Initiative for
Climate Action
Transparency

DEVELOPMENT OF AN MRV FRAMEWORK FOR THE WASTE SECTOR IN CAMBODIA

Report on the NDC tracking framework for the waste sector: NDC tracking indicators, Data Collection Protocols, QA/QC Procedures, and Integration into the national MRV framework and Roadmap for Addressing Data Gaps

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Initiative for Climate Action Transparency - ICAT
DEVELOPMENT OF AN MRV FRAMEWORK FOR THE WASTE SECTOR, INCLUDING APPLICATION OF THE WASCAD AND GACMO TOOLS, CAMBODIA

Output H - Report on NDC tracking indicators for the waste sector

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List of Abbreviations

ADB	Asian Development Bank
BOD	Biochemical Oxygen Demand
BTRs	Biennial Transparency Reports
CDM	Clean Development Mechanism
COD	Chemical Oxygen Demand
COP	Conference of the Parties
CRT	Common Reporting Tables
CTF	Common Tabular Format
DCC	Department of Climate Change
DOC	Degradable Organic Carbon
DoSWM	Department of Solid Waste Management
EDC	Electricité du Cambodge
EF	Emission Factor
EFB	Empty Fruit Bunches
EPR	Extended Producer Responsibility
ETF	Enhanced Transparency Framework
F & B	Food and Beverages
FOD	First Order Decay
GACMO	Greenhouse Gas Abatement Cost Model
GCF	Green Climate Fund
GDCE	General Department of Customs and Excise
GDPS	General Directorate of Policy and Strategy
GEF	Global Environment Facility
GFT	Garment, Footwear and Travel Goods
GHG	Greenhouse Gas
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GWP	Global Warming Potential
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
IWW	Industrial WasteWater
LCA	Life Cycle Assessment
LFG	Landfill Gas
MAP	Mean Annual Precipitation
MAT	Mean Annual Temperature
MBT	Mechanical-Biological Treatment
MCF	Methane Correction Factor
MISTI	Ministry of Industry, Science, Technology & Innovation

MME	Ministry of Mines and Energy
MoE	Ministry of Environment
MoP	Ministry of Planning
MRD	Ministry of Rural Development
MRV	Measurement, Reporting and Verification
MSW	Municipal Solid Waste
MWMU	Medical Waste Management Unit
NCs	National Communications
NCSD	National Council for Sustainable Development
NCV	Net Calorific Value
NDC	Nationally Determined Contribution
NGOs	Non-Governmental Organization
NIR	National Inventory Report
NIS	National Institute of Statistics
OX	Oxidation Factor
PDD	Project Design Document
PET	Potential EvapoTranspiration
PITW	Post-Industrial Textile Waste
QA	Quality Assurance
QC	Quality Control
RDF	Refuse-Derived Fuel
SMEs	Small and Medium Enterprises
SNAs	Sub-National Administrations
SUP	Single Use Plastic
SWDS	Solid Waste Disposal Site
SWM	Solid Waste Management
T & D	Transmission and Distriution
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services
WasCAD	Waste Climate Action Database
WtE	Waste to Energy

Executive summary

This report establishes the Measurement, Reporting and Verification (MRV) framework for Cambodia’s waste sector, developed under the Initiative for Climate Action Transparency (ICAT) Phase 3 project using the WasCAD tool. It consolidates the NDC tracking indicators, data-collection protocols, QA/QC procedures, the pathway for integration into the national MRV framework, and the roadmap for addressing data gaps for the seven waste-sector mitigation measures of Cambodia’s third Nationally Determined Contribution (NDC 3.0). The waste sector carries a conditional emission-reduction target of 59% by 2035 (Cambodia NDC 3.0, 2025); across the seven measures the combined mitigation potential is approximately 24.3 $MtCO_2e$ over 2026–2035, of which landfill management (NDC 5) contributes the largest single share at 6.40 $MtCO_2e$ (ICAT Cambodia Phase 3, Deliverable 2: Report on NDC tracking indicators and data gaps, 2025).

Chapter 1 sets out the purpose, structure and scope of the framework, covering measures NDC 1–NDC 7 across solid waste, organic-waste processing, landfill and industrial wastewater, and records the sub-measures deliberately excluded with the reasons agreed in Deliverable 2.

Chapter 2 defines the data-collection protocols for each measure: the targets tracked, the data required with sources and frequency, the parameters under the IPCC 2006 Guidelines and 2019 Refinement and the relevant CDM methodologies, and the entry route into WasCAD. The complete sub-NDC data-collection templates and parameter monitoring protocols, prepared from the initial ClimateSI version, are consolidated in Annexes B and C.

Chapter 3 establishes the QA/QC procedures: a common procedure covering completeness, consistency, plausibility, transcription and documentation checks, data-quality levels and independent QA review, complemented by measure-specific quality controls on the records that drive each indicator.

Chapter 4 describes integration into the national MRV framework. As Cambodia is still developing a comprehensive national MRV system, the waste-sector framework is being actively integrated with the national NDC-tracking platform under the Enhanced Transparency Framework; the chapter maps each measure’s WasCAD outputs to the national GHG inventory, NDC tracking and Biennial Transparency Report vehicles.

Chapter 5 presents the roadmap for addressing data gaps using a three-step approach — identify, prioritise, and plan — applying scored prioritisation criteria, a cross-cutting action plan for the sector, and a time-bound, owner-assigned roadmap for every measure.

1 Introduction

Cambodia’s NDC 3.0, submitted to the UNFCCC in 2025, sets an economy-wide emission-reduction pathway with a dedicated waste-sector conditional target of 59% by 2035. Delivering against that target depends on a transparent, verifiable system that can measure progress, report it through the Enhanced Transparency Framework (ETF), and stand up to independent verification. This report sets out that system for the waste sector.

1.1 Purpose and structure

The framework is presented function-by-function, so that each MRV step is defined once and applied consistently across all measures:

- **Chapter 2 — Data Collection Protocols:** the data each measure requires, its source, its collection frequency, and how it enters WasCAD.
- **Chapter 3 — QA/QC Procedures:** how data quality is assured and controlled before reporting.
- **Chapter 4 — Integration into the National MRV Framework:** how WasCAD outputs feed — without replacing — the national GHG inventory, NDC tracking and the Biennial Transparency Reports (BTRs).
- **Chapter 5 — Roadmap for Addressing Data Gaps:** for each measure, the data gaps are identified, prioritized, and addressed through a time-bound roadmap.

Chapters 2, 3 and 5 are organised by measure, with one sub-section per measure from NDC 1 to NDC 7. Chapters 3 and 5 additionally open with a common section — Section 3.0 for the general QA/QC procedures, and Section 5.0 for the prioritisation method and the sector-wide cross-cutting action plan — that applies to every measure. Chapter 4, by contrast, is presented wholly in common, because integration into the national MRV system follows the same pathway for all seven measures. Landfill management (NDC 5) is developed in full in Section 2.5, Section 3.5 and Section 5.5 to serve as the worked template that the other measures follow. In Chapter 5, each measure then follows the same three-step approach: identify the data gaps, prioritise them against the common criteria, and set a time-bound roadmap of actions with owners.

1.2 Scope: NDC 3.0 waste-sector measures covered

The report covers the seven waste-sector mitigation measures of NDC 3.0, spanning four sub-sectors: solid waste, organic-waste processing, landfill, and industrial wastewater.

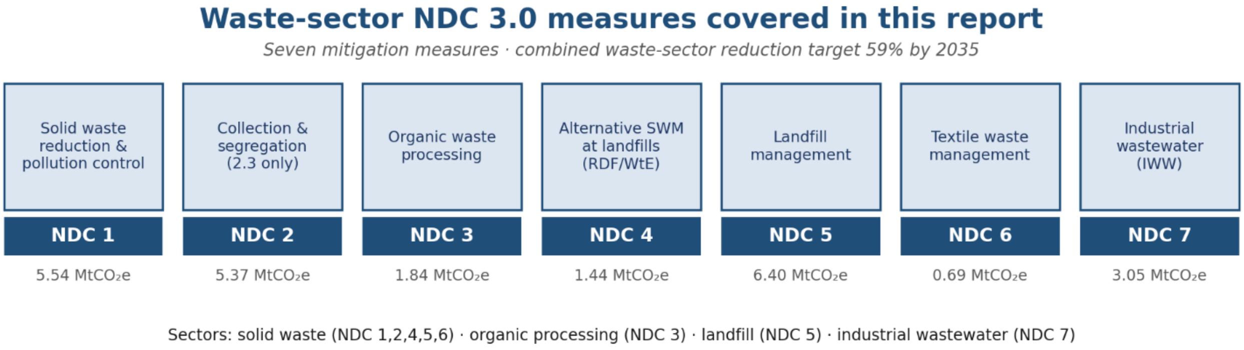


Figure 1: Scope of NDC 3.0 waste-sector measures covered in this report.

Code	Measure (NDC 3.0)	Lead / supporting	GHG ER (Mt)	Sub-targets in scope
NDC 1	Implement solid waste reduction strategies and pollution control	MoE	5.54	1.1, 1.2
NDC 2	Waste collection and segregation at source	MoE; PDoE; SNA	5.37	2.3 only
NDC 3	Increase capacities for organic waste processing	MoE; MAFF; PDoE; SNA	1.84	3.1
NDC 4	Introduce alternative SWM processing at existing landfills	MoE; MME	1.44	4.1, 4.2, 4.4
NDC 5	Landfill management	MoE	6.40	5.1, 5.2, 5.4
NDC 6	Improve textile waste management capacities	MoE; MISTI	0.69	6.1
NDC 7	Industrial wastewater (IWW) management	MISTI; MoE; MME	3.05	7.1, 7.2

Table 1: measures, lead institutions and mitigation potential (NDC 3.0).

Sub-measures deliberately excluded

Consistent with the agreed framework and the previous report, not every NDC 3.0 sub-target is tracked here. The exclusions are deliberate, not omissions:

NDC 2.1 (source segregation) and **NDC 2.2** (collection coverage) are excluded from GHG-impact tracking; only **NDC 2.3** (open burning) is tracked. Reason for exclusion, as agreed in Deliverable 2: “It was assumed that waste collected and segregated under Actions 1 and 2 is subsequently managed through appropriate waste treatment and disposal pathways, with the associated emission reductions accounted for under other NDC mitigation measures.” Within other measures, only the sub-targets listed in Table 1 are tracked; remaining sub-targets are either covered elsewhere or not yet measurable. Where a measure adds a sub-target during the cycle, it should follow the same protocol/QA-QC/integration/roadmap pattern used here.

NDC 5.3 (install and operationalise landfill-gas extraction at the new Phnom Penh regional sanitary landfill by 2027) is excluded from separate tracking, using the same format as the NDC 2 exclusion. Reason for exclusion, as agreed in Deliverable 2: “Assumption: This action also discusses the installation of LFG extraction technology, like the sanitary landfill approach considered under Action 5.1, where landfill gas is captured and flared or utilised. Therefore, it is assumed that Action 5.3 is already covered under Action 5.1.” Its mitigation effect is therefore captured within the **NDC 5.1** estimate.

2 Data Collection Protocols

This chapter defines, for each measure, the activity data and parameters required to estimate emissions and track NDC progress, together with the data source, responsible entity, collection frequency and the route into WasCAD. Sections follow the order NDC 1 to NDC 7.

2.1 NDC 1: Implement solid waste reduction strategies and pollution control

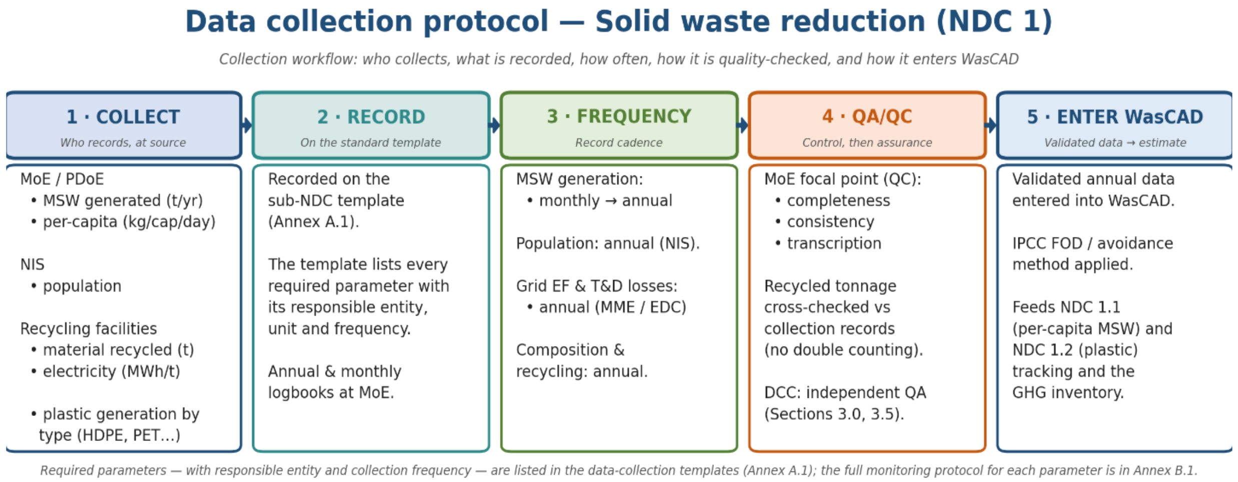
Lead / supporting	Ministry of Environment (MoE)
Mitigation potential	5.54 $MtCO_2e$
Target(s) in scope	Reduce MSW per capita (1.1) and limit plastic-waste generation (1.2).

Targets tracked (NDC 1.1–1.2)

NDC 1.1. Reduce MSW generation per capita to 0.84 kg/capita/day by 2030 and maintain at or below 0.86 kg/capita/day by 2035 through waste-management practices, recycling programmes and public awareness campaigns.
NDC 1.2. Limit plastic-waste generation to 400,000 tons per year by 2035 by enforcing the ban on single-use plastics (SUP) and strengthening EPR schemes.

Data required, sources and frequency

Tracking NDC 1 requires annual national MSW generation (Gg/year), population (NIS census and projections), per-capita generation (kg/capita/day), plastic-waste generation by type (HDPE, LDPE, PET, PS, PVC), and quantities of material recycled locally or exported. MoE compiles national figures from Provincial Departments of Environment (PDoE) and sub-national administration (SNA) reports; NIS supplies population data annually. Waste-quantity and recycling records are collected monthly at facility level and aggregated annually. The grid emission factor is provided annually by MME and transmission-and-distribution losses by EDC; where a recycling facility does not meter its own electricity use, the default material-specific electricity intensities in CDM AMS-III.AJ are applied.



Data collection protocol — Solid waste reduction (NDC 1)

Collection workflow: who collects, what is recorded, how often, how it is quality-checked, and how it enters WasCAD

1 · COLLECT	2 · RECORD	3 · FREQUENCY	4 · QA/QC	5 · ENTER WasCAD
Who records, at source	*On the standard template*	*Record cadence*	*Control, then assurance*	*Validated data → estimate*
MoE / PDoE • MSW generated (t/yr) • per-capita (kg/cap/day) NIS • population Recycling facilities • material recycled (t) • electricity (MWh/t) • plastic generation by type (HDPE, PET…)	Recorded on the sub-NDC template (Annex A.1). The template lists every required parameter with its responsible entity, unit and frequency. Annual & monthly logbooks at MoE.	MSW generation: • monthly → annual Population: annual (NIS). Grid EF & T&D losses: • annual (MME / EDC) Composition & recycling: annual.	MoE focal point (QC): • completeness • consistency • transcription Recycled tonnage cross-checked vs collection records (no double counting). DCC: independent QA (Sections 3.0, 3.5).	Validated annual data entered into WasCAD. IPCC FOD / avoidance method applied. Feeds NDC 1.1 (per-capita MSW) and NDC 1.2 (plastic) tracking and the GHG inventory.

Required parameters — with responsible entity and collection frequency — are listed in the data-collection templates (Annex A.1); the full monitoring protocol for each parameter is in Annex B.1.

Figure 2: Solid waste reduction (NDC 1) data-collection protocol — collection workflow.

The protocol operates as a five-stage workflow. At the collect stage the responsible entities record activity data at source: the Ministry of Environment and the Provincial Departments of Environment compile municipal solid waste generated and per-capita generation, the National Institute of Statistics supplies population, and recycling facilities report the quantity of material recycled and their electricity use. These values are recorded on the standard sub-NDC templates in Annex A.1 — monthly for waste quantity and annually for population, composition and recycling. At the quality-control stage the Ministry of Environment focal point applies the common checks set out in Section 3.0 and cross-checks recycled tonnage against collection records to prevent double counting, after which the Department of Climate Change carries out the independent quality-assurance review. The validated annual data are then entered into WasCAD, which applies the IPCC first-order-decay and avoidance methods to estimate the emission reductions tracked under NDC 1.1 and NDC 1.2.

The complete sub-NDC data-collection templates — listing every parameter with its value field, unit, responsible entity and collection frequency (annual and monthly) — are provided in Annex A.1 and follow the templates prepared by ClimateSI in the initial version of this deliverable.

Parameters (IPCC 2006 GLs & 2019 Refinement; CDM methodologies)

Emission-impact parameters follow the IPCC 2006 Guidelines and 2019 Refinement (Vol. 5) together with the CDM methodology AMS-III.AJ (recovery and recycling of materials from solid wastes): waste fractions (WFj), dry-matter and carbon fractions, material-specific electricity and fuel consumption for virgin-material production, grid emission factor (MME/EAC, 0.353 tCO_2/MWh) and GWP values.

Although the NDC 1.1 indicator is expressed as per-capita municipal solid waste generation and the NDC 1.2 indicator as plastic-waste tonnage, the greenhouse-gas impact of each is quantified through the downstream disposal pathway. Waste prevented or recycled under NDC 1.1 is credited as avoided landfill methane using the IPCC first-order-decay (Solid Waste Disposal System) method, while plastic kept out of the waste stream under NDC 1.2 is credited as avoided open burning. This is why the parameter set and the Annex A.1 template draw on the landfill and open-burning parameters rather than on the headline indicators alone. Plastic-waste generation is derived as municipal solid waste multiplied by the plastic fraction (a monitored parameter); the reduction to 400,000 t/year is a policy-scenario assumption arising from the single-use-plastic ban and EPR schemes rather than a directly measured value.

The full monitoring protocol for each parameter is reproduced for reference in Annex B.1; the QA/QC procedure to be applied is the common procedure in Sections 3.0 and 3.5.

Entry into WasCAD

PDoE/Sub-Natinal Administration (SNA) monthly records flow to the MoE focal point, who validates and enters annual totals and waste-composition shares into WasCAD. WasCAD computes avoided emissions from waste prevention and recycling against the 2020 baseline of 0.78 kg/capita/day and the 2022 plastic baseline of 546,000 t/year. Recycled tonnage, including textile recycled, is validated against national waste-collection records before entry to prevent the same material being counted twice.

2.2 NDC 2: Waste collection and segregation at source

Lead / supporting	MoE; PDoE; SNA
Mitigation potential	5.37 $MtCO_2e$
Target(s) in scope	Reduce the share of population engaged in open burning of waste (2.3 only; 2.1 and 2.2 excluded).

Targets tracked (NDC 2.3)

NDC 2.3. Reduce the percentage of the total population engaged in open burning of waste from 54% in 2022 to 10% by 2035, supported by open-burning restrictions in at least 10 provinces by 2030.

Data required, sources and frequency

Tracking NDC 2.3 requires the total amount of MSW open-burned (t/year), population engaged in open burning (survey-based), uncollected-waste fraction (35% baseline, of which 40% burned and 60% dumped), waste composition of the burned fraction, and collection-coverage rates. MoE/PDoE compile collection and disposal records monthly; NIS provides population and household-survey data annually. NIS supplies population through the decennial census and annual intercensal projections, reported to the MoE focal point and consolidated by DCC.

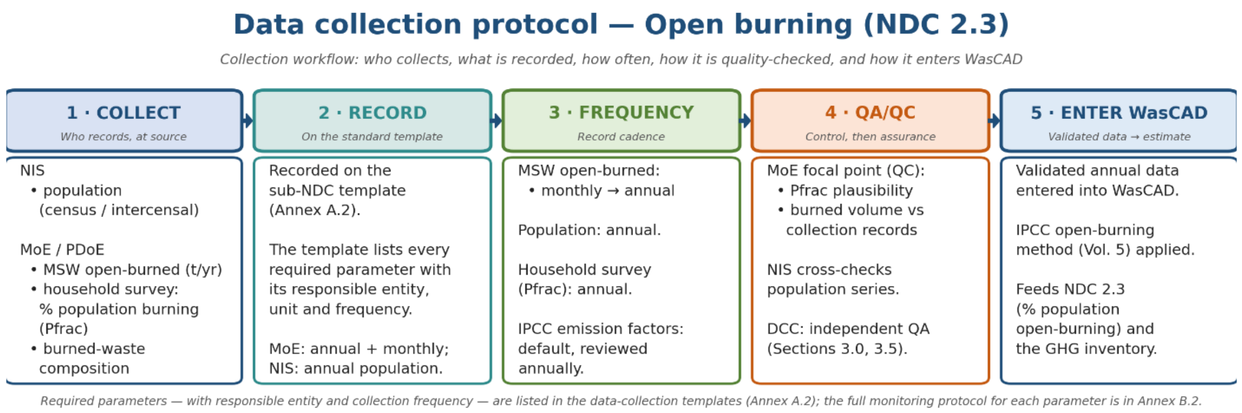


Figure 3: Open burning (NDC 2.3) data-collection protocol — collection workflow.

The workflow follows the same five stages. The National Institute of Statistics provides population from census and intercensal estimates, while the Ministry of Environment and the Provincial Departments of Environment record the mass of municipal solid waste open-burned and, through a periodic household survey, the share of the population that practises open burning (Pfrac). These are entered on the Annex A.2 templates — burned-waste quantity monthly, population and survey results annually. Quality control verifies the survey-based fraction for plausibility and reconciles burned volumes against municipal collection records, and the National Institute of Statistics cross-checks the population series before the Department of Climate Change conducts the independent review. WasCAD then applies the IPCC open-burning method (2006 Guidelines, Volume 5) to estimate the avoided CH4 and N2O emissions tracked under NDC 2.3.

The complete sub-NDC data-collection templates — listing every parameter with its value field, unit, responsible entity and collection frequency (annual and monthly) — are provided in Annex A.2 and follow the templates prepared by ClimateSI in the initial version of this deliverable.

Parameters (IPCC 2006 GLs & 2019 Refinement; CDM methodologies)

Parameters follow IPCC 2006 Guidelines and 2019 Refinement (Vol. 5, open burning) and IPCC defaults where country data are absent: fraction burned relative to waste treated, oxidation and carbon fractions (CFi, FCFi, OFi), CH_4 and N_2O emission factors for open burning, and GWP values (CH_4 = 28; N_2O = 265).
The full monitoring protocol for each parameter is reproduced for reference in Annex B.2; the QA/QC procedure to be applied is the common procedure in Sections 3.0 and 3.5.

Entry into WasCAD

Annual open-burning activity data and waste-composition fractions are entered into WasCAD by the MoE focal point. WasCAD estimates avoided CH_4 and N_2O emissions as collection coverage expands toward 75% of the population and the open-burning share declines toward 10% by 2035.

2.3 NDC 3: Increase capacities for organic waste processing

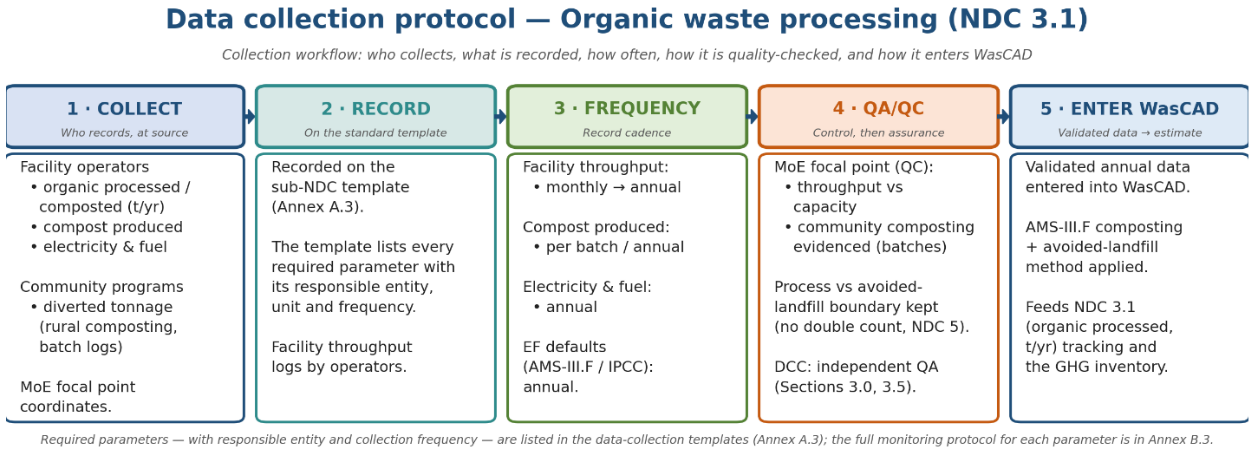
Lead / supporting	MoE; with MAFF, PDoE, SNA
Mitigation potential	1.84 $MtCO_2e$
Target(s) in scope	Process 600,000 t/yr (≈25% of the organic fraction) through dedicated facilities (3.1).

Targets tracked (NDC 3.1)

NDC 3.1. Process 600,000 tons per year of organic waste (about 25% of the total organic fraction) through dedicated composting and related facilities.

Data required, sources and frequency

Tracking NDC 3.1 requires quantities of organic waste diverted to composting facilities (t/year), compost produced, facility throughput, electricity and fuel consumption of facilities, and the amount of solid waste prevented from disposal in solid-waste disposal sites. Facility operators report monthly to PDoE/SNA; MoE aggregates annually. For community-based composting, where no weighbridge is available, throughput is estimated as the number of participating sites multiplied by a standard batch volume and bulk density, evidenced by dated batch logs.



Data collection protocol — Organic waste processing (NDC 3.1)

Collection workflow: who collects, what is recorded, how often, how it is quality-checked, and how it enters WasCAD

1 · COLLECT — Who records, at source

Facility operators
- organic processed / composted (t/yr)
- compost produced
- electricity & fuel

Community programs
- diverted tonnage (rural composting, batch logs)

MoE focal point coordinates.

2 · RECORD — On the standard template

Recorded on the sub-NDC template (Annex A.3).

The template lists every required parameter with its responsible entity, unit and frequency.

Facility throughput logs by operators.

3 · FREQUENCY — Record cadence

Facility throughput:
- monthly → annual

Compost produced:
- per batch / annual

Electricity & fuel:
- annual

EF defaults (AMS-III.F / IPCC): annual.

4 · QA/QC — Control, then assurance

MoE focal point (QC):
- throughput vs capacity
- community composting evidenced (batches)

Process vs avoided-landfill boundary kept (no double count, NDC 5).

DCC: independent QA (Sections 3.0, 3.5).

5 · ENTER WasCAD — Validated data → estimate

Validated annual data entered into WasCAD.

AMS-III.F composting + avoided-landfill method applied.

Feeds NDC 3.1 (organic processed, t/yr) tracking and the GHG inventory.

Required parameters — with responsible entity and collection frequency — are listed in the data-collection templates (Annex A.3); the full monitoring protocol for each parameter is in Annex B.3.

Figure 4: Organic waste processing (NDC 3.1) data-collection protocol — collection workflow.

The five-stage workflow begins with facility operators recording the quantity of organic waste processed, the compost produced and the facility's electricity and fuel use, together with the tonnage diverted through community-based composting programmes, with the Ministry of Environment focal point coordinating collection. Data are recorded on the Annex A.3 templates — facility throughput monthly and emission-factor defaults reviewed annually. Quality control checks facility throughput against capacity, requires the community-composting tonnage to be evidenced through calibrated-volume or batch records, and confirms that composting process emissions and the avoided-landfill credit are kept within their respective system boundaries so the benefit is not double-counted against NDC 5. The Department of Climate Change performs the independent review before the validated tonnages enter WasCAD, which applies the CDM methodology AMS-III.F together with the avoided-landfill first-order-decay calculation to estimate the reductions tracked under NDC 3.1.

The complete sub-NDC data-collection templates — listing every parameter with its value field, unit, responsible entity and collection frequency (annual and monthly) — are provided in Annex A.3 and follow the templates prepared by ClimateSI in the initial version of this deliverable.

Parameters (IPCC 2006 GLs & 2019 Refinement; CDM methodologies)

Parameters follow the IPCC 2006 Guidelines and 2019 Refinement (Vol. 5) and the CDM methodology AMS-III.F (avoidance of methane emissions through composting): first-order-decay parameters (φ, OX, F, DOCf, MCF, DOCj, kj), composting emission factors (EF CH_4, EF N_2O), specific electricity consumption (SECcomp) and GWP values.
The full monitoring protocol for each parameter is reproduced for reference in Annex B.3; the QA/QC procedure to be applied is the common procedure in Sections 3.0 and 3.5.

Entry into WasCAD

Validated annual tonnages of composted organic waste are entered into WasCAD, which models avoided landfill CH_4 via the first-order-decay method net of composting process emissions. Organic waste diverted under NDC 3 is excluded from the NDC 5 landfill-disposal baseline, so the avoided-landfill benefit is counted once and not double-counted across the two measures.

2.4 NDC 4: Introduce alternative SWM processing at existing landfills

Lead / supporting	MoE; MME
Mitigation potential	1.44 $MtCO_2e$
Target(s) in scope	RDF capacity ≥200,000 t/yr by 2030 (4.1); ≥1 large-scale WtE by 2035 (4.2); expand MWMU capacity (4.4).

Alternative SWM processing at existing landfills targets the methane reduction through RDF processing facilities and waste to energy facilities. Emissions are estimated with the IPCC and CDM methods, so the protocol must capture both the quantity and the organic character of waste landfilled.

Targets tracked (NDC 4.1–4.4)

NDC 4.1: Establish RDF processing facilities to convert at least 200,000 tons per year of fresh or old MSW into RDF for industrial use by 2030;

NDC 4.2: Construct and operationalize at least one large-scale WtE facility capable of processing 300,000 tons per year of MSW to generate electricity and reduce landfill dependency by 2035;

NDC 4.3: Achieve a 30% reduction in MSW disposed of in landfills through RDF, WtE, and other waste treatment initiatives by 2035; and

NDC4.4: Increase the capacity of the Medical Waste Management Unit (MWMU) to at least 8 tons/day, to face the growing amount of medical waste.

In order to track the progress of all sub NDC4, data collection template that have been developed in the annex… should be used to collect the needed data for GHG emissions estimation and input into the WasCAD tool.

Data required, sources and frequency

All sub NDC from 4.1 - 4.4 shall be applied to the same data collection protocol indicated in the figure and table below:

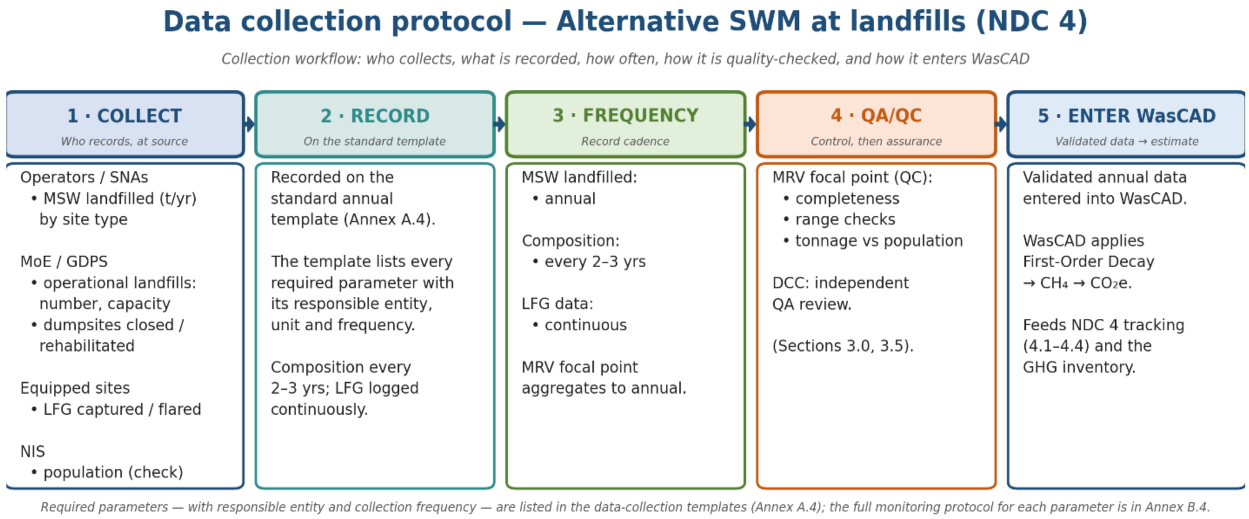


Figure 5: Alternative SWM processing at existing landfills (NDC 4) data-collection protocol — collection workflow.

The protocol mirrors the landfill (NDC 5) worked model, since all four NDC 4 targets act on waste that would otherwise be landfilled. At the collect stage, landfill operators and sub-national administrations record the mass of municipal solid waste landfilled by site type from weighbridge logs; MoE and GDPS record the number and capacity of operational landfills and the count of dumpsites closed or rehabilitated; equipped sites report landfill gas captured or flared; and NIS provides population for cross-checking tonnage. These variables are recorded on the standard annual template in Annex A.4, with waste composition refreshed every two to three years and landfill-gas data logged continuously. The MRV focal point applies the completeness, range and tonnage-versus-population checks of Section 3.0 before the Department of Climate Change performs the independent review, after which WasCAD computes methane via the first-order-decay method and converts it to CO2e to track NDC 4.1 to 4.4.

Variable	Source	Frequency	Notes / use
MSW landfilled (t/yr), by site type (controlled / sanitary / dumpsite)	Landfill operators & SNAs (weighbridge logs)	Annual	Core activity data; basis for 4.1&4.2 share calculation

Variable	Source	Frequency	Notes / use
Number & capacity (m³) of operational controlled/sanitary landfills	MoE / GDPS	Annual	Tracks 4.1, 4.2 and remaining site life
Waste composition (% organic / DOC, moisture)	Composition studies	Every 2–3 yrs	FOD parameter; supports all sub NDC (organic content)
LFG captured / flared (m³ CH_4)	PP regional landfill & equipped sites	Continuous / annual	Tracks 4.2; net of recovered CH_4
Dumpsites closed / rehabilitated (count)	MoE / SNAs	Annual	Tracks all sub NDC
RDF/compost produced	MoE	Annual	Tracks 4.1&4.2
Population served (urban/rural)	NIS	Annual	Cross-check for tonnage estimates

Table 2: Alternative SWM processing at existing landfills (NDC 4) data-collection protocol.

Parameters (IPCC 2006 GLs & 2019 Refinement, Vol. 5)

Each calculation draws default or country-specific values for: degradable organic carbon (DOC), fraction of DOC decomposed (DOC_F), methane correction factor (MCF, by site type), decay rate (k), oxidation factor (OX), methane fraction in LFG (F) and GWP_{100} for CH_4. These are maintained centrally in the cross-cutting parameters table so values are consistent across all measures; site type drives MCF (e.g. higher for sanitary/managed-anaerobic than for shallow unmanaged sites).

Entry into WasCAD

Operators and SNAs submit the variables above on the standard annual template; the MRV focal point records them in WasCAD, which computes CH_4 via FOD and converts to CO_2e. The same template is the input to the QA/QC procedure in Section 3.5.

2.5 NDC 5: Landfill management — worked model

Sector: landfill. **Lead:** MoE. **Mitigation potential:** 6.40 MtCO_2e (2026–2035) — the largest waste-sector measure.

Landfill management targets the methane generated by anaerobic decomposition of organic waste in disposal sites. Emissions are estimated using two methodologies: the CDM methodology ACM0001 for the landfill-gas capture target (NDC 5.1), and the IPCC 2006 Guidelines (Vol. 5, Ch. 4.A) First-Order Decay (FOD) method for the disposal and pre-treatment targets (NDC 5.2 and 5.4). The protocol must therefore capture both the quantity and the organic character of waste landfilled, the type of site receiving it, and any landfill-gas (LFG) captured or flared.

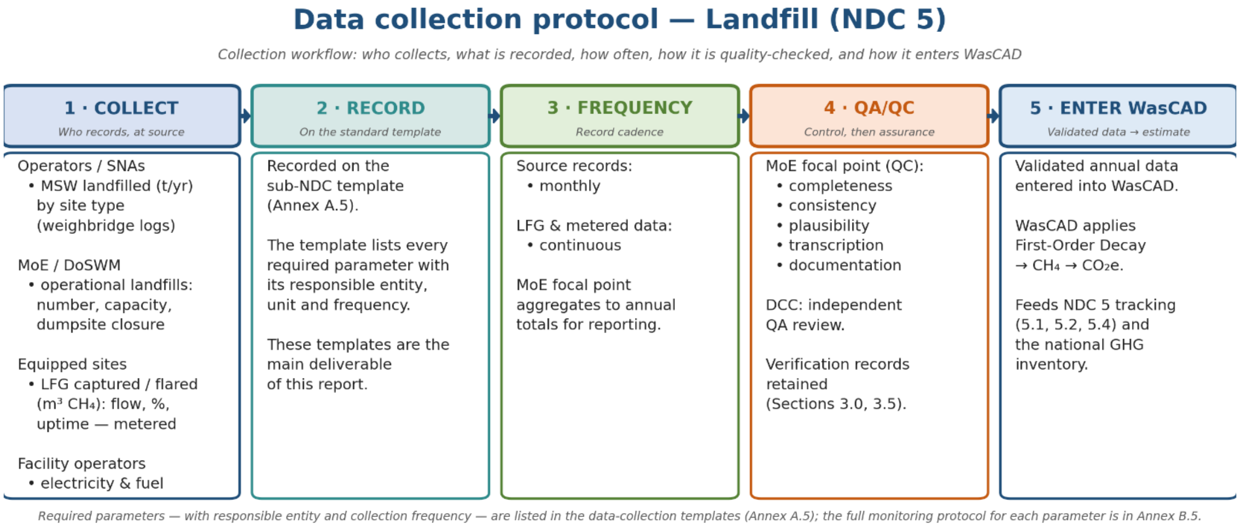
Targets tracked (NDC 5.1, 5.2, 5.4)

1. 5.1 — Increase by 50% the share of waste disposed at controlled and sanitary landfills by 2035 (baseline: 11 controlled landfills, ≈4,486,000 m³, 2024).
2. 5.2 — Launch a National Plan for Dumpsite Closure and Transition, rehabilitating/upgrading ≥2 dumpsites per year (baseline: 0 closed, 2024).

Note: NDC 5.3 (LFG extraction at the new Phnom Penh regional sanitary landfill by 2027) is not tracked as a separate target — it is excluded and treated as covered under NDC 5.1, consistent with the scope in Section 1.2 and the agreed Deliverable 2 assumption. The remaining tracked targets for landfill are 5.1, 5.2 and 5.4.

3. 5.4 — Assess feasibility of Mechanical-Biological Treatment (MBT) to pre-treat waste and reduce its landfilled organic content (baseline: average organic content 55%, 2024).

Data required, sources and frequency



Operators / SNAs
- MSW landfilled (t/yr) by site type (weighbridge logs)

MoE / DoSWM
- operational landfills: number, capacity, dumpsite closure

Equipped sites
- LFG captured / flared (m^3 CH_4): flow, %, uptime — metered

Facility operators
- electricity & fuel

Recorded on the sub-NDC template (Annex A.5).

The template lists every required parameter with its responsible entity, unit and frequency.

These templates are the main deliverable of this report.

Source records:
- monthly

LFG & metered data:
- continuous

MoE focal point aggregates to annual totals for reporting.

MoE focal point (QC):
- completeness
- consistency
- plausibility
- transcription
- documentation

DCC: independent QA review.

Verification records retained (Sections 3.0, 3.5).

Validated annual data entered into WasCAD.

WasCAD applies First-Order Decay → CH_4 → CO_2e.

Feeds NDC 5 tracking (5.1, 5.2, 5.4) and the national GHG inventory.

Required parameters — with responsible entity and collection frequency — are listed in the data-collection templates (Annex A.5); the full monitoring protocol for each parameter is in Annex B.5.

Figure 6: Landfill (NDC 5) data-collection protocol — collection workflow.

Two requirements of the FOD method must be met when collecting these data. First, the disposal tonnage must be supplied as a multi-year time series back to the model start year, not only the current year, because methane is generated over many years from waste buried in earlier periods. Second, the decay rate (k) is climate-dependent: Cambodia is treated as tropical and wet (mean annual temperature > 20°C, mean annual precipitation > 1000 mm), and the corresponding IPCC 2006 default k values are applied unless country-specific values become available.

Parameters (IPCC 2006 GLs & 2019 Refinement, Vol. 5)

The figure above sets out the data-collection workflow for this measure: which entity collects each item at source, how it is recorded on the standard sub-NDC template, the collection frequency, the QA/QC steps, and entry into WasCAD. The required parameters themselves — each with its responsible entity, unit and collection frequency — are listed in the data-collection templates in Annex A.5, and providing those templates is the main focus of this report. The full monitoring protocol for each parameter is reproduced for reference in Annex B.5. For reference, the parameters fall into three groups.

First, the FOD generation and decay parameters that convert landfilled tonnage into methane: degradable organic carbon by waste type (DOCj), the fraction of DOC that decomposes (DOCf), the decay rate (kj), the methane correction factor by site type (MCF), the methane fraction in landfill gas (F), the oxidation factor (OX / OXtop_layer), the fraction of methane captured or flared (fy) and the global warming potential of methane (GWP(CH_4)). Site type drives MCF — higher for managed sanitary cells than for shallow unmanaged sites.

Second, the landfill-gas capture and flaring parameters used where extraction is installed: methane destroyed by flaring (FCH4,flared), flare efficiency (η,flare), methane in the residual gas (FCH4,RG) and methane delivered to consumers or sent by trucks (FCH4,NG-cons, FCH4,NG-TR).

Third, the energy and project-emission parameters where captured gas, electricity or fuel is used: the combined-margin grid emission factor (EFgrid,CM), transmission and distribution losses (TDL), project electricity consumed (ECPJ), fuel combusted (FCi), its net calorific value (NCVi) and CO_2 emission factor (EFCO2,i). All default values are held centrally in the cross-cutting parameters table so they stay consistent across measures.

Entry into WasCAD

Operators and SNAs submit the variables above on the standard annual template; the MRV focal point records them in WasCAD, which computes CH_4 via FOD and converts to CO_2e. The same template is the input to the QA/QC procedure in Section 3.5.

2.6 NDC 6: Improve textile waste management capacities

Lead / supporting	MoE; MISTI
Mitigation potential	0.69 MtCO_2e
Target(s) in scope	80% of post-industrial textile waste traceable, recorded and sent to recyclers (6.1).

Targets tracked (NDC 6.1)

NDC 6.1. At least 80% of post-industrial textile waste (PITW) is diverted from landfill or open burning through centralized sorting, recycling and recovery channels by 2035.

Data required, sources and frequency

Tracking NDC 6.1 requires quantities of textile material generated, collected, sorted and recycled (t/year), the share landfilled or burned, and electricity consumption of recycling facilities. MISTI compiles factory-level monthly reports; MME provides grid data annually; MoE consolidates the national picture with the Cambodia Garment Training Institute (CGTI).

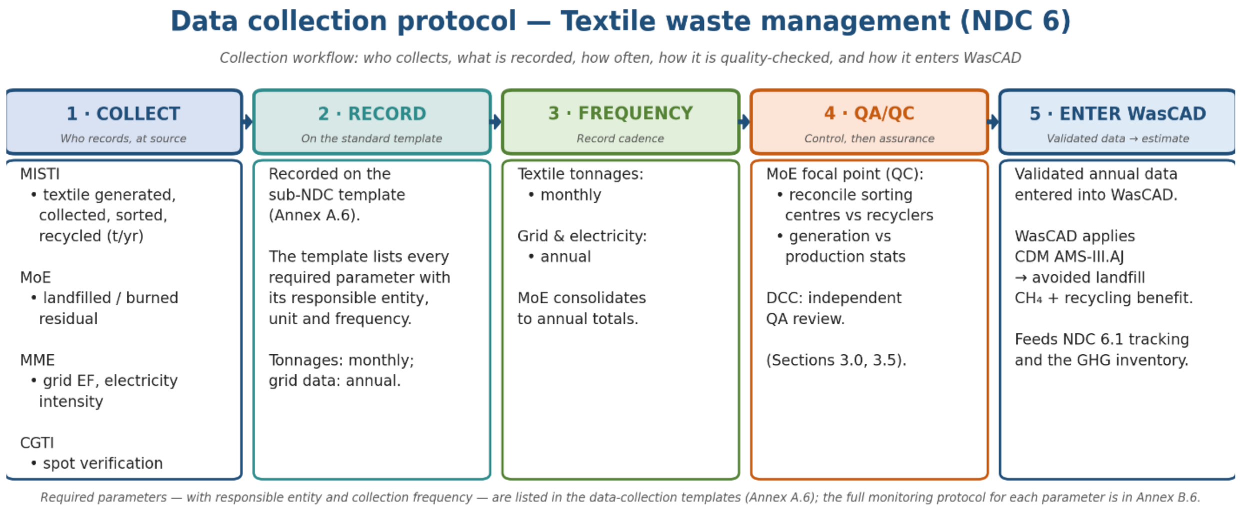


Figure 7: Textile waste management (NDC 6) data-collection protocol — collection workflow.

The protocol follows the standard five-stage workflow. At the collect stage MISTI compiles factory and sorting-centre records of textile waste generated, collected, sorted and recycled; MoE consolidates the national picture and the landfilled or burned residual; MME supplies the grid emission factor and the recycling electricity intensity; and the Cambodia Garment Training Institute supports spot verification at factory level. These values are recorded on the Annex A.6 templates — textile tonnages monthly, grid and electricity data annually. The MoE focal point applies the common checks of Section 3.0, reconciling diverted quantities between sorting centres and recyclers and cross-checking generation against production statistics, before the Department of Climate Change performs the independent review. WasCAD then applies the CDM methodology AMS-III.AJ to estimate the avoided landfill methane and the net recycling benefit tracked under NDC 6.1.

The complete sub-NDC data-collection templates — listing every parameter with its value field, unit, responsible entity and collection frequency (annual and monthly) — are provided in Annex A.6 and follow the templates prepared by ClimateSI in the initial version of this deliverable.

Parameters (IPCC 2006 GLs & 2019 Refinement; CDM methodologies)

Parameters follow the IPCC 2006 Guidelines and 2019 Refinement (Vol. 5) and CDM AMS-III.AJ: first-order-decay parameters for avoided landfilling of textiles (DOCf, MCF, kj, φ, OX, F), material-specific electricity intensity of recycling, grid emission factor and transmission and distribution losses.
The full monitoring protocol for each parameter (source of data, measurement procedure, monitoring frequency, QA/QC requirements and purpose) is provided in Annex B.6.

Entry into WasCAD

MISTI/CGTI factory data are validated by MoE and entered annually into WasCAD, which estimates avoided landfill CH_4 and net recycling benefits against the textile-waste baseline.

2.7 NDC 7: Industrial wastewater (IWW) management

Lead / supporting	MISTI; with MoE and MME
Mitigation potential	3.05 $MtCO_2e$
Target(s) in scope	100% of GFT and leather factories connected to compliant treatment (7.1); +100% IWW plants producing biogas (7.2).

Targets tracked (NDC 7.1–7.2)

NDC 7.1. Achieve 100% industrial wastewater treatment coverage for Garment, Footwear and Travel-goods (GFT) and leather factories by 2035.
NDC 7.2. Double the number of biogas-producing industrial wastewater treatment plants (notably in the food and beverage sector) with methane recovery and utilisation.

Data required, sources and frequency

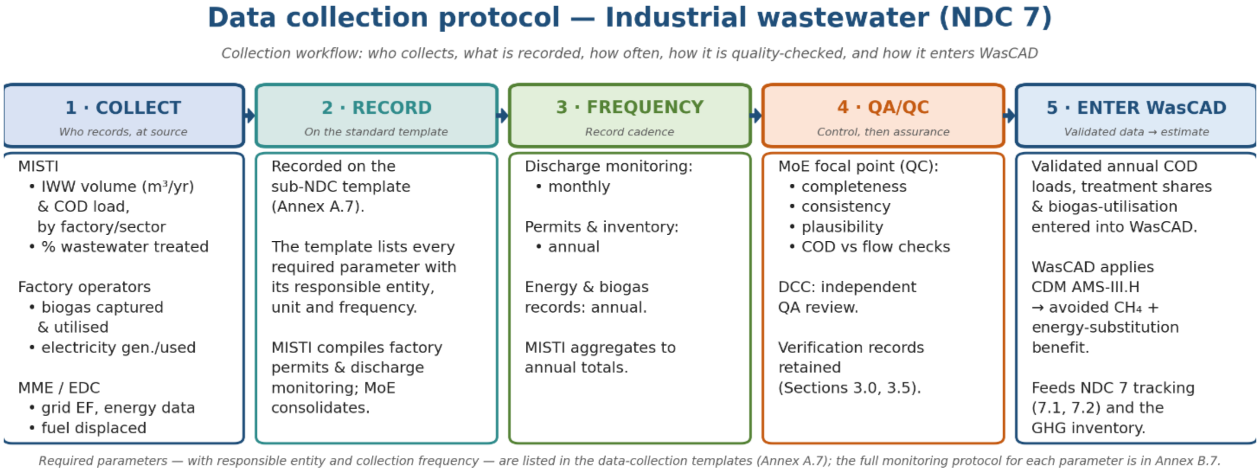
The protocol monitors progress towards full compliance of wastewater treatment in the Garment, Footwear and Travel-goods (GFT) and leather industries (NDC 7.1) and the increase in methane recovery through biogas generation at industrial wastewater treatment plants (NDC 7.2).

Two kinds of data are collected. **Progress-tracking data** measure how far each target has advanced: the number of GFT and leather factories, the number connected to compliant wastewater treatment plants (7.1), the number of treatment plants with biogas recovery, and the biogas produced, biogas utilised and electricity generated from biogas (7.2) — reported annually by MISTI and the operators. **GHG-estimation data** drive the emission calculation: industrial wastewater volume (m^3/year), COD concentration untreated and treated and COD removed (kg/year), the percentage of wastewater treated, the treatment technology (for emission-factor selection), methane captured and utilised, and the electricity and fuel used. Wastewater flow and COD are reported quarterly and consolidated annually; the remaining parameters are reported annually.

Industrial operators submit their operational data to MISTI on standardised reporting templates. MISTI consolidates and validates the records and shares them with the Ministry of Environment and the Department of Climate Change for entry into WasCAD and onward use in the national MRV system, the National Inventory Report (NIR) and the Biennial Transparency Reports (BTRs).

Parameters (IPCC 2006 GLs & 2019 Refinement; CDM methodologies)

Parameters follow the IPCC 2006 Guidelines and 2019 Refinement (Vol. 5, wastewater) and CDM methodologies AMS-III.H / AMS-I.C: COD concentration, maximum methane-producing capacity (B_0 = 0.25 kg CH_4/kg COD), MCF by treatment pathway, methane captured and flared or utilised, grid emission factor and fuel emission factors (NCV, EF CO_2).
The full monitoring protocol for each parameter (source of data, measurement procedure, monitoring frequency, QA/QC requirements and purpose) is provided in Annex B.7.



Data collection protocol — Industrial wastewater (NDC 7)

Collection workflow: who collects, what is recorded, how often, how it is quality-checked, and how it enters WasCAD

1 · COLLECT
Who records, at source

MISTI
- IWW volume (m^3/yr) & COD load, by factory/sector
- % wastewater treated

Factory operators
- biogas captured & utilised
- electricity gen./used

MME / EDC
- grid EF, energy data
- fuel displaced

2 · RECORD
On the standard template

Recorded on the sub-NDC template (Annex A.7).

The template lists every required parameter with its responsible entity, unit and frequency.

MISTI compiles factory permits & discharge monitoring; MoE consolidates.

3 · FREQUENCY
Record cadence

Discharge monitoring:
- monthly

Permits & inventory:
- annual

Energy & biogas records: annual.

MISTI aggregates to annual totals.

4 · QA/QC
Control, then assurance

MoE focal point (QC):
- completeness
- consistency
- plausibility
- COD vs flow checks

DCC: independent QA review.

Verification records retained (Sections 3.0, 3.5).

5 · ENTER WasCAD
Validated data → estimate

Validated annual COD loads, treatment shares & biogas-utilisation entered into WasCAD.

WasCAD applies CDM AMS-III.H → avoided CH_4 + energy-substitution benefit.

Feeds NDC 7 tracking (7.1, 7.2) and the GHG inventory.

Required parameters — with responsible entity and collection frequency — are listed in the data-collection templates (Annex A.7); the full monitoring protocol for each parameter is in Annex B.7.

Figure 8: Data collection protocol for industrial waste water sector

Entry into WasCAD

Validated annual COD loads, treatment shares and biogas-utilisation records are entered into WasCAD, which estimates avoided CH_4 from anaerobic lagoons and the energy-substitution benefit of biogas recovery.

3 QA/QC Procedures

This chapter defines how the data collected under Chapter 2 are quality-assured (QA — the methods and documentation that prevent errors) and quality-controlled (QC — the checks that detect them) before they are reported. A common four-tier review applies to every measure; the landfill example shows it in full.

3.0 General QA/QC procedures (common to all measures)

Quality assurance and quality control follow a single, common procedure for all seven measures, applied by the institutions identified in the Institutional Arrangements report. Quality control (QC) is performed by the data provider and the MoE focal point at the point of compilation; quality assurance (QA) is an independent review performed by staff not involved in the compilation, coordinated by the Department of Climate Change (DCC).

Common QC checks applied to every dataset before entry into WasCAD: (i) completeness — all reporting entities and months accounted for; (ii) consistency — units, conversion factors and time series checked against prior years; (iii) plausibility — values compared with expected ranges and flagged if deviating by more than 20% without explanation; (iv) transcription — a second person re-checks a sample of entries against source records; (v) documentation — every value traceable to a dated source record.

Data-quality levels. Instead of the IPCC/CDM “tier” terminology, the framework grades each dataset by a data-quality level: Level 1 — international default values; Level 2 — country-specific values from studies or statistics; Level 3 — measured, facility-level data. The roadmap in Chapter 5 prioritises movement of key parameters from Level 1 toward Level 3.

Records of all QC checks, corrections and QA reviews are retained by the MoE focal point for each reporting cycle and archived with the WasCAD dataset; these records constitute the verification evidence referenced in Chapter 4.

3.1 NDC 1: Implement solid waste reduction strategies and pollution control

QC for NDC 1 focuses on the waste-quantity and recycling records that drive the indicator: cross-checking PDoE/SNA monthly waste-generation reports against landfill weighbridge records, verifying NIS population figures used for the per-capita calculation, and validating plastic-type disaggregation against the most recent waste-composition study. Recycling and export volumes are checked against GDCE export records where available.

All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.1 and Annex B.1.

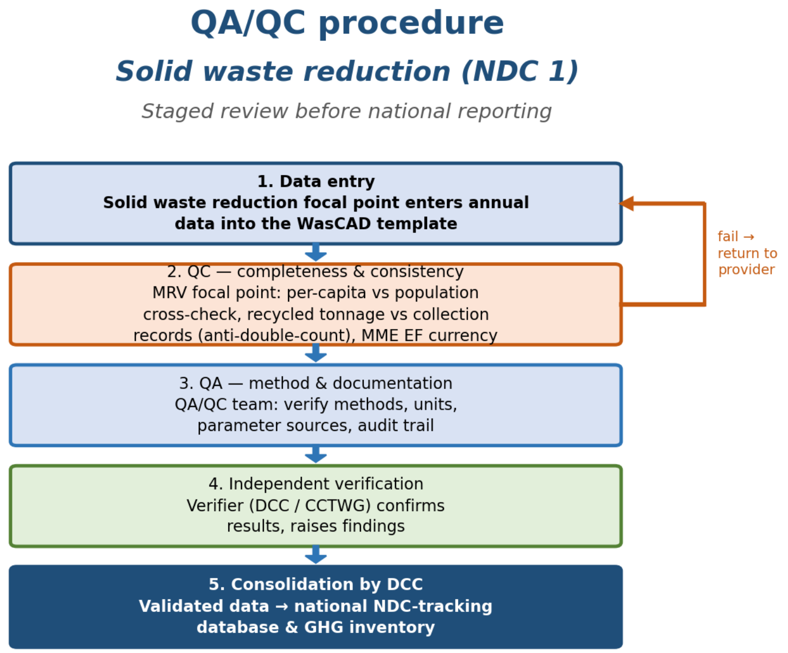


Figure 9: Solid waste reduction (NDC 1) QA/QC review flow.

The figure sets out the staged review that every dataset passes through before national reporting. Data entered by the responsible entity into the WasCAD template are first subjected to quality control by the Ministry of Environment focal point — the measure-specific checks described above together with the common completeness, consistency, plausibility, transcription and documentation checks of Section 3.0; any dataset that fails is returned to the provider for correction. Datasets that pass move to the quality-assurance stage, where staff not involved in compilation verify the methods, units, parameter sources and audit trail, followed by independent verification by the Department of Climate Change and the Climate Change Technical Working Group. The Department of Climate Change then consolidates the validated data into the national NDC-tracking database and the GHG inventory.

3.2 NDC 2: Waste collection and segregation at source

QC for NDC 2.3 focuses on the open-burning estimate, which is survey-based and carries high uncertainty: verifying the uncollected-waste fraction against collection-coverage records, checking survey design and sample coverage (urban/rural) with NIS, and reconciling the burned fraction with waste-composition data. Each survey round is independently reviewed before the population-share indicator is updated.

All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.2 and Annex B.2.

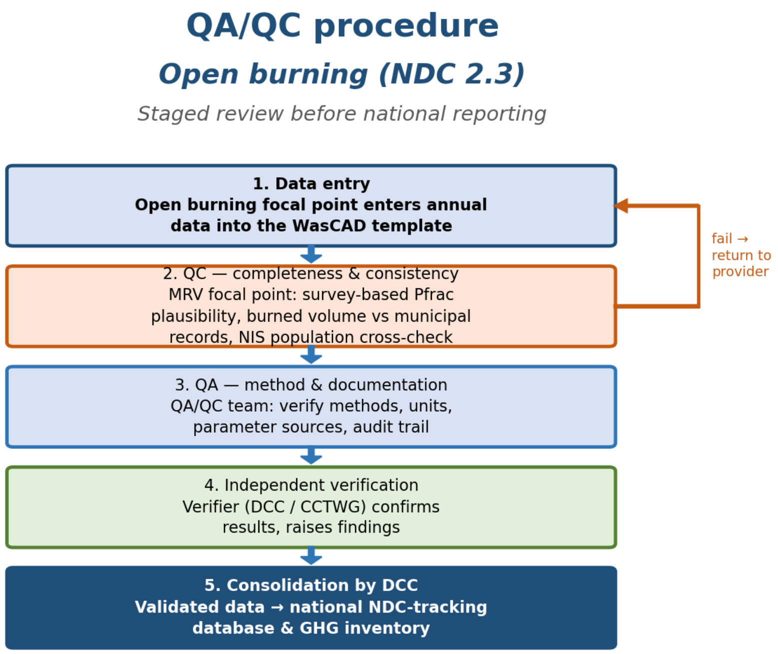


Figure 10: Open burning (NDC 2.3) QA/QC review flow.

The review follows the common staged flow: data entry, quality control by the Ministry of Environment focal point — here concentrated on the survey-based open-burning estimate and its comparatively high uncertainty — independent quality assurance, verification by the Department of Climate Change and the Climate Change Technical Working Group, and consolidation into the national tracking database and GHG inventory. A dataset that fails any control stage is returned to the provider before it can proceed.

3.3 NDC 3: Increase capacities for organic waste processing

QC for NDC 3.1 focuses on facility-level records: monthly compost-facility throughput cross-checked against feedstock delivery logs, compost-output records reconciled with sales/distribution records, and energy-consumption data validated against utility bills. Facilities reporting zero or constant values are flagged for follow-up.

All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.3 and Annex B.3.

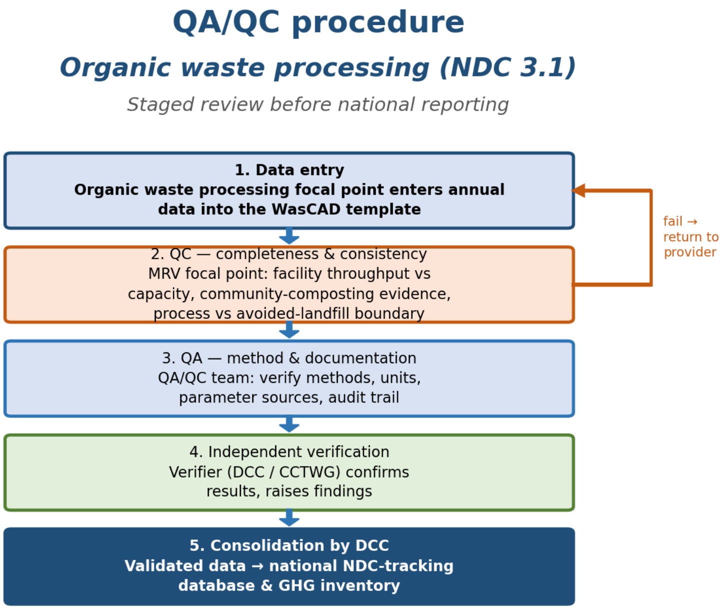


Figure 11: Organic waste processing (NDC 3.1) QA/QC review flow.

The review follows the common staged flow — data entry, quality control by the Ministry of Environment focal point (here focused on facility throughput against capacity, community-composting evidence, and the composting versus avoided-landfill boundary), independent quality assurance, verification by the Department of Climate Change and the Climate Change Technical Working Group, and consolidation into the national tracking database and GHG inventory — with any failing dataset returned to the provider for correction.

3.4 NDC 4: Introduce alternative SWM processing at existing landfills

The data for alternative SWM processing at existing landfills are reported by many operators and sub-national administrations of varying capacity, so consistency and completeness are the main risks. The procedure routes every annual submission through four review steps before consolidation, with a return loop for any submission that fails a check.

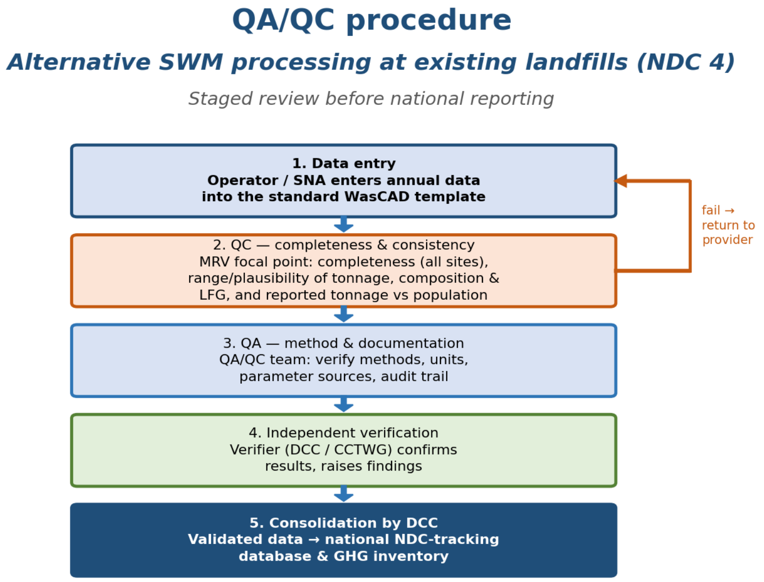


Figure 12: Alternative SWM processing at existing landfills (NDC 4) QA/QC review flow.

The review applies the common staged flow before national reporting. Data entered by the operator or sub-national administration on the standard template are first subjected to quality control by the MRV focal point — completeness across all reporting sites, range and plausibility of tonnage, composition and landfill-gas values, and a cross-check of reported tonnage against the population-based estimate; any submission that fails is returned to the provider. Submissions that pass move to quality assurance, where the methods, units and parameter sources are verified against the cross-cutting parameters table, followed by independent verification by the Department of Climate Change and the Climate Change Technical Working Group, and consolidation of the validated data into the national NDC-tracking database and GHG inventory. The detailed checks and acceptance criteria are set out in the QC checklist below.

QC checklist and acceptance criteria

Check	What is verified	Acceptance criterion
Completeness	All required variables present for every reporting site	100% of operational sites reported; gaps flagged
Range / plausibility	Tonnage, composition, LFG within expected bounds	Within ± historical range; outliers explained
Cross-validation	Reported tonnage vs population-based estimate	Deviation ≤ agreed threshold or documented
Unit & method	Units, FOD method and parameter sources correct	Matches central parameters table; SI units
Consistency over time	Year-on-year continuity of series	No unexplained step changes
Documentation	Audit trail and source references attached	Traceable to source record

Table 3: Alternative SWM processing at existing landfills (NDC 4) QC checklist and acceptance criteria.

Roles and escalation

- **Step 1 — Data entry:** operator/SNA enters data on the standard template.
- **Step 2 — QC:** MRV focal point runs completeness, range and cross-validation checks; failures return to the provider.
- **Step 3 — QA:** QA/QC team verifies methods, units, parameter sources and the audit trail.
- **Step 4 — Verification:** independent verifier confirms results and raises findings; DCC consolidates validated data.

3.5 NDC 5: Landfill management

Landfill data are reported by many operators and sub-national administrations of varying capacity, so consistency and completeness are the main risks. Every annual submission is therefore taken through a staged review — data entry, quality control, quality assurance and independent verification — before the validated figures are consolidated, with a return loop that sends any submission failing a check back to the provider for correction.

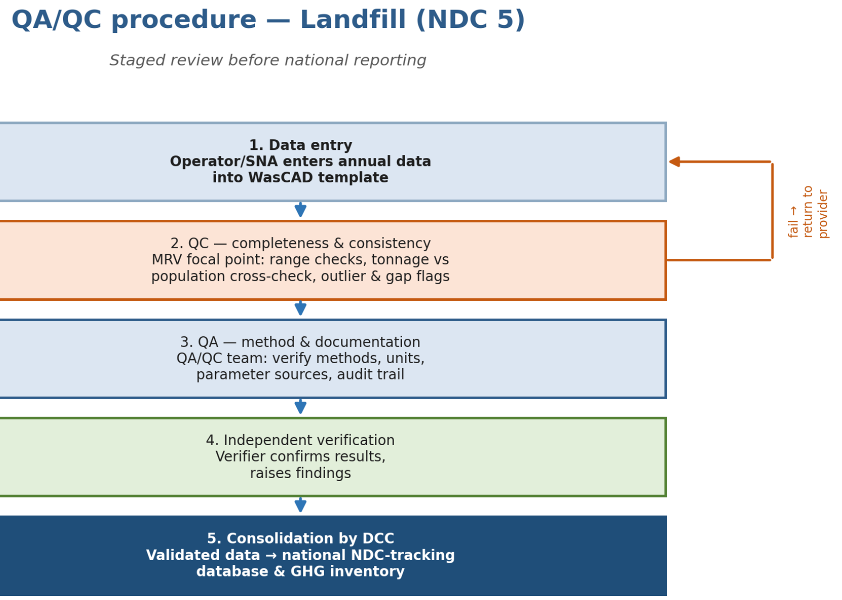


Figure 13: Landfill (NDC 5) QA/QC review flow.

Figure 3 applies the common QA/QC procedure of Section 3.0 to landfill data, and a submission moves through five stages. At data entry, the operator or sub-national administration records the year's figures on the standard WasCAD template. The MRV focal point then performs quality control: completeness, range and plausibility, and cross-validation against an independent estimate. Any submission that fails a check is returned to the provider for correction before it can move on, shown by the return loop on the right of the figure.

Once quality control is passed, the QA/QC team carries out quality assurance — confirming that the correct methods, units and parameter sources were used and that the audit trail is complete. An independent verifier then confirms the results and records any findings, and finally the Department of Climate Change (DCC) consolidates the validated data for national NDC tracking. Because only data that has cleared every stage is consolidated, the flow is both sequential and self-correcting, catching errors at the earliest possible point.

QC checklist and acceptance criteria

Check	What is verified	Acceptance criterion
Completeness	All required variables present for every reporting site	100% of operational sites reported; gaps flagged
Range / plausibility	Tonnage, composition, LFG within expected bounds	Within ± historical range; outliers explained
Cross-validation	Reported tonnage vs population-based estimate	Deviation ≤ agreed threshold or documented
Unit & method	Units, FOD method and parameter sources correct	Matches central parameters table; SI units
Consistency over time	Year-on-year continuity of series	No unexplained step changes
Documentation	Audit trail and source references attached	Traceable to source record

Table 4: Landfill (NDC 5) QC checklist.

The checks summarised in Table 10 are the common checks defined in Section 3.0, applied here to landfill data with the acceptance criterion for each. Completeness requires every operational site to report all required variables, with any gap flagged rather than left blank. Range and plausibility screens tonnage, composition and LFG values against expected historical bounds, and any outlier must be explained. Cross-validation compares reported tonnage with a population-based estimate, and deviations beyond the agreed threshold are investigated or documented. The unit-and-method check confirms that SI units and the correct FOD method and parameter sources have been used. Consistency over time looks for unexplained step changes in the year-on-year series, and documentation requires that every figure is traceable to a source record through the audit trail.

Roles and escalation

Responsibilities are distributed across these review steps. At Step 1 (data entry) the operator or sub-national administration enters the data on the standard template. At Step 2 (quality control) the MRV focal point runs the completeness, range and cross-validation checks and returns any failing submission to the provider. At Step 3 (quality assurance) the QA/QC team verifies the methods, units, parameter sources and audit trail. At Step 4 (verification) an independent verifier confirms the results and raises any findings, after which the DCC consolidates the validated data. These are review steps and should not be confused with the IPCC/CDM data-quality levels — default, country-specific or measured — which describe the basis of a parameter value and are defined in Section 3.0.

Maintaining data quality, by parameter

Beyond the common checks, the data-collection team maintains the quality of each landfill parameter as set out below; these checks follow the general QA/QC procedure set out in Sections 3.0 and 3.5, while Annex B.5 reproduces the source-methodology monitoring protocol for each parameter for reference. For the mass of municipal solid waste disposed (Wi), weighbridge logs are reconciled against gate records and cross-checked against the population-based tonnage estimate, and any gap is back-filled only with a documented assumption. For waste composition (organic fraction and DOC), sampling follows a consistent seasonal protocol and each campaign is compared with previous results and regional benchmarks. For methane recovered and flared

(LFG), the flow and CH_4-concentration meters are calibrated on a regular schedule, uptime is logged, and flared volumes are reconciled with operating hours. For project electricity (ECPJ), metered consumption is read from calibrated meters or utility bills and cross-checked against the grid-emission-factor source. For fuel combusted (FCi), metered or invoiced quantities are cross-checked against delivery and stock logs, and the net calorific value and CO_2 emission factor are verified against IPCC defaults. In every case the responsible data provider is the landfill operator, with the MoE focal point as the verifying authority, consistent with the institutional arrangements set out in this report.

3.6 NDC 6: Improve textile waste management capacities

Lead / supporting	MoE; MISTI
Mitigation potential	0.69 $MtCO_2e$
Target(s) in scope	80% of post-industrial textile waste traceable, recorded and sent to recyclers (6.1).

QC for NDC 6.1 focuses on factory and sorting-centre records compiled by MISTI: textile-waste generation cross-checked against production statistics, diverted quantities reconciled between sorting centres and recyclers, and the landfilled/burned residual checked against disposal-site records. CGTI supports spot verification at factory level.

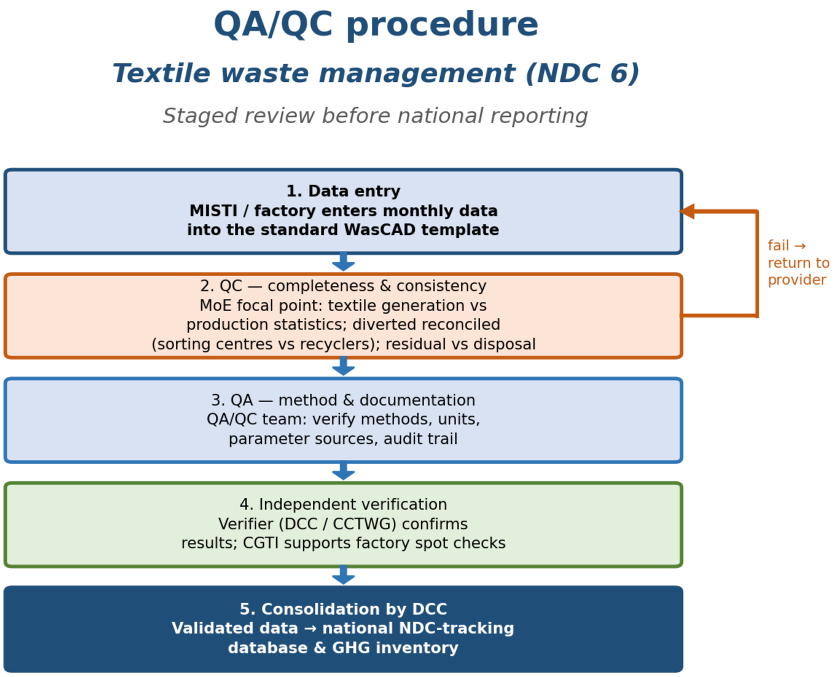


Figure 14: Textile waste management (NDC 6) QA/QC review flow.

The review follows the common staged flow before national reporting. Data entered by MISTI or the reporting factory on the standard template are first subjected to quality control by the MoE focal point — completeness across all reporting sites, reconciliation of diverted tonnage between sorting centres and recyclers, and a cross-check of textile generation against production statistics; any submission that fails is returned to the provider. Submissions that pass move to quality assurance of methods, units and parameter sources, followed by independent verification by the Department of Climate Change and the Climate Change Technical Working Group, with the

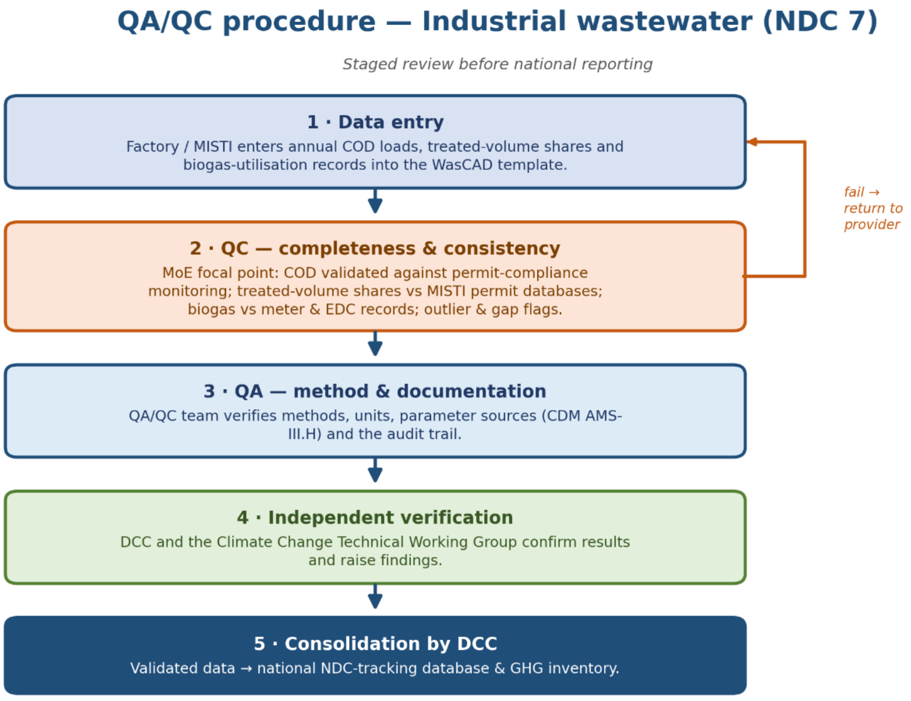
Cambodia Garment Training Institute supporting factory-level spot checks, and consolidation of the validated data into the national NDC-tracking database and GHG inventory.

All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.6 and Annex B.6.

3.7 NDC 7: Industrial wastewater (IWW) management

QC for NDC 7 focuses on the discharge-monitoring, treatment and biogas records that drive both the progress indicators and the emission estimate. COD loads are validated against permit-compliance monitoring; treated-volume shares are reconciled with the MISTI permit databases; and biogas capture and utilisation are verified against meter readings and EDC electricity records. Because the emission estimate is sensitive to COD measurement, laboratories used for COD analysis must hold national accreditation.

QC for NDC 7 focuses on discharge-monitoring and biogas records: COD loads validated against permit-compliance monitoring, treated-volume shares reconciled with MISTI permit databases, and biogas capture/utilisation verified against meter readings and EDC electricity records. Laboratories used for COD analysis must hold national accreditation.
All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.7 and Annex B.7.



Note: laboratories used for COD analysis must hold national accreditation. The procedure applies the common QA/QC flow of Section 3.0 to industrial-wastewater data.

The review applies the common staged flow of Section 3.0: data entry by the factory or MISTI; quality control by the MoE focal point — here concentrated on COD validation, treated-volume reconciliation and biogas verification; followed by independent quality assurance, verification by the Department of Climate Change and the Climate Change Technical Working Group, and consolidation into the national NDC-tracking database and GHG inventory. Any submission that fails a check is returned to the provider for correction.

Maintaining data quality, by parameter

Beyond the common checks, the data-collection team maintains the quality of each industrial-wastewater parameter as set out below; these checks follow the general QA/QC procedure in Sections 3.0 and 3.5, while Annex B.7 reproduces the source-methodology monitoring protocol for each parameter for reference. For wastewater volume generated (m^3/year), industry records are cross-checked against available national statistics and screened for consistency through year-on-year trend analysis. For the percentage of wastewater treated, the value is derived from treated and total generated volumes and checked for plausibility against permit and flow-meter records. For COD concentration, untreated and treated samples are analysed only by nationally accredited laboratories, and the results are compared against historical trends and regional benchmarks. For the maximum methane-producing capacity (B_0) and the methane correction factor (MCF), IPCC default values are used only where country-specific data are unavailable, and the treatment pathway is confirmed before the MCF is selected. For methane recovered and biogas produced and utilised, metering equipment is calibrated on a regular schedule and the recovered volumes are reconciled against the electricity generated and EDC records. For electricity consumed or generated, metered values are cross-checked against utility bills and facility logs; and for fuel combusted, metered or invoiced quantities are reconciled against an annual energy balance and purchase invoices, with the net calorific value and CO_2 emission factor verified against IPCC defaults. In every case the responsible data provider is the industrial operator, with MISTI as the compiling authority and the MoE focal point (under DCC) as the verifying authority, consistent with the institutional arrangements set out in this report.

All other checks, the data-quality grading and the QA review follow the common procedure in Section 3.0. QC checklists and acceptance criteria mirror the worked model in Section 3.5, applied to the parameters listed in Annex A.7 and Annex B.7.

4 Integration into the National MRV Framework

This chapter sets out how the outputs of WasCAD are integrated into Cambodia's national MRV system — the national greenhouse-gas inventory reported through the National Inventory Report (NIR), the NDC-tracking system, and the Biennial Transparency Reports (BTR) submitted to the UNFCCC under the Enhanced Transparency Framework (ETF). Because the integration process is common to every waste-sector measure, it is described once rather than measure by measure: the national architecture and the point at which WasCAD enters it (Section 4.0), the integration pathway now under way (Section 4.1), how each measure's outputs map onto the national MRV elements (Section 4.2), and the institutional roles that hold the system together (Section 4.3).

4.0 National MRV architecture and the WasCAD entry point

Coordination of the national MRV system rests with the Ministry of Environment (MoE), acting through the General Directorate of Policy and Strategy (GDPS) and the Department of Climate Change (DCC), under the oversight of the National Council for Sustainable Development (NCSD). Designated data providers — line ministries, sub-national administrations, landfill and facility operators, factories, and the National Institute of Statistics — submit activity data to MoE focal points on the standard templates in Annex A. WasCAD records these data and computes the avoided emissions and NDC progress indicators for each measure; the QA/QC team and an independent verifier assure quality; and DCC consolidates the validated data into the national NDC-tracking database and the GHG inventory, which are reported through the inventory tables (CRT) and the NDC-progress tables (CTF) of successive BTRs. The figure below sets out this common pathway.

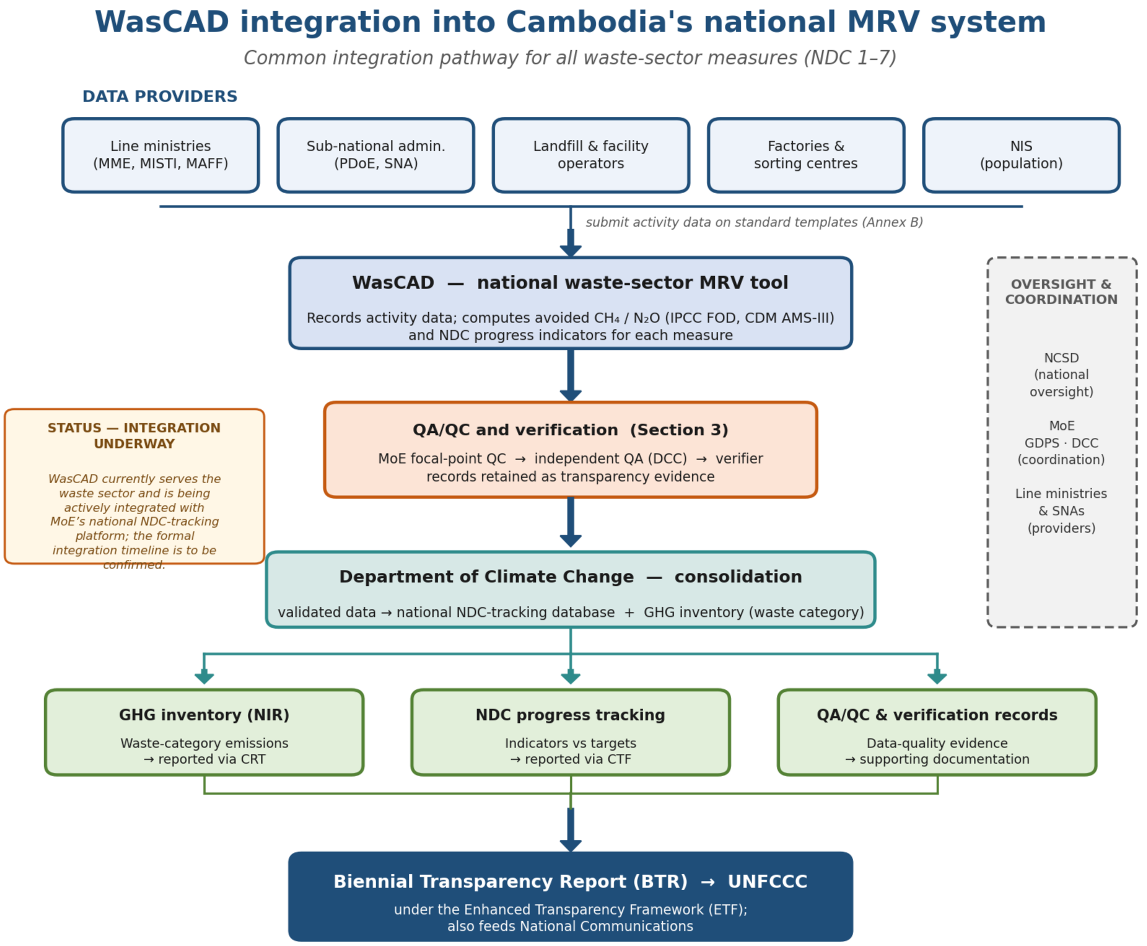


Figure 15: WasCAD integration into Cambodia's national MRV system — common pathway for all waste-sector measures.

WasCAD currently serves as the national waste-sector MRV tool and is being actively integrated with MoE's existing national NDC-tracking platform, as part of Cambodia's broader, ongoing development of a comprehensive national MRV system. The waste-sector framework therefore functions both as an operational tracking system for the waste sector and as a reference model whose templates, QA/QC procedures and data-flow arrangements can be extended to other sectors. Because the integration logic is identical for all seven measures, the pathway, the output mapping and the institutional roles set out below are written once, commonly.

4.1 Integration pathway: from sectoral tool to national MRV

Integration of WasCAD into the national MRV system is being advanced through the agreed actions below, sequenced from short-term alignment to the medium-term build-out of a shared national platform. The formal timeline for each action is confirmed with MoE as the national MRV system matures.

Phase	Action	Lead
Short-term	Align waste-sector indicators, methodologies and reporting procedures with national GHG-inventory and NDC-reporting requirements	MoE; DCC
Short-term	Establish standardised reporting templates and data-sharing procedures extensible to other sectors	MoE; DCC
Short-term	Develop formal data-flow and verification procedures	DCC; QA/QC team
Short-term	Strengthen institutional coordination among MoE, line ministries, sub-national administrations and private operators	MoE
Medium-term	Design the WasCAD database structure to allow integration with a centralised national MRV platform	DCC
Medium-term	Build institutional and technical capacity on MRV methodologies, QA/QC and digital reporting	MoE; DCC
Medium-term	Use lessons learned from the waste sector to guide the broader national MRV system	NCSD; MoE
Medium-term	Ensure consistency between WasCAD reporting and future BTR, National Communication and NDC-tracking obligations	DCC

Table 5: Integration pathway — agreed actions to integrate WasCAD into the national MRV system.

4.2 How WasCAD outputs feed the national MRV system

Every measure's WasCAD outputs flow to the same national MRV elements: the emission estimates feed the GHG inventory; the progress indicators feed the NDC-tracking record; the country-specific parameters feed the inventory methodology record; and the QA/QC and verification records (Section 3) feed the national transparency and data-quality evidence. The table below consolidates this mapping across all seven measures. In every case the reporting vehicle is a successive BTR under the ETF — the inventory tables (CRT) for emissions and the NDC-progress tables (CTF) for indicators — supported by the National Inventory Report and supporting documentation.

Measure	Emission output → GHG inventory (NIR / CRT)	Progress indicator → NDC tracking (CTF)	Key parameters → methodology record
NDC 1	Avoided emissions from MSW reduction and recycling	Per-capita MSW; plastic-waste generation (1.1–1.2)	Waste-composition and recycling parameters
NDC 2	Avoided CH_4/N_2O from reduced open burning	Population share engaged in open burning (2.3)	Collection-coverage and uncollected-waste fractions
NDC 3	Avoided landfill CH_4 from organic-waste diversion	Organic waste processed, t/year (3.1)	FOD and composting parameters
NDC 4	CH_4 from landfilled MSW (FOD); incineration emissions	Share to controlled/sanitary; LFG; RDF/WtE (4.1–4.4)	DOC, MCF, k; combustion parameters
NDC 5	CH_4 from landfilled MSW (FOD)	Controlled/sanitary share; LFG; dumpsites (5.1–5.4)	DOC, MCF, k (by site type)
NDC 6	Avoided landfill CH_4 and recycling benefit (textiles)	PITW diverted from landfill/burning, % (6.1)	Textile FOD and recycling parameters
NDC 7	Avoided CH_4 from IWW treatment and biogas recovery	IWW treatment coverage; biogas plants (7.1–7.2)	COD, B_0, MCF and energy parameters

Table 6: Consolidated mapping of WasCAD outputs to national MRV elements (all measures).

For every measure, the QA/QC and verification records produced under Section 3 constitute the transparency and data-quality evidence, retained as supporting documentation alongside each reporting cycle.

4.3 Institutional roles, data-sharing and verification

Clear institutional roles hold the integrated system together. Data providers — line ministries (MME, MISTI, MAFF), sub-national administrations (PDoE, SNA), landfill and facility operators, factories, and the National Institute of Statistics — are responsible for collecting and submitting activity data on the standard templates. MoE focal points receive and record the data and perform first-line quality control. The Department of Climate Change coordinates quality assurance and independent verification, consolidates the validated data, and is the custodian of the national NDC-tracking database and the GHG inventory. The National Council for Sustainable Development provides national oversight and ensures consistency with Cambodia's transparency obligations under the Enhanced Transparency Framework.

To make these responsibilities binding across ministries, provincial administrations and private operators, a Prakas on WasCAD data reporting is proposed — set out in the Recommendations — to formalise the data-submission obligations, reporting frequencies and quality requirements established in this framework.

5 Roadmap for Addressing Data Gaps

This chapter identifies, for each measure, the gaps that currently limit the accuracy or completeness of tracking, priorities them, and sets a phased plan to close them. The prioritisation method is common to all measures; each measure then carries its own gap–action–timeline plan.

5.0 Prioritisation method (common to all measures)

Each gap is scored against seven criteria — alignment with NDC targets, data availability/accessibility, impact on policy and decisions, cost-effectiveness, international reporting obligations, cross-sectoral relevance, and availability of financing/technical support. A simple scale (Yes = 3, Maybe yes = 2, Maybe no = 1, No = 0) is summed to rank gaps; the highest-scoring gaps are addressed first. Section owners apply this scale to their measure's gaps and use the resulting ranking to set the priority order in the measure roadmaps (Section 5.1–Section 5.7).

The roadmap applies the same three-step approach to every measure: (1) identify the data gaps from the protocols and templates in Chapter 2; (2) prioritise them using the seven scored criteria in Table 16; and (3) set a time-bound roadmap of actions with owners. Steps 1–3 are presented for each measure in Section 5.1–Section 5.7.

Table 7: Scoring criteria and weights used to prioritise each identified data gap

Criteria	Questions	Intensity Weight	Score
Alignment with NDC targets	Does the data directly support NDC tracking?	0–3	
Data availability and accessibility	Is data collection feasible?	0–3	
Impact on policies	Does the data support policy or investment decisions?	0–3	
Cost-effectiveness	Is addressing the gap financially feasible?	0–3	
International reporting obligations	Does the gap affect ETF/BTR reporting?	0–3	
Cross-sectoral relevance	Is the data useful across sectors?	0–3	
Availability of financing/support	Is technical or financial support available?	0–3	
Total Score	**Overall level of priority**	**0–21**	

The scored prioritisation criteria and the cross-cutting action plan set out in this common section follow the framework prepared by ClimateSI in the initial version of this deliverable, which was developed with reference to the ICAT methodological references. In addition to the measure-specific roadmaps, the following cross-cutting action plan addresses gaps common to the whole sector — the centralised MRV database, standardised reporting templates, formal data-sharing agreements, sector QA/QC protocols and continuous capacity building — drawn from consultations with MoE, MISTI, MME and sub-national administrations.

Table 8: Cross-cutting action plan for addressing data gaps (all waste sub-sectors)

Sub-sector	Data Gap	Recommended Actions	Suggested Timeline
All Waste Sectors	Lack of centralized MRV data management system	Establish a centralized digital waste-sector MRV database integrated with WasCAD and national NDC tracking systems	Short-term: 6–12 months
All Waste Sectors	Inconsistent institutional reporting formats	Develop and implement standardized national reporting templates for waste-sector data collection	Short-term: 6–12 months
All Waste Sectors	Weak institutional coordination and data sharing	Establish formal data-sharing agreements among MoE, MISTI, MRD, NIS, SNAs, and private operators	Medium-term: 1–2 years
All Waste Sectors	Limited QA/QC procedures	Develop sector-specific QA/QC protocols and verification procedures for waste-sector MRV	Medium-term: 1–2 years
All Waste Sectors	Limited technical capacity for MRV implementation	Conduct national and sub-national capacity-building programs on IPCC methodologies, data management, and reporting	Continuous: Annual
Solid Waste Management	Lack of systematic waste quantity monitoring	Install weighing systems and establish mandatory waste quantity reporting at landfill and transfer stations	Short-term: 1 year
Solid Waste Management	Limited waste characterization data	Conduct regular national waste composition studies using standardized methodologies	Continuous: Annual or biannual
Solid Waste Management	Limited monitoring of open burning practices	Develop survey-based and remote monitoring systems for open burning estimation, particularly in rural areas	Medium-term: 1–2 years
Solid Waste Management	Lack of landfill operational monitoring	Introduce facility-level operational monitoring systems for landfill gas generation, recovery, flaring, and oxidation	Medium-term: 2–3 years
Solid Waste Management	Reliance on IPCC default emission factors	Conduct country-specific studies to develop national methane correction factors, oxidation factors, and DOC values	Long-term: 3–5 years
Waste Segregation and Recycling	Limited data on source segregation rates	Introduce municipal-level reporting systems for segregation and recycling performance	Short-term: 1 year
Organic Waste Processing	Limited data on composting and anaerobic digestion	Develop reporting systems for compost production, feedstock quantities, and treatment efficiency	Medium-term: 1–2 years
Textile Waste Management	Limited textile waste tracking systems	Develop centralized reporting mechanisms for textile waste collection, recycling, and diversion	Medium-term: 1–2 years
Industrial Wastewater	Weak monitoring of wastewater treatment performance	Establish mandatory reporting requirements for industrial wastewater flow, COD/BOD, and treatment efficiency	Short-term: 6–12 months
Industrial Wastewater	Limited monitoring of biogas recovery systems	Install monitoring equipment for methane recovery and utilization at industrial wastewater treatment facilities	Medium-term: 1–2 years
Industrial Wastewater	Fragmented data management between institutions	Integrate wastewater permitting and monitoring databases into the national MRV framework	Medium-term: 1–2 years

Sub-national Administration	Inconsistent local-level reporting	Develop sub-national MRV guidelines and reporting procedures for municipalities and provinces	Short-term: 1 year
Private Sector Engagement	Limited reporting from private operators	Introduce mandatory reporting requirements through licensing and permitting mechanisms	Medium-term: 1–2 years

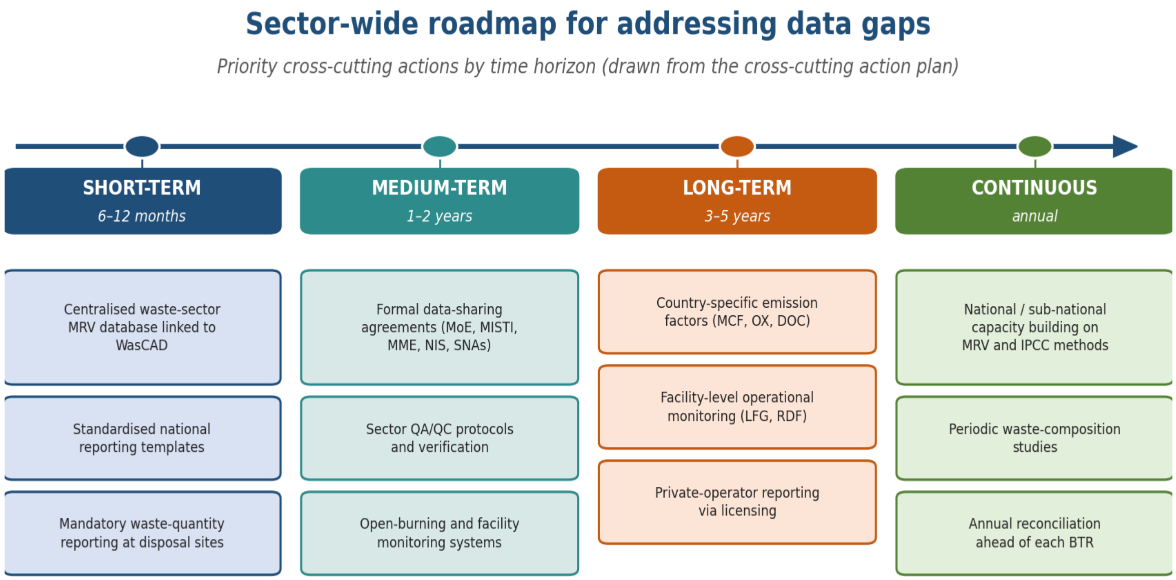


Figure 16: Sector-wide roadmap for addressing data gaps — priority cross-cutting actions by time horizon.

5.1 NDC 1: Implement solid waste reduction strategies and pollution control

Step 1 — Identify data gaps. No systematic national tracking of per-capita MSW generation outside Phnom Penh; sub-national reporting is inconsistent. Plastic-waste quantities are not disaggregated by polymer type in ministry records. Recycling volumes (local and exported) are untracked or scattered across operators and GDCE records. The national waste-composition study is outdated, forcing reliance on 2022 values.

Step 2 — Prioritise. Applying the Section 5.0 criteria, the highest-priority gaps are systematic waste-quantity monitoring (direct driver of indicator 1.1) and a current waste-composition study (affects every downstream estimate); polymer disaggregation and recycling traceability follow.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

Table 9: NDC 1 data gaps, actions and timeline

Data gap	Recommended action	Owner	Timeline
No systematic waste-quantity monitoring	Install weighbridges at major disposal sites; mandate monthly waste-quantity reporting by SNAs through WasCAD templates	MoE / SNAs	Short-term: 1 year
Outdated waste-composition data	Conduct a national waste-composition study using a standardised protocol; repeat biannually	MoE / development partners	Continuous: biannual

Untracked recycling volumes	Introduce traceable weighing and inventory reporting for recyclers; reconcile with GDCE export records	MoE / GAEA / private sector	Medium-term: 1–2 years
No polymer-type disaggregation	Add polymer-type fields to the WasCAD plastic templates and industry survey	MoE / MISTI	Medium-term: 1–2 years

5.2 NDC 2: Waste collection and segregation at source

Step 1 — Identify data gaps. No direct measurement of open burning, especially in rural areas; estimates rely on extrapolation from the 2022 survey. The uncollected-waste fraction (35%) and its split between burning (40%) and dumping (60%) are assumptions, not measurements. Sub-national collection-coverage reporting is inconsistent across provinces.

Step 2 — Prioritise. The open-burning survey is the highest-priority gap: the indicator itself (population share burning waste) cannot be updated without it, and the assumed burning/dumping split drives the emission estimate. Collection-coverage harmonisation follows.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

Table 10: NDC 2 data gaps, actions and timeline

Data gap	Recommended action	Owner	Timeline
No open-burning measurement	Develop a survey-based and remote-sensing monitoring system for open burning; integrate questions into NIS household surveys	MoE / NIS	Medium-term: 1–2 years
Assumed uncollected-waste split	Field-verify the burned/dumped split in representative urban and rural districts	MoE / PDoE / universities	Medium-term: 1–2 years
Inconsistent coverage reporting	Issue sub-national MRV reporting guidelines and a standard collection-coverage template	MoE / SNAs	Short-term: 1 year

5.3 NDC 3: Increase capacities for organic waste processing

Step 1 — Identify data gaps. Limited reporting from composting and anaerobic-digestion facilities; no consolidated registry of facilities and capacities. Feedstock quantities and compost output are not systematically recorded. Facility energy use (electricity, fuel) is rarely reported, forcing default values.

Step 2 — Prioritise. The facility registry and mandatory throughput reporting are the priority: indicator 3.1 (600,000 t/year processed) cannot be verified without facility-level records. Energy-use reporting is lower priority as it affects only the (small) process-emission term.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

Table 11: NDC 3 data gaps, actions and timeline

Data gap	Recommended action	Owner	Timeline

No facility registry / throughput records	Establish an organic-waste facility registry in WasCAD with monthly feedstock and output reporting	MoE / PdoE	Short-term: 1 year
No compost-output verification	Require facilities to keep delivery and sales logs; spot-check during PdoE inspections	PdoE / SNAs	Medium-term: 1–2 years
Default energy parameters	Collect utility-bill data from major facilities to derive country-specific SECcomp	MoE / facilities	Long-term: 2–3 years

5.4 NDC 4: Introduce alternative SWM processing at existing landfills

Step 1 — Identify data gaps. Alternative-processing capacity is not yet systematically monitored: there is no record of refuse-derived-fuel (RDF) or compost production at existing facilities, no operating data for the planned waste-to-energy (WtE) plant, and no throughput records for the mobile or modular waste-management units (MWMU). The site-specific landfill data that the estimate also draws on — waste composition and metering — remain weak.

Step 2 — Prioritise. RDF and compost production monitoring is the highest-priority gap, because indicator 4.1 (RDF capacity of at least 200,000 t/year by 2030) cannot be tracked without it; MWMU throughput (4.4) follows, while WtE operating data (4.2) becomes relevant as the first large-scale plant is commissioned toward 2035.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below and 45 summarized in the phased figure; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

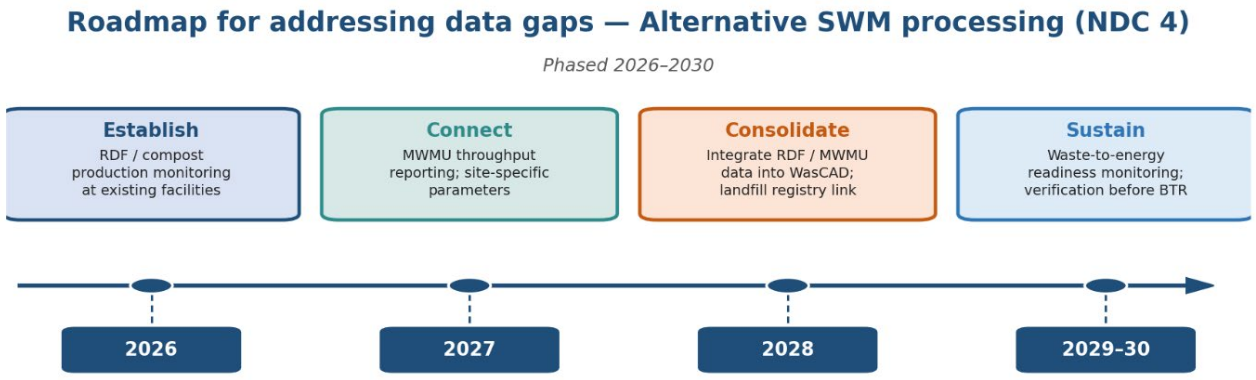


Figure 17: Alternative SWM processing at existing landfills (NDC 4) phased roadmap, 2026–2030.

Data gap	Recommended action	Owner	Timeline
No RDF / compost production monitoring	Install production monitoring and mandate monthly reporting of RDF and compost output at existing facilities	MoE; facility operators	Short-term: 1 year

Data gap	Recommended action	Owner	Timeline
No MWMU throughput records	Require throughput and operating-hours reporting from mobile and modular waste-management units through WasCAD templates	MoE; MME	Medium-term: 1–2 years
No waste-to-energy operating data	Define the WtE monitoring and reporting format ahead of plant commissioning	MoE; MME; operator	Medium-term, then on commissioning
Weak site-specific landfill data	Link RDF/MWMU records to the landfill registry and site-specific composition (shared with NDC 5)	MoE; DCC	Short- to medium-term

Table 12: NDC 4 data gaps, actions and timeline.

5.5 NDC 5: Landfill management — worked model

Because landfill management carries the largest mitigation potential and the weakest baseline data (no LFG metering history, sparse composition data, incomplete dumpsite inventory), it is the priority for data-system investment. The phased plan aligns with the biennial BTR cycle so each milestone strengthens the next report.

The actions are scoped to be achievable within each horizon with existing institutions and partners: the short-term steps (2026–27) — completing the national dumpsite inventory, standardising weighbridge data and the first composition study — build on systems already in place at MoE and the sub-national administrations and require no new mandate, while the metering baseline, the digital landfill registry and routine independent verification follow as capacity grows, each timed to strengthen the next BTR. Detailed responsibilities and budgets will be confirmed with the landfill operators and line agencies during implementation.

Step 1 — Identify data gaps. Landfill management carries the largest mitigation potential (6.40 $MtCO_2e$) and the weakest baseline data: there is no LFG capture/flare metering history, waste-composition (organic % / DOC) data are sparse, the national dumpsite inventory is incomplete, weighbridge coverage at smaller sites is patchy, and there is no centralized, digital landfill dataset linking operators to the NDC-tracking system.

Step 2 — Prioritise. Applying the Section 5.0 criteria, the short-term priorities are completing the national dumpsite inventory and standardizing weighbridge data — both feasible with existing institutions and no new mandate, and prerequisites for every downstream estimate — followed by the first composition study. The LFG metering baseline, the digital landfill registry and routine independent verification rank next, sequenced as capacity grows so each milestone strengthens the next Biennial Transparency Report.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below and summarised in the phased figure; detailed responsibilities and budgets will be confirmed with landfill operators and line agencies during implementation. Cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

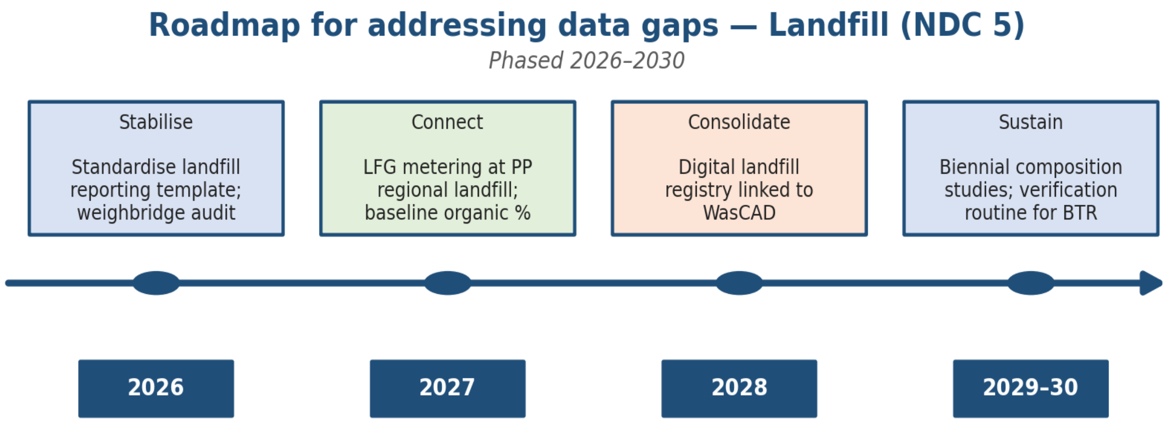


Figure 18: Landfill (NDC 5) phased roadmap, 2026–2030.

Data gap	Recommended action	Owner	Timeline
No centralised, digital landfill dataset	Build a landfill registry linked to WasCAD and the NDC-tracking system	MoE / DCC	2028
No LFG capture/flare metering baseline	Install metering at the PP regional landfill; define reporting format	MoE; operator	2027
Sparse waste-composition (organic %) data	Biennial composition studies feeding DOC/MCF	MoE	2027, then 2-yrly
Incomplete dumpsite inventory	Complete national dumpsite inventory; link to closure plan (5.2)	MoE / SNAs	2026–27
Weighbridge coverage gaps at smaller sites	Audit and standardise weighing; interim estimation protocol	SNAs	2026
Verification not yet routine	Embed independent verification ahead of each BTR	DCC / verifier	2029–30

Table 13: Landfill (NDC 5) data gaps, actions and timeline.

5.6 NDC 6: Improve textile waste management capacities

Step 1 — Identify data gaps. No centralised tracking of post-industrial textile waste; factory-level data are not consolidated. Quantities diverted through sorting centres and recyclers are unreported. The landfilled/burned residual share is unknown.

Step 2 — Prioritise. The centralised reporting mechanism is the priority: indicator 6.1 (80% PITW diverted) is currently unmeasurable. Once factory and sorting-centre reporting exists, the residual share follows by difference.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

Table 14: NDC 6 data gaps, actions and timeline

Data gap	Recommended action	Owner	Timeline
No centralised textile-waste tracking	Develop a centralised reporting mechanism for textile-waste generation, collection and recycling, linked to WasCAD	MISTI / MoE / CGTI	Medium-term: 1–2 years
Unreported diversion quantities	Mandate monthly reporting by sorting centres and recyclers through licensing conditions	MISTI	Medium-term: 1–2 years
Unknown residual share	Reconcile factory generation against diversion records annually; verify against disposal-site records	MoE / MISTI	Long-term: 2–3 years

5.7 NDC 7: Industrial wastewater (IWW) management

Step 1 — Identify data gaps. Monitoring of treatment-plant performance is weak and COD discharge data are incomplete across factories; biogas-recovery systems are largely unmetered, so methane captured and utilised is unrecorded. Permitting and monitoring data are fragmented across MISTI, MoE and MME databases, there is no centralised industrial-wastewater registry, the facility inventory is incomplete, and country-specific emission factors and routine verification are not yet in place.

Step 2 — Prioritise. Standardising flow and COD reporting is the priority: indicator 7.1 (100% treatment coverage) and the emission estimate both depend on COD loads. Biogas metering is the priority for 7.2, while a centralised industrial-wastewater registry and database integration are the enabling cross-cutting actions.

Step 3 — Roadmap. The prioritised actions, owners and timelines are set out below and summarised in the phased figure; cross-cutting enablers (central database, templates, data-sharing agreements, capacity building) are in Section 5.0.

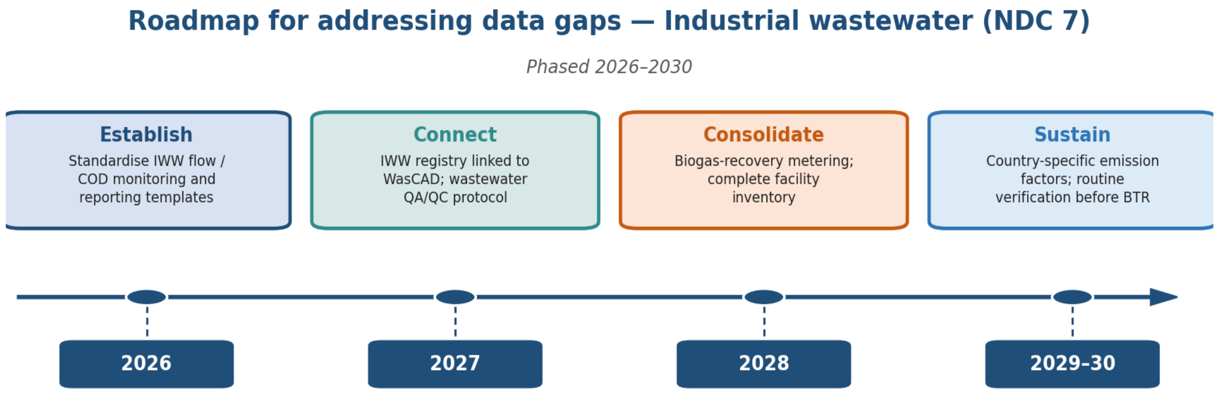


Figure 19: Industrial wastewater (NDC 7) phased roadmap, 2026–2030.

Table 15: NDC 7 data gaps, actions and timeline

Data gap	Recommended action	Owner	Timeline
No centralised industrial-wastewater database	Establish a national industrial-wastewater registry linked to WasCAD and the MRV system	MISTI / MoE	2027–28
Limited reporting of wastewater flow and COD data	Standardise industrial-wastewater monitoring and reporting templates	MISTI	2026
Incomplete inventory of IWW treatment plants	Develop and maintain a national inventory of IWW treatment facilities	MISTI / MoE	2026–27
Limited monitoring of biogas-recovery systems	Install metering and reporting for biogas production and utilisation	operators / MISTI	2027–28
No country-specific wastewater emission factors	Conduct studies to develop Cambodia-specific emission factors	MoE / universities	2028–30
Weak QA/QC procedures for wastewater data	Develop a wastewater QA/QC protocol and verification procedures	MoE / MISTI	2027
Limited technical capacity on wastewater MRV and GHG accounting	Conduct regular MRV, WasCAD and ETF training	MoE / MISTI / DCC	2026–30
Verification not yet routine	Introduce independent verification ahead of BTR submissions	DCC / verifier	2029–30

Annex A — Data collection templates by NDC measure

The data-collection templates below consolidate, for every sub-NDC measure, the parameters to be collected with their value fields, units, responsible entities and collection frequencies. They follow the templates prepared by ClimateSI in the initial version of this deliverable and are migrated here from the body of the previous consolidated report so that Chapter 2 remains concise. Templates are organised B.1–B.7 by measure.

A.1 NDC 1 — Solid waste reduction and pollution control

NDC 1.1 — MSW per-capita reduction

Table 16: Annual data collection template at MoE — NDC 1.1

<table>
<tr><th colspan="5">Data collection template at MoE</th></tr>
<tr><td colspan="2">Parameter</td><td colspan="2">Value</td><td>Unit</td></tr>
<tr><td colspan="2">Municipal solid waste mass disposed of at SWDS in year y</td><td colspan="2"></td><td>tonnes/ yr</td></tr>
<tr><td colspan="2">Municipal solid waste composition of waste disposed of in SWDS in year y
(Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.</td><td colspan="2"></td><td>%</td></tr>
<tr><td colspan="2">Population of Cambodia in year y (sourced from NIS)</td><td colspan="2"></td><td>persons</td></tr>
<tr><td colspan="2">Per capita municipal solid waste generation in year y</td><td colspan="2"></td><td>kg/capita/day</td></tr>
<tr><td colspan="2">Methane Correction Factor (MCF) – Unmanaged shallow</td><td colspan="2"></td><td>fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon that can decompose (DOCf)</td><td colspan="2"></td><td>fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon in waste type j (DOCj) (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.</td><td colspan="2"></td><td>fraction</td></tr>
<tr><td colspan="2">Methane generation rate for waste type j (k)</td><td colspan="2"></td><td>yr-1</td></tr>
<tr><td colspan="2">Fraction of CH_4 in generated Landfill Gas (F)</td><td colspan="2"></td><td>Volume fraction</td></tr>
<tr><td colspan="2">Amount of CH_4 recovered from SWDS in year y</td><td colspan="2"></td><td>tonnes/ yr</td></tr>
<tr><td colspan="2">Oxidation factor in year y</td><td colspan="2"></td><td>fraction</td></tr>
<tr><td colspan="2">Global warming potential of CH4</td><td colspan="2"></td><td>tCO_2e/ tCH4</td></tr>
<tr><td>Year</td><td colspan="4"></td></tr>
<tr><td>Responsible person</td><td colspan="4"></td></tr>
<tr><td>Designation</td><td colspan="4"></td></tr>
<tr><td>Signature</td><td colspan="2"></td><td>Date</td><td></td></tr>
<tr><td>Respective NDCs</td><td colspan="4">NDC 1.1: Reduce MSW generation per capita to 0.84 kg/capita/day by 2030 and maintain below ≤ 0.86 kg/capita/day by 2035 through waste management practices (especially food waste), recycling programs, and public awareness campaigns</td></tr>
</table>

Table 17: Monthly data collection template at MoE — NDC 1.1

Monthly Data Collection Template at Ministry of Environment

<table>
<tr><th>Month</th><th colspan="3">Total amount of municipal solid waste (wet weight) generated per month (Tonne)</th></tr>
<tr><td>January</td><td colspan="3"></td></tr>
<tr><td>February</td><td colspan="3"></td></tr>
<tr><td>March</td><td colspan="3"></td></tr>
<tr><td>April</td><td colspan="3"></td></tr>
<tr><td>May</td><td colspan="3"></td></tr>
<tr><td>June</td><td colspan="3"></td></tr>
<tr><td>July</td><td colspan="3"></td></tr>
<tr><td>August</td><td colspan="3"></td></tr>
<tr><td>September</td><td colspan="3"></td></tr>
<tr><td>October</td><td colspan="3"></td></tr>
<tr><td>November</td><td colspan="3"></td></tr>
<tr><td>December</td><td colspan="3"></td></tr>
<tr><td>Annual total (tonne)</td><td colspan="3"></td></tr>
<tr><td>Year</td><td colspan="3"></td></tr>
<tr><td>Responsible person</td><td colspan="3"></td></tr>
<tr><td>Designation</td><td colspan="3"></td></tr>
<tr><td>Signature</td><td></td><td>Date</td><td></td></tr>
<tr><td>Respective NDC</td><td colspan="3">NDC 1.1: Reduce MSW generation per capita to 0.84 kg/capita/day by 2030 and maintain below ≤ 0.86 kg/capita/day by 2035 through waste management practices (especially food waste), recycling programs, and public awareness campaigns</td></tr>
</table>

NDC 1.2 — Plastic-waste limitation

Table 18: Annual data collection template at MoE — NDC 1.2

Data collection template at MoE

Parameter	Value	Unit
Fraction of population burning waste (Plastic waste)		Fraction
Per capita waste generation		kg waste/capita/day
Fraction of the waste amount that is burned relative to the total amount of waste treated		Fraction
Fraction of waste type/material of component j in the MSW (as wet weight incinerated or open-burned		Fraction
Dry matter content in the component j of the MSW incinerated or open-burned		Fraction
Fraction of carbon in the dry matter (i.e., carbon content) of component j		Fraction
Fraction of fossil carbon in the total carbon of component j		Fraction
Oxidation factor		Fraction
Aggregate CH_4 emission factor		kg CH_4/Gg of waste
N_2O emission factor		kg N_2O/Gg of waste
Year		
Responsible person		
Designation		
Signature	**Date**	
Respective NDCs	NDC 1.2: Limit the plastic waste generation to 400,000 tons per year by 2035 by enforcing a ban on Single Use Plastic (SUP) and strengthening EPR schemes.	

Table 19: Monthly data collection template at MoE — NDC 1.2

Monthly Data Collection Template at Ministry of Environment	
Month	Total amount of municipal solid waste-Plastic waste open-burned (Gg)
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
Annual total (Gg)	
Year	
Responsible person	
Designation	
Signature	Date
Respective NDC	NDC 1.2: Limit the plastic waste generation to 400,000 tons per year by 2035 by enforcing a ban on Single Use Plastic (SUP) and strengthening EPR schemes.

A.2 NDC 2 — Waste collection and segregation at source

NDC 2.3 — Open burning

Table 20: Annual data collection template at MoE — NDC 2.3

Data collection template at MoE			
Parameter		**Value**	**Unit**
Fraction of population burning waste			Fraction
Per capita waste generation			kg waste/capita/day
Fraction of the waste amount that is burned relative to the total amount of waste treated			Fraction
Fraction of waste type/material of component j in the MSW (as wet weight incinerated or open-burned			Fraction
Dry matter content in the component j of the MSW incinerated or open-burned			Fraction
Fraction of carbon in the dry matter (i.e., carbon content) of component j			Fraction
Fraction of fossil carbon in the total carbon of component j			Fraction
Oxidation factor			Fraction
Aggregate CH_4 emission factor			kg CH_4/Gg of waste
N_2O emission factor			kg N_2O/Gg of waste
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDC	NDC 2: Waste collection and segregation at source (at households, schools, markets, restaurants/hotels)		

Table 21: Monthly data collection template at MoE — NDC 2.3

Monthly Data Collection Template at Ministry of Environment			
Month	Total amount of municipal solid waste (wet weight) open-burned (Gg)		
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total (Gg)			
Year			
Responsible person			
Designation			
Signature		Date	
Respective NDC	NDC 2: Waste collection and segregation at source (at households, schools, markets, restaurants/hotels)		

Table 22: Annual data collection template at NIS — NDC 2.3

Data collection template at NIS

<table>
<tr><td colspan="2">Parameter</td><td colspan="2">Value</td><td>Unit</td></tr>
<tr><td colspan="2">Population (Country)</td><td colspan="2"></td><td>Dimensionless</td></tr>
<tr><td>Year</td><td colspan="4"></td></tr>
<tr><td>Responsible person</td><td colspan="4"></td></tr>
<tr><td>Designation</td><td colspan="4"></td></tr>
<tr><td>Signature</td><td colspan="2"></td><td>Date</td><td></td></tr>
<tr><td>Respective NDCs</td><td colspan="4">NDC 2: Waste collection and segregation at source (at households, schools, markets, restaurants/hotels)</td></tr>
</table>

A.3 NDC 3 — Organic waste processing

NDC 3.1 — Organic-waste processing

Table 23: Annual data collection template at MoE — NDC 3.1

Data collection template at MoE		
Parameter	Value	Unit
Global Warming Potential for CH_4 applicable for the year		tCO2e/tCH4
Global Warming Potential for N_2O applicable for the year		tCO2e/tN2O
Emission factor for electricity generation for source in the year		kgCO2e/kWh
Average T & D loss in the year		%
Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for the year*		Fraction
Model correction factor to account for model uncertainties for the year*		Fraction
Methane correction factor for the year*		Fraction
Amount of methane that would have to be captured and combusted in the year to comply with the prevailing regulations		tonne
Fraction of methane captured at the SWDS and flared/used		Fraction
Specific quantity of electricity consumed per tonne of waste composted*		kWh/tonne
Project emissions from fossil fuel consumption associated with composting in the year*		kgCO2/ tonne
Emission factor for fossil fuels consumed by the composting activity per tonne of waste*		kgCO2/litre of diesel
Emission factor of methane per tonne of waste composted valid for the year*		kgCH4/tonne
Emission factor of nitrous oxide per tonne of waste composted, valid for the year*		kgN2O/tonne

Oxidation factor*			fraction
Fraction of methane in the SWDS gas*			volume fraction
Fraction of degradable organic carbon in the wood waste*			weight fraction
Fraction of degradable organic carbon in the paper/cardboard waste*			weight fraction
Fraction of degradable organic carbon in the food waste*			weight fraction
Fraction of degradable organic carbon in the textile waste*			weight fraction
Decay rate for the wood waste*			1/year
Decay rate for the paper/cardboard waste*			1/year
Decay rate for the food waste*			1/year
Decay rate for the textile waste*			1/year
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 3: Increase capacities for organic waste processing		

Table 24: Monthly data collection template at MoE — NDC 3.1

Monthly Data Collection Template at the Ministry of Environment					
Month	**Amount of solid waste type j disposed of or prevented from disposal (tonnes)**				**Quantity of waste composted in year y (tonnes)**
	Food	**Wood**	**Pulp/ paper**	**Textile**	
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

Annual total			
Year			
Responsible person			
Designation			
Signature		Date	
Respective NDC	NDC 3: Increase capacities for organic waste processing		

A.4 NDC 4 — Alternative SWM processing at existing landfills

NDC 4.1 — Refuse-Derived Fuel (RDF) processing

Table 25: Summary of NDC 4.1 — baseline and project scenarios

Baseline scenario	In the absence of RDF processing facilities, fresh and old MSW continues to be disposed of primarily in landfills or dumpsites, missing opportunities for waste diversion and alternative fuel production.
Project scenario	By 2030, RDF processing facilities will be established to convert at least 200,000 tons per year of fresh or old MSW into RDF for industrial use, reducing landfill disposal and supporting fuel substitution in industry.
Methodology and assumptions	Methodology: Integrated IPCC and CDM methodologies for SWDS, incineration and heat generation

Table 26: Annual data collection template at MoE — NDC 4.1

Data collection template at MoE		
Parameter	Value	Unit
Methane Correction Factor (MCF) – Unmanaged shallow		fraction
Fraction of degradable organic carbon that can decompose (DOC_f)		fraction
Fraction of degradable organic carbon in waste type j (DOCj) (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.		fraction
Oxidation factor in year y		fraction
Global warming potential of CH_4		tCO_2e/ tCH_4
Model correction factor to account for model uncertainties		fraction
Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere		fraction
Fraction of methane in the SWDS gas (volume fraction)		volume fraction
Decay rate for the waste type		fraction
Waste composition of waste type (MSW)		fraction
Efficiency of the boiler or air heater used for heat generation in the baseline		%

CO_2 emission factor of the fossil fuel type used for heat generation by the boiler or air heater in the baseline		tCO_2/TJ
Combustion efficiency of combustor c in year y		%
Emission factor for N_2O associated with waste treatment option		t N_2O/t
Emission factor for CH_4 associated with treatment option		t CH_4/t
Global Warming Potential of nitrous oxide		tCO_2e/ tN_2O
Weighted average net calorific value of fuel in year y		GJ/t
Weighted average CO2 emission factor of fuel in year y		tCO_2/GJ

Table 27: Annual template (continued) — NDC 4.1

Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 4.1: - By 2030, to establish RDF processing facilities to convert at least 200,000 tons per year of fresh or old MSW into RDF for industrial use		

Table 28: Monthly data collection template at MoE — NDC 4.1

Monthly Data Collection Template at Ministry of Environment			
Month	MSW disposal quantity (Tonne)	Quantity of heat supplied by the project activity displacing baseline heat generation by the fossil fuel boiler or air heater (TJ)	Quantity of fuel type combusted in process (in the Project)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total (tonne)			
Year			
Responsible person			
Designation			
Signature		**Date**	

Respective NDC	NDC 4.1: - By 2030, to establish RDF processing facilities to convert at least 200,000 tons per year of fresh or old MSW into RDF for industrial use

NDC 4.2 — Waste-to-energy

Table 29: Summary of NDC 4.2 — baseline and project scenarios

Baseline scenario	In the absence of largescale waste-to-energy infrastructure, most municipal solid waste continues to be disposed of in landfills, increasing landfill dependency and associated environmental impacts.
Project scenario	By 2035, at least one large-scale waste-to-energy facility will be constructed and operational, processing 300,000 tons per year of municipal solid waste to generate electricity and significantly reduce reliance on landfilling.
Methodology and assumptions	Methodology: Integrated IPCC and CDM methodologies for SWDS, incineration and electricity generation

Table 30: Annual data collection template at MoE — NDC 4.2

Data collection template at MoE		
Parameter	Value	Unit
Methane Correction Factor (MCF) – Unmanaged shallow		fraction
Fraction of degradable organic carbon that can decompose (DOCf)		fraction
Fraction of degradable organic carbon in waste type j (DOCj) (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.		fraction
Oxidation factor in year y		fraction
Global warming potential of CH_4		tCO_2e/ tCH_4
Model correction factor to account for model uncertainties		fraction
Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere		fraction
Fraction of methane in the SWDS gas (volume fraction)		volume fraction
Decay rate for the waste type		fraction
Waste composition of waste type (MSW)		fraction
Emission factor for electricity generation for source.		tCO_2/MWh
Average technical transmission and distribution losses for providing electricity to source k in year y		%
Combustion efficiency of combustor c in year y		%
Emission factor for N_2O associated with waste treatment option		t N_2O/t

Emission factor for CH_4 associated with treatment option			t CH_4/t
Global Warming Potential of nitrous oxide			tCO_2e/ tN_2O
Weighted average net calorific value of fuel in year y			GJ/t
Weighted average CO_2 emission factor of fuel in year y			tCO_2/GJ
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 4.2: By 2035, to construct and operationalize at least one large-scale WtE facility capable of processing 300,000 tons per year of MSW to generate electricity and reduce landfill dependency.		

Table 31: Monthly data collection template at MoE — NDC 4.2

Monthly Data Collection Template at Ministry of Environment			
Month	MSW disposal quantity (Tonne)	Quantity of electricity that would be consumed by the baseline electricity consumption source (or generated Electricity quantity by the WtE facility)	Quantity of fuel type combusted in process (in the Project)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total (tonne)			
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDC	NDC 4.2: - By 2035, to construct and operationalize at least one large-scale WtE facility capable of processing 300,000 tons per year of MSW to generate electricity and reduce landfill dependency.		

NDC 4.4 — Medical waste management

Table 32: Summary of NDC 4.4 — baseline and project scenarios

Baseline scenario	Without capacity expansion, the Medical Waste Management Unit operates below the level required to manage increasing volumes of medical waste, leading to treatment bottlenecks and potential environmental and health risks (In 2021, the capacity of the Medical Waste Management Unit (MWMU) was 2 tons/day. Meanwhile the total amount of medical waste was estimated at 4 tons/day in 2021). And medical waste continues to be disposed of in landfills, increasing landfill dependency and associated environmental impacts.
Project scenario	By 2035, the capacity of the Medical Waste Management Unit will be increased to at least 8 tons per day, enabling the safe and efficient management of growing volumes of medical waste. In addition, medical waste will be utilized as feedstock for RDF processing facilities, and the resulting RDF will be used as industrial fuel, thereby reducing landfill disposal and supporting alternative fuel use.
Methodology and assumptions	Methodology: Integrated IPCC and CDM methodologies for SWDS, incineration and heat generation

Table 33: Annual data collection template at MoE — NDC 4.4

Data collection template at MoE		
Parameter	Value	Unit
Methane Correction Factor (MCF) – Unmanaged shallow		fraction
Fraction of degradable organic carbon that can decompose (DOCf		fraction
Fraction of degradable organic carbon in waste type j (DOCj) (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.		fraction
Oxidation factor in year y		fraction
Global warming potential of CH_4		tCO_2e/ tCH_4
Model correction factor to account for model uncertainties		fraction
Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere		fraction
Fraction of methane in the SWDS gas (volume fraction)		volume fraction
Decay rate for the waste type		fraction
Waste composition of waste type (Medical Waste)		fraction
Efficiency of the boiler or air heater used for heat generation in the baseline		%

CO_2 emission factor of the fossil fuel type used for heat generation by the boiler or air heater in the baseline			tCO_2/TJ
Combustion efficiency of combustor c in year y			%
Emission factor for N_2O associated with waste treatment option			t N_2O/t
Emission factor for CH_4 associated with treatment option			t CH_4/t
Global Warming Potential of nitrous oxide			tCO_2e/ tN_2O
Weighted average net calorific value of fuel in year y			GJ/t
Weighted average CO_2 emission factor of fuel in year y			tCO_2/GJ
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 4.4: By 2035, to increase the capacity of the Medical Waste Management Unit (MWMU) to at least 8 tons/day, to face the growing amount of medical waste.		

Table 34: Monthly data collection template at MoE — NDC 4.4

Monthly Data Collection Template at Ministry of Environment			
Month	Medical waste disposal quantity (Tonne)	Quantity of heat supplied by the project activity displacing baseline heat generation by the fossil fuel boiler or air heater	Quantity of fuel type combusted in process (in the Project)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total (tonne)			
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDC	NDC 4.4: By 2035, to increase the capacity of the Medical Waste Management Unit (MWMU) to at least 8 tons/day, to face the growing amount of medical waste.		

A.5 NDC 5 — Landfill management

NDC 5.1 — Controlled and sanitary landfills

Table 35: Summary of NDC 5.1 — baseline and project scenarios

Baseline scenario	Under the baseline scenario, the share of municipal solid waste disposed of at controlled and sanitary landfills remains at or near the 2024 level, with most waste continuing to be disposed of in open dumps or poorly managed sites.
Project scenario	Under the project scenario, the action will increase the share of total collected MSW disposed of at controlled and sanitary landfills to 50% by 2035.
Methodology and assumptions	Methodology: ACM0001: Flaring or use of landfill gas --- Version 19.0 Assumption: Not Applicable

Table 36: Annual data collection template at MoE — NDC 5.1

<table>
<tr><th colspan="4">Data collection template at MoE</th></tr>
<tr><td colspan="2">Parameter</td><td>Value</td><td>Unit</td></tr>
<tr><td colspan="2">Global Warming Potential for CH_4 applicable for the year</td><td></td><td>tCO_2e/tCH_4</td></tr>
<tr><td colspan="2">Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS*</td><td></td><td>Fraction (Dimensionless)</td></tr>
<tr><td colspan="2">Amount of methane in the LFG which is destroyed by flaring</td><td></td><td>tCH_4/yr</td></tr>
<tr><td colspan="2">Emission factor for electricity generation for source k in year y – Grid emissions factor</td><td></td><td>tCO_2e/MWh</td></tr>
<tr><td colspan="2">Average technical transmission and distribution losses</td><td></td><td>%</td></tr>
<tr><td colspan="2">Weighted average net calorific value of the fuel*</td><td></td><td>GJ/mass or volume unit</td></tr>
<tr><td colspan="2">Weighted average CO_2 emission factor of fuel*</td><td></td><td>tCO_2/GJ</td></tr>
<tr><td colspan="2">Amount of methane in the LFG which is sent to trucks in the year</td><td></td><td>tCH_4/yr</td></tr>
<tr><td colspan="2">Amount of methane in the LFG which is delivered to consumers using trucks in the year</td><td></td><td>tCH_4/yr</td></tr>
<tr><td colspan="2">Flare efficiency in the minute*</td><td></td><td>%</td></tr>
<tr><td colspan="2">Mass flow of methane in the residual gas in the minute</td><td></td><td>kg</td></tr>
<tr><td>Year</td><td colspan="3"></td></tr>
<tr><td>Responsible person</td><td colspan="3"></td></tr>
<tr><td>Designation</td><td colspan="3"></td></tr>
<tr><td>Signature</td><td></td><td>Date</td><td></td></tr>
<tr><td>Respective NDCs</td><td colspan="3">NDC 5.1: Increase the share of waste disposed at controlled and sanitary landfills to 50% of total collected municipal solid waste (MSW) by 2035</td></tr>
</table>

Table 37: Monthly data collection template at MoE — NDC 5.1

Monthly Data Collection Template at the Ministry of Environment			
Month	**Quantity of electricity consumed by the project, electricity consumption source (MWh)**	**Quantity of fuel type i combusted in the process (for purposes other than electricity generation) (mass or volume unit/yr)**	**Quantity of fuel type i combusted in the process (for purposes of distribution of compressed/liquefied LFG using trucks) (mass or volume unit/yr)**
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total			
Year			
Responsible person			
Designation			
Signature		Date	
Respective NDC	NDC 5.1: Increase the share of waste disposed at controlled and sanitary landfills to 50% of total collected municipal solid waste (MSW) by 2035		

NDC 5.2 — Dumpsite rehabilitation

Table 38: Summary of NDC 5.2 — baseline and project scenarios

Baseline scenario	Without intervention, existing dumpsites continue to operate with minimal upgrades, leading to ongoing environmental and health risks, and no systematic closure or rehabilitation program is implemented.
Project scenario	The National Plan for Dumpsite Closure and Transition will be launched, rehabilitating or upgrading at least two prioritized dumpsites per year, focusing on sites where controlled or sanitary landfills, or improved alternatives, are available.
Methodology and assumptions	Methodology: IPCC 4.A. Solid Waste Disposal Assumption: Not Applicable

Table 39: Annual data collection template at MoE — NDC 5.2

<table>
<tr><th colspan="4">Data collection template at MoE</th></tr>
<tr><td colspan="2">Parameter</td><td>Value</td><td>Unit</td></tr>
<tr><td colspan="2">Methane Correction Factor (MCF) – Unmanaged shallow*</td><td></td><td>Fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon that can decompose (DOCf)*</td><td></td><td>Fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon in the wood waste*</td><td></td><td>weight fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon in the paper/cardboard waste*</td><td></td><td>weight fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon in the food waste*</td><td></td><td>weight fraction</td></tr>
<tr><td colspan="2">Fraction of degradable organic carbon in the textile waste*</td><td></td><td>weight fraction</td></tr>
<tr><td colspan="2">Methane generation rate for the wood waste*</td><td></td><td>1/year</td></tr>
<tr><td colspan="2">Methane generation rate for the paper/cardboard waste*</td><td></td><td>1/year</td></tr>
<tr><td colspan="2">Methane generation rate for the food waste*</td><td></td><td>1/year</td></tr>
<tr><td colspan="2">Methane generation rate for the textile waste*</td><td></td><td>1/year</td></tr>
<tr><td colspan="2">Fraction of CH4 in generated Landfill Gas *</td><td></td><td>Volume fraction</td></tr>
<tr><td colspan="2">Oxidation factor in the year*</td><td></td><td>Fraction</td></tr>
<tr><td colspan="2">Fraction of methane captured at the SWDS and flared/used</td><td></td><td>Fraction</td></tr>
<tr><td>Year</td><td colspan="3"></td></tr>
<tr><td>Responsible person</td><td colspan="3"></td></tr>
<tr><td>Designation</td><td colspan="3"></td></tr>
<tr><td>Signature</td><td></td><td>Date</td><td></td></tr>
<tr><td>Respective NDCs</td><td colspan="3">NDC 5.2: Launch a National Plan for Dumpsite Closure and Transition, aiming to rehabilitate or upgrade at least 2 dumpsites per year</td></tr>
</table>

Table 40: Monthly data collection template at MoE — NDC 5.2

<table>
<tr><th colspan="8">Monthly Data Collection Template at the Ministry of Environment</th></tr>
<tr><td rowspan="2">Month</td><td>Municipal solid waste mass disposed of at SWDS (tonnes)</td><td colspan="5">Municipal solid waste composition of waste disposed of in SWDS (%)</td><td rowspan="2">Amount of CH_4 recovered from SWDS (tonnes)</td></tr>
<tr><td></td><td>Food</td><td>Paper</td><td>Wood</td><td>Textile</td><td>Inert</td></tr>
<tr><td>January</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							
Annual total							
Year							
Responsible person							
Designation							
Signature						Date	
Respective NDC		NDC 5.2: Launch a National Plan for Dumpsite Closure and Transition, aiming to rehabilitate or upgrade at least 2 dumpsites per year					

NDC 5.4 — MBT feasibility

Table 41: Summary of NDC 5.4 — baseline and project scenarios

Baseline scenario	Without assessing MBT technologies, waste continues to be landfilled with high organic content (As of 2024, the average organic content of landfill waste is 55%), leading to increased GHG emissions and inefficient use of landfill space.
Project scenario	A feasibility assessment of MBT technologies is conducted, aiming to implement pre-treatment that reduces the organic content of landfilled waste to below 20% by 2035, thereby lowering GHG emissions and optimizing landfill capacity.
Methodology and assumptions	Methodology: IPCC 4.A. Solid Waste Disposal Assumption: Not Applicable

Table 42: Annual data collection template at MoE — NDC 5.4

Data collection template at MoE		
Parameter	Value	Unit
Methane Correction Factor (MCF) – Unmanaged shallow*		Fraction
Fraction of degradable organic carbon that can decompose (DOCf)*		Fraction
Fraction of degradable organic carbon in the wood waste*		weight fraction

Fraction of degradable organic carbon in the paper/cardboard waste*			weight fraction
Fraction of degradable organic carbon in the food waste*			weight fraction
Fraction of degradable organic carbon in the textile waste*			weight fraction
Methane generation rate for the wood waste*			1/year
Methane generation rate for the paper/cardboard waste*			1/year
Methane generation rate for the food waste*			1/year
Methane generation rate for the textile waste*			1/year
Fraction of CH_4 in generated Landfill Gas*			Volume fraction
Oxidation factor in the year*			Fraction
Fraction of methane captured at the SWDS and flared/used			Fraction
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 5.4: Assess the feasibility of Mechanical-Biological Treatment (MBT) technologies for pre-treatment of waste prior to disposal		

Table 43: Monthly data collection template at MoE — NDC 5.4

Monthly Data Collection Template at the Ministry of Environment							
Month	**Municipal solid waste mass disposed of at SWDS (tonnes)**	**Municipal solid waste composition of waste disposed of in SWDS (Average fraction of the waste type j in the waste in month) (%)**					**Amount of CH4 recovered from SWDS (tonnes)**
		Food	**Paper**	**Wood**	**Textile**	**Inert**	
January							
February							
March							
April							
May							
June							
July							
August							

September							
October							
November							
December							
Annual total							
Year							
Responsible person							
Designation							
Signature						Date	
Respective NDC		NDC 5.4: Assess the feasibility of Mechanical-Biological Treatment (MBT) technologies for pre-treatment of waste prior to disposal					

A.6 NDC 6 — Textile waste management

NDC 6.1 — Post-industrial textile waste

Table 44: Annual data collection template at MoE — NDC 6.1

Data collection template at MoE		
Parameter	Value	Unit
Fraction of DOC that decomposes under the specific conditions occurring in the SWDS for year y		weight fraction
Amount of solid waste type j (Textile materials) disposed in the SWDS in the year x		tonne
Model correction factor to account for model uncertainties for year y		Fraction
Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y		Fraction
Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)		Fraction
Fraction of methane in the SWDS gas		Volume fraction
Methane correction factor for year y		Fraction
Fraction of degradable organic carbon in the waste type j (Textile materials)		Weight fraction
Decay rate for the waste type j (Textile materials)		1/y
Global Warming Potential for CH_4 applicable for the year		tCO2e/tCH4
Year		
Responsible person		
Designation		

Signature		**Date**	
Respective NDCs	NDC 6: Improve textile waste management capacities		

Table 45: Annual data collection template at MME — NDC 6.1

Data collection template at MME			
Parameter		Value	Unit
Material-specific electricity intensities for recycling			MWh/tonne
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 6: Improve textile waste management capacities		

Table 46: Monthly data collection template at MISTI — NDC 6.1

Monthly Data Collection Template at MISTI			
Month	Quantity of textile material recycled (tonne)		
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Annual total (tonne)			
Year			
Responsible person			
Designation			
Signature		Date	
Respective NDC	NDC 6: Improve textile waste management capacities		

A.7 NDC 7 — Industrial wastewater management

NDC 7.1 — IWW treatment coverage (GFT and leather)

Table 47: Data collection template at MoE — NDC 7.1

Data collection template at MoE			
Parameter	Value		Unit
Global Warming Potential for CH_4 applicable for the year			CO_2e
Average T & D loss			%
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 48: Data collection template at MME — NDC 7.1

Data collection template at MME			
Parameter	Value		Unit
Quantity of fuel type i combusted in wastewater treatment			kg
Weighted average net calorific value of the fuel type i in year y			GJ/kg
Weighted average CO_2 emission factor of fuel type i			tCO_2/GJ
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 49: Data collection template at EDC — NDC 7.1

Data collection template at EDC		
Parameter	Value	Unit
Quantity of electricity consumed by project activity in the respective year		MWh/yr
Emission factor for electricity		$t\ CO_2/MWh$
Year		

Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 50: Data collection template at MISTI — NDC 7.1

Data collection template at MISTI		
Parameter	Value	Unit
Total volume of wastewater generated for the respective industry sector		m^3/yr
Percentage of wastewater treated in the respective year from project activity for the respective industry		%
Chemical Oxygen Demand (untreated)		kg COD/m^3
Chemical Oxygen Demand (treated)		kg COD/m^3
Sludge removed in the respective industry (only if applicable)		kg COD/yr
Maximum CH_4 producing capacity (untreated)		kg CH_4/kg COD
Maximum CH_4 producing capacity (treated)		kg CH_4/kg COD
Methane correction factor (Untreated)		Fraction
Methane correction factor (treated)		Fraction
Methane recovered (only if applicable)		kg CH_4
Year		
Responsible person		
Designation		
Signature		**Date**
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management	

NDC 7.2 — Biogas-producing IWW treatment plants

Table 51: Data collection template at MoE — NDC 7.2

Data collection template at MoE		
Parameter	Value	Unit
Global Warming Potential for CH_4 applicable for the year		CO_2e
Average T & D loss		%
Year		

Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 52: Data collection template at MME — NDC 7.2

Data collection template at MME			
Parameter	Value		Unit
Quantity of fuel type i combusted in wastewater treatment			kg
Weighted average net calorific value of the fuel type i in year y			GJ/kg
Weighted average CO_2 emission factor of fuel type i			tCO_2/GJ
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 53: Data collection template at EDC — NDC 7.2

Data collection template at EDC			
Parameter	Value		Unit
Quantity of electricity consumed by project activity in the respective year			MWh/yr
Emission factor for electricity			$t\ CO_2/MWh$
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Table 54: Data collection template at MISTI — NDC 7.2

Data collection template at MISTI		
Parameter	Value	Unit
Total volume of wastewater generated for the respective industry sector in the respective year		m^3/yr

Percentage of wastewater treated by the plants that produce biogas for the respective year			%
Chemical Oxygen Demand (treated)			kg COD/m^3
Sludge removed in the respective industry (only if applicable)			kg COD/yr
Maximum CH_4 producing capacity (treated)			kg CH_4/kg COD
Methane correction factor (treated)			Fraction
Methane recovered in the baseline (only if applicable)			kg CH_4
Biogas recovered in respective industrial sector in respective year, due to the project activity			kg CH_4
Year			
Responsible person			
Designation			
Signature		**Date**	
Respective NDCs	NDC 7: Industrial Wastewater (IWW) management		

Annex B — Parameter monitoring protocols (IPCC and CDM)

The protocols below specify, for every parameter used in the GHG-impact assessment of each measure, the data unit, source, measurement procedure, monitoring frequency, QA/QC requirement and purpose, following the IPCC 2006 Guidelines and 2019 Refinement and the applicable CDM methodologies. They are migrated unchanged from the previous consolidated report and from the initial ClimateSI version.

B.1 NDC 1 — Solid waste reduction and pollution control

Table 55: Parameter monitoring protocol — DOCf,default (NDC 1)

Data / Parameter:	$DOC_{f,default}$
Data unit:	Weight fraction
Description:	Fraction of DOC that decomposes under the specific conditions occurring in the SWDS for year y
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	
QA/QC procedures:	-
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS.

Table 56: Parameter monitoring protocol — Wx or Wi (NDC 1)

Data / Parameter:	W_x or W_i
Data unit:	tonne
Description:	Amount of solid waste type j disposed in the SWDS in the year x
Source of data:	Measurements by project participants

Measurement procedures (if any):	Measure on wet basis
Monitoring frequency:	Monthly
QA/QC procedures:	-
Any comment:	-

Table 57: Parameter monitoring protocol — φdefault (NDC 1)

Data / Parameter:	$\varphi_{default}$
Data unit:	Fraction
Description:	Model correction factor (default) to account for model uncertainties for year y
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 58: Parameter monitoring protocol — fy (NDC 1)

Data / Parameter:	f_y
Data unit:	Fraction
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Table 59: Parameter monitoring protocol — OX (NDC 1)

Data / Parameter:	OX
Data unit:	Fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	Annually

QA/QC procedures:	-
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2 This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Table 60: Parameter monitoring protocol — F (NDC 1)

Data / Parameter:	F
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Table 61: Parameter monitoring protocol — MCFdefault (NDC 1)

Data / Parameter:	$MCF_{default}$
Data unit:	Fraction
Description:	Methane correction factor for year y
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	MCF accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS. In case of a water table above the bottom of the SWDS, a larger proportion of the SWDS is anaerobic and MCF shall be estimated according to equation 12 in CDM Tool 4.

Table 62: Parameter monitoring protocol — DOCj (NDC 1)

Data / Parameter:	DOC_j
Data unit:	Fraction
Description:	Fraction of degradable organic carbon in the waste type j
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-

Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS.

Table 63: Parameter monitoring protocol — kj (NDC 1)

Data / Parameter:	k_j
Data unit:	1/yr
Description:	Decay rate for the waste type j
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 64: Parameter monitoring protocol — GWPCH4 (NDC 1)

Data / Parameter:	GWP_{CH4}
Data unit:	t CO_2e/t CH_4
Description:	Global Warming Potential for CH_4 applicable for the year
Source of data:	IPCC Assessment Reports
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 65: Parameter monitoring protocol — Material-specific electricity intensities for recycling (NDC 1)

Data / Parameter:	Material-specific electricity intensities for recycling
Data unit:	MWh/tonne
Description:	Material-specific electricity intensities for recycling
Source of data:	• Life Cycle Assessment (LCA) studies • Industry reports and technical studies • Recycling facility operational records
Measurement procedures (if any):	Determined from facility electricity consumption records divided by quantity of specific material recycled: **Material-specific electricity intensity = Total electricity consumed / Total material (specific) recycled**
Monitoring frequency:	Update periodically when technology, equipment, or operational practices change
QA/QC procedures:	• Cross-check electricity consumption data against utility bills and facility logs • Compare values with national or international benchmarks
Any comment:	-

Table 66: Parameter monitoring protocol — Quantity of textile material recycled (NDC 1)

Data / Parameter:	Quantity of textile material recycled
Data unit:	tonne

Description:	Quantity of textile material recycled
Source of data:	• Recycling facility operational records • Municipal and National Waste Management Authorities • Textile collection and recovery organizations
Measurement procedures (if any):	• Determine from measured quantities of textiles entering recycling facilities: **Quantity Recycled = Total textile waste collected for recycling − Rejects/disposal losses** • Quantities measured using weighbridges, calibrated scales
Monitoring frequency:	Monthly
QA/QC procedures:	• Cross-check facility records with national waste statistics and collection reports • Ensure no double counting between reuse, recycling, and disposal streams
Any comment:	-

Table 67: Parameter monitoring protocol — EFEL,j,y (NDC 1)

Data / Parameter:	$EF_{EL,j,y}$
Data unit:	tCO_2/MWh
Description:	Grid emission factor
Source of data:	• Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" • Ministry of Mines and Energy and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	• Compare historical trends and regional benchmarks
Any comment:	-

Table 68: Parameter monitoring protocol — TDLj,y (NDC 1)

Data / Parameter:	$TDL_{j,y}$
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to source k in year y
Source of data:	• Ministry of Mines and Energy and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	• Compare historical trends and regional benchmarks
Any comment:	-

Table 69: Parameter monitoring protocol — MSW (NDC 1)

Data / Parameter:	MSW
Data unit:	Gg/year
Description:	Total amount of municipal solid waste (Plastic waste), open burned

Source of data:	• National/local waste management authorities (municipal councils, urban development authorities) • National Statistics Offices (waste generation datasets) • Environmental agencies (solid waste inventories) • Field surveys and household questionnaires
Measurement procedures (if any):	• Identify active open burning locations (dumpsites, community burning spots) • Record truck weights (full vs empty) of waste carrying trucks using weighbridges • Track proportion of waste that is burned onsite
Monitoring frequency:	Monthly
QA/QC procedures:	• Cross-check MSW generation data with multiple sources (municipal records vs national statistics) • Apply consistency checks across time series (trend analysis) • Use default values from IPCC only where country-specific data is unavailable
Any comment:	Open burning is often underreported due to informal practices

Table 70: Parameter monitoring protocol — P (NDC 1)

Data / Parameter:	P
Data unit:	Number of people (capita)
Description:	Population Total resident population within the national geographic boundary for a given year. Includes all individuals regardless of age or gender,
Source of data:	• National statistics office (censuses and intercensal estimates) • National demographic surveys • International databases (e.g., the World Bank)
Measurement procedures (if any):	• Population derived from national census data • Interpolation/extrapolation applied between census years
Monitoring frequency:	Annually (using official estimates)
QA/QC procedures:	• Cross-check population figures with multiple official sources (census vs administrative records) • Verify consistency with historical trends and demographic indicators (growth rates, fertility rates)
Any comment:	Population is a key driver for estimating waste generation and emissions

Table 71: Parameter monitoring protocol — Pfrac (NDC 1)

Data / Parameter:	P_{frac}
Data unit:	Fraction
Description:	Fraction of population burning waste
Source of data:	• Household surveys • National statistics office datasets • Academic and research studies
Measurement procedures (if any):	• Derived from survey data: **Fraction burning = (Number of households practicing open burning) / (Total households surveyed)** • Default values from IPCC may be used if country-specific data is not available
Monitoring frequency:	Annually

QA/QC procedures:	- Compare with similar countries or regional benchmarks for plausibility - Ensure consistency across time series (avoid sudden unrealistic changes)
Any comment:	This parameter is often highly uncertain due to informal practices

Table 72: Parameter monitoring protocol — MSWP (NDC 1)

Data / Parameter:	MSW_P
Data unit:	kg waste/capita/day
Description:	Daily per capita waste generation
Source of data:	- National/local waste management authorities (municipal records) - Field measurements - Research studies and academic publications
Measurement procedures (if any):	- Direct measurement through waste sampling and weighing campaigns (household or facility level) and Calculate using: **Per capita waste = Total MSW generated / Total population / 365 days** - Use of default values from IPCC where country-specific data is unavailable
Monitoring frequency:	Annually
QA/QC procedures:	- Cross-check measured values with municipal collection data - Compare with regional/international benchmarks
Any comment:	- Highly sensitive to income level, urbanization, and consumption patterns - Urban areas generally have higher per capita waste generation

Table 73: Parameter monitoring protocol — Bfrac (NDC 1)

Data / Parameter:	B_{frac}
Data unit:	Fraction
Description:	Fraction of the waste amount that is burned relative to the total amount of waste treated
Source of data:	- National/local waste management authorities (municipal records) - Facility-level data (dumpsites, disposal sites) - Academic and research studies
Measurement procedures (if any):	- Derived using the equation: **Fraction burned = Amount of waste burned / Total waste treated**
Monitoring frequency:	Annually
QA/QC procedures:	- Cross-check treatment data with national waste balances (generation vs treatment) - Validate burned waste estimates using multiple approaches (top-down vs bottom-up) - Compare with regional/international benchmarks
Any comment:	-

Table 74: Parameter monitoring protocol — WFj (NDC 1)

Data / Parameter:	WF_j
Data unit:	Fraction

Description:	Fraction of waste type/material of component j in the MSW (as wet weight incinerated or open-burned)
Source of data:	• National/local waste management authorities (municipal records) • Academic and research studies
Measurement procedures (if any):	• Sampling conducted at representative sites (households, transfer stations, disposal/burning sites) • Default composition values from IPCC may be used where country-specific data is unavailable
Monitoring frequency:	Annually or Review and update periodically
QA/QC procedures:	• Ensure representativeness of sampling (geographic, seasonal, socio-economic coverage) • Cross-check composition with national/regional benchmarks
Any comment:	Composition varies significantly by income level, consumption patterns, and region

Table 75: Parameter monitoring protocol — dmj (NDC 1)

Data / Parameter:	dm_j
Data unit:	Fraction
Description:	Dry matter content in the component j of the MSW incinerated or open-burned
Source of data:	• Local waste composition studies • Default values from IPCC guidelines where country-specific data is unavailable • Academic and research studies
Measurement procedures (if any):	• Determine through laboratory analysis
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Calibrate laboratory equipment and follow standardized drying protocols • Cross-check with default/reference values from IPCC
Any comment:	-

Table 76: Parameter monitoring protocol — CFi (NDC 1)

Data / Parameter:	CF_i
Data unit:	Fraction
Description:	Fraction of carbon in the dry matter (i.e., carbon content) of component j
Source of data:	• Laboratory analysis of waste samples • Default values from IPCC guidelines • Academic and research studies
Measurement procedures (if any):	• Determined through laboratory elemental analysis • Use IPCC default carbon content values if country-specific data is unavailable
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Calibration of laboratory instruments • Cross-check with default/reference values from IPCC
Any comment:	-

Table 77: Parameter monitoring protocol — FCFi (NDC 1)

Data / Parameter:	FCF_i
Data unit:	Fraction

Description:	Fraction of fossil carbon in the total carbon of component j
Source of data:	• Waste composition studies • Academic and research studies • Default values from IPCC guidelines
Measurement procedures (if any):	• Determine based on material composition • Use default values from IPCC where direct measurement is unavailable
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Cross-check with IPCC default values and literature benchmarks • Perform time-series consistency checks
Any comment:	-

Table 78: Parameter monitoring protocol — OFi (NDC 1)

Data / Parameter:	OF_i
Data unit:	Fraction
Description:	Oxidation factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Verify consistency with IPCC-recommended default values
Any comment:	-

Table 79: Parameter monitoring protocol — EFi (NDC 1)

Data / Parameter:	EF_i
Data unit:	kg CH_4/Gg of waste
Description:	Aggregate CH_4 emission factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Verify consistency with IPCC-recommended default values
Any comment:	-

Table 80: Parameter monitoring protocol — EFi (NDC 1)

Data / Parameter:	EF_i
Data unit:	kg N_2O/Gg of waste
Description:	N_2O emission factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	Verify consistency with IPCC-recommended default values

Any comment:	-

B.2 NDC 2 — Waste collection and segregation at source

Table 81: Parameter monitoring protocol — MSW (NDC 2)

Data / Parameter:	MSW
Data unit:	Gg/year
Description:	Total amount of municipal solid waste as wet weight, open burned
Source of data:	• National/local waste management authorities (municipal councils, urban development authorities) • National Statistics Offices (waste generation datasets) • Environmental agencies (solid waste inventories) • Field surveys and household questionnaires
Measurement procedures (if any):	• Identify active open burning locations (dumpsites, community burning spots) • Record truck weights (full vs empty) of waste carrying trucks using weighbridges • Track proportion of waste that is burned onsite
Monitoring frequency:	Monthly
QA/QC procedures:	• Cross-check MSW generation data with multiple sources (municipal records vs national statistics) • Apply consistency checks across time series (trend analysis) • Use default values from IPCC only where country-specific data is unavailable
Any comment:	Open burning is often underreported due to informal practices

Table 82: Parameter monitoring protocol — P (NDC 2)

Data / Parameter:	P
Data unit:	Number of people (capita)
Description:	Population Total resident population within the defined geographic boundary (national, regional, or municipal level) for a given year. Includes all individuals regardless of age or gender,
Source of data:	• National statistics office (censuses and intercensal estimates) • National demographic surveys • International databases (e.g., the World Bank)
Measurement procedures (if any):	• Population derived from national census data • Interpolation/extrapolation applied between census years
Monitoring frequency:	Annually (using official estimates)
QA/QC procedures:	• Cross-check population figures with multiple official sources (census vs administrative records) • Verify consistency with historical trends and demographic indicators (growth rates, fertility rates)
Any comment:	Population is a key driver for estimating waste generation and emissions

Table 83: Parameter monitoring protocol — Pfrac (NDC 2)

Data / Parameter:	P_{frac}
Data unit:	Fraction

Description:	Fraction of population burning waste
Source of data:	• Household surveys • National statistics office datasets • Academic and research studies
Measurement procedures (if any):	• Derived from survey data: **Fraction burning = (Number of households practicing open burning) / (Total households surveyed)** • Default values from IPCC may be used if country-specific data is not available
Monitoring frequency:	Annually
QA/QC procedures:	• Compare with similar countries or regional benchmarks for plausibility • Ensure consistency across time series (watch for sudden unrealistic changes)
Any comment:	This parameter is often highly uncertain due to informal practices

Table 84: Parameter monitoring protocol — MSWP (NDC 2)

Data / Parameter:	MSW_P
Data unit:	kg waste/capita/day
Description:	Per capita waste generation
Source of data:	• National/local waste management authorities (municipal records) • Field measurements • Research studies and academic publications
Measurement procedures (if any):	• Direct measurement through waste sampling and weighing campaigns (household or facility level) and Calculate using: **Per capita waste = Total MSW generated / Total population / 365 days** • Use of default values from IPCC where country-specific data is unavailable
Monitoring frequency:	Annually
QA/QC procedures:	• Cross-check measured values with municipal collection data • Compare with regional/international benchmarks
Any comment:	• Highly sensitive to income level, urbanization, and consumption patterns • Urban areas generally have higher per capita waste generation

Table 85: Parameter monitoring protocol — Bfrac (NDC 2)

Data / Parameter:	B_{frac}
Data unit:	Fraction
Description:	Fraction of the waste amount that is burned relative to the total amount of waste treated
Source of data:	• National/local waste management authorities (municipal records) • Facility-level data (dumpsites, disposal sites) • Academic and research studies
Measurement procedures (if any):	• Derived using the equation: **Fraction burned = Amount of waste burned / Total waste treated**
Monitoring frequency:	Annually

QA/QC procedures:	• Cross-check treatment data with national waste balances (generation vs treatment) • Validate burned waste estimates using multiple approaches (top-down vs bottom-up) • Compare with regional/international benchmarks
Any comment:	-

Table 86: Parameter monitoring protocol — WFj (NDC 2)

Data / Parameter:	WF_j
Data unit:	Fraction
Description:	Fraction of waste type/material of component j in the MSW (as wet weight incinerated or open-burned
Source of data:	• National/local waste management authorities (municipal records) • Academic and research studies
Measurement procedures (if any):	• Sampling conducted at representative sites (households, transfer stations, disposal/burning sites) • Default composition values from IPCC may be used where country-specific data is unavailable
Monitoring frequency:	Annually or Review and update periodically
QA/QC procedures:	• Ensure representativeness of sampling (geographic, seasonal, socio-economic coverage) • Cross-check composition with national/regional benchmarks
Any comment:	Composition varies significantly by income level, consumption patterns, and region

Table 87: Parameter monitoring protocol — dmj (NDC 2)

Data / Parameter:	dm_j
Data unit:	Fraction
Description:	Dry matter content in the component j of the MSW incinerated or open-burned
Source of data:	• Local waste composition studies • Default values from IPCC guidelines where country-specific data is unavailable • Academic and research studies
Measurement procedures (if any):	• Determine through laboratory analysis
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Calibrate laboratory equipment and follow standardized drying protocols • Cross-check with default/reference values from IPCC
Any comment:	-

Table 88: Parameter monitoring protocol — CFi (NDC 2)

Data / Parameter:	CF_i
Data unit:	Fraction
Description:	Fraction of carbon in the dry matter (i.e., carbon content) of component j
Source of data:	• Laboratory analysis of waste samples • Default values from IPCC guidelines • Academic and research studies
Measurement procedures (if any):	• Determined through laboratory elemental analysis

	• Use IPCC default carbon content values if country-specific data is unavailable
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Calibration of laboratory instruments • Cross-check with default/reference values from IPCC
Any comment:	-

Table 89: Parameter monitoring protocol — FCFi (NDC 2)

Data / Parameter:	FCF_i
Data unit:	Fraction
Description:	Fraction of fossil carbon in the total carbon of component j
Source of data:	• Waste composition studies • Academic and research studies • Default values from IPCC guidelines
Measurement procedures (if any):	• Determine based on material composition • Use default values from IPCC where direct measurement is unavailable
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Cross-check with IPCC default values and literature benchmarks • Perform time-series consistency checks
Any comment:	-

Table 90: Parameter monitoring protocol — OFi (NDC 2)

Data / Parameter:	OF_i
Data unit:	Fraction
Description:	Oxidation factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Verify consistency with IPCC-recommended default values
Any comment:	-

Table 91: Parameter monitoring protocol — EFi (NDC 2)

Data / Parameter:	EF_i
Data unit:	kg CH_4/Gg of waste
Description:	Aggregate CH_4 emission factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Verify consistency with IPCC-recommended default values
Any comment:	-

Table 92: Parameter monitoring protocol — EFi (NDC 2)

Data / Parameter:	EF_i
Data unit:	kg N_2O/Gg of waste
Description:	N_2O emission factor
Source of data:	• Default values from IPCC Guidelines • Academic and research studies
Measurement procedures (if any):	• Typically estimated using default values recommended by IPCC
Monitoring frequency:	Review and update periodically
QA/QC procedures:	• Verify consistency with IPCC-recommended default values
Any comment:	-

B.3 NDC 3 — Organic waste processing

Table 93: Parameter monitoring protocol — φdefault (NDC 3)

<table>
<tr><td>Data / Parameter:</td><td>$\varphi_{default}$</td></tr>
<tr><td>Data unit:</td><td>Fraction</td></tr>
<tr><td>Description:</td><td>Default value for the model correction factor to account for model uncertainties</td></tr>
<tr><td>Source of data:</td><td>CDM Methodological tool- SWDS</td></tr>
<tr><td>Measurement procedures (if any):</td><td>For project or leakage emissions: φdefault = 1. For baseline emissions: refer to the table below to identify the appropriate factor based on the application of the tool (A or B) and the climate where the SWDS is located
Default values for the model correction factor
<table>
<tr><td></td><td>Humid/wet conditions</td><td>Dry conditions</td></tr>
<tr><td>Application A</td><td>0.75</td><td>0.75</td></tr>
<tr><td>Application B</td><td>0.85</td><td>0.80</td></tr>
</table></td></tr>
<tr><td>Monitoring frequency:</td><td>Annually</td></tr>
<tr><td>QA/QC procedures:</td><td>NA</td></tr>
<tr><td>Any comment:</td><td>This table is applicable to Option 1 in the procedure “Determining the model correction factor (φy)”</td></tr>
</table>

Table 94: Parameter monitoring protocol — OX (NDC 3)

Data / Parameter:	OX
Data unit:	fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data:	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value : 0.1
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2 This should be distinguished from the methane correction factor

	(MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Table 95: Parameter monitoring protocol — F (NDC 3)

Data / Parameter:	F
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Table 96: Parameter monitoring protocol — DOCf (NDC 3)

Data / Parameter:	DOC_f
Data unit:	fraction
Description:	Fraction of degradable organic carbon that can decompose
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can only be used for: (a) Application A; or (b) Application B if the tool is applied to MSW. An alternative to using the default factor is to estimate DOCf,y or DOCf,m using equations (9), (10) and (11) in the CDM Methodological tool: Emissions from solid waste disposal site.

Table 97: Parameter monitoring protocol — MCF (NDC 3)

Data / Parameter:	MCF
Data unit:	fraction
Description:	Methane Correction Factor (MCF) – Unmanaged shallow
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	In cases where the SWDS does not have a water table above the bottom of the site, and Application A is applied, a value of 0.4 shall be selected for unmanaged shallow solid waste disposal sites (SWDS) or stockpiles considered as SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than five meters. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)
Monitoring frequency:	Annually
QA/QC procedures:	NA

Any comment:	MCF accounts for the fact that unmanaged SWDS produce less methane than managed SWDS because a larger fraction of waste decomposes aerobically. Where a water table exists above the bottom of the SWDS, MCF shall be estimated using equation (12) in tool 4.

Table 98: Parameter monitoring protocol — DOCj (NDC 3)

Data / Parameter:	DOC_j
Data unit:	%
Description:	Fraction of degradable organic carbon in type of waste (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)

Table 99: Parameter monitoring protocol — For MSW, the following values for different waste types j sh (NDC 3)

<table>
<tr>
<td>Measurement procedures (if any):</td>
<td>
For MSW, the following values for different waste types j should be applied:
Default values for DOCj
<table>
<tr><th>Waste type j</th><th>DOC_j (% wet waste)</th></tr>
<tr><td>Wood and wood products</td><td>43</td></tr>
<tr><td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr>
<tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr>
<tr><td>Textiles</td><td>24</td></tr>
<tr><td>Garden, yard and park waste</td><td>20</td></tr>
<tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr>
</table>
For the following residual waste types, project participants may use or derive default values, as follows:
a) For empty fruit bunches (EFB), as their characteristics are similar to garden waste, the value for garden, yard and park waste in the table above may be used as a default
b) For industrial sludge, either a value of 9 per cent (% wet sludge) may be used as a default assuming an organic dry matter content of 35 percent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 9 * (% organic dry matter content/35);
c) For domestic sludge, either a value of 5 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 10 per cent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 5 * (% organic dry matter content/10).
If a waste type is not comparable to MSW and cannot clearly be described as a combination of waste types in the table above or if a default value is not available or if the project participants wish to measure DOCj, then project participants should measure DOCj in an ignition loss test according to the procedure in EN 15169 or similar national or international standards. This measurement is only required once for each waste type j and the value determined for DOCj remains valid during the crediting period
</td>
</tr>
</table>

Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	The procedure for the ignition loss test is described in BS EN 15169:2007 Characterization of waste – Determination of loss on ignition in waste, sludge and sediments. The percentages listed in table above are based on wet waste basis which are concentrations in the waste as it is delivered to the SWDS. The IPCC Guidelines also specify DOC values on a dry waste basis, which are the concentrations after complete removal of all moist from the waste, which is not believed to be practical for this situation

Table 100: Parameter monitoring protocol — kj (NDC 3)

Data / Parameter:	k_j
Data unit:	1/yr
Description:	Decay rate for the waste type j
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)

Table 101: Parameter monitoring protocol — Apply the following default values for the different waste t (NDC 3)

Measurement procedures (if any):	Apply the following default values for the different waste types j: **Default values for the decay rate (kj)**

		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)	
		Dry (MAP/ PET	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP > 1000 mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40

Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references.

Table 102: Parameter monitoring protocol — GWPCH4 (NDC 3)

Data / Parameter	$GWPCH_4$
Data unit	t CO_2e/t CH_4
Description	Global Warming Potential of methane
Source of data	IPCC
Value to be applied	Global warming potential of methane valid for the relevant commitment period.
Monitoring frequency	Annually
QA/QC procedures	–
Comment	–

Table 103: Parameter monitoring protocol — fy (NDC 3)

Data / Parameter	fy
Data unit	–
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available); and (b) historic data on the amount captured.
Measurement procedures	–
Monitoring frequency	For Application A: Once for the crediting period (fy = f) For Application B: Annually
QA/QC procedures	–
Comment	–

Table 104: Parameter monitoring protocol — Wi (NDC 3)

Data / Parameter	Wi
Data unit	tonnes
Description	Total amount of waste disposed in a SWDS in year x or month i
Source of data	Measurements by project participants
Measurement procedures	Measure on wet basis
Monitoring frequency	Continuously, aggregated at least annually for year x or monthly for month i
QA/QC procedures	–
Comment	For Application B

Table 105: Parameter monitoring protocol — EFgrid,CM,y (NDC 3)

Data / Parameter	EFgrid,CM,y
Data unit	t CO_2/MWh
Description	Combined margin emission factor for the grid in year y (Emission factor for electricity generation for source in the year)
Source of data	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any)	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency	Annually
QA/QC procedures	As per the "Tool to calculate the emission factor for an electricity system"
Any comment	Only applicable to scenarios A and C (cases C.I and C.III)

Table 106: Parameter monitoring protocol — TDLj,y (NDC 3)

Data / Parameter	TDLj,y
Data unit	—
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Options: (1) Annual average value based on most recent host country data; (2) Default 20% for project/leakage sources or baseline sources where project+leakage consumption > baseline consumption; (3) Default 3% for baseline sources or project/leakage where baseline consumption > project+leakage consumption. For Scenarios B and C.II, assume TDL = 0.
Measurement procedures (if any)	TDLj,y should be estimated for the distribution and transmission networks of the electricity grid at the same voltage as the CDM project activity connection point. Technical losses only — no commercial losses/theft. Can be calculated by project participants or based on utility/network operator references.
Monitoring frequency	Annually. In the absence of data from the relevant year, use most recent figures (not older than 5 years).
QA/QC procedures	
Any comment	

Table 107: Parameter monitoring protocol — EFCH4,default (NDC 3)

Data / Parameter	EFCH4,default
Data unit	t CH_4 / tonne of waste composted
Description	Default emission factor of methane per tonne of waste composted (wet basis)
Source of data	The emission factor was selected based on studying published results of emission measurements from composting facilities, literature reviews on the subject and published emission factors. Data from recent, high quality sources was analysed and a value conservatively selected from the higher end of the range in results.
Value to be applied	0.002
Comment	Applicable to Option 2 in the step "Determination of methane and nitrous oxide emissions from the composting process"

Table 108: Parameter monitoring protocol — EFN2O,default (NDC 3)

Data / Parameter	EFN2O,default
Data unit	t N_2O / tonne of waste composted

Description	Default emission factor of nitrous oxide per tonne of waste composted (wet basis)
Source of data	The emission factor was selected based on studying published results of emission measurements from composting facilities, literature reviews on the subject and published emission factors. Data from recent, high quality sources was analyzed and a value conservatively selected from the higher end of the range in results.
Value to be applied	0.0002
Comment	Applicable to Option 2 in the step "Determination of methane and nitrous oxide emissions from the composting process"

Table 109: Parameter monitoring protocol — SECcomp,default (NDC 3)

Data / Parameter	SECcomp,default
Data unit	MWh / t
Description	Default value for the specific quantity of electricity consumed per tonne of waste composted
Source of data	Based on a review of information from relevant validation reports of CDM projects
Value to be applied	0.01
Comment	Applicable to the step "Determination of project emissions from electricity consumption (PEEC,y)"

Table 110: Parameter monitoring protocol — EFFC,default (NDC 3)

Data / Parameter	EFFC,default
Data unit	t CO_2 / t
Description	Default emission factor for fossil fuel consumed by the composting activity per tonne of waste composted (wet basis)
Source of data	Based on a review of fossil fuel consumption per tonne of waste composed in relevant validation reports of CDM projects and using a conservative default emission factor for diesel (from the 2006 IPCC Guidelines)
Value to be applied	0.0207
Comment	Applicable to Option 2 in the step "Determination of project emissions from fossil fuel consumption (PEFC,y)"

Table 111: Parameter monitoring protocol — GWPN2O (NDC 3)

Data / Parameter	GWPN2O
Data unit	t CO2e / t N_2O
Description	Global Warming Potential of N_2O
Source of data	'Standard for application of the global warming potentials to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto protocol'
Value to be applied	Shall be updated for future commitment periods according to any future COP/MOP decisions
Comment	–

Table 112: Parameter monitoring protocol — TWCOMy (NDC 3)

Data / Parameter	TWCOMy
Data unit	tonne/ yr
Description	Total quantity of waste composted in year y at the facility
Measurement procedures	Use a weighbridge or any other applicable and calibrated weighing device, e.g. belt-scales In the case of increase of capacity utilization of existing composting facilities, it is used for the calculation of the factor r

Monitoring/recording frequency	Monthly
QA/QC procedures	Weighbridge or any other applicable weighing device is subject to periodic calibration (in accordance with stipulation of the weighing device supplier)
Comment	In case the data from weighbridge or any other applicable and calibrated weighing device available on site are missing for up to 30 consecutive days within six consecutive months, one of the following options to estimate quantity of waste composted can be applied: (a) Option 2 from the step "Determination of the quantity of waste composted"; (b) The highest value of the parameter for the same calendar period of the previous years. These options are applicable for project activities or PoAs, where end users of the subsystems or measures are households/communities/small and medium enterprises (SMEs).

B.4 NDC 4 — Alternative SWM processing at existing landfills

Table 113: Parameter monitoring protocol — MCF (NDC 4)

Data / Parameter:	MCF
Data unit:	fraction
Description:	Methane Correction Factor (MCF) – Unmanaged shallow
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	In case the SWDS does not have a water table above the bottom of the SWDS and in case of application A, then select the applicable value from the following 0.4 for unmanaged-shallow solid waste disposal sites or stockpiles that are considered SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than five meters. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 114: Parameter monitoring protocol — DOCf (NDC 4)

Data / Parameter:	DOC_f
Data unit:	fraction
Description:	Fraction of degradable organic carbon that can decompose
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can only be used for: (a) Application A; or

	(b) Application B if the tool is applied to MSW. An alternative to using the default factor is to estimate DOCf,y or DOCf,m using equations (9), (10) and (11) in the CDM Methodological tool: Emissions from solid waste disposal site.

Table 115: Parameter monitoring protocol — DOCj (NDC 4)

<table>
<tr><td>Data / Parameter:</td><td>DOC_j</td></tr>
<tr><td>Data unit:</td><td>%</td></tr>
<tr><td>Description:</td><td>Fraction of degradable organic carbon in type of waste (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.</td></tr>
<tr><td>Source of data:</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)</td></tr>
<tr><td>Measurement procedures (if any):</td><td>For MSW, the following values for the different waste types j should be applied:
Default values for DOCj
<table>
<tr><th>Waste type j</th><th>DOC_j (% wet waste)</th></tr>
<tr><td>Wood and wood products</td><td>43</td></tr>
<tr><td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr>
<tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr>
<tr><td>Textiles</td><td>24</td></tr>
<tr><td>Garden, yard and park waste</td><td>20</td></tr>
<tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr>
</table>
For the following residual waste types, project participants may use or derive default values, as follows:
d) For empty fruit bunches (EFB), as their characteristics are similar to garden waste, the value for garden, yard and park waste in the table above may be used as a default
e) For industrial sludge, either a value of 9 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 35 percent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 9 * (% organic dry matter content/35);
f) For domestic sludge, either a value of 5 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 10 per cent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 5 * (% organic dry matter content/10).
If a waste type is not comparable to MSW and cannot clearly be described as a combination of waste types in the table above or if a default value is not available or if the project participants wish to measure DOCj, then project participants should measure DOCj in an ignition loss test according to the procedure in EN 15169 or similar national or international standards. This measurement is only required once for each waste type j and the value determined for DOCj remains valid during the crediting period</td></tr>
<tr><td>Monitoring frequency:</td><td>Annually</td></tr>
<tr><td>QA/QC procedures:</td><td>NA</td></tr>
</table>

Any comment:	The procedure for the ignition loss test is described in BS EN 15169:2007 Characterization of waste. Determination of loss on ignition in waste, sludge and sediments. The percentages listed in table above are based on wet waste basis which are concentrations in the waste as it is delivered to the SWDS. The IPCC Guidelines also specify DOC values on a dry waste basis, which are the concentrations after complete removal of all moist from the waste, which is not believed to be practical for this situation

Table 116: Parameter monitoring protocol — OX (NDC 4)

Data / Parameter:	OX
Data unit:	fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data:	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value : 0.1
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2 This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Table 117: Parameter monitoring protocol — GWPCH4 (NDC 4)

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/ tCH_4
Description:	Global warming potential of CH_4
Source of data:	Based on published IPCC Assessment Report
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 118: Parameter monitoring protocol — φdefault (NDC 4)

Data / Parameter:	$\varphi_{default}$
Data unit:	Fraction
Description:	Default value for the model correction factor to account for model uncertainties
Source of data:	CDM Methodological tool- SWDS
Measurement procedures (if any):	For project or leakage emissions: φdefault = 1. For baseline emissions: refer to the table below to identify the appropriate factor based on the application of the tool (A or B) and the climate where the SWDS is located Default values for the model correction factor

<table>
<tr><td></td><td><table><tr><td></td><td>Humid/wet conditions</td><td>Dry conditions</td></tr><tr><td>Application A</td><td>0.75</td><td>0.75</td></tr><tr><td>Application B</td><td>0.85</td><td>0.80</td></tr></table></td></tr>
<tr><td>Monitoring frequency:</td><td>Annually</td></tr>
<tr><td>QA/QC procedures:</td><td>NA</td></tr>
<tr><td>Any comment:</td><td>The table above is applicable to Option 1 in the procedure “Determining the model correction factor (φy)”</td></tr>
</table>

Table 119: Parameter monitoring protocol — F (NDC 4)

Data / Parameter:	F
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Table 120: Parameter monitoring protocol — fy (NDC 4)

Data / Parameter:	f_y
Data unit:	Fraction
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data:	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Measurement procedures (if any):	NA
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 121: Parameter monitoring protocol — kj (NDC 4)

<table>
<tr><td>Data / Parameter:</td><td>k_j</td></tr>
<tr><td>Data unit:</td><td>1/yr</td></tr>
<tr><td>Description:</td><td>Decay rate for the waste type j</td></tr>
<tr><td>Source of data:</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)</td></tr>
<tr><td>Measurement procedures (if any):</td><td>Apply the following default values for the different waste types j:
Default values for the decay rate (kj)<table><tr><td></td><td>Boreal and Temperate (MAT≤20°C)</td><td>Tropical (MAT>20°C)</td></tr></table></td></tr>
</table>

<table>
<tr><td rowspan="5"></td><td colspan="2"></td><td>Dry (MAP/ PET</td><td>Wet (MAP/PET >1)</td><td>Dry (MAP<1000mm)</td><td>Wet (MAP > 1000 mm)</td></tr>
<tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper, cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr>
<tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr>
<tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr>
<tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.06</td><td>0.185</td><td>0.085</td><td>0.40</td></tr>
<tr><td>Monitoring frequency:</td><td colspan="6">Annually</td></tr>
<tr><td>QA/QC procedures:</td><td colspan="6">NA</td></tr>
<tr><td>Any comment:</td><td colspan="6">Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references.</td></tr>
</table>

Table 122: Parameter monitoring protocol — μ com (NDC 4)

Data / Parameter:	μ_{com}
Data unit:	%
Description:	Combustion efficiency of combustor c in year y
Source of data:	Project participants
Measurement procedures (if any):	The source of data will be the following, in order of preference: a) Project specific data; b) Country specific data; or c) IPCC default values
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 123: Parameter monitoring protocol — EF N2O (NDC 4)

Data / Parameter:	EF_{N2O}
Data unit:	tN_2O /tonne of waste

Description:	Emission factor for N_2O associated with waste treatment option
Source of data:	- Project participants
Measurement procedures (if any):	The source of data will be the following, in order of preference: a) Project specific data; b) Country specific data; or c) IPCC default values
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 124: Parameter monitoring protocol — EF CH4 (NDC 4)

Data / Parameter:	EF_{CH4}
Data unit:	tCH_4 /tonne of waste
Description:	Emission factor for CH_4 associated with waste treatment option
Source of data:	Project participants
Measurement procedures (if any):	The source of data will be the following, in order of preference: a) Project specific data; b) Country specific data; or c) IPCC default values
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 125: Parameter monitoring protocol — GWPN2O (NDC 4)

Data / Parameter:	GWP_{N2O}
Data unit:	$tCO_2e/\ tN_2O$
Description:	Global warming potential of CH_4
Source of data:	Based on published IPCC Assessment Report
Measurement procedures (if any):	NA
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 126: Parameter monitoring protocol — NCV (NDC 4)

Data / Parameter:	NCV
Data unit:	GJ/mass or volume units
Description:	Net calorific value of fossil fuel type
Source of data:	As per the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”. When applying the tool, requirements for NCVk should be followed
Measurement procedures (if any):	As per the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 127: Parameter monitoring protocol — EF CO2 fuel (NDC 4)

Data / Parameter:	EF $_{CO2\ fuel}$
Data unit:	tCO_2/GJ
Description:	$EFCO_2$: CO_2 emission factor of the fossil fuel type
Source of data:	As per the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”
Measurement procedures (if any):	As per the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 128: Parameter monitoring protocol — Wx or Wi (NDC 4)

Data / Parameter	Wx or Wi
Data unit	tonnes
Description	Total amount of waste disposed in a SWDS in year x or month i
Source of data	Measurements by project participants
Measurement procedures	Measure on wet basis
Monitoring frequency	Continuously, aggregated at least annually for year x or monthly for month i
QA/QC procedures	–
Comment	For Application B

Table 129: Parameter monitoring protocol — Wi (NDC 4)

Data / Parameter	Wi
Data unit	tonnes
Description	Total amount of waste disposed in a SWDS in month i
Source of data	Measurements by project participants
Measurement procedures	Measure on wet basis
Monitoring frequency	Monthly
QA/QC procedures	NA
Comment	NA

Table 130: Parameter monitoring protocol — Pi (NDC 4)

Data / Parameter	P_i

Data unit	TJ
Description	Quantity of heat supplied by the project activity displacing baseline heat generation by the fossil fuel boiler or air heater
Source of data	Measurements by project participants
Measurement procedures	NA
Monitoring frequency	Monthly
QA/QC procedures	NA
Comment	NA

Table 131: Parameter monitoring protocol — Q fuel (NDC 4)

Data / Parameter	Q_{fuel}
Data unit	tonnes
Description	Quantity of fuel type combusted in process (in the Project)
Source of data	Measurements by project participants
Measurement procedures	NA
Monitoring frequency	Monthly
QA/QC procedures	NA
Comment	NA

Table 132: Parameter monitoring protocol — f (NDC 4)

Data / Parameter:	f
Data unit:	%
Description:	Waste composition of waste type (MSW)
Source of data:	Measurements by project participants
Measurement procedures (if any):	NA
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 133: Parameter monitoring protocol — μ boiler (NDC 4)

Data / Parameter:	μ_{boiler}
Data unit:	%
Description:	Efficiency of the boiler or air heater used for heat generation in the baseline
Source of data:	- Project participants
Measurement procedures (if any):	The source of data will be the following, in order of preference: a) Project specific data;

	b) Country specific data; or c) IPCC default values
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

Table 134: Parameter monitoring protocol — EF boiler (NDC 4)

Data / Parameter:	EF_{boiler}
Data unit:	tCO_2e/TJ
Description:	CO_2 emission factor of the fossil fuel type used for heat generation by the boiler or air heater in the baseline
Source of data:	- Project participants
Measurement procedures (if any):	The source of data will be the following, in order of preference: a) Project specific data; b) Country specific data; or c) IPCC default values
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	NA

135*Table 136: Parameter monitoring protocol — EC (NDC 4)*

Data / Parameter	EC
Data unit	MWh
Description	Quantity of electricity that would be consumed by the baseline electricity consumption source(or generated Electricity quantity by the WtE facility)
Source of data	Measurements by project participants
Measurement procedures	NA
Monitoring frequency	Monthly
QA/QC procedures	NA
Comment	NA

Table 137: Parameter monitoring protocol — EF grid (NDC 4)

Data / Parameter	EF_{grid}
Data unit	tCO_2e/MWh
Description	Emission factor for electricity generation for source.
Source of data	As per the latest version of the “CDM TOOL07: Tool to calculate the emission factor for an electricity system” or published country specific data
Measurement procedures	As per the latest version of the “CDM TOOL07: Tool to calculate the emission factor for an electricity system

Monitoring frequency	Annually
QA/QC procedures	NA
Comment	NA

Table 138: Parameter monitoring protocol — EF grid (NDC 4)

Data / Parameter	EF_{grid}
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to the grid to which the project building unit j in building unit category i is connected
Source of data	Country Specific Report
Measurement procedures	NA
Monitoring frequency	Annually
QA/QC procedures	NA
Comment	NA

Table 139: Parameter monitoring protocol — W medical (NDC 4)

Data / Parameter	$W_{medical}$
Data unit	tonnes
Description	Total amount of medical waste disposed in a SWDS in month i
Source of data	Measurements by project participants
Measurement procedures	Measure on wet basis
Monitoring frequency	Monthly
QA/QC procedures	NA
Comment	NA

Table 140: Parameter monitoring protocol — f (NDC 4)

Data / Parameter:	f
Data unit:	%
Description:	Waste composition of waste type (Medical waste)
Source of data:	Measurements by project participants
Measurement procedures (if any):	NA
Monitoring frequency:	Annually

QA/QC procedures:	NA
Any comment:	NA

B.5 NDC 5 — Landfill management

Table 141: Parameter monitoring protocol — OXtop_layer (NDC 5)

Data / Parameter	OXtop_layer
Data unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool "Emissions from solid waste disposal sites"
Value to be applied	0.1
Monitoring frequency	–
QA/QC procedures	–
Comment	Applicable to section 5.4.1. OXtop_layer is the fraction of the methane in the LFG that would oxidize in the top layer of the SWDS in the absence of the project activity. Under the project activity, this effect is reduced as a part of the LFG is captured and does not pass through the top layer of the SWDS. This oxidation effect is also accounted for in the methodological tool "Emissions from solid waste disposal sites". In addition, the installation of a LFG capture system may result in the suction of additional air into the SWDS. In some cases, such as with high suction pressure, the air may decrease the amount of methane generated. However, in most circumstances this effect is very small, as operators have an incentive to maintain a high methane concentration in the LFG. For these reasons, the oxidation factor shall be included in the calculation of baseline emissions whereas the effect of oxidation is, as a conservative assumption, neglected under the project activity.

Table 142: Parameter monitoring protocol — FCH4, flared,y (NDC 5)

Data / Parameter	FCH4, flared,y
Data unit	t CH_4/yr
Description	Amount of methane in the LFG which is destroyed by flaring in the year
Source of data	Information recorded by the SWDS operator
Value to be applied	–
Monitoring frequency	Annually
QA/QC procedures	–
Comment	Data can be measured and monitored using a flow meter

Table 143: Parameter monitoring protocol — EFgrid,CM,y (NDC 5)

Data / Parameter	EFgrid,CM,y
Data unit	t CO2/MWh
Description	Combined margin emission factor for the grid in year y (Emission factor for electricity generation for source in the year)
Source of data	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"

Measurement procedures (if any)	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency	Annually
QA/QC procedures	As per the "Tool to calculate the emission factor for an electricity system"
Any comment	Only applicable to scenarios A and C (cases C.I and C.III)

Table 144: Parameter monitoring protocol — TDLj,y (NDC 5)

Data / Parameter	TDLj,y
Data unit	—
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Options: (1) Annual average value based on most recent host country data; (2) Default 20% for project/leakage sources or baseline sources where project+leakage consumption > baseline consumption; (3) Default 3% for baseline sources or project/leakage where baseline consumption > project+leakage consumption. For Scenario B and C.II, assume TDL = 0.
Measurement procedures (if any)	TDLj,y should be estimated for the distribution and transmission networks of the electricity grid at the same voltage as the CDM project activity connection point. Technical losses only — no commercial losses/theft. Can be calculated by project participants or based on utility/network operator references.
Monitoring frequency	Annually. In the absence of data from the relevant year, use most recent figures (not older than 5 years).
QA/QC procedures	
Any comment	

Table 145: Parameter monitoring protocol — GWPCH4 (NDC 5)

Data / Parameter	GWPCH4
Data unit	t CO_2e/t CH_4
Description	Global Warming Potential of methane
Source of data	IPCC
Value to be applied	Global warming potential of methane valid for the relevant commitment period.
Monitoring frequency	Annually
QA/QC procedures	–
Comment	–

Table 146: Parameter monitoring protocol — NCVi,y (NDC 5)

Data / parameter	NCVi,y
Data unit	GJ per mass or volume unit
Description	Weighted average net calorific value of fuel type i in year y
Source of data	Fuel supplier invoices, measurements, regional/national default values, or IPCC default values
Measurement procedures (if any)	Measurements should follow national or international fuel standards
Monitoring frequency	For each fuel delivery or annual review depending on source
QA/QC procedures	Verify values against IPCC default uncertainty ranges
Any comment	Applicable where Option B is used

Table 147: Parameter monitoring protocol — EFCO2,i,y (NDC 5)

Data / parameter	EFCO2,i,y

Data unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Source of data	Fuel supplier invoices, measurements, regional/national default values, or IPCC default values
Measurement procedures (if any)	Measurements should follow national or international fuel standards
Monitoring frequency	For each fuel delivery or annual review depending on source
Any comment	Applicable where Option B is used

Table 148: Parameter monitoring protocol — FCH4,NG-cons,y (NDC 5)

Data / Parameter	FCH4,NG-cons,y
Data unit	t CH_4/yr
Description	Amount of methane in the LFG which is delivered to consumers using trucks in year y
Source of data	–
Measurement procedures	Determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream".
Monitoring frequency	Per batch and aggregated annually
QA/QC procedures	–
Comment	–

Table 149: Parameter monitoring protocol — FCH4,NG TR,y (NDC 5)

Data / Parameter	FCH4,NG TR,y
Data unit	t CH_4/yr
Description	Amount of methane in the LFG which is sent to trucks in year y
Source of data	–
Measurement procedures	Determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream".
Monitoring frequency	Per batch and aggregated annually
QA/QC procedures	–
Comment	–

Table 150: Parameter monitoring protocol — η,$flare$,m (NDC 5)

Data / Parameter	η,$flare$,m
Data unit	%
Description	Flare efficiency in the minute m
Source of data	–
Measurement procedures	Determined using the "Tool 06: Project emissions from flaring ".
Monitoring frequency	Annually
QA/QC procedures	–
Comment	–

Table 151: Parameter monitoring protocol — F$CH4,RG$,m (NDC 5)

Data / Parameter	F$CH4,RG$,m
Data unit	kg
Description	Mass flow of methane in the residual gas in the minute m
Source of data	–
Measurement procedures	Determined using the "Tool 06: Project emissions from flaring ".
Monitoring frequency	Annually
QA/QC procedures	–

Comment	–

Table 152: Parameter monitoring protocol — ECPJ,j,y (NDC 5)

Data / Parameter	ECPJ,j,y
Data unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Direct measurement or calculated based on measurements from more than one electricity meter
Measurement procedures (if any)	Use electricity meters installed at the electricity consumption sources.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Scenario A (grid): Meter subject to regular maintenance per supplier/grid operator/national requirements. Calibration per national standards or meter supplier/grid operator requirements. Accuracy class per supplier/grid operator/national requirements. Scenario B (captive): Calibrate every 3 years minimum; use meters with at least 0.5 accuracy class.
Any comment	No post-registration changes needed for: (a) changing meter type (analogue to electronic or vice versa, same accuracy class); (b) upgrading accuracy class; (c) changing calibration frequency within national/supplier standards; (d) changing from check meter to bi-directional meter. Missing data options: (a) conservative value based on rated capacity and 8,760 hours; (b) highest daily value × missing days (up to 7 consecutive days in 3 months); (c) highest value for same calendar period in previous years; (d) representative sample of first batch.

Table 153: Parameter monitoring protocol — FCi,j,y (NDC 5)

Data / parameter	FCi,j,y
Data unit	Mass or volume unit per year (e.g. ton/yr or m3/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Onsite measurements
Measurement procedures (if any)	Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed. Accessories such as transducers, sonar and piezoelectric devices are accepted if properly calibrated. In case of daily tanks with pre-heaters for heavy oil, calibration will be made under typical operational conditions.
Monitoring frequency	Continuously
QA/QC procedures	Cross-check metered fuel consumption quantities by annual energy balance and available purchase invoices.
Any comment	Project activities with data gaps due to meter failure may estimate fuel quantity using invoices, energy produced adjusted by efficiency, previous years' highest value, or representative sample consumption.

Table 154: Parameter monitoring protocol — OX (NDC 5)

Data / Parameter:	OX
Data unit:	fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data:	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Measurement procedures (if any):	Default value : 0.1
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2 This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Table 155: Parameter monitoring protocol — F (NDC 5)

Data / Parameter:	F
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Table 156: Parameter monitoring protocol — DOCf (NDC 5)

Data / Parameter:	DOC_f
Data unit:	fraction
Description:	Fraction of degradable organic carbon that can decompose
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	Default value: 0.5
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can only be used for: (a) Application A; or (b) Application B if the tool is applied to MSW. An alternative to using the default factor is to estimate DOCf,y or DOCf,m using equations (9), (10) and (11) in the CDM Methodological tool: Emissions from solid waste disposal site.

Table 157: Parameter monitoring protocol — MCF (NDC 5)

Data / Parameter:	MCF
Data unit:	fraction
Description:	Methane Correction Factor (MCF) – Unmanaged shallow
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	In case the SWDS does not have a water table above the bottom of the SWDS and in case of application A, then select the applicable value from the following

	0.4 for unmanaged-shallow solid waste disposal sites or stockpiles that are considered SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than five meters. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	MCF accounts for the fact that unmanaged SWDS produce less methane than managed SWDS because a larger fraction of waste decomposes aerobically. Where a water table exists above the bottom of the SWDS, MCF shall be estimated using equation (12) in tool 4.

Table 158: Parameter monitoring protocol — DOCj (NDC 5)

Data / Parameter:	DOC_j
Data unit:	%
Description:	Fraction of degradable organic carbon in type of waste (Food, Garden, Paper, Wood, Textile, inert waste (Glass, plastic, metal), etc.
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Measurement procedures (if any):	For MSW, the following values for the different waste types j should be applied: Default values for DOCj

Waste type j	**DOC_j (% wet waste)**
Wood and wood products	43
Pulp, paper and cardboard (other than sludge)	40
Food, food waste, beverages and tobacco (other than sludge)	15
Textiles	24
Garden, yard and park waste	20
Glass, plastic, metal, other inert waste	0

For the following residual waste types, project participants may use or derive default values, as follows:

a) For empty fruit bunches (EFB), as their characteristics are similar to garden waste, the value for garden, yard and park waste in the table above may be used as a default

b) For industrial sludge, either a value of 9 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 35 percent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 9 * (% organic dry matter content/35);

c) For domestic sludge, either a value of 5 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 10 per cent, or alternatively, if the percentage of organic dry matter content is known, then

	the DOC value may be calculated as follows: DOCj (% wet sludge) = 5 * (% organic dry matter content/10). If a waste type is not comparable to MSW and cannot clearly be described as a combination of waste types in the table above or if a default value is not available or if the project participants wish to measure DOCj, then project participants should measure DOCj in an ignition loss test according to the procedure in EN 15169 or similar national or international standards. This measurement is only required once for each waste type j and the value determined for DOCj remains valid during the crediting period
Monitoring frequency:	Annually
QA/QC procedures:	NA
Any comment:	The procedure for the ignition loss test is described in BS EN 15169:2007 Characterization of waste. Determination of loss on ignition in waste, sludge and sediments. The percentages listed in table above are based on wet waste basis which are concentrations in the waste as it is delivered to the SWDS. The IPCC Guidelines also specify DOC values on a dry waste basis, which are the concentrations after complete removal of all moist from the waste, which is not believed practical for this situation

Table 159: Parameter monitoring protocol — kj (NDC 5)

<table>
<tr><td>Data / Parameter:</td><td>k_j</td></tr>
<tr><td>Data unit:</td><td>1/yr</td></tr>
<tr><td>Description:</td><td>Decay rate for the waste type j</td></tr>
<tr><td>Source of data:</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)</td></tr>
<tr><td>Measurement procedures (if any):</td><td>Apply the following default values for the different waste types j:
Default values for the decay rate (kj)
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Boreal and Temperate (MAT≤20°C)</td><td colspan="2">Tropical (MAT>20°C)</td></tr>
<tr><td>Dry (MAP/PET</td><td>Wet (MAP/PET >1)</td><td>Dry (MAP< 1000mm)</td><td>Wet (MAP > 1000 mm)</td></tr>
<tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper, cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr>
<tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr>
<tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr>
</table>
</td></tr>
</table>

	Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40
Monitoring frequency:	Annually					
QA/QC procedures:	NA					
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references.					

Table 160: Parameter monitoring protocol — fy (NDC 5)

Data / Parameter	fy
Data unit	–
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available); and (b) historic data on the amount captured.
Measurement procedures	–
Monitoring frequency	For Application A: Once for the crediting period (fy = f) For Application B: Annually
QA/QC procedures	–
Comment	–

Table 161: Parameter monitoring protocol — Wi (NDC 5)

Data / Parameter	Wi
Data unit	tonnes
Description	Total amount of waste disposed in a SWDS in year x or month i
Source of data	Measurements by project participants
Measurement procedures	Measure on wet basis
Monitoring frequency	Continuously, aggregated at least annually for year x or monthly for month i
QA/QC procedures	–
Comment	For Application B

Table 162: Parameter monitoring protocol — pn,j,i (NDC 5)

Data / Parameter	pn,j,i
Data unit	–
Description	Weight fraction of the waste type j in the sample n collected during the month i

Source of data	Sample measurements by project participants
Measurement procedures	Sample the waste composition using the waste types j as provided in the tables for DOCj and kj, and weigh each waste fraction (measure on wet basis).
Monitoring frequency	Monthly
QA/QC procedures	–
Comment	This parameter only needs to be monitored for Application B and if the waste includes more than one waste type j. Sampling is not required if the waste comprises only one waste type.

B.6 NDC 6 — Textile waste management

Table 163: Parameter monitoring protocol — DOCf,default (NDC 6)

Data / Parameter:	$DOC_{f,default}$
Data unit:	Weight fraction
Description:	Fraction of DOC that decomposes under the specific conditions occurring in the SWDS for year y
Source of data:	• IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS.

Table 164: Parameter monitoring protocol — Wx or Wi (NDC 6)

Data / Parameter:	W_x or W_i
Data unit:	tonne
Description:	Amount of solid waste type j (Textile materials) disposed in the SWDS in the year x
Source of data:	Measurements by project participants
Measurement procedures (if any):	• Measure on wet basis
Monitoring frequency:	Monthly
QA/QC procedures:	-
Any comment:	-

Table 165: Parameter monitoring protocol — φdefault (NDC 6)

Data / Parameter:	$\varphi_{default}$
Data unit:	Fraction
Description:	Model correction factor (default) to account for model uncertainties for year y
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-

QA/QC procedures:	-
Any comment:	-

Table 166: Parameter monitoring protocol — fy (NDC 6)

Data / Parameter:	f_y
Data unit:	Fraction
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Table 167: Parameter monitoring protocol — OX (NDC 6)

Data / Parameter:	OX
Data unit:	Fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data:	• CDM Tool 4: Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site • IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2 This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Table 168: Parameter monitoring protocol — F (NDC 6)

Data / Parameter:	F
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-

QA/QC procedures:	-
Any comment:	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Table 169: Parameter monitoring protocol — MCFdefault (NDC 6)

Data / Parameter:	$MCF_{default}$
Data unit:	Fraction
Description:	Methane correction factor for year y
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	MCF accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS. In case of a water table above the bottom of the SWDS, a larger proportion of the SWDS is anaerobic and MCF shall be estimated according to equation 12 in CDM Tool 4.

Table 170: Parameter monitoring protocol — DOCj (NDC 6)

Data / Parameter:	DOC_j
Data unit:	Fraction
Description:	Fraction of degradable organic carbon in the waste type j (Textile materials)
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS.

Table 171: Parameter monitoring protocol — kj (NDC 6)

Data / Parameter:	k_j
Data unit:	1/yr
Description:	Decay rate for the waste type j (Textile materials)
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 172: Parameter monitoring protocol — GWPCH4 (NDC 6)

Data / Parameter:	GWP_{CH4}

Data unit:	t CO_2e/t CH_4
Description:	Global Warming Potential for CH_4 applicable for the year
Source of data:	IPCC Assessment Reports
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 173: Parameter monitoring protocol — Material-specific electricity intensities for recycling (NDC 6)

Data / Parameter:	Material-specific electricity intensities for recycling
Data unit:	MWh/tonne
Description:	Material-specific electricity intensities for recycling
Source of data:	• Life Cycle Assessment (LCA) studies • Industry reports and technical studies • Recycling facility operational records
Measurement procedures (if any):	Determined from facility electricity consumption records divided by quantity of specific material recycled: **Material-specific electricity intensity = Total electricity consumed / Total material (specific) recycled**
Monitoring frequency:	Update periodically when technology, equipment, or operational practices change
QA/QC procedures:	• Cross-check electricity consumption data against utility bills and facility logs • Compare values with national or international benchmarks
Any comment:	-

Table 174: Parameter monitoring protocol — Quantity of textile material recycled (NDC 6)

Data / Parameter:	Quantity of textile material recycled
Data unit:	tonne
Description:	Quantity of textile material recycled
Source of data:	• Recycling facility operational records • Municipal and National Waste Management Authorities • Textile collection and recovery organizations
Measurement procedures (if any):	• Determine from measured quantities of textiles entering recycling facilities: **Quantity Recycled = Total textile waste collected for recycling − Rejects/disposal losses** • Quantities measured using weighbridges, calibrated scales
Monitoring frequency:	Monthly
QA/QC procedures:	• Cross-check facility records with national waste statistics and collection reports • Ensure no double counting between reuse, recycling, and disposal streams
Any comment:	-

Table 175: Parameter monitoring protocol — FEEL,j,y (NDC 6)

Data / Parameter:	$FE_{EL,j,y}$
Data unit:	tCO_2/MWh

Description:	Grid emissions factor
Source of data:	• Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" • Energy ministries and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	• Compare historical trends and regional benchmarks
Any comment:	-

Table 176: Parameter monitoring protocol — TDLj,y (NDC 6)

Data / Parameter:	$TDL_{j,y}$
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to source k in year y
Source of data:	• Energy ministries and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	• Compare historical trends and regional benchmarks
Any comment:	-

B.7 NDC 7 — Industrial wastewater management

Table 177: Parameter monitoring protocol — Wi (NDC 7)

Data / Parameter:	Wi
Data unit:	m^3/year
Description:	Total volume of wastewater generated for the industry sector i
Source of data:	Records of respective industries on wastewater generation
Measurement procedures (if any):	• Identify entities separately that generate wastewater in their processes within the respective industry • Measure the volume of generated wastewater according to national or international standards
Monitoring frequency:	Continuously
QA/QC procedures:	• Cross-check wastewater generation data with multiple sources (Industry records vs available national statistics) • Apply consistency checks across time series (trend analysis)
Any comment:	-

Table 178: Parameter monitoring protocol — Percentage of wastewater treated in the respective year from (NDC 7)

Data / Parameter:	Percentage of wastewater treated in the respective year from the project activity
Data unit:	%
Description:	Percentage of wastewater treated in the respective year from the project activity

Source of data:	Records of respective industries on wastewater treatment Project flow meters
Measurement procedures (if any):	Derived using the equation: **Percentage of wastewater treated = Amount of wastewater treated / Total wastewater generated*100%**
Monitoring frequency:	Continuously
QA/QC procedures:	Apply consistency checks across time series (trend analysis)
Any comment:	-

Table 179: Parameter monitoring protocol — COD (NDC 7)

Data / Parameter:	COD
Data unit:	kg COD/m^3
Description:	Chemical Oxygen Demand
Source of data:	Laboratory analysis documents
Measurement procedures (if any):	Measure the COD according to national or international standards. COD is measured through representative sampling Default values from IPCC may be used if country-specific data is not available
Monitoring frequency:	Annual
QA/QC procedures:	Compare with similar countries or regional benchmarks
Any comment:	-

Table 180: Parameter monitoring protocol — Si (NDC 7)

Data / Parameter:	Si
Data unit:	kg COD/yr
Description:	Sludge removed in the respective industry i (only if applicable)
Source of data:	Operator records of wastewater treatment plants
Measurement procedures (if any):	Measure according to national or international guidelines
Monitoring frequency:	Continuously
QA/QC procedures:	Cross-check the values if there are multiple records
Any comment:	-

Table 181: Parameter monitoring protocol — B0 (NDC 7)

Data / Parameter:	B_0
Data unit:	kg CH_4/kg COD
Description:	Maximum CH_4 producing capacity
Source of data:	National industrial expert judgements and IPCC default values
Measurement procedures (if any):	Can be based on industrial expert judgements or IPCC default values if there are not any country specific values
Monitoring frequency:	Annual
QA/QC procedures:	Use default values from IPCC only where country-specific data is unavailable
Any comment:	-

Table 182: Parameter monitoring protocol — MCFdefault (NDC 7)

Data / Parameter:	$MCF_{default}$
Data unit:	Fraction
Description:	Methane correction factor for year y
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 183: Parameter monitoring protocol — Fi (NDC 7)

Data / Parameter:	Fi
Data unit:	kg CH_4
Description:	Methane recovered (only if applicable)
Source of data:	Operator logs and meter readings
Measurement procedures (if any):	Amount of methane recovered shall be monitored using continuous flow meters
Monitoring frequency:	Continuously
QA/QC procedures:	-
Any comment:	-

Table 184: Parameter monitoring protocol — GWPCH4 (NDC 7)

Data / Parameter:	GWP_{CH4}
Data unit:	t CO_2e/t CH_4
Description:	Global Warming Potential for CH_4 applicable for the year
Source of data:	IPCC Assessment Reports
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Table 185: Parameter monitoring protocol — ECPJ,j,y (NDC 7)

Data / Parameter:	$EC_{PJ,j,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity consumed by the project electricity consumption
Source of data:	Project monitoring records
Measurement procedures (if any):	Determine from facility electricity consumption records
Monitoring frequency:	Continuously
QA/QC procedures:	• Apply consistency checks across time series (trend analysis) • Cross check data obtained with multiple sources including electricity consumption data against utility bills and facility logs
Any comment:	-

Table 186: Parameter monitoring protocol — FEEL,j,y (NDC 7)

Data / Parameter:	$FE_{EL,j,y}$
Data unit:	tCO_2/MWh
Description:	Grid emissions factor
Source of data:	• Calculate the combined margin emission factor, using the procedures in the latest approved version of the “Tool to calculate the emission factor for an electricity system” • Energy ministries and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	Compare historical trends and regional benchmarks
Any comment:	-

Table 187: Parameter monitoring protocol — TDLj,y (NDC 7)

Data / Parameter:	$TDL_{j,y}$
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to source k in year y
Source of data:	• Energy ministries and regulatory authorities • National GHG inventory reports
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	Compare historical trends and regional benchmarks
Any comment:	-

Table 188: Parameter monitoring protocol — FCi,j,y (NDC 7)

Data / parameter	FCi,j,y
Data unit	Mass or volume unit per year (e.g. kg/yr or m^3/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Onsite measurements
Measurement procedures (if any)	Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed.
Monitoring frequency	Continuously
QA/QC procedures	Cross-check metered fuel consumption quantities by annual energy balance and available purchase invoices.

Any comment	Project activities with data gaps due to meter failure may estimate fuel quantity using invoices, energy produced adjusted by efficiency, previous years' highest value, or representative sample consumption.

Table 189: Parameter monitoring protocol — EFCO2,i,y (NDC 7)

Data / parameter	$EF_{CO2,i,y}$
Data unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Source of data	Fuel supplier invoices, measurements, regional/national default values, or IPCC default values
Measurement procedures (if any)	Measurements should follow national or international fuel standards
QA/QC procedures	-
Monitoring frequency	For each fuel delivery or annual review depending on source
Any comment	Applicable where Option B is used

Table 190: Parameter monitoring protocol — NCVi,y (NDC 7)

Data / parameter	$NCV_{i,y}$
Data unit	GJ/kg
Description	Weighted average net calorific value of the fuel type i in year y
Source of data	Fuel supplier invoices, measurements, regional/national default values, or IPCC default values
Measurement procedures (if any)	Measurements should be undertaken in line with national or international fuel standards
QA/QC procedures	Cross-check the values obtained to ensure whether they are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines.
Monitoring frequency	-
Any comment	-

Table 191: Parameter monitoring protocol — Percentage of wastewater treated by the plants that produce (NDC 7)

Data / Parameter:	Percentage of wastewater treated by the plants that produce biogas for the respective year due to the project activity

Data unit:	%
Description:	Percentage of wastewater treated by the plants that produce biogas for the respective year due to the project activity
Source of data:	- Records of respective industries on wastewater treatment - Project flow meters
Measurement procedures (if any):	Derived using the equation: **Percentage of wastewater treated by plants producing biogas = Amount of wastewater treated by plants that produce biogas / Total wastewater generated*100%**
Monitoring frequency:	Continuously
QA/QC procedures:	Apply consistency checks across time series (trend analysis)
Any comment:	-

Table 192: Parameter monitoring protocol — B0 (NDC 7)

Data / Parameter:	B_0
Data unit:	kg CH_4/kg COD
Description:	Maximum CH_4 producing capacity
Source of data:	National industrial expert judgements or IPCC default factors
Measurement procedures (if any):	Can be based on industrial expert judgements or IPCC default values
Monitoring frequency:	Annual
QA/QC procedures:	Use default values from IPCC only where country-specific data is unavailable
Any comment:	-

Table 193: Parameter monitoring protocol — Fi (NDC 7)

Data / Parameter:	Fi
Data unit:	kg CH_4
Description:	Biogas recovered
Source of data:	Operator logs and meter readings
Measurement procedures (if any):	Amount of methane recovered shall be monitored using continuous flow meters
Monitoring frequency:	Continuously
QA/QC procedures:	-
Any comment:	-

Table 194: Parameter monitoring protocol — ECPJ,j,y (NDC 7)

Data / Parameter:	$EC_{PJ,j,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity consumed by the project electricity consumption
Source of data:	Project monitoring records
Measurement procedures (if any):	Determine from facility electricity consumption records
Monitoring frequency:	Continuously
QA/QC procedures:	- Apply consistency checks across time series (trend analysis) - Cross check electricity consumption data against utility bills and facility logs

Any comment:	-