



Biscay
Eco
Aggregates

Valorising EfW Residues
via Carbon Mineralisation

September 29th, 2026



The **Challenge** of EfW Residues

Energy from Waste (EfW) plays a crucial role in managing non-recyclable waste. However, the process generates significant solid residues.

Primarily consisting of Incinerator Bottom Ash (IBA) and Air Pollution Control (APC) residues, these ashes often contain heavy metals and chlorides, posing significant environmental and economic challenges for disposal.



What is **Carbon Mineralisation**?

-  **Geological Process:** Natural carbonation is a geological process where CO_2 reacts with alkaline minerals (calcium and magnesium) over centuries to form stable, solid carbonates.
-  **Technological Acceleration:** Accelerated Carbonation Technology (ACT) compresses this natural reaction into a matter of minutes inside a highly controlled environment.
-  **Permanent Storage:** The resulting calcium carbonate (CaCO_3) securely and permanently stores the CO_2 , meaning it cannot be released back into the atmosphere.
-  **Total Transformation:** When applied to alkaline industrial wastes like EfW residues, it completely transforms their chemical and physical properties.

Chemical Reaction

The core reaction involves calcium oxide dissolving in water and reacting with CO₂:



This exothermic reaction permanently binds the carbon dioxide into a solid crystal lattice.

Alkaline Advantage

Energy from Waste (EfW) residues are highly suited for this process because they are naturally rich in highly reactive calcium and magnesium oxides.

This inherent alkalinity acts as a catalyst, driving the rapid absorption of industrial CO₂ without requiring the input of excessive external thermal energy.

Accelerated Carbonation Technology



REACTIVE
WASTE

+



WATER

+



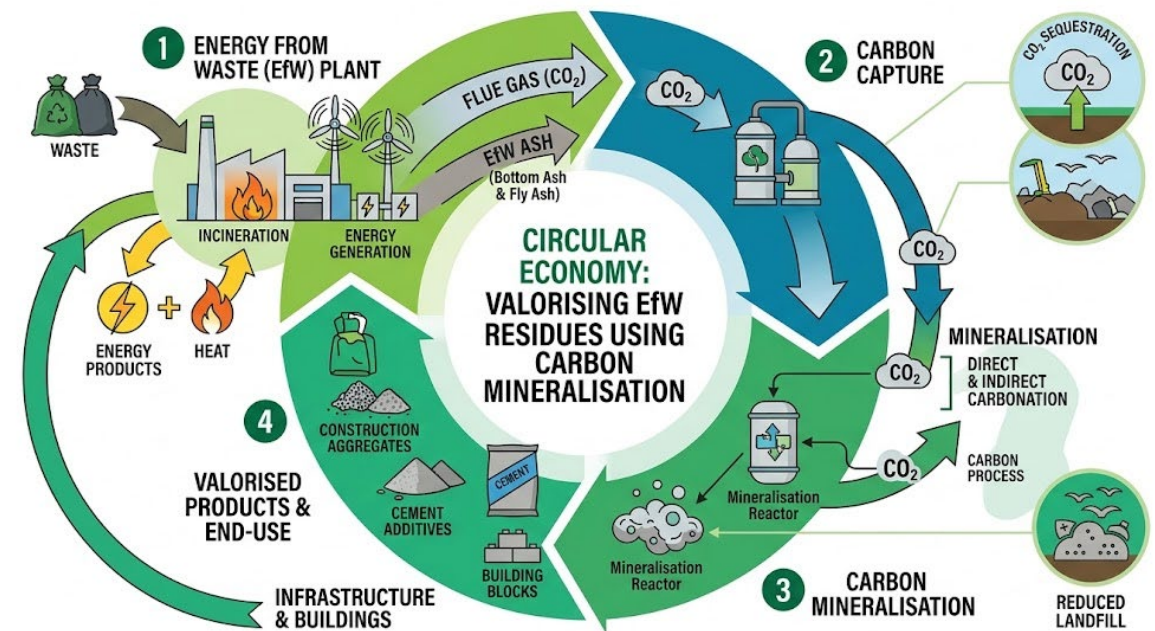
CARBON
DIOXIDE



CALCIUM
CARBONATE

Transitioning to a **Circular Economy**

- Traditional disposal of Air Pollution Control (APC) residues involves costly hazardous waste landfilling.
- Carbon mineralisation shifts this linear "take-make-dispose" model into a completely circular one.
- Waste residues are valorised into high-quality, carbon-negative secondary aggregates.
- We simultaneously capture industrial CO₂ emissions and prevent the destructive mining of virgin natural resources.



Process Flow: Ash to **Aggregate**



2. Carbonation

Exposure to CO₂-rich flue gas in a controlled reactor, triggering rapid mineralisation.

4. Curing

Final strengthening and permanent locking of CO₂ into the robust calcium carbonate lattice.

1. Preparation

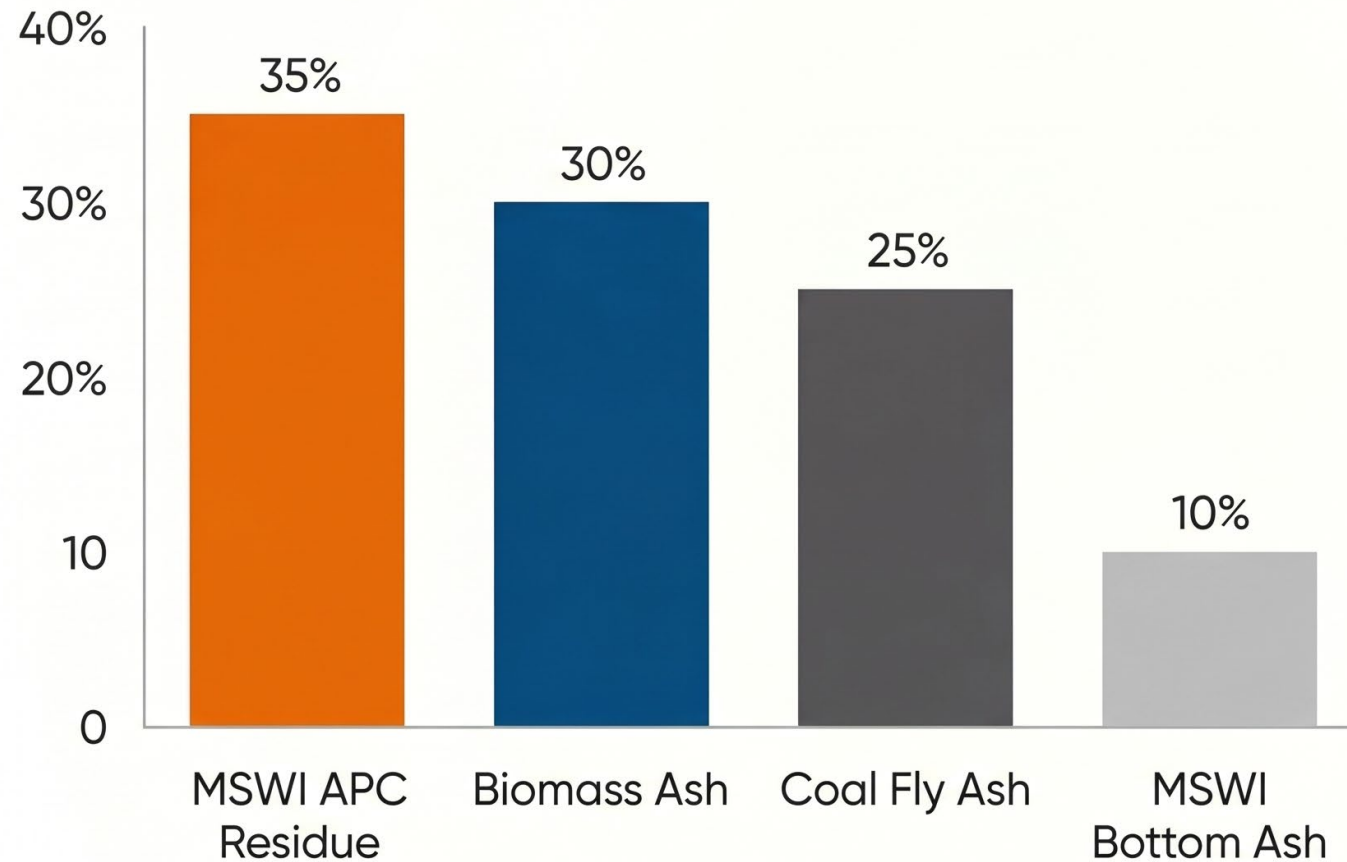
Silo storage and precise moisture adjustment of raw EfW residues to prepare for the reaction.

3. Granulation

Binding and pelletising the carbonated powder into distinct, usable aggregate sizes.

Characteristic	Bottom Ash (IBA)	Fly Ash (APCr)
Volume Generated	20-25% of waste input	2-5% of waste input
Reactivity to CO ₂	Moderate	Very High (High CaO content)
Hazardous Status	Non-Hazardous – ecotoxic metals	Hazardous (pH, ecotoxic metals)
Management	Bulk aggregates / Metals recovery	Disposal <u>or</u> Carbonation / Stabilisation

Carbon Uptake Potential

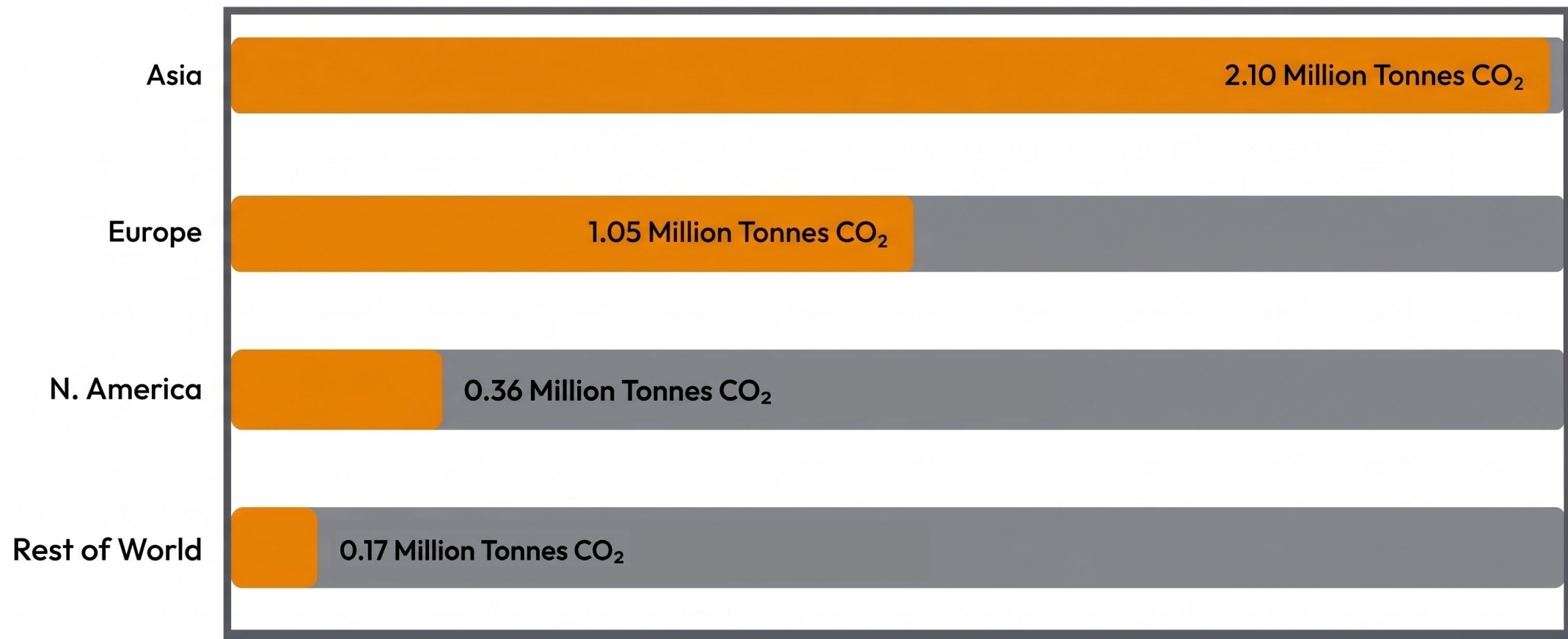


MSWI APC residues represent a highly efficient sink for CO₂, capable of sequestering up to 10-15% of their own weight in carbon dioxide due to their high reactive calcium content.

Global Residue **Generation**



Global CO₂ Sequestration Potential



Estimated annual carbon capture potential based on average uptake rates of 15% for Air Pollution Control residues (APCr) and 3% for Incinerator Bottom Ash (IBA). Asia dominates the potential market due to massive recent expansions in EfW infrastructure.



Defined Application

The carbonated material must be commonly used for specific, identifiable purposes within the construction sector, effectively replacing virgin resources.



Market Demand

A legitimate, existing market or demand must be proven for the secondary aggregate, ensuring it will be actively utilized and not stored indefinitely.



Environmental Safety

Rigorous scientific testing must demonstrate that the product fulfills all technical requirements and poses no adverse impacts on human health or the environment.

2. Processing

Applying Accelerated Carbonation Technology to permanently lock in CO₂ and chemically stabilize heavy metals.

4. EoW Status

Formal declassification from 'waste' to 'product', allowing unrestricted commercial use as a sustainable aggregate.

1. Characterisation

Extensive chemical testing of raw EfW residues to establish baseline hazardous properties and carbonation potential.

3. Validation

Conducting rigorous leaching tests (e.g., EN 12457) to prove the material meets strict environmental and engineering criteria.

The **Biscay Eco Aggregates (B.E.A)** Partnership



- Formed between Petronor (Repsol Group) holding a 75% stake, and carbon capture pioneers O.C.O Technology Group holding 25%.
- B.E.A. utilises the multi-award-winning Accelerated Carbonation Technology (ACT), exclusively licensed by O.C.O.
- The technology builds upon immense commercial success in the UK, where O.C.O currently operates three industrial-scale plants processing over 250,000 tonnes of waste annually.
- The B.E.A. facility marks the very first full-scale commercial deployment of this specific mineralisation process in Continental Europe.



Biscay Eco Aggregates




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A €20 million industrial-scale facility integrating carbon capture and waste recovery into a single circular process.



50,000t

Waste Recovered

Of thermal residue (APCr) recovered annually, diverting highly hazardous waste away from environmentally damaging landfill sites.



6,000t

CO₂ Captured

Of industrial carbon dioxide permanently captured from the nearby Petronor refinery and mineralised securely into the aggregate.



125,000t

Eco-Aggregates

Of sustainable, carbon-negative construction material produced, preserving an estimated 170,000 tonnes of natural quarry extraction.

A €20 million industrial-scale facility integrating carbon capture and waste recovery into a single circular process



Concrete Blocks

Manufacture of lightweight, thermally efficient, and carbon-negative masonry blocks for commercial and residential construction.



Ready-Mix Concrete

Acts as a partial and sustainable replacement for virgin natural aggregates in non-structural or low-strength concrete blends.



Road Sub-base

Provides a highly durable fill material and foundational sub-base layer for major infrastructure and highway development projects.

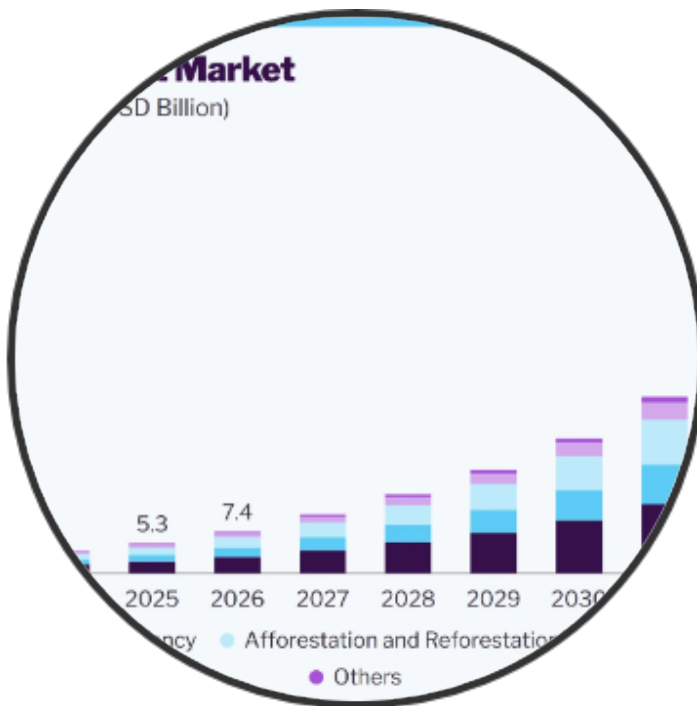
-45%

Carbon Footprint Reduction

Decarbonising Supply Chains

By replacing virgin limestone and cementitious materials with carbonated EfW aggregates, construction projects can reduce the carbon footprint of their concrete blocks by up to 45%.

This process completely bypasses the emissions associated with mining, processing, and long-distance transport of natural raw materials, actively driving the construction industry towards Net-Zero.



A New Revenue Stream

The valorisation of EfW residues is not just an environmental imperative; it is highly economically viable.

By permanently sequestering CO₂ within the aggregates, the process generates high-quality, verifiable Carbon Dioxide Removal (CDR) credits. These credits can be traded on voluntary carbon markets, offsetting operational CapEx and providing a new revenue stream for waste management operators.

“ We cannot solve our waste and emissions problems with the same linear thinking that created them. Carbon mineralisation turns two massive liabilities into one powerful asset. ”

— Consortium for Circular Technologies



1. Industrial Capture

Capturing raw CO₂ directly from heavy industrial flue gas pipelines.



2. Eco-Aggregates

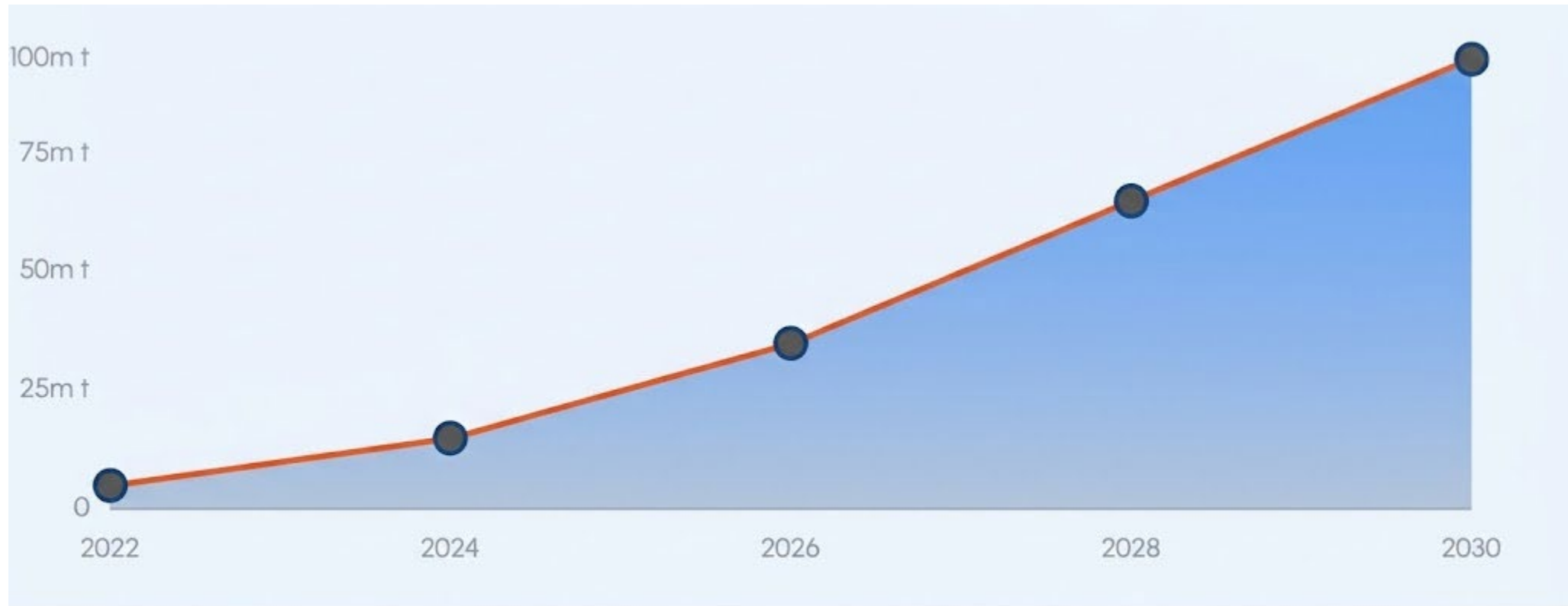
The manufactured carbon-negative limestone ready for deployment.



3. Building Blocks

Finished construction materials seamlessly integrating into building sites.

Projected Market Growth



Driven by rising landfill taxes, stricter emissions regulations, and the demand for green building materials, the CCUS market volume (million tonnes) for mineralised waste is expected to grow exponentially over the next decade.

Regulatory Hurdles

End-of-waste criteria vary significantly by region.

Standardising the classification of carbonated aggregates as "products" rather than "treated waste" remains a critical barrier to widespread adoption and cross-border commercialization.

Process Economics

While carbon credits help offset costs, the initial CapEx for Accelerated Carbonation plants and the complex logistics of sourcing concentrated CO₂ streams require deep strategic partnerships between EfW operators and heavy industry.

3x

Bottom Line

A Holistic Solution

Carbon mineralisation of Energy from Waste residues delivers on three distinct environmental and economic fronts simultaneously:

1. It diverts hazardous waste from landfill.
2. It permanently sequesters industrial CO₂.
3. It preserves virgin natural resources by supplying the construction sector with sustainable, circular aggregates.



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Thank you
Muchas gracias