Biscay Eco Aggregates

Transforming Thermal Waste and CO_2 into Sustainable Construction Materials



Ana Cagigas · Managing Director, Biscay Eco Aggregates

DS Industry · Circularity in Industry Track · Waste Valorisation

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www.b-ecoaggregates.com

Cofinanciado por la Unión Europea

EUSKO JAURLARITZA
GOBIERNO VASCO
EKONOMIAREN GARAPEN, JASANGARRITASUN ETA INGURUMEN SAILA
DEPARTAMENTO DE DESARROLLO ECONÓMICO, SOSTENIBILIDAD Y MEDIO AMBIENTE

BEA

The one idea we want you to take away from this talk

Biscay Eco Aggregates

We turn incineration ash and CO_2 into a carbon-negative aggregate: the only solution of its kind, already operating in Bilbao

THE PROBLEM

Incineration ash that ends up in **landfill**

Industrial CO_2 released into the **atmosphere**

Aggregates extracted from **quarries**



OUR SOLUTION

Biscay Eco Aggregates

First commercial plant of its kind in the EU · Port of Bilbao

Capacity: **125,000 t/year** of eco-aggregate, **50,000 t** of waste and **~5,000 t** of CO_2



Waste that becomes a product · CO_2 stored forever · a material that **replaces natural aggregates**

WHO WE ARE: BISCAY ECO AGGREGATES

A project that only makes sense through collaboration

Biscay Eco Aggregates

We transform thermal waste and CO_2 into eco-aggregates for construction



First commercial plant of its kind in the **European Union**

Port of Bilbao · in operation since March 2026

THE SUM THAT MAKES US POSSIBLE

Petronor — 75 %

Industry, safety, environmental permitting and **decades capturing CO_2**

+

O·C·O® TECHNOLOGY — 25 %

Accelerated Carbonation Technology (ACT) and know-how

=

Biscay Eco Aggregates

BACKED BY

Cofinanciado por la Unión Europea

EUSKO JAURLARITZA GOBIERNO VASCO

Innovation Fund (EU) and the **Indartu programme** (Basque Government)

WHAT OUR PARTNERS SAY

"Using our ash as a raw material allows us to recover it, reduce the consumption of natural resources and create new value chains"

Inés Alonso, Sustainability Director · Zabalgarbi

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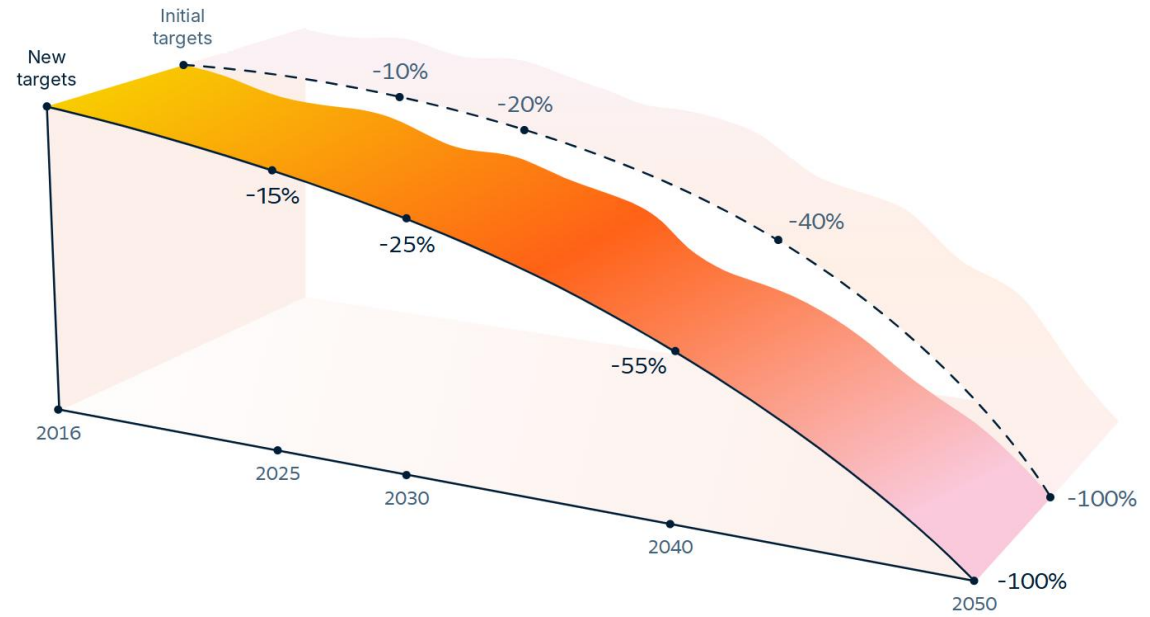
PETRONOR: THE PATH TO NET ZERO BY 2050

A roadmap with interim targets, aligned with the Paris Agreement

Biscay Eco Aggregates



DECARBONISATION ROADMAP



NET ZERO EMISSIONS BY 2050

Meeting the growing demand for energy and products **while maximising our contribution to sustainable development**

A roadmap with **interim targets** along the decarbonisation path

NEW EMISSION REDUCTION TARGETS

−15 %	−25 %	−55 %	−100 %
2025	2030	2040	2050 · net zero

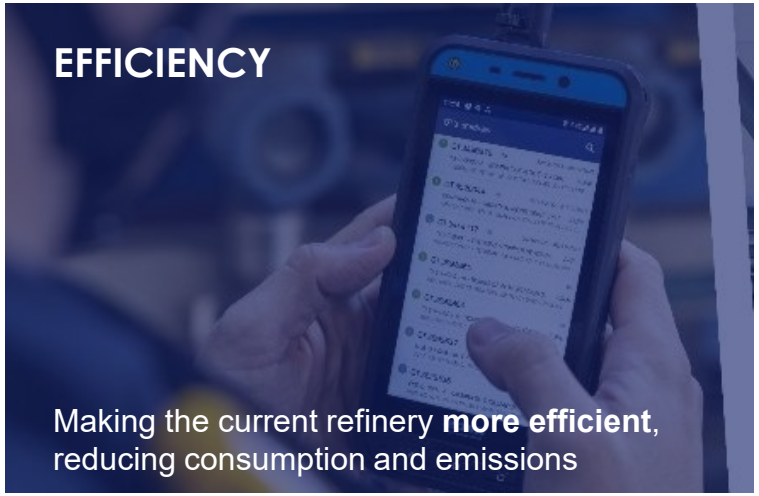
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THE TRANSFORMATION: TOWARDS A NEW PETRONOR

Transformation roadmap: three investment pillars

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Petronor / Transformation Roadmap
Investment projects



EFFICIENCY

Making the current refinery **more efficient**, reducing consumption and emissions



UPGRADING EXISTING UNITS

Extending their useful life by producing **new low-carbon products** and, where appropriate, building new units



NEW BUSINESS DEVELOPMENT

Producing **hydrogen, renewable fuels** and other decarbonised products

AND ON THE CO_2 PATH, BEA TAKES THE NEXT STEP

1 REDUCE

Emissions in our own processes

2 CAPTURE AND USE

Captured at the refinery since the late 1980s: food and industrial uses

3 REMOVE PERMANENTLY

Fixing CO_2 so it never returns to the atmosphere

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BEA combines 2 and 3: CO_2 becomes a **raw material** and is **mineralised forever**

"We no longer just capture and use it: we turn it into mineral"

A CO_2 ECOSYSTEM IN THE PORT OF BILBAO

From emitter to product: large-scale capture needs shared infrastructure

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Petronor is developing **two projects in the Port of Bilbao** and takes part in **Hub CO_2 Norte**



EMITTERS

CO_2 captured by **industries across northern Spain**

HUB CO_2 NORTE

Led by Enagás and EVE

Channels captured CO_2 to the **Port of Bilbao**

To **use it there** or **export it** for underground **geological storage**

USE IN THE PORT



SYNTHETIC FUELS

Demo 50 bbl/d · 10 MW electrolyser



MINERALISATION · BEA

CO_2 + ash → **eco-aggregate**

EXPORT for underground **geological storage**

There is no single CO_2 market: among its uses, **mineralisation** offers the **greatest carbon permanence**. **BEA is the destination where CO_2 becomes a product.**

THREE CHALLENGES, ONE CIRCULAR OPPORTUNITY

Waste, emissions and extraction: one industrial problem

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Incineration ash: complex waste with few recovery routes, usually sent to **landfill**



WASTE

High volumes of **waste-to-energy residues** sent to landfill



EMISSIONS

Urgent need to **cut industrial CO_2 emissions** to meet climate targets



EXTRACTION

Heavy reliance on **quarried natural aggregates**: after water, the most used materials by humankind

REGULATION PUSHES IN THE SAME DIRECTION

EU · 2025

55 % recycling of municipal waste

EU · 2035

Landfill capped at **10 %** of municipal waste

Basque Country · 2030

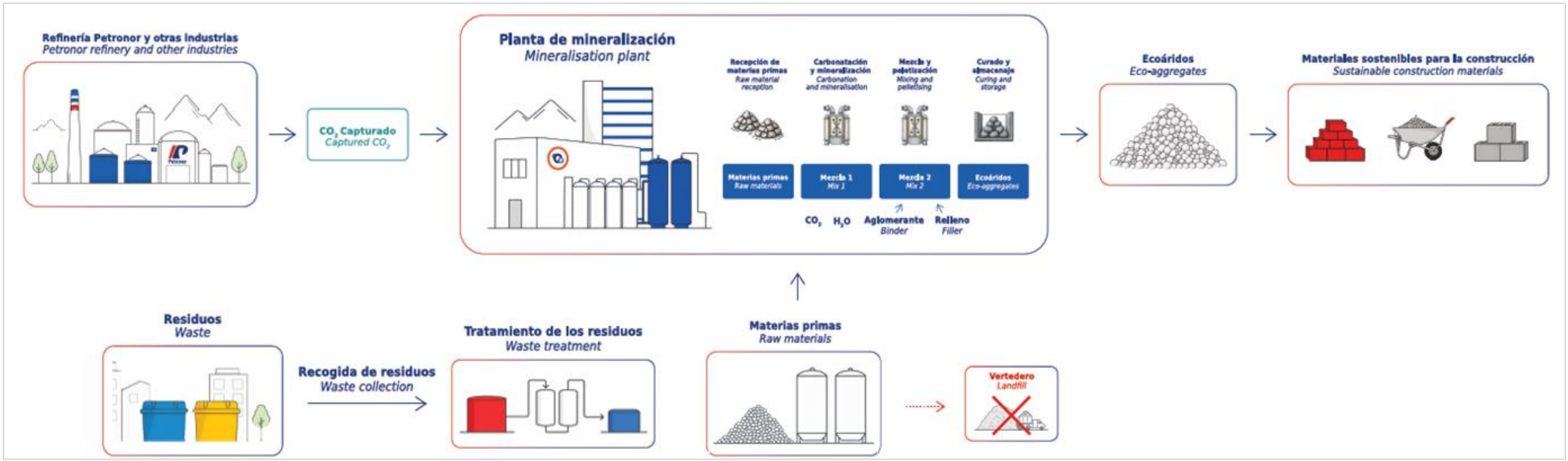
Waste Prevention and Management Plan: more recovery, less landfill

Biscay Eco Aggregates is **currently the only solution of its kind for thermal incineration residues**, keeping them out of landfill

FIRST COMMERCIAL PLANT OF ITS KIND IN THE EUROPEAN UNION

How it works: from captured CO_2 and waste to eco-aggregate · Port of Bilbao

Biscay Eco Aggregates









2 production lines

125,000 t/year

eco-aggregate production capacity

www.b-ecoaggregates.com



THE TECHNOLOGY: ACCELERATED CARBONATION (ACT)

We reproduce in minutes a natural process that would take centuries

Biscay Eco Aggregates

CO_2 reacts with mineral components **rich in calcium or magnesium** to form **stable carbonates**



$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Incineration ash is **highly alkaline**: it reacts with industrial CO_2 without excessive external heat input

MINUTES, NOT CENTURIES

Control of **moisture and temperature** and conditioning of the residue to maximise its reactivity

PERMANENT FIXATION

Immobilisation with **long-term stability**, on a “geological” scale, versus solutions with shorter permanence horizons

INERTISED RESIDUE

The residue is **inertised** as it turns into a carbonated material

PROVEN TECHNOLOGY

Industrially proven process in the **United Kingdom**, where O.C.O Technology operates several facilities

MEASURABLE IMPACT: THE PROJECT IN THREE FIGURES

Currently in the stabilisation phase, progressively ramping up capacity

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Tonnes of **eco-aggregate** on the market, of **waste** diverted from landfill and of **CO_2** permanently mineralised



WASTE RECOVERED

MAXIMUM CAPACITY

50,000

t/year of ash

CURRENT CONFIGURATION

22,000 t/year

diverted from landfill



CO_2 MINERALISED

MAXIMUM CAPACITY

~6,000

t/year of CO_2

CURRENT CONFIGURATION

2,200 t/year

captured, used and permanently fixed



ECO-AGGREGATE PRODUCED

MAXIMUM CAPACITY

125,000

t/year of eco-aggregate

CURRENT CONFIGURATION

56,000 t/year

replacing quarried natural aggregates

THE ECO-AGGREGATE: A CARBON-NEGATIVE AGGREGATE

Lightweight, durable and stable, suitable for multiple applications

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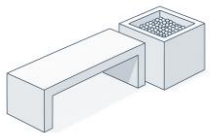


	Traditional model	BEA circular model
Material origin	Natural extraction (quarries)	✓ **100 % circular (recovered ash)**
Carbon footprint	Net emitter in production	✓ **Carbon sink (mineralised CO_2)**
Waste destination	Landfill accumulation	✓ **Full recovery (useful raw material)**

APPLICATIONS



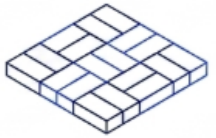
Non-structural concrete, blocks and precast



Street furniture



Self-levelling compounds



Outdoor paving tiles

Waste that becomes a product · CO_2 stored forever · a material that **replaces natural aggregates**

FROM STABILISATION TO FULL CAPACITY

A real solution to today's problems, ready to grow and be replicated

Biscay Eco Aggregates

We bring a real, operating solution to problems industry faces today

A REAL SOLUTION, TODAY



INCINERATION ASH

An outlet **with no landfill**: the only solution of its kind for thermal incineration residues



INDUSTRIAL CO_2

Captured CO_2 becomes a raw material and is **permanently fixed** in a product



CONSTRUCTION

A **carbon-negative aggregate**, compliant with that replaces quarried aggregates

OUR ROADMAP

NOW

1 STABILISE

Fine-tuning the process and ensuring **product quality**

2 REACH FULL CAPACITY

Two lines at maximum production: up to **125,000 t/year** of eco-aggregate, **50,000 t** of waste, **~6,000 t** of CO_2

3 GROW AND REPLICATE

New applications and a model **replicable** wherever ash, CO_2 and demand for aggregates meet

LEARN MORE

www.b-ecoaggregates.com



“The eco-aggregate plant is a good example that decarbonisation also means opening up new paths”

Waste that becomes a product

CO_2 stored forever

A **material** that replaces natural aggregates

Biscay Eco Aggregates

Petronor

O·C·O® TECHNOLOGY

Thank you

Ana Cagigas · Managing Director
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