REURASIA
MANAGEMENT CORPORATION

Containerised anaerobic digestion for municipal organics

Specification, evidence and operating model from the Biosfair pilot, Philippines

Technical briefing for Asian Development Bank project teams · September 2026

Maxime Droit, CEO, REURASIA Management Corporation

The design problem: waste management below the scale of a landfill

1,156

of 1,634 LGUs have no access to a sanitary landfill

25,628

of 42,046 barangays have no materials recovery facility

~52%

of generated MSW is biodegradable

ADB's own assessment of Philippine SWM: investment cost and management burden are too heavy for a single small LGU, and clustered landfill schemes have foundered on siting. RA 9003 prescribes engineered landfill as final disposal; the Clean Air Act restricts incineration of municipal waste.

The question this briefing answers:

What treatment option is technically sound, financeable and operable for a municipality of 30,000 to 70,000 people, and what does a project team need to specify to deploy it?

COA performance audit of the Solid Waste Management Programme (CY2021 data); NSWMC waste characterisation; ADB Blog, solid waste management in the Philippines.

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Technology positioning by scale and feedstock

Technology	Typical scale	Feedstock	Where it fits
Moving-grate combustion	300 – 3,000 t/day	Mixed MSW, LHV > 7 MJ/kg	Metro and provincial clusters; DOE / DENR permitting load
Fluidised bed, RDF	200 – 1,000 t/day	Pre-processed RDF	Requires an industrial or cement offtake
Gasification, pyrolysis	20 – 200 t/day	Homogeneous, dry	Limited bankable references at municipal scale
Dry batch anaerobic digestion	2 – 15 t/day	Source-segregated organics	Decentralised; municipality, market, island, institution
Landfill gas capture	Existing sites	Landfilled waste	Retrofit; not a treatment route
Composting	Any	Segregated organics	No energy recovery; lowest cost



MARTIN Technologies Private Limited

Songkhla, Thailand — grate combustion, Martin Technology. REURASIA on site, July 2026.



Methania

Biosfair — dry batch AD, Methania. Financed, built and operated by REURASIA.

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Process: dry batch digestion with percolate recirculation

1	2	3	4	5	6	7
Reception	**Pre-treatment**	**Loading**	**Digestion**	**Biogas**	**CHP**	**Digestate**
Weighbridge; visual acceptance; source log	Bag opener, sorting cabin, 5 cm trommel, drainage	Wheel loader; 30% inoculum from previous batch	4 × 75 m³ sealed garage digesters; 24-day batch; thermophilic	Gasholder 90 m³; H_2S removal; drying; flare	40 kW engine; heat to percolate loop	Maturation, screening, bagging

Why dry batch for municipal organics

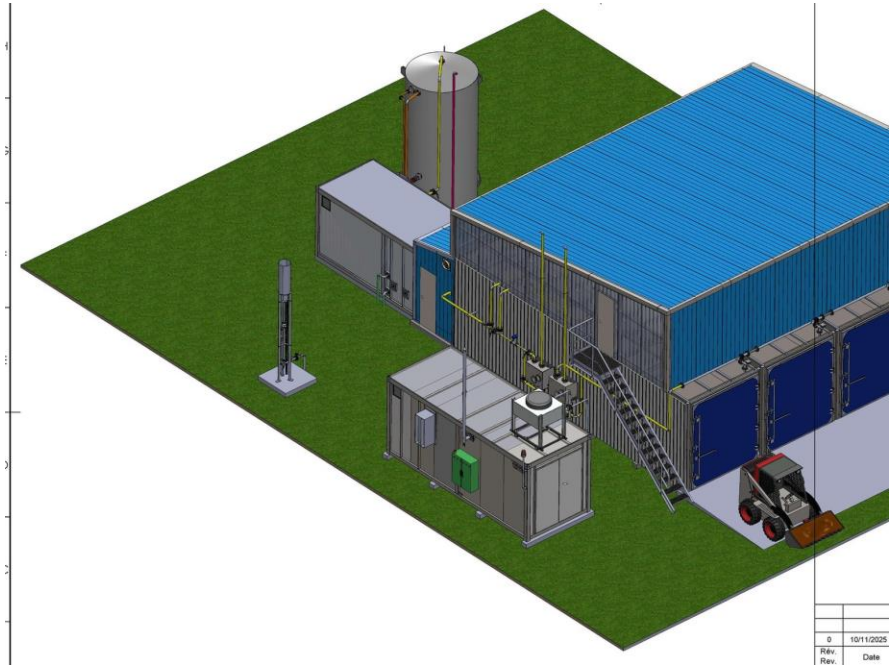
- Tolerates 25–45% dry matter without dilution water
- No stirring, no pumping of solids; wear parts are minimal
- Batch operation isolates a bad load to one digester
- Percolate loop carries heat and inoculum; recirculation replaces mixing
- Containerised: shipped, placed on a slab, commissioned in weeks

Design parameters, JALLAGAZ 4+

Parameter	Value
Digester volume	4 × 75 m³ (210 m³ working at 70% fill)
Retention time	24 days; ~15 cycles per year
Regime	Thermophilic
Inoculum recycle	30% of previous batch
Methane yield (design)	~130 Nm³ CH_4 per t feedstock at 70% VS destruction

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The unit: JALLAGAZ 4+ containerised plant



General arrangement (AR-RD-25.01)





Component	Specification
Digesters	4 × 75 m³ insulated steel garage modules, hydraulic doors
Gasholder	90 m³ double-membrane, in container
CHP	40 kW nominal; 37.7 kWe / 47.4 kWth; 35% / 44% efficiency
Percolate	20 m³ percolate digester; 2–3 m³ tank; pumping container
Safety	Flare, condensate pot, pressure relief, gas detection, biofilter
Control	PLC in technical container; remote monitoring (SCADA)
Pre-treatment	Hopper and bag opener, belt conveyor, sorting cabin, trommel 5 cm, drainage
Post-treatment	Maturation area, screen, bagging
Footprint	Core ~460 m²; facility 1,700–2,000 m² incl. reception and maturation
Delivery	~3 months ex-works; ~1 month on-site installation

Supplier general arrangement AR-RD-25.01; Biosfair layout AR-RD-26.01; heat and mass balance 366-01.

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Feedstock: what the unit accepts, and what we measured

Acceptance criteria (contractual)

Criterion	Limit
Waste type	Source-segregated organics: food, market, kitchen, putrescibles
Plastic contamination	≤ 5% by volume
Total contaminants	≤ 7% by volume (plastics, paper, glass, metal, inerts)
Excluded	Hazardous, biomedical, radioactive, prohibited under law
Delivery	Daily; weighed at reception; source recorded

Measured: Philippine mall, restaurant and market stream

Parameter	Assumed	Measured
Dry matter	30%	43 – 44%
Gate tonnage per t of digester feed	~1.5	2.08 (at 5 cm screen)
Contaminants returned	—	~20% of intake
Digestible fraction	64% (model basis)	48% (WACS basis)

The single most useful number for a planner: on a real Southeast Asian commercial organics stream, roughly two tonnes must arrive at the gate for every tonne that enters the digester. Design the reception, sorting and reject handling for the gate tonnage, not the digester tonnage.

Lease Agreement 366-SOW01 (definitions of Organic Waste and Contaminant); Waste Analysis and Characterisation Study 366-01 REV 1, May 2026.

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Characterisation before design: the WACS method





Field campaign, San Pablo, 20–22 May 2026, GPS-stamped

Protocol

- Five samples over three days, two source types
- Quartering to ~100 kg samples
- Sieve split at 5 cm and 2 cm
- Manual sort into 12 categories, weighed
- Drainage test for free liquid
- Laboratory: DM, VS, N–P_2O_5–K_2O, BMP
- Output: gate-to-digester ratio, contaminant profile, design basis

Global Green Growth Institute

Campaign financed by the Global Green Growth Institute. Protocol, sampling plan and data templates available to project teams.

Waste Analysis and Characterisation Study, ref. 366-01 REV 1.

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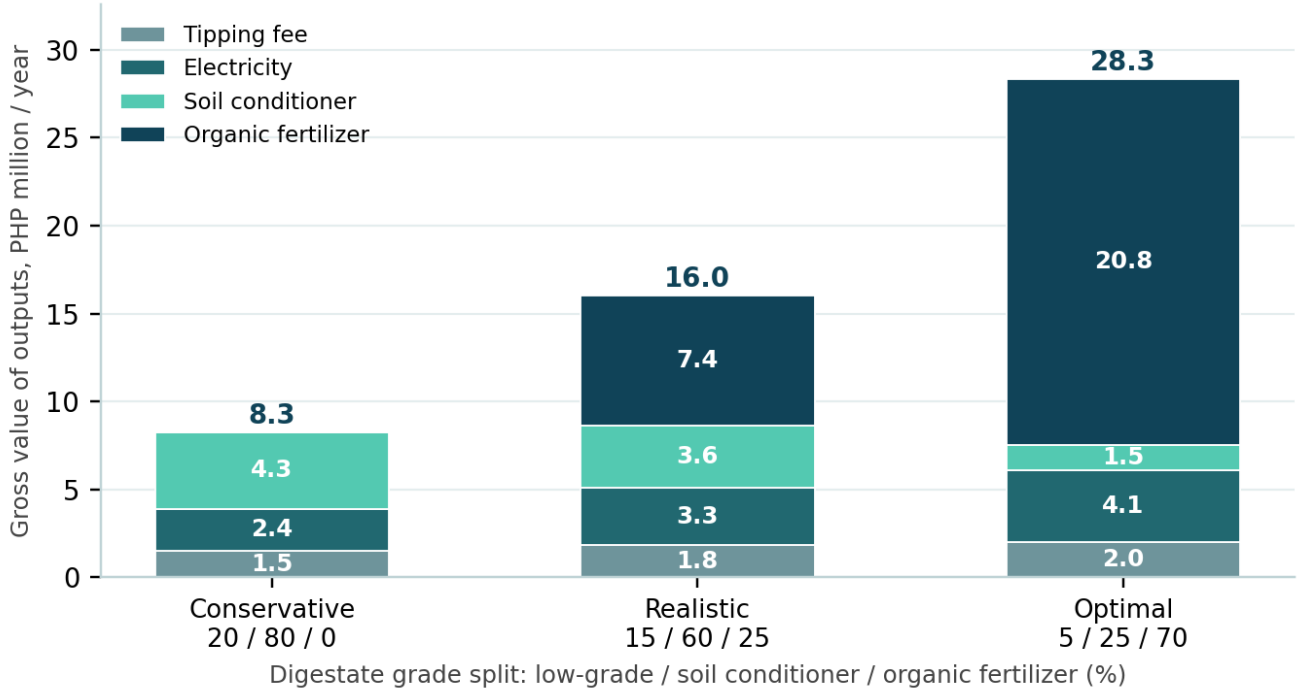
Mass and energy balance, one unit, realistic operating case

Stream	Quantity	Unit	Basis
Waste received at gate	2,694	t/year	7.4 t/day, 64% digestible fraction
Retained after contaminant return	2,155	t/year	20% contaminants returned to host
Feedstock to digesters	1,724	t/year	2,463 t gross incl. 30% inoculum
Biogas	281,449	Nm³/year	56% CH_4 → 157,600 Nm³ CH_4
Electricity, gross	301,900	kWh/year	37.7 kWe × 8,000 h
Electricity, net	271,700	kWh/year	10% parasitic load
Heat, net	284,600	kWh/year	47.4 kWth; 25% to percolate heating
Raw digestate	1,875	t/year	post-digestion
Marketable digestate	986	t/year	after screening and drying to 65% DM
Contaminants returned	539	t/year	to host for disposal

Heat and mass balance 366-01 REV0.2; REURASIA project model, realistic scenario. CH_4 yield 130.6 Nm³/t at 70% VS destruction; PCI 9.95 kWh/Nm³; engine performance factor 0.55.

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Digestate: classification drives the economics, not the electricity



Classification by laboratory analysis

Total $N–P_2O_5–K_2O$	Class (PNS / FPA)	Indicative value
< 2.5%	Low-grade digestate	nil
2.5 – < 5%	Organic soil conditioner	PHP 6,000 / t
5 – 10%	Organic fertilizer	PHP 30,000 / t

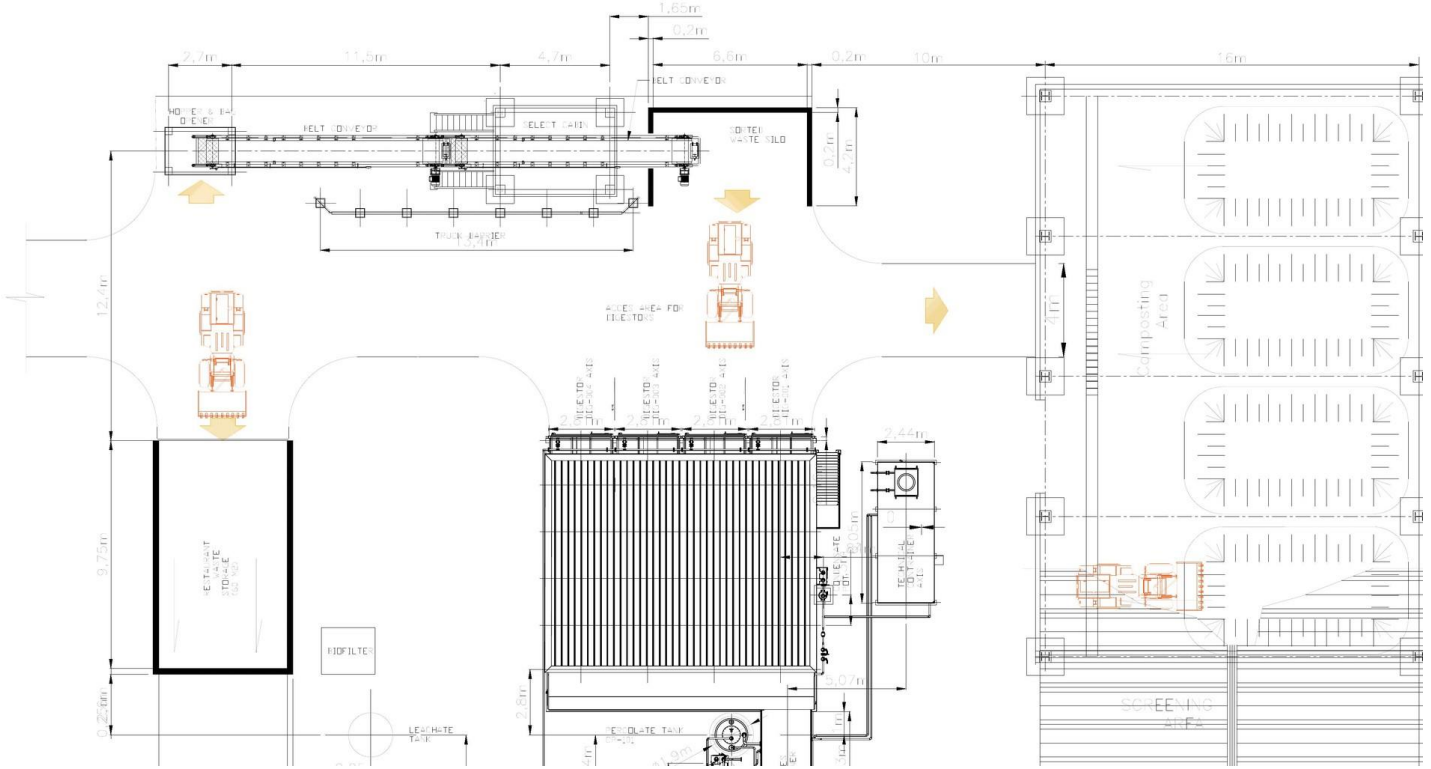
Levers on grade: source quality, co-substrates (poultry litter, crop residue), maturation and drying, and registration with the Fertilizer and Pesticide Authority. Mapúa University runs the analysis and the registration dossier for the pilot.

For a project team: treat digestate grade as the principal commercial risk. Electricity moves 2.4 → 4.1 M across the three cases; digestate moves 4.3 → 22.3 M. The lab result is worth more than the engine.

REURASIA project model, three operating scenarios; PNS classification bands as adopted in the Biosfair lease definitions; Philippine values, indicative.

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Site and layout: the container is the small part

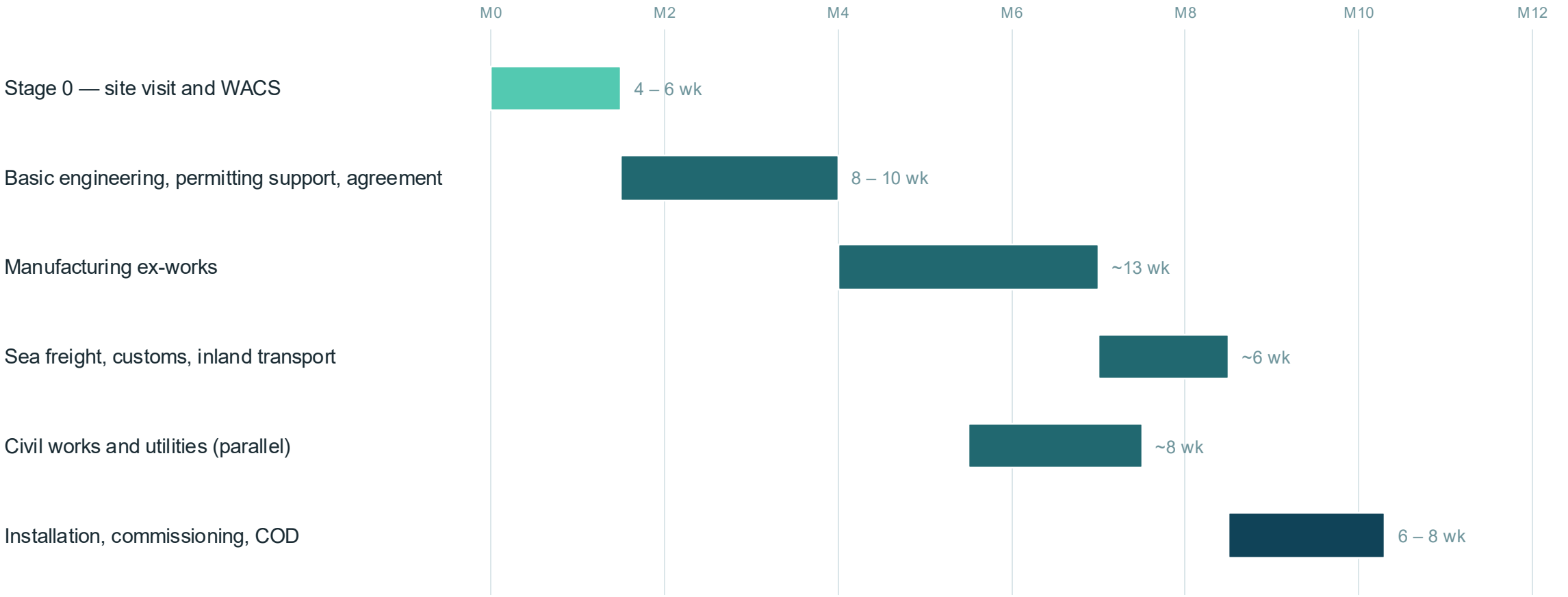


General layout, Biosfair San Pablo (AR-RD-26.01): reception, sorting cabin, silo, four digesters, percolate, biofilter, maturation and screening

Site requirement	Value
Core plant	~460 m²
Facility, phase 1	1,700 – 2,000 m²
Facility, two units	~2,900 m²
Ground	Level, drained, reinforced slab under modules
Access	All-weather road; 10-t truck turning
Power	3-phase connection; grid-parallel or island mode
Water	Process and wash-down; percolate is closed loop
Tenure	Secure for the term (11 years in the pilot)
Buffer	Odour: biofilter; sealed digestion; maturation under cover

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Schedule: 10 to 12 months from feedstock study to COD



Critical path in practice: ECC and LGU permits, grid interconnection where export is intended, and import clearance. Manufacturing is rarely the constraint.

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Operating regime: what makes a small plant bankable

Operator model

- REURASIA operates, maintains and staffs the plant for the term
- Host provides site, security and the committed organic waste stream
- Host owns and markets all outputs: electricity, digestate, tipping fees
- Payment to operator: fixed base lease + performance component on measured output

Availability commitments

Contract year	Target availability
Year 1	80% — 5,600 h
Year 2	90% — 6,300 h
Year 3 onward	100% — 7,000 h

Monitoring and reporting

Instrument / report	Content
Weighbridge	Organic waste received, prior to pre-treatment
Generator meter	Net electricity, kWh
Bag count / scale	Digestate by class after post-treatment
Monthly technical report	Tonnage, digestate, kWh, availability, downtime log, forecast
Downtime incident report + CAP	Within 10 business days of a missed monthly target
Quarterly performance report	Basis of the performance payment; 5 days before due date
Annual availability statement	Target, actual, excused downtime, scenario

Structure as executed in the Biosfair lease agreement, ref. 366-SOW01, April 2026.

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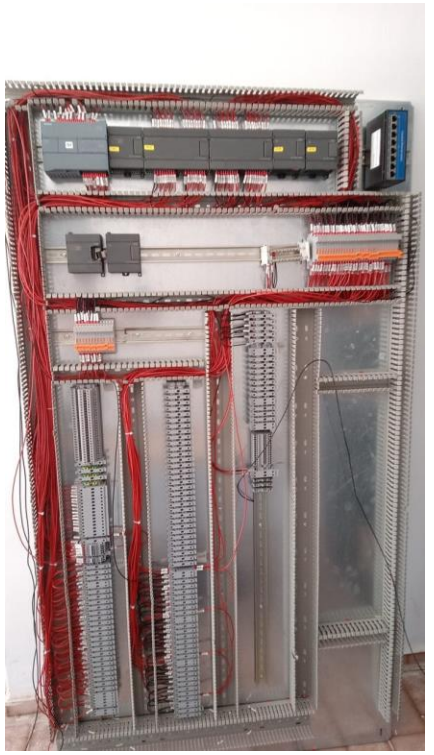
Status: units in fabrication, pilot site prepared



Assembly hall — four digester modules



Process pipework



Control panel





Host site: Alterna Verde SWM facility, San Pablo City, Laguna. Lease executed April 2026; COD targeted Q4 2026.

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Stakeholder engagement and certification





Gold Standard for the Global Goals

Gold Standard Impact Registry

GS23708, listed September 2026

- Local Stakeholder Consultation held before construction
- Grievance mechanism open for project life
- SDG monitoring: 5, 7, 8, 11, 12, 13
- Independent verification of emission reductions

Local Stakeholder Consultation, San Pablo, 7 April 2026 — 40 participants: residents, recycling cooperative, LGU

atmosfair

Consultation designed and documented with atmosfair; published on atmosfair.de, June 2026. Maps onto ADB Safeguard Policy Statement requirements for meaningful consultation and grievance redress.

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Carbon accounting: sources, magnitude, cross-border rules

1,137 tCO_2e

avoided per unit per year, realistic case

Emission reduction source	Basis in model	Share
Avoided landfill methane	0.444 tCO_2e per t of organics diverted	~84%
Grid electricity displaced	0.665 tCO_2e per MWh net export	~16%
Fertilizer substitution	Not claimed in the model	0%

Fifteen units at this specification: ~17,000 tCO_2e per year; programme target stated conservatively at ~10,000 for a mixed fleet.

Crediting pathway

- Gold Standard for the Global Goals; project GS23708
- Credits purchased at a fixed price by atmosfair for its portfolio
- Monitoring: weighbridge tonnage, generator kWh, digestate by class — the same instruments as the lease

For other DMCs

- Grid emission factor: use the national or ADB-published factor
- Baseline: landfill vs open dump changes the methane factor
- Article 6: host-country authorisation and corresponding adjustment if credits leave the country
- ADB's Article 6 support programme is the natural counterpart

REURASIA project model (avoided emissions factors); Gold Standard Impact Registry; ADB Article 6 Support Facility.

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Cost structure per unit: where the money goes



- Digestion, pre- and post-treatment equipment — 82%
- Packing, sea freight, duties, inland transport — 6%
- Civil works and installation — 3%
- Warranty extension, spares kit, remote monitoring — 4%
- Development, engineering, contingency — 5%

Reading the bar

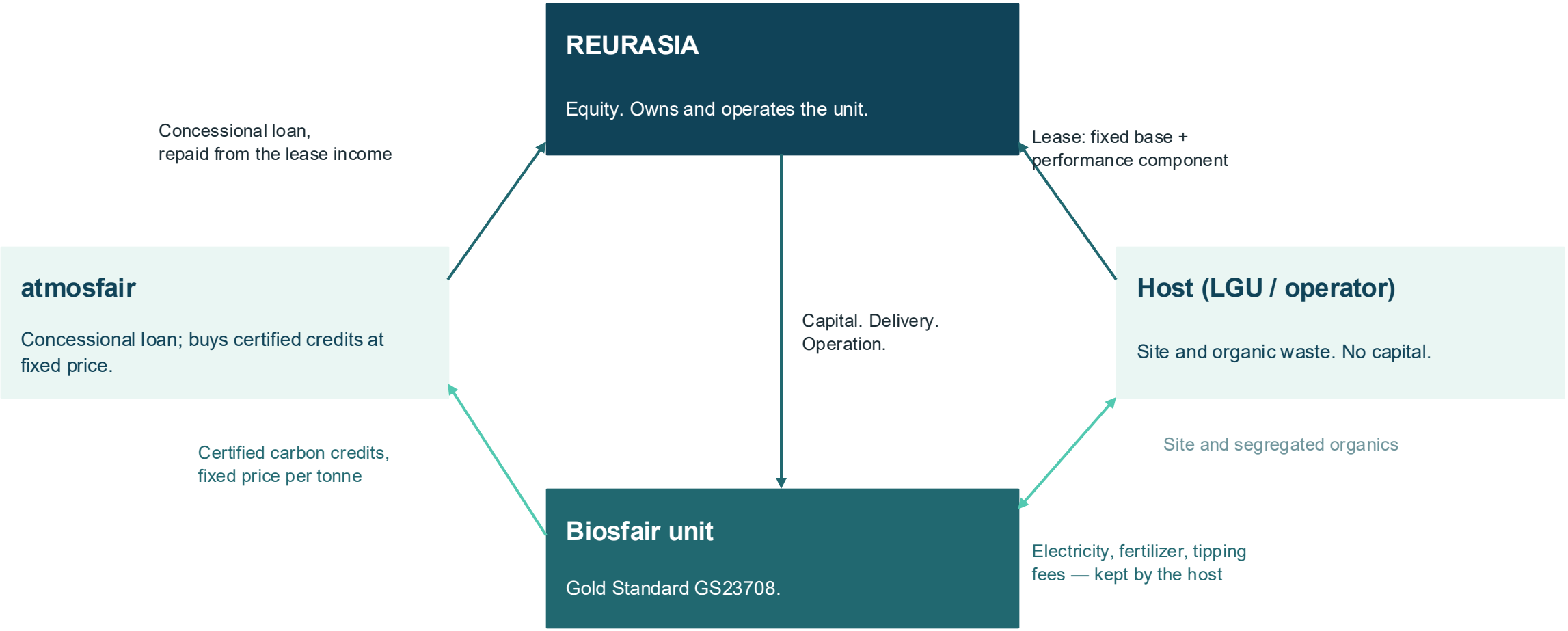
- Equipment is euro-denominated: FX risk sits on capex, not on operations
- Civil works ~3%: no building programme, no piling
- Annual operating cost ~14% of installed cost, including pre-treatment labour, spares, remote monitoring, insurance
- Second unit on the same site: pre-treatment and civils largely shared

Sizing rule for planners: one unit absorbs 7 – 10 t/day of segregated organics — the organic fraction of ~35,000 people at full segregation, or 50,000 – 70,000 in practice; 2,000 – 5,000 m²; add a second unit once segregation performance is demonstrated.

REURASIA project model and supplier price sheet, 2026; percentages of installed cost. Absolute figures available under NDA.

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Financing structure as executed



Carbon makes the loan cheap. The lease repays it. The host invests no capital. Substitutable: the concessional tranche could be an ADB climate or results-based facility; the operator could be a local private company under the same lease.

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Across the region: what changes, and what does not

Country-specific — must be re-established per DMC

Item	Why it matters
Fertilizer standards and registration	Digestate class and price; PH uses PNS / FPA
Grid interconnection rules	Export vs behind-the-meter; net metering thresholds
Incineration and landfill regulation	Positions AD against thermal alternatives
Carbon: Article 6 authorisation	Needed if credits are exported; corresponding adjustment
Import duties and customs	~6% logistics line; exemptions for RE equipment vary
Tipping fee and electricity tariff	Two of the four revenue lines
Waste composition	Re-run the WACS; the 2.08 ratio is a Philippine result

Portable — unchanged across sites

- The unit: containerised, standardised, shipped complete
- Feedstock acceptance specification
- The WACS protocol and templates
- Mass and energy balance method
- Operating regime: availability ramp, reporting stack, performance-linked payment
- Lease and O&M contract structure
- Safeguards: consultation and grievance procedure
- Sizing rule: 7 – 10 t/day per unit

Thermophilic digestion favours the tropics: ambient temperatures of 25–35 °C reduce the heat load on the percolate loop. Island and remote sites benefit most: no landfill option, high diesel-based tariffs, local fertilizer demand.

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Where this fits in an ADB project

1	**Component in a sovereign SWM loan**	Clustered small LGUs or a province: one or more units per cluster; procurement as standardised equipment plus an O&M contract; the availability and reporting regime attached as loan covenants.
2	**Technical assistance**	Feedstock characterisation (WACS) and pre-feasibility across a shortlist of towns using the sizing rule; protocol and templates provided; 4–6 weeks per site.
3	**Climate and results-based finance**	A concessional tranche or payment-for-results instrument tied to verified tCO_2e; monitoring already built on weighbridge, meter and digestate records; Gold Standard or Article 6 pathway.
4	**Private sector operations**	An operator finances, owns and runs units under the lease structure; the LGU or a private waste company hosts; suits PSOD-style participation without sovereign guarantee.

Island and remote DMCs are the sharpest case: no landfill alternative, diesel tariffs, and a local market for organic fertilizer.

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Lessons from the pilot, stated plainly

Assumed versus measured.	Supplier design assumed 30% dry matter and a 1.5:1 gate ratio. We measured 43–44% and 2.08:1. The front end was redesigned before a bolt was turned. Characterise first.
Contamination is a design input, not a nuisance.	A fifth of the intake comes back out. Reception, sorting labour and reject logistics must be sized and costed for it, and the host must accept the returns.
Digestate grade is the commercial risk.	Nutrient content sets the class and the price, by a factor of five. Fund the laboratory work and the registration pathway in the feasibility stage.
The operating regime is what lenders can hold.	Availability targets, instrumented monitoring, monthly and quarterly reports, corrective action plans. Without them a small plant is a donation, not an asset.
Permits and stakeholders run on the critical path.	ECC, LGU permits and grid connection took longer than manufacturing. Start consultation and permitting on day one.

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Specification, evidence, operating model.

Available to project teams

- WACS protocol, sampling plan and data templates
- Feedstock acceptance specification and mass-balance model
- Reference layout, site requirements and schedule
- Lease and O&M contract structure, availability and reporting regime
- Site visit to the San Pablo pilot

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