, particularly related to the MEL Framework. The ACR will be expected to provide: an overview of the activity, including the main tasks undertaken and outputs delivered, the extent to which desired outcomes were achieved, actual expenditure as compared to budgets, observations and insights gained over the life of the activity, and recommendations or opportunities for KIAT's future engagement.

6.2. Technical Deliverables

The Contractor will submit to KIAT over the assignment period, the following key deliverables in 'draft' and 'final' editions:

- **Interim Report** describing overall methodological approach to data collection, sampling and estimation.
- **Sanitation Emissions Dataset** summarising sanitation emissions in the form of robust datasets, disaggregated by technology, segments of the sanitation service chain, treatment process and locations.
- **Sanitation Emissions Policy Summary Paper** summarising key finding and policy recommendations in an 'easy-to-read' format.
- **Journal Manuscript(s) (Sanitation Emissions Production)** on emissions produced in Indonesia from the sanitation sector to be submitted for peer-review and publication in internationally reputable journals, lead or co-authored by Indonesian researchers.
- **Sanitation Sector Recommendations Report** that describes sanitation regulations, management practices, and technologies that can reduce greenhouse gas emissions and public health risks and are practicable to implement in the Indonesian context and the legal and policy implications of these.

- **Journal Manuscript(s) (Sanitation Emissions Reduction)** on pathways for sanitation emissions reduction in Indonesia, lead or co-authored by Indonesian researchers.
- **Technical Note** describing replicable methods for measuring emissions from the generation and management of human waste and for producing national estimates.

Table 1: List of Deliverables

Deliverable	Month of Assignment
Inception Report	1
Fraud Control Strategy	1
Operations Manual	2
MEL Framework/Plan	2
Sustainability Action Plan	3
Interim Report	5
Handover Plan	6
Progress report (Monthly Snapshot)	Monthly (10 th day of each month)
Six-Monthly Progress Report	Six-Monthly (15 th of the following month)
Activity Completion Report	Final month of assignment
Sanitation Emissions Dataset	20
Technical Note	22
Sanitation Sector Recommendations Report	22
Sanitation Emissions Policy Summary Paper	23
Journal Manuscript (Sanitation Emissions Production)	24
Journal Manuscript (Sanitation Emissions Reduction)	24

7. Work Schedule and Staffing

7.1. Work schedule

The activity is anticipated to be completed in 24 months. Figure 1 below provides an indicative schedule as a basis for activity planning.

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7.2. Staffing

The Contractor shall propose a team with appropriate research experience to carry out the required services in Indonesia and take responsibility for the preparation of all activities and outputs. The Contractor will provide a team of appropriate composition, size, and inputs for the research task, including the skills and roles specified below. Gender balance within the team and diversity of team members is encouraged.

The technical and financial proposal of the tenderer shall outline the proposed resourcing and demonstrate the specific skills and experience of individual team members against one or more of the skill categories in Table 2, as well as the two specified roles. The Contracting organisation must be an internationally recognised university or research organisation with an established track-record of research publications on safely managed sanitation in low and middle-income country contexts, and with access to research ethics approval processes. The Contracting organisation is anticipated to partner with one or more Indonesian research institutions.

The Contractor will be required to nominate the structure and assignment of relevant team members for completion of all tasks outlined under Section 5 and listed deliverables under Section 6 to the satisfaction of KIAT. Tenderers shall propose a team of specialists that encompasses the requirements outlined below including the two specified Team Leader and Deputy Team Leader roles. Tenderers are encouraged to make the most cost-effective allocation of resources to achieve the objectives of the activity. It is the responsibility of the Tenderer to propose a team composition that will best utilise relevant skills and knowledge for achieving the objective and deliverables of this assignment within the provided timeframe and according to value for money principles.

Table 2: Team Skill Requirements

Skill category	Requirements
Onsite, decentralised, and centralised sanitation in low and middle-income countries expertise	Familiarity with designs, engineering and real-world functioning of onsite, decentralised, and centralised sanitation and drainage systems in low and middle-income countries; Understanding of sanitation service chain, faecal waste flow diagrams (SFD), and public health aspects; Sanitation planning and regulation; Occupational health and safety expertise in relation to working with diverse sanitation systems.
Wastewater and faecal sludge treatment processes and emissions expertise	Familiarity with physical, microbiological, and chemical treatment processes for faecal sludge and wastewater across onsite and centralised systems; Knowledge of methods for measurements of GHG emissions from physical, microbiological, and chemical treatment processes; Knowledge of GHG mitigation options for treatment processes.
Data analytics/science, GHG accounting and climate financing expertise	Quantitative data modelling skills; Familiarity with GHG emissions inventories, emissions reporting methodologies, and IPCC emissions measurement methods; Sector and national level reporting of GHGs; Knowledge of climate financing mechanisms.
Indonesian governance, policy and regulation expertise	Familiarity with the governance, policy and regulatory context of the sanitation, environment, climate, urban planning, health, and infrastructure sectors in Indonesia.
Applied and transdisciplinary research expertise	Research leadership, quantitative and qualitative research design, research project management, research implementation, research-to-policy methods, research capacity building, research communication, data management, co-design and research ethics skills; Experience with fieldwork, laboratory work, workshop facilitation, consultations, and logistics in the Indonesian context.
Monitoring, evaluation and learning (MEL) for applied research expertise	Expertise in monitoring and evaluation of research uptake, use and impact, including evaluating research-to-policy links and capacity building; Expertise on theory of change / program logic, monitoring processes, data sources and monitoring and evaluation tools and framework.

Skill category	Requirements
Gender Equality, Disability and Inclusion (GEDSI) expertise and social safeguards	Familiarity with gender and inclusion in the sanitation sector; Expertise in development of gender action plans and reporting covering relevant GEDSI dimensions; Familiarity with social safeguard frameworks and their implementation.

Core specialists:

- Team Leader – 6 months intermittent inputs – ARF D4
- Deputy Team Leader – 8 months intermittent inputs – Indonesian National

Further details of these roles are outlined below.

Team Leader (ARF D4)

Job Description:

- Provide strategic and results-oriented leadership and manage team members for achieving the objective of their assignments, guide and oversee the developments of key tasks and activities
- Maintain at all times proactive communication and collaboration with KIAT and relevant key stakeholders
- Provide guidance and review (quality assurance) of technical deliverables produced by team members
- Provide leadership of a high-quality, robust research design, analytical processes and policy engagement processes, and ensure appropriate training and capacity building of all team members in relevant methodologies
- Engage effectively with key Government of Indonesia stakeholders
- Ensure ethical research approvals are obtained
- Regularly monitor implementation risks and progress, adjust workplans and staffing schedules as necessary and in close collaboration with KIAT and DGHS
- Provide guidance on all outputs, including both peer-reviewed articles and outputs of other types, including review and sign-off deliverables prepared by team members, prior to KIAT submission
- Ensure that team members are provided with guidance on (i) occupational health and safety, (ii) social and environmental safeguards, including child protection, sexual abuse and modern slavery, and (iii) technical standards and research practices

Requirements:

- Doctorate (or equivalent) in Civil/Environmental/Chemical/Water/Wastewater engineering
- At least 15 years of international research experience in the sanitation sector, with technical and institutional exposure related to the Indonesian water and sanitation sector
- Knowledge and experience of greenhouse gas emissions and climate change aspects of sanitation systems
- Extensive experience in team leadership, project management and stakeholder collaboration and senior government officials
- Excellent verbal and written communication skills in English, Bahasa Indonesia is desirable

Deputy Team Leader (open to Indonesian nationals only)

Job Description:

- Serve as Deputy Team Leader during the activity assignment period and Acting Team Leader when required
- Support and lead elements of the research design including empirical research, analysis and policy engagement

- Provide comprehensive liaison with relevant Government of Indonesia ministries, including Bappenas, MPWH Directorate Sanitation (DitSan), Ministry of Environment and Forestry, relevant local governments agencies and other relevant actors
- Lead field implementation of research activities, including oversight of field implementation logistics, risk management, quality assurance, protocol development and adherence, local research permits, local ethics approval and oversight of the safety and well-being of field staff members
- Engage local research organisations and/or enumerators as needed and appropriate, including relevant subcontracting arrangements
- Actively support effective communication and collaboration across all team members

Qualifications:

- Doctorate (or equivalence) in Civil/Environmental/Chemical/Water/Wastewater Engineering or related discipline
- At least 10 years' research experience in urban sanitation
- Strong technical background in the water and sanitation sector, including knowledge of wastewater treatment system design and operation
- Demonstrated experience in working on donor funded research-related programs
- Experience in effectively working with national and local governments
- Excellent spoken and written communication skills in Bahasa Indonesia and high-level English proficiency

8. Management of the Services

The Contractor will work under the guidance of the KIAT Deputy Director (Water and Sanitation) or delegate to achieve the required outcomes on time. Day-to-day operational management, technical reviews, and clarification of technical matters with GOI counterparts will be the Contractor's responsibility, supported by KIAT where necessary.

The Contractor shall work closely and develop good working relations with the Directorate-General of Human Settlements (DGHS) in the Ministry of Public Works and Housing (MPWH) and Directorate of Greenhouse Gas Inventory and Monitoring, Reporting and Verification in the Ministry of Environment and Forestry (MoEF). The Contractor shall act appropriately under the code of behaviour for personnel operating under the Australian Government's aid program, including behaving in a culturally appropriate way and ensuring integrity in undertaking all the work contracted under this activity.

When a meeting is due to take place between the Contractor and GOI counterpart, the Contractor should note the approach outlined below:

Type of Meeting	Approach
For meeting with GOI counterparts above Echelon 1	KIAT must be present and DFAT will be informed
For meeting with GOI counterparts equal to Echelon 1	KIAT must be informed and may present
For meeting with GOI counterparts below Echelon 1	The Contractor may lead on the process

9. Knowledge Transfer

KIAT prioritises ensuring an effective transfer of knowledge, skills and expertise to GOI stakeholders. Effective knowledge transfer requires proper planning and engagement with key stakeholders.

The Contractor must allocate adequate time and resources for participating government agencies to benefit from closely collaborating with the Activity. For this purpose, the Contractor shall present its proposed approach to developing a Sustainability Action Plan covering capacity-building and knowledge transfer in their technical proposal under approach and methodology. The Sustainability Action Plan contents and timing will be agreed during the Inception Phase.

10. Performance Milestone Management Fee

The typical structure of KIAT's subcontract agreements incorporates an agreed management fee, and all other expenditure under the contract are reimbursed to the Contractor at cost. Agreement will be reached as to the structure of how the management fee is payable to the Contractor prior to entering a contract. To encourage high quality performance of the Contractor, milestones are utilised as a mechanism to validate and pay a component of the agreed management fee. In its Financial Proposal, the tenderer will propose the deliverables and milestones that are linked to management fee payments, and this will be subject to KIAT approval during the contracting process. This should comprise a mix of deliverables (such as reports, plans etc.) and activity outcomes achieved through the activity implementation (known as Performance Milestones). Performance Milestones based on activity outcomes related to GEDSI improvements are encouraged, where possible. In addition, tenderers will be requested to outline a proposed management fee payment deduction schedule for the late submission and/ or non-achievement of report deliverables and performance milestones. Agreed at contract negotiations, this management fee payment deduction can be applied at the discretion of KIAT.

Tenderers are to pay particular attention in the Request for Tender (RFT) for the requirements of "performance targets" linked to the management fee (at Section 4.3 of the RFT).

The Management Fee shall be structured as follows:

- A management fee linked to management reports (30% of total management fee payable)
- A management fee paid on technical deliverables as nominated by the tenderers in their Financial Proposal (60% of total management fee payable). Tenderers shall select from specific outputs/deliverables listed in Section 6 of the Description of Services.
- A management fee paid on achieving performance milestones¹ as proposed by KIAT and by the tenderers (in their Financial Proposal), with a specific inclusion of at least one GEDSI indicator (10% of total management fee payable). These performance milestones and verifiable indicators will be refined and agreed with KIAT during the contract negotiations stage.

11. Environmental and Social Safeguards

Safeguards are measures taken to avoid or minimise the negative impacts of aid investments on people and the environment. The Contractor is required to comply with DFAT's Environmental and Social Safeguard Policies at all times. This includes:

- DFAT's *Environmental and Social Safeguard Policy for the Aid Program*. This policy sets out the requirements for managing five safeguards including when working with partners:
 - Environmental protection
 - Children, vulnerable and disadvantaged groups
 - Displacement and resettlement

¹ A performance milestone can be a tangible relevant policy change, and/or buy-in from GOI counterparts which is beyond the sphere of control for the tenderers but within their sphere of influence.

- Indigenous peoples
- Health and safety²
- DFAT's *Child Protection Policy*. DFAT, DT Global and KIAT have a zero-tolerance approach to child exploitation or abuse. The Child Protection Policy is part of DFAT's child protection framework. The policy is principles based, articulates DFAT's zero tolerance of child exploitation and abuse, and includes expectations of DFAT funded partners in the management of child protection risks.³
- DFAT's *Preventing Sexual Exploitation, Abuse and Harassment Policy*. DFAT, DT Global and KIAT do not tolerate sexual exploitation, abuse or harassment (SEAH) of any kind. The policy outlines both expectations and requirements for DFAT partners to manage the risk of SEAH and SEAH incidents, should they occur in the delivery of DFAT business.⁴

The Contractor, its personnel and any subcontractors of the Contractor must comply with the requirements outlined in the safeguard policies at all times.

KIAT completed a safeguards screening based on the work expected in this Description of Services and the safeguards risk rating for this Activity is **Medium**. The Contractor will revisit the safeguards risks at the inception stage and identify aspects of the activity that pose high safeguards risk and therefore require additional support from KIAT.

With a Medium safeguards risk rating, the Contractor is responsible to ensure any safeguards risk mitigation is implemented throughout the activity. At a minimum, the Contractor must have:

- A PSEAH⁵ policy or other documented policies and procedures in place, which clearly meet the expectations of this policy. The policy must state how the organisation will ensure that downstream partners (sub-contracted entities or individuals) will comply.
- Documented SEAH incident reporting and management processes. Reporting and investigation processes must include engagement of and reporting to senior management and executive boards.
- Effective risk management processes that include consideration of the risk of SEAH. The process must document the controls already in place or to be implemented to reduce or remove risks.

12. Climate Resilience

KIAT is committed to supporting GOI to understand and address the risks of climate change in the development and management of infrastructure. Indonesia is already highly exposed to natural disasters that impact the utility of its infrastructure. As Indonesia adapts to increasing physical risks from climate change, the appropriateness and resilience of infrastructure will be critical.

The Contractor will work with KIAT's Climate Change Team to ensure that climate risk is properly considered across the activity, and that the analysis produced is high quality and relevant.

² Department of Foreign Affairs and Trade, 2018 Environmental and Social Safeguard Policy for the Aid Program
<http://dfat.gov.au/about-us/publications/Documents/environmental-social-safeguard-policy-for-the-aid-program.pdf>

³ Department of Foreign Affairs and Trade, 2018 DFAT Child Protection Policy
<https://www.dfat.gov.au/sites/default/files/child-protection-policy.pdf>

⁴ Department of Foreign Affairs and Trade, 2019 Preventing Sexual Exploitation, Abuse and Harassment Policy
<https://www.dfat.gov.au/sites/default/files/pseah-policy.pdf>

⁵ Preventing Sexual Exploitation, Abuse and Harassment

13. Operations

KIAT is committed to safeguarding its employees, Contractors, assets, operations, and reputation to create a safe and secure work environment and manage all operational risks. To ensure the effective and compliant implementation of the activity it is paramount that there are robust operational policies and procedures in place. Key operational deliverables will include (but not limited to) the following:

- Development of a bi-lingual **Operations Manual** for the activity within 2 months of commencement which must consider the operational environment as a result of the ongoing COVID-19 pandemic. At a minimum, this will need to outline the approach to:
 - HR
 - Financial Management
 - Procurement
 - Occupational Health, Safety and Security
 - Information technology and data management systems and related policies
 - Risk management
 - Administration
 - Travel
- Undertake a Fraud Risk Assessment and develop an associated **Fraud Control Strategy** within one month of commencement in compliance with the Commonwealth Fraud Control Framework available at (<https://www.ag.gov.au/integrity/publications/commonwealth-fraud-control-framework>)
- Develop a **Handover Plan** within six months of activity commencement which includes all the functions to be performed to hand over contract material, supplies, data and information, documents and other materials to KIAT and/or relevant Government of Indonesia partner
- Develop a **Risk Register** which is to be updated and submitted to KIAT no less than quarterly
- Develop and maintain an **Asset Register** which shall record any non-consumable Supplies valued at AUD5,000 or more which at a minimum contains the following information: reference identification number; description of the asset; date of procurement; cost; location; current status.
- Develop and maintain an **Inventory Register** which shall record any non-consumable Supplies valued at AUD1,000 to AUD4,999 which at a minimum contains the following information: reference identification number; description of the asset; date of procurement; cost; location; current status. This will include IT equipment within this value range.

14. Monitoring, Evaluation, and Learning (MEL)

Over the course of the implementation phase, the Contractor will be expected to monitor and report on progress toward the achievement of the desired outcomes of the Activity. As part of the inception phase, the Contractor will be responsible for developing the approach to monitoring, evaluation, learning, and reporting on progress and outcomes, as described in a dedicated MEL Framework/Plan for the activity. This approach should be developed in coordination with the KIAT Performance Unit to ensure sufficient integration with the overall KIAT approach to performance and reporting.

At a minimum, the approach will be expected to cover the following:

- An approach to setting and reviewing 6-monthly performance targets in line with the KIAT approach to managing activity performance.

- A limited number of key questions and/or indicators used to communicate key aspects of implementation and/or results, including for each question or indicator: baseline data (as relevant), data and supporting documentation required, methods for collecting data and ensuring that it is disaggregated by sex and disability status as relevant, the frequency and timing of data collection, and the allocation of responsibility for collecting and reporting on the indicator.
- The schedule of all main MEL reports.
- An operational workplan for all main MEL-related activities, including the frequency/timing, resource requirements, and methods/mechanisms.

Based on the agreed MEL framework (or alternative approach), the Contractor will be responsible for:

- Agreeing performance targets with KIAT at the start of each 6-monthly performance period.
- Preparing a summary of achievement against agreed performance targets (in a format agreed with KIAT), and discussing achievement, challenges, and implications of the future during 6-monthly performance reviews.
- Preparing 6-monthly progress reports (see “Deliverables”), incorporating all relevant MEL data.
- Preparing an Activity Completion report (see “Deliverables”), incorporating all relevant MEL data.

15. Gender Equality, Disability and Social Inclusion (GEDSI)

In promoting infrastructure that is accessible for all, KIAT has a strong focus on the promotion of gender equality, disability, and social inclusion (GEDSI) in its activities. This means ensuring research processes, at all stages consider the needs of communities, particularly women, people with disabilities and other vulnerable groups, to ensure the research outcomes and infrastructure benefit all.

For this activity, there are at least three key areas in which gender and inclusion are deemed important: (i) in relation to gender balance and inclusion of early career researchers in opportunities to build capacity through this activity; (ii) seeking gender balance in stakeholder engagement processes, including with government; (iii) in relation to sensitive, ethical research practice when conducting empirical research amongst vulnerable households and communities. These should be included amongst the GEDSI entry point to monitor and measure as part of the inception report.

16. Communications

The Contractor is required to comply with the KIAT Communications Strategy, Communications Handbook and the Branding Style Guide.

All media engagement and publicity related to the Activity, including communication with media, the use of social media, and any speaking engagements about or related to the activity, must be coordinated with the KIAT Communications Unit. The Contractor is not authorised to speak to the media or invite media representatives to any events managed or conducted as part of the activity., unless prior KIAT approval is obtained.

Strategies for media engagement through KIAT and/or GOI counterparts should be considered and developed as part of the inception report.

Appendix 1: Sanitation Systems in Indonesia

Onsite systems: A large proportion of the Indonesian population is reliant on onsite systems (80%), including cubluks and septic tanks.

Centralised systems: In Indonesia, there are several major cities with centralised wastewater treatment systems. These cities include Bali, Balikpapan, Bandung, Banjar Masin, Batam, Cirebon, DKI Jakarta, Medan, Prapat, Surakarta, Tangerang, and Yogyakarta, with other cities with treatment plants in progress.

Sewerage and centralised wastewater treatment systems in Indonesia (WWTP > 2 MLD)

Kab/Kota	Location	Year of construction	System	Capacity (m3/day)
Banda Aceh				
Medan	Pulo Brajan	1994	UASB	10,000
Parapat	Ajibata	1994	Aerated pond	2,000
Batam	Batam Center	1990	Oxidation ditch	2,852
Jakarta Pusat	Setiabudhi	1986	Aerated system	38,880
		2012	MBBR	21,600
Tangerang	Tanah Tinggi, Sukasari	1981	Oxidation ditch	2,852
Bandung	Bojongsoang	1979	Anaerobic facultative pond	80,835
Cirebon	Kesenden	1987	Anaerobic facultative pond	7,033
	Ade Irma	1987	Anaerobic facultative pond	5,626
	Gelatik	1977	Anaerobic facultative pond	3,944
	Rinjani	1977	Anaerobic facultative pond	3,944
Surakarta	Semanggi	1999/2000	Biofilter	5,184
	Mojosongo	1997/1998	Aerobic facultative pond	4,320
	Pucang Sawit	2012	Biofilter	3,456
Yogya, Sleman, Bantul	Sewon	1994	Aerobic facultative pond	15,500
Denpasar	Suwung	2004	Aerated pond	51,000
Balikpapan	Margasari	2001	Extended Aeration	800
Banjarmasin	KHKS	2008	Rotating biocontactor	5,000
	Pekapuran Raya	2007	Rotating biocontactor	2,500
	Lambung Mangkurat	2000	Rotating biocontactor	1,000
	Basirih	2010	Rotating biocontactor	2,000
	Tata Banua	2011	Rotating biocontactor	2,000
	Sungai Andai	2011	Rotating biocontactor	3,000
	Sultan Adam	2013	Rotating biocontactor	2,000
Manado	Boulevard	2010	Rotating biocontactor	2,000
Pekanbaru	Bambu Kuning	2020-2023	MBBR	8.100
Jambi	Kasang	2020-2023	MBBR	7.600
Palembang	Sei Selayur	2020-2023	ABR and biological trickling filter	20.300
Makassar	Losari	2020-2023	MBBR	16.000

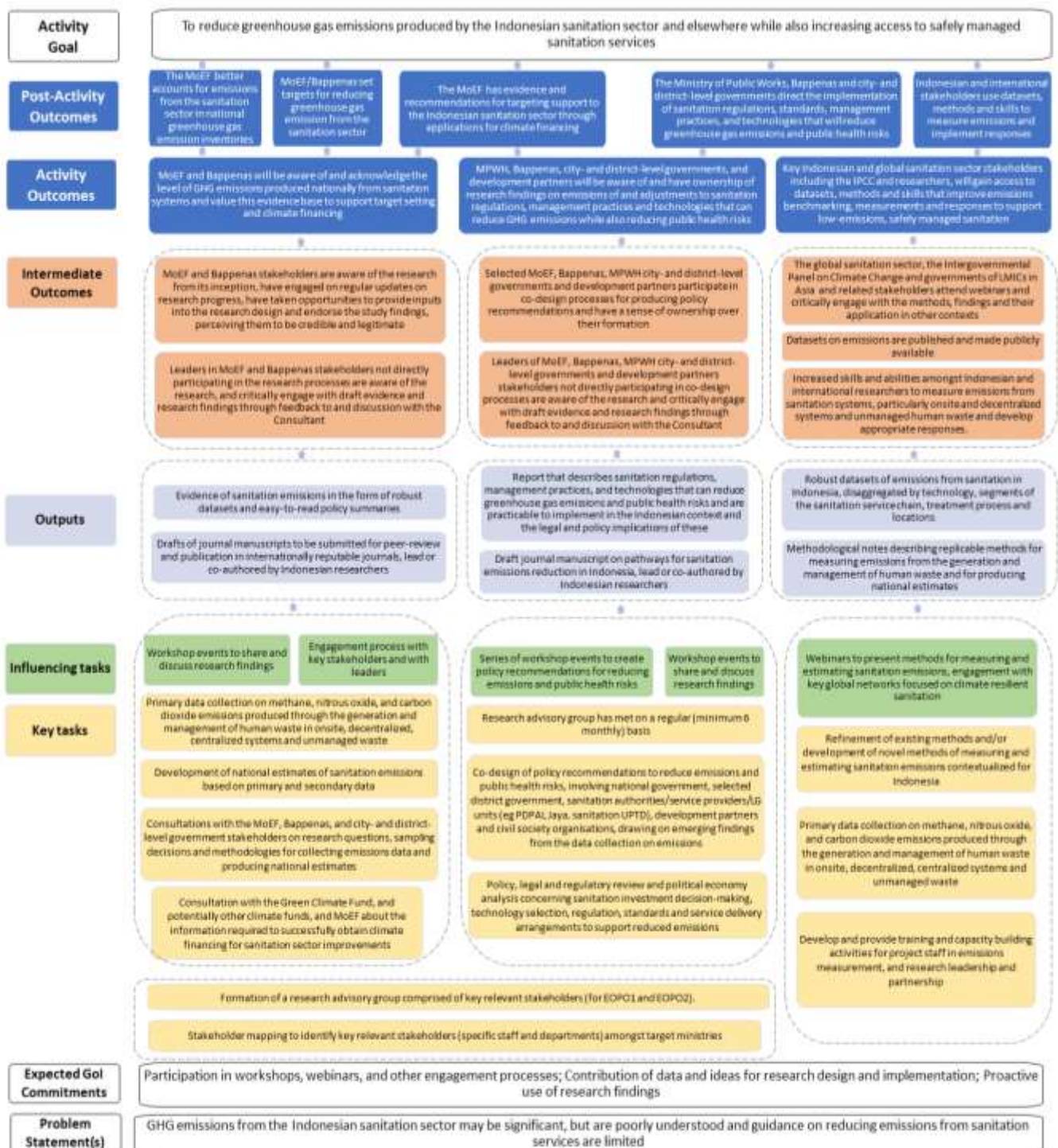
Kab/Kota	Location	Year of construction	System	Capacity (m3/day)
Semarang	6 locations at Banjardowo	2024-2026		25.000
Mataram	Sekarbela	2024	Activated sludge	8.000
Pontianak	Martapura & Nipah Kuning	2024	MBBR	12.000

Decentralised systems: The Government of Indonesia has invested significantly in communal-scale sanitation systems (known as SANIMAS) in the past decade, with over 25,000 systems built by the end of 2015. These communal-scale sanitation systems have been funded through various programs, with the Special Allocation Fund (Dana Alokasi Khusus, DAK) being the largest contributor. The Australia Indonesia Infrastructure Grant for Municipal Sanitation (sAIIIG) also constructed several larger-scale area-based treatment plants also using anaerobic baffled reactors. More recently, systems such as the moving bed bioreactor (MBBR) have been implemented and further treatment plants are planned. The table below includes a summary of treatment systems of <2MLD.

Wastewater treatment of < 2 MLD in Indonesia

WWTP System	Number of systems
Aerobic Baffled Reactor	3
Anaerobic digester	1
Anaerobic baffle reactor	15
Anaerobic Filter	4
Anaerobic-Aerobic Biofilter	2
Moving Bed Bio Reactor (MBBR)	1
Stabilization Ponds	1
Bio Filter	3
Septic tank Communal	3
Combined ABR to ABF	5
ABR	13
RBC	10
ABF	4

Annex 2: Initial Activity Logic for Sanitation GHG Emissions Research



Annex 3. MEL Requirements

Name of Activity	Sanitation GHG Emissions Research
Activity Stream	
Activity Number	
Activity Goal	To reduce greenhouse gas emissions produced by the Indonesian sanitation sector and elsewhere while also increasing access to safely managed sanitation services.
Activity Outcomes	<ol style="list-style-type: none"> 1. The Ministry of Environment and Forestry and Bappenas will be aware of and acknowledge the level of greenhouse gas emissions produced nationally from sanitation systems and value this evidence base to support target setting and climate financing. 2. The Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners will be aware of and have ownership of research findings on emissions of and adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks. 3. Key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, will gain access to datasets, methods and skills that improve emissions benchmarking, measurements and responses to support low-emissions, safely managed sanitation.
Activity Contribution to KIAT End of Facility Outcomes	
KIAT End of Facility Outcomes	Contribution of the Activity
KIAT EOFO 1: Improved policy and regulatory framework for infrastructure development	<p>Outcome 1: The Ministry of Environment and Forestry and Bappenas will be aware of and acknowledge the level of greenhouse gas emissions produced nationally from sanitation systems and value this evidence base to support target setting and climate financing.</p> <p>Outcome 2: The Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners will be aware of and have ownership of research findings on emissions of and adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks.</p> <p>The Activity is expected to produce policy and regulatory recommendations for sustainable, lower-emissions sanitation infrastructure.</p>
KIAT EOFO 2: High quality projects prepared and financed by GOI, the private sector and/or MDBs	N/A
KIAT EOFO 3: High quality infrastructure delivered, managed and maintained by GOI	Outcome 3: The Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners will be aware of and have ownership of research findings on emissions of and adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks.

	The activity is expected to provide guidance to GOI on management practices, technologies and regulations that will support high-quality sanitation infrastructure.
KIAT EOFO 4: Infrastructure policies, design and delivery are more inclusive for women and people with disabilities	Gender, disability and social inclusion should be considered across recommendations coming out of the activity, but are not a primary focus of the research.
KIAT EOFO 5: Improved policy, planning and design results in lower-emission, more climate-resilient infrastructure	<p>Outcome 4: The Ministry of Environment and Forestry and Bappenas will be aware of and acknowledge the level of greenhouse gas emissions produced nationally from sanitation systems and value this evidence base to support target setting and climate financing.</p> <p>Outcome 5: The Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners will be aware of and have ownership of research findings on emissions and potential adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks.</p> <p>Outcome 6: Key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, will gain access to datasets, methods and skills that improve emissions benchmarking, measurements and responses to support low-emissions, and safely managed sanitation.</p> <p>The above intended outcomes of the activity reflect the contribution of the activity to KIAT EOFO 5. The research findings will serve as a basis for improvement of policy, planning and design of sanitation infrastructure that reduce emissions and make infrastructure more climate-resilient.</p>

Key Evaluation Questions (KEQs)

Outcome #1: The Ministry of Environment and Forestry and Bappenas will be aware of and acknowledge the level of greenhouse gas emissions produced nationally from sanitation systems and value this evidence base to support target setting and climate financing.

- **KEQ #1: To what extent do staff members at leadership and technical-levels from the Ministry of Environment and Bappenas demonstrate that they are aware of the level of greenhouse gas emissions produced nationally from sanitation systems per the findings of the activity and value this evidence in support of setting targets to reduce greenhouse gas emissions and applying for climate financing?**

Outcome #2: The Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners will be aware of and have ownership of research findings on emissions of and adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks.

- **KEQ #2: To what extent do staff members at leadership and technical-levels from the Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners demonstrate awareness of and motivation to support the implementation of adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks per the findings of the activity?**

Outcome #3: Key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, will gain access to datasets, methods and skills that improve emissions benchmarking, measurements and responses to support low-emissions, safely managed sanitation.

- **KEQ #3: In what ways do key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, demonstrate awareness of datasets and methods created by the activity? To what extent do they perceive them as useful to improve**

emissions benchmarking, measurements and responses to support low-emissions, safely managed sanitation?

- **KEQ #4 To what extent do Indonesian stakeholders demonstrate improved skills to benchmark and measure greenhouse gas emissions from sanitation systems as compared with the outset of the activity.**

Monitoring Questions (MQs)

KEQ #1: To what extent do staff members at leadership and technical-levels from the Ministry of Environment and Bappenas demonstrate that they are aware of the level of greenhouse gas emissions produced nationally from sanitation systems per the findings of the activity and value this evidence in support of setting targets to reduce greenhouse gas emissions and applying for climate financing?

- **MQ #1: How many and what level of staff members have provided input and engaged on the project activities (e.g. meetings, workshops etc.).**
- **MQ #2: How many and what level of staff members acknowledged the evidence through verbal or written communications or have they attended a workshop or webinar in which the evidence was disseminated?**
- **MQ #3: How many and what type staff members verbally or in writing indicated affirmations of the evidence with regard to setting targets to reduce greenhouse gas emissions or applying for climate financing?**

KEQ #2: To what extent do staff members at leadership and technical-levels from the Ministry of Public Works and Housing, Bappenas, city- and district-level governments, and development partners demonstrate awareness of and motivation to support the implementation of adjustments to sanitation regulations, management practices and technologies that can reduce greenhouse gas emissions while also reducing public health risks per the findings of the activity?

- **MQ #1: How many and what level of staff members have provided input and engaged on the project activities (eg meetings, workshops etc.).**
- **MQ #2: How many and what level of staff members acknowledged the adjustments proposed through the activity through verbal or written communications or have they attended a workshop or webinar in which the evidence was disseminated?**
- **MQ# 3: How many and what level staff members verbally or in writing indicated affirmations of the adjustments with regard to reducing greenhouse gas emissions and reducing public health risks and indicated responsibility of the Government of Indonesia to drive implementation of the adjustments?**

KEQ #3: In what ways do key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, demonstrate awareness of datasets and methods created by the activity? To what extent do they perceive them as useful to improve emissions benchmarking, measurements and responses to support low-emissions, safely managed sanitation?

KEQ #4 To what extent do Indonesian stakeholders demonstrate improved skills to benchmark and measure greenhouse gas emissions from sanitation systems as compared with the outset of the activity?

- **MQ #1: How many members of key Indonesian and global sanitation sector stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) and researchers, have acknowledged the datasets and methods produced through the Activity through verbal or written communications or have they attended a workshop or webinar in which the datasets and methods were disseminated?**
- **MQ #2: How many Indonesian stakeholders have reported an improvement in their interest in benchmarking and measure greenhouse gas emissions from sanitation systems as a result of their participation in the activity, and what specific skills did they improve?**

Expected Activity Contribution to KIAT Performance Indicators

No.	KIAT Performance Indicator	Contribution of the Activity
1	Number of districts with improved service delivery practices and policies for infrastructure planning, delivery management and maintenance.	Per Outcome #2, the activity will support district-level and national level-governments to plan for sanitation regulations, management practices and technologies that reduce emissions while protecting public health.

2	Number of instances of substantive collaboration between Australian and Indonesian institutions facilitated by KIAT	The composition of Consultant may comprise Australian and Indonesian institutions and, per Outcome #3, the lead organisation should plan for capacity building opportunities for Indonesian collaborators.
3	Number of studies that contribute to evidence for policy improvement/development	The activity is expected to create substantial empirical evidence in support of policies for reducing greenhouse gas emissions from the sanitation sector while protecting public health outcomes.

Suggested M&E Tools

Record-keeping of meeting attendees and minutes, engagement and dissemination reach

Key informant interviews with key government and other stakeholders

Outcome harvesting could be used at the end of the Activity

Annex 4. Gender Equality, Disability, Social Inclusion (GEDSI)

Name of Activity	Sanitation GHG Emissions Research
Activity Stream	
Activity Number	
Gender Equality, Disability, Social Inclusion (GEDSI) issues of the activity	<ol style="list-style-type: none"> 1. The activity will include capacity building opportunities for Indonesian researchers and other stakeholders on greenhouse gas measuring and benchmarking for sanitation. There is a risk that stakeholders who receive these opportunities are disproportionately male due to overrepresentation of men in STEM fields. 2. The activity will include consultations within government on the design of the research and interpretation of findings. There is a risk that staff members within government that are consulted are disproportionately male. 3. The activity will include measurements of gas emissions from household onsite sanitation facilities which may inconvenience householders. The ways in which householders are inconvenienced may be influenced by social factors (e.g. gender of head of household, presence of a family member with a disability) and should be accounted for in ethics risk management procedures.
Actions to be taken	<ol style="list-style-type: none"> 1. The Consultant should proactively seek a balance in female and male personnel who are learning about and supporting the work related to direct measurements from the field, laboratory measurements, and in the development of national estimates of emissions. 2. Where possible, the Consultant should seek inputs from female and male staff members from each government department/agency consulted during the Activity. 3. During a research ethics approval process, the Consultant should consider the potential risks posed to diverse householders when emissions are measured from on-site sanitation facilities and implement control measures that ensure risks of harm to all potential participants are minimised.
GEDSI Key Evaluation Questions/s (KEQ) and Monitoring Question/s (MQ)	<p>KEQ: Is there an approximately equal number of Indonesian researchers and other stakeholders who have received capacity building opportunities with regard to sanitation emission measurements and benchmarking?</p> <p>MQ: How many women and men have had their capacity built and in what ways?</p> <p>KEQ: Have both women and men been consulted within the government departments that have been engaged by the activity?</p> <p>MQ: How many women and men have been consulted and in which government departments?</p>

KEQ: Has the research ethics approvals process thoughtfully considered the risks that onsite data collection poses to diverse householders and how to manage these risks?

MQ: Does the approved research ethics application contain a description of the risks that onsite data collection poses to diverse householders and how they will be managed?

Notes:

All data to be sex- and disability-disaggregated.

Individual progress markers to be developed as part of the GAP for this activity.