

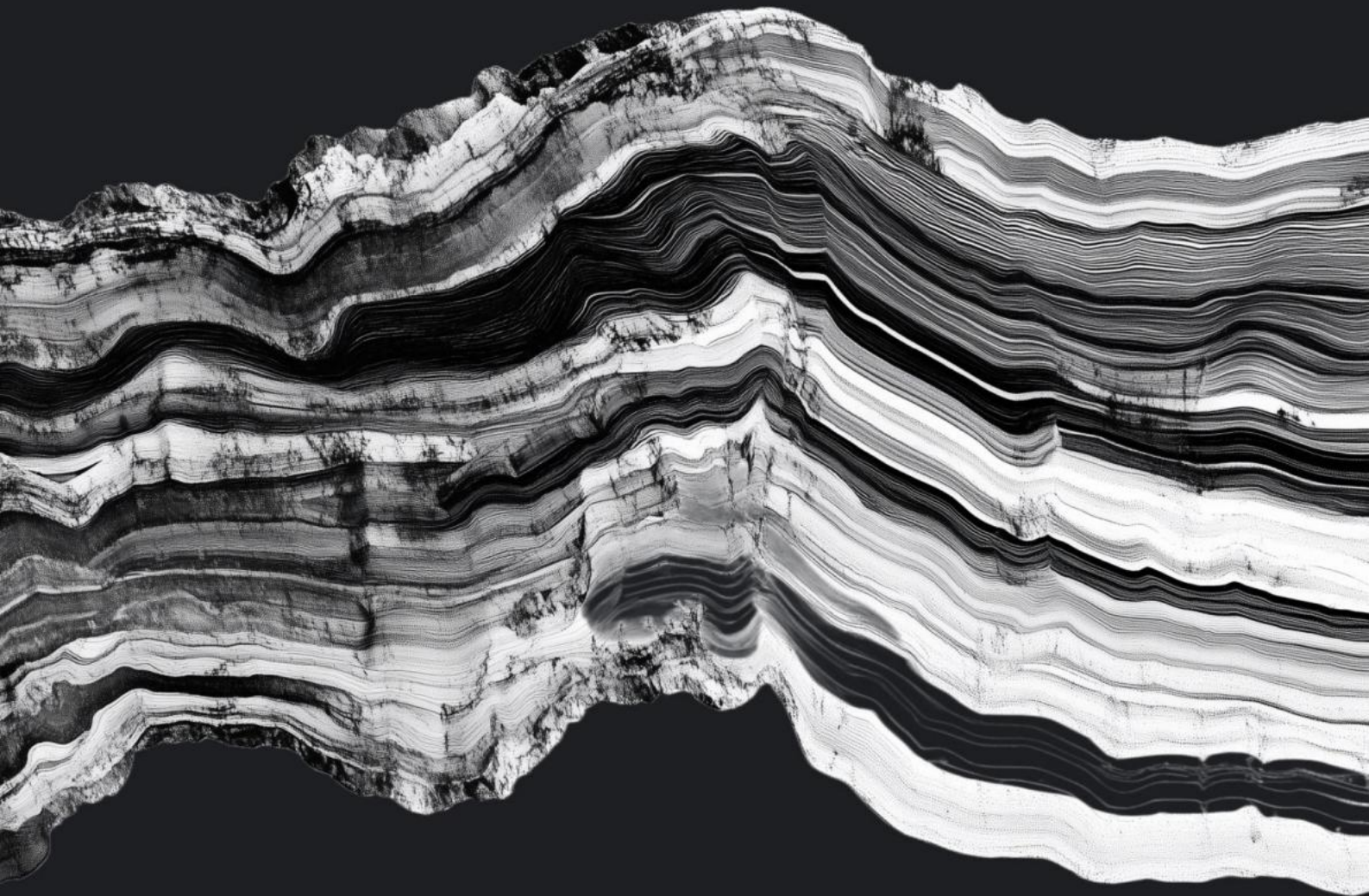
# Environmental Product Declaration

In accordance with en 15804+A2 & ISO 14025



## Paebbl Rebond 300 M.2.X

EPD HUB, HUB-6579  
Published on 23.06.2026, last updated on 23.06.2026, valid until 22.12.2027



# General information

## Manufacturer

|                        |  |
|------------------------|--|
| <b>Manufacturer</b>    | Paebbl   |
| <b>Address</b>         | Scheepsbouwweg 29, 3089 JW, Rotterdam, The Netherlands                     |
| <b>Contact details</b> | <a href="mailto:product-support@paebbl.com">product-support@paebbl.com</a> |
| <b>Website</b>         | <a href="https://paebbl.com">https://paebbl.com</a>                        |

## EPD standards, scope and verification

|                           |  |
|---------------------------|--|
| <b>Program operator</b>   | EPD Hub, <a href="mailto:hub@epdhub.com">hub@epdhub.com</a>  |
| <b>Reference standard</b> | EN 15804:2012+A2:2019/AC:2021 and ISO 14025  |
| <b>PCR</b>                | EPD Hub Core PCR Version 1.2, 24 Mar 2025  |
| <b>Sector</b>             | Construction product   |
| <b>Category of EPD</b>    | Design phase EPD   |
| <b>Parent EPD number</b>  | -  |
| <b>Scope of the EPD</b>   | Cradle to gate   |
| <b>EPD author</b>         | Ikaros Altantzis, D D Ramteke, Paebbl  |
| <b>EPD verification</b>   | Independent verification of this EPD and data, according to ISO 14025:<br><input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification |
| <b>EPD verifier</b>       | Elma Avdyli  |

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

## Product

|   |                            |
|---|----------------------------|
| <b>Product name</b>                               | Paebbl Rebond 300 M.2.X    |
| <b>Additional labels</b>                          | -                          |
| <b>Product reference</b>                          | -                          |
| <b>Place(s) of raw material origin</b>            | Norway & The Netherlands   |
| <b>Place of production</b>                        | The Netherlands, Rotterdam |
| <b>Places of installation and use</b>             | Europe                     |
| <b>Period for data</b>                            | Jan 2026 - February 2026   |
| <b>Averaging in EPD</b>                           | No grouping                |
| <b>Variation in GWP-fossil for A1-A3 (%)</b>      | -                          |
| <b>GTIN (Global Trade Item Number)</b>            | -                          |
| <b>NOBB (Norwegian Building Product Database)</b> | -                          |
| <b>A1-A3 Specific data (%)</b>                    | -61                        |

## Environmental data summary

|   |       |
|---|-------|
| <b>Declared Unit (Tonne)</b>                              | 1     |
| <b>Declared Unit Mass (kg)</b>                            | 1000  |
| <b>Mass Of Packaging (Kg)</b>                             | 4     |
| <b>GWP-Fossil, A1-A3 (kgCO<sub>2</sub>e)</b>              | -177  |
| <b>GWP-Total, A1-A3 (kgCO<sub>2</sub>e)</b>               | -149  |
| <b>Secondary Material, Inputs (%)</b>                     | 31,5  |
| <b>Secondary Material, Outputs (%)</b>                    | 0     |
| <b>Total Energy Use, A1-A3 (kWh)</b>                      | 76600 |
| <b>Total Manufacturing Energy Use By Paebbl, A3 (KWh)</b> | 2100  |
| <b>Net Freshwater Use, A1-A3 (m<sup>3</sup>)</b>          | 1,66  |

# Product and manufacturer

## About Paebbl

Paebbl is a mission-driven organisation focused on combating global warming at unprecedented scale. We believe the immense volumes of greenhouse gases humanity needs to find a home for are a huge opportunity - CO<sub>2</sub> can be a literal building block for our society.

Through a proprietary accelerated mineralisation process, Paebbl is developing innovative ways to permanently store carbon under CCUS (carbon capture utilisation and storage) principles. Paebbl converts industrial CO<sub>2</sub> emissions into stable carbonate minerals that can be used as supplementary cementitious materials (SCMs) and reactive fillers. The resulting product stores carbon permanently within the built environment - in roads, bridges, buildings, and infrastructure. By turning concrete into a carbon sink, building society's infrastructure becomes an act of climate stabilisation. Paebbl makes carbon-storing construction materials a reality.

## About Paebbl Rebond 300

Paebbl Rebond 300 is part of the Paebbl Rebond series, built on the foundation established by previous generations of products. Paebbl Rebond 300 is a high-performance, engineered mineral reactive filler design to supplement cement in concrete applications.

When used as a partial replacement in conventional concrete mixes, Paebbl Rebond 300 can reduce the carbon footprint of concrete projects by around 30%, with the achieved reduction varying based on mix design, cement choice, and project-specific conditions. This represents a meaningful step forward from Paebbl Rebond 200, as this new generation delivers 10x more carbon footprint reduction.

## Environmental Performance

The environmental performance data presented in this EPD has been independently verified in accordance with EN 15804+A2. The assessment covers the full lifecycle of the product from cradle to gate, including raw material extraction, transport, and manufacturing.

The reported environmental profile is only valid if the user of the carbonated Rebond 300 is also provided with the corresponding certificate of carbonation.

In case the user of the carbonated Rebond 300 product is NOT provided with the corresponding certificate of carbonation, the GWP-fossil has to be set to zero because the net difference of burdens from fossil GHG emissions and benefits from carbonation is attributed to the one buying the certificate.

Hence, the GWP-total must be calculated accordingly as the sum of the GWP-fossil (zero), GWPbiogenic, and GWP-luluc.

The Global Warming Potential (GWP) of Paebbl 300 is -149 kg CO<sub>2</sub> eq per tonne of product, meaning that each tonne of Paebbl 300 sequesters more CO<sub>2</sub> than is emitted during its production. This figure accounts for all emissions associated with the production process.

## Application in Construction

Paebbl Rebond 300 can be used in cement based-construction applications. Typical applications include structural and non-structural concrete, including ready-mix and precast applications. Additionally, Paebbl Rebond 300 can be used in mortars, grouting and as road-base in civil engineering works.

Paebbl Rebond 300 easily integrates into existing concrete mix designs with minimal process changes. The material can be used as a partial cement replacement, enabling manufacturers to produce lower-carbon concrete while maintaining required performance that complies to European norms such as EN-206. Paebbl provides a CO<sub>2</sub> calculator tool on their website to help project teams estimate the carbon footprint reduction achievable for their concrete mix design and replacement ratio.

## Product raw material main composition

| Raw material category | Amount, mass % | Material origin |
|-----------------------|----------------|-----------------|
| Metals                | -              | -               |
| Minerals              | 100            | EU              |
| Fossil materials      | -              | -               |
| Bio-based materials   | -              | -               |

## Biogenic carbon content

### Product's biogenic carbon content at the factory gate

|   |   |
|---|---|
| Biogenic carbon content in product (kg C)   | 0 |
| Biogenic carbon content in packaging (kg C) | 0 |

## Functional unit and service life

|                                |      |
|--------------------------------|------|
| Declared unit (Tonne)          | 1    |
| Mass per declared unit (kg)    | 1000 |
| Functional unit                | -    |
| Reference service life (years) | 50   |

## Substances, reach - very high concern

| Substances of very high concern  | EC | CAS |
|--|----|-----|
| The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm). | -  | -   |

# Product life-cycle

## System boundary

This EPD covers the life-cycle modules listed in the following table.

### Product stage

|    |   |               |
|----|---|---------------|
| A1 | X | Raw Materials |
| A2 | X | Transport     |
| A3 | X | Manufacturing |

### Assembly stage

|    |    |           |
|----|----|-----------|
| A4 | ND | Transport |
| A5 | ND | Assembly  |

### Use Stage

|    |    |                        |
|----|----|------------------------|
| B1 | ND | Use                    |
| B2 | ND | Maintenance            |
| B3 | ND | Repair                 |
| B4 | ND | Replacement            |
| B5 | ND | Refurbishment          |
| B6 | ND | Operational energy use |
| B7 | ND | Operational water use  |

### End of life stage

|    |    |                            |
|----|----|----------------------------|
| C1 | ND | Deconstruction/ demolition |
| C2 | ND | Transport                  |
| C3 | ND | Waste processing           |
| C4 | ND | Disposal                   |

### Benefits & loads

|   |    |                                |
|---|----|--------------------------------|
| D | ND | Reuse<br>Recovery<br>Recycling |
|---|----|--------------------------------|

## Manufacturing and packaging (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is used in modelling the electricity mix utilized in the factory. The environmental assessment of Paebbl's product evaluates the raw materials used, the mineralization reaction, and the final drying process. Transport logistics for raw materials are assessed using estimated distances from supplier locations. Additionally, the energy requirements for production and the management of waste byproducts are taken into account. Paebbl's pilot unit energy requirements for production of 1 tonne of Paebbl Rebond 300 M.2.X are 2100kWh. Paebbl utilises renewable energy sourced from wind power. For packaging (paper bags) and ancillary materials, factors such as material composition, weight, and recyclability are analyzed. Estimated material losses during handling and processing are estimated to be negligible. Waste is disposed according to local regulations. No hazardous waste is generated from the production process nor emissions of listed priority substances to water have been identified.

The production process of Paebbl's product begins with the transfer of the necessary chemicals to a silo where they are mixed. Afterwards, olivine, water and CO<sub>2</sub> are pumped into the reactor alongside the chemicals in a controlled manner.

CO<sub>2</sub> mineralisation then occurs under high pressures and temperatures. The olivine reacts with carbon dioxide to form a stable magnesium carbonate and silica-based material. Once the reaction is complete, the product undergoes drying to achieve the required powder consistency for use as a binder or filler. The processed powder is then transferred to storage silos and packaged in paper bags or loaded into sealed silo trucks (for large-scale use), which use pneumatic systems to efficiently and cleanly convey the powder from the truck directly into the customer's on-site storage silos or plants. Biogenic CO<sub>2</sub> is mineralised into a stable carbonate (CO<sub>3</sub><sup>2-</sup>) form for permanent storage and can be treated equivalently to atmospheric CO<sub>2</sub>, with no distinction in how the CO<sub>2</sub> is sequestered. The use of green energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc.), and its use is ensured throughout the validity period of this EPD.

Only modules A1–A3 are declared. This corresponds to a cradle-to-gate EPD in accordance with EN 15804:2012+A2:2019, Clause 5.2.

Paebbl Rebond 300 is used as a constituent material in the production of concrete and becomes chemically and physically integrated into the host construction product during manufacture. Once incorporated, it cannot be separated, identified, or removed as an individual material at the end of the service life without destructive processing of the host product.

As a result, product-specific and representative scenarios for downstream life cycle stages (A4–C4) and Module D cannot be defined at the level of the declared unit. The impacts associated with these stages depend on the design, use, and end-of-life treatment of the host construction product and are therefore to be assessed at the level of that product or at building level.

## Transport and installation (A4-A5)

This EPD does not cover the installation stage.

## Product use and maintenance (B1-B7)

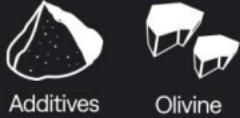
This EPD does not cover the use phase.

## Product end of life (C1-C4, D)

In accordance with EN 15804+A2, end-of-life information modules shall be declared where technically relevant and where a meaningful, product-specific end-of-life scenario can be defined. For the Paebbl Rebond 300, no independent or representative end-of-life scenario can be established at the level of the declared unit, as the material's end-of-life treatment is inseparable from that of the host construction product and depends entirely on the design, use, and demolition pathway of the construction works in which it is embedded. As a consequence, the end-of-life processes, and benefits and loads beyond the system boundary (C1-C4, D) cannot be modelled in a technically meaningful, non-speculative, or verifiable manner for Paebbl Rebond 300 as a standalone product. Any potential benefits or loads beyond the system boundary would be dependent on the end-of-life treatment of the composite construction product and cannot be robustly assigned to Paebbl Rebond 300 alone without risk of double counting or misallocation. These modules are therefore reported as ND (Not Declared), with the justification that the end-of-life impacts are governed by the host construction product and shall be accounted for, where relevant, at the level of that product or at building level.

For an end-of-life scenario for a material that becomes a part of either concrete, plaster, or mortar, please refer to an EPD representing the respective products.

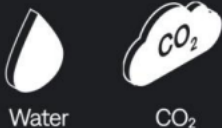
# Manufacturing process



Additives

Olivine

Raw materials (A1)



Water

CO<sub>2</sub>



Transport to Paebbl (A2)



Manufacturing  
Rebond Series (A3)

Electricity for  
Milling / Heating / Cooling / Drying

# Life-cycle assessment

## Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

## Validation of data

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1, 2, and 3. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterisation factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

## Allocation, estimates and assumptions

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

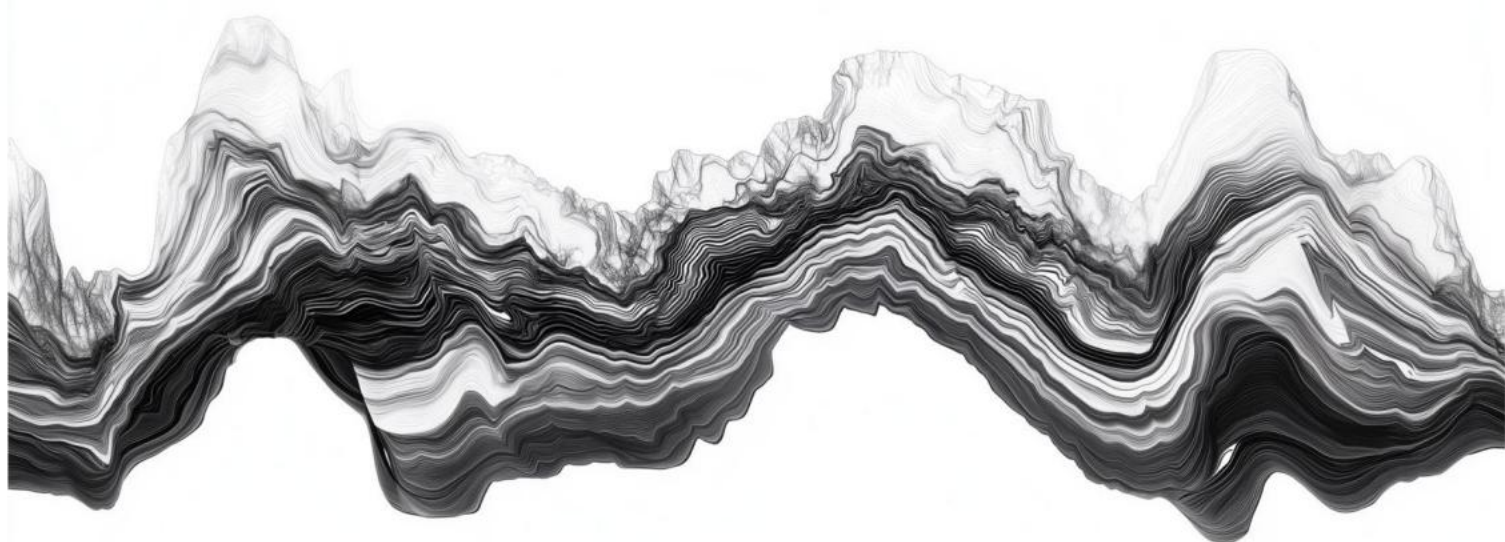
| <b>Data Type</b>               | <b>Allocation</b>           |
|--------------------------------|-----------------------------|
| Raw Materials                  | No Allocation               |
| Packaging Material             | No Allocation               |
| Ancillary Materials            | Allocated By Mass Or Volume |
| Manufacturing Energy And Waste | Allocated By Mass Or Volume |

## Product and manufacturing sites grouping

|   |                |
|---|----------------|
| <b>Type Of Grouping</b>                     | No Grouping    |
| <b>Grouping Method</b>                      | Not Applicable |
| <b>Variation In GWP-Fossil For A1-A3, %</b> | -              |

This EPD is product and factory specific.

# LCA software and bibliography



This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.4.

The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044.

The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data.

Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology's allocation, Cut-off, EN 15804+A2.

## References

<https://publications.tno.nl/publication/34628514/f2>

# Environmental impact data

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

| Impact category                   | GWP – total <sup>1)</sup> | GWP – fossil         | GWP – biogenic       | GWP – LULUC          | Ozone depletion pot. | Acidification potential | EP – fresh-water <sup>2)</sup> |
|-----------------------------------|---------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|--------------------------------|
| Unit                              | kg CO <sub>2</sub> e      | kg CO <sub>2</sub> e | kg CO <sub>2</sub> e | kg CO <sub>2</sub> e | kg CFC-11e           | mol H+E                 | kg PE                          |
| <b>Product stage</b>              |                           |                      |                      |                      |                      |                         |                                |
| A1                                | -2,85E+02                 | -2,85E+02            | 0,00E+00             | 9,62E-03             | 1,91E-06             | 7,91E-02                | 1,90E-03                       |
| A2                                | 2,41E+01                  | 2,40E+01             | 0,00E+00             | 1,19E-02             | 4,31E-07             | 2,77E-01                | 1,41E-03                       |
| A3                                | 1,12E+02                  | 8,46E+01             | 2,50E+01             | 2,66E+00             | 1,01E-02             | 3,55E-01                | 2,80E-01                       |
| A1-A3                             | -1,49E+02                 | -1,77E+02            | 2,50E+01             | 2,69E+00             | 1,01E-02             | 7,11E-01                | 2,83E-01                       |
| <b>Construction process stage</b> |                           |                      |                      |                      |                      |                         |                                |
| A4                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| A5                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| <b>Use stage</b>                  |                           |                      |                      |                      |                      |                         |                                |
| B1                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B2                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B3                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B4                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B5                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B6                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| B7                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| <b>End of life stage</b>          |                           |                      |                      |                      |                      |                         |                                |
| C1                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| C2                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| C3                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| C4                                | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |
| <b>Benefits &amp; loads</b>       |                           |                      |                      |                      |                      |                         |                                |
| D                                 | ND                        | ND                   | ND                   | ND                   | ND                   | ND                      | ND                             |

<sup>1)</sup> GWP = Global Warming Potential; <sup>2)</sup> EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO<sub>4</sub>e

| Impact category                   | EP-marine | EP-terrestrial | POCP ("smog") <sup>3)</sup> | ADP-minerals & metals <sup>4)</sup> | ADP-fossil resources | Water use <sup>5)</sup> |
|-----------------------------------|-----------|----------------|-----------------------------|-------------------------------------|----------------------|-------------------------|
| Unit                              | kg Ne     | mol Ne         | kg NMVOCe                   | kg Sbe                              | MJ                   | m <sup>3</sup> e depr.  |
| <b>Product stage</b>              |           |                |                             |                                     |                      |                         |
| A1                                | 2,28E-01  | 7,45E-01       | 8,75E-02                    | 9,28E-06                            | 2,05E+02             | 1,57E+01                |
| A2                                | 7,78E-02  | 8,59E-01       | 2,60E-01                    | 5,54E-05                            | 3,21E+02             | 1,45E+00                |
| A3                                | 2,00E-01  | 8,59E-01       | 2,46E-01                    | 1,39E-03                            | 9,55E+02             | 5,17E+01                |
| A1-A3                             | 5,06E-01  | 2,46E+00       | 5,94E-01                    | 1,45E-03                            | 1,48E+03             | 6,88E+01                |
| <b>Construction process stage</b> |           |                |                             |                                     |                      |                         |
| A4                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| A5                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| <b>Use Stage</b>                  |           |                |                             |                                     |                      |                         |
| B1                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B2                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B3                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B4                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B5                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B6                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| B7                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| <b>End of life stage</b>          |           |                |                             |                                     |                      |                         |
| C1                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| C2                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| C3                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| C4                                | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |
| <b>Benefits &amp; loads</b>       |           |                |                             |                                     |                      |                         |
| D                                 | ND        | ND             | ND                          | ND                                  | ND                   | ND                      |

<sup>3)</sup> POCP = Photochemical ozone formation; <sup>4)</sup> ADP = Abiotic depletion potential; <sup>5)</sup> EN 15804+A2  
 Disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact

Indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

## Additional (optional) environmental impact indicators – EN 15804+A2, EF 3.1

| Impact category                   | Particulate matter | Ionizing radiation <sup>6)</sup> | Ecotoxicity (freshwater) | Human toxicity, cancer | Human tox. non-cancer | SQP <sup>7)</sup> |
|-----------------------------------|--------------------|----------------------------------|--------------------------|------------------------|-----------------------|-------------------|
| <b>Unit</b>                       | Incidence          | kBq U235e                        | CTUe                     | CTUh                   | CTUh                  | -                 |
| <b>Product stage</b>              |                    |                                  |                          |                        |                       |                   |
| A1                                | 9,79E-07           | 9,59E-01                         | 1,59E+03                 | 6,81E-10               | 2,04E-08              | 2,12E+03          |
| A2                                | 1,45E-06           | 3,88E-01                         | 3,54E+01                 | 4,28E-09               | 1,56E-07              | 1,67E+02          |
| A3                                | 3,46E-06           | 2,80E+00                         | 1,90E+03                 | 4,04E-08               | 1,12E-06              | 3,11E+02          |
| A1-A3                             | 5,89E-06           | 4,14E+00                         | 3,53E+03                 | 4,53E-08               | 1,30E-06              | 2,60E+03          |
| <b>Construction process stage</b> |                    |                                  |                          |                        |                       |                   |
| A4                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| A5                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| <b>Use Stage</b>                  |                    |                                  |                          |                        |                       |                   |
| B1                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B2                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B3                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B4                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B5                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B6                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| B7                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| <b>End of life stage</b>          |                    |                                  |                          |                        |                       |                   |
| C1                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| C2                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| C3                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| C4                                | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |
| <b>Benefits &amp; loads</b>       |                    |                                  |                          |                        |                       |                   |
| D                                 | ND                 | ND                               | ND                       | ND                     | ND                    | ND                |

<sup>6)</sup> EN15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator;

<sup>7)</sup> SQP= Land use related impacts/soil quality.

# Use of natural resources

| Impact category                   | Renew. PER as energy <sup>8)</sup> | Renew. PER as material | Total use of renew. PER | Non-re. PER as energy | Non-re. PER as material | Total use of non-re. PER | Secondary materials | Renew. secondary fuels | Non-ren. secondary fuels | Use of net fresh water |
|-----------------------------------|------------------------------------|------------------------|-------------------------|-----------------------|-------------------------|--------------------------|---------------------|------------------------|--------------------------|------------------------|
| Unit                              | MJ                                 | MJ                     | MJ                      | MJ                    | MJ                      | MJ                       | kg                  | MJ                     | MJ                       | m <sup>3</sup>         |
| <b>Product stage</b>              |                                    |                        |                         |                       |                         |                          |                     |                        |                          |                        |
| A1                                | 1,21E+01                           | 0,00E+00               | 1,21E+01                | 2,22E+02              | 0,00E+00                | 2,22E+02                 | 3,15E+02            | 2,45E+05               | 0,00E+00                 | 2,89E-01               |
| A2                                | 5,10E+00                           | 0,00E+00               | 5,10E+00                | 3,21E+02              | 0,00E+00                | 3,21E+02                 | 1,57E-01            | 1,29E-03               | 0,00E+00                 | 4,01E-02               |
| A3                                | 8,67E+03                           | 0,00E+00               | 8,67E+03                | 9,79E+02              | 0,00E+00                | 9,79E+02                 | 2,89E+01            | 2,04E+04               | 0,00E+00                 | 1,33E+00               |
| A1-A3                             | 8,68E+03                           | 0,00E+00               | 8,68E+03                | 1,52E+03              | 0,00E+00                | 1,52E+03                 | 3,44E+02            | 2,66E+05               | 0,00E+00                 | 1,66E+00               |
| <b>Construction process stage</b> |                                    |                        |                         |                       |                         |                          |                     |                        |                          |                        |
| A4                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| A5                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| <b>Use stage</b>                  |                                    |                        |                         |                       |                         |                          |                     |                        |                          |                        |
| B1                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B2                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B3                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B4                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B5                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B6                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| B7                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| <b>End of life stage</b>          |                                    |                        |                         |                       |                         |                          |                     |                        |                          |                        |
| C1                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| C2                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| C3                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| C4                                | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |
| <b>Benefits &amp; loads</b>       |                                    |                        |                         |                       |                         |                          |                     |                        |                          |                        |
| D                                 | ND                                 | ND                     | ND                      | ND                    | ND                      | ND                       | ND                  | ND                     | ND                       | ND                     |

<sup>8)</sup> PER=Primary energy resources.

## End of life – waste

| Impact category                   | Hazardous waste | Non-hazardous waste | Radioactive waste |
|-----------------------------------|-----------------|---------------------|-------------------|
| <b>Unit</b>                       | kg              | kg                  | kg                |
| <b>Product stage</b>              |                 |                     |                   |
| A1                                | 1,48E-01        | 1,17E+01            | 8,87E-04          |
| A2                                | 4,74E-01        | 9,07E+00            | 9,68E-05          |
| A3                                | 1,07E+01        | 4,37E+03            | 8,06E-03          |
| A1-A3                             | 1,13E+01        | 4,40E+03            | 9,04E-03          |
| <b>Construction process stage</b> |                 |                     |                   |
| A4                                | ND              | ND                  | ND                |
| A5                                | ND              | ND                  | ND                |
| <b>Use stage</b>                  |                 |                     |                   |
| B1                                | ND              | ND                  | ND                |
| B2                                | ND              | ND                  | ND                |
| B3                                | ND              | ND                  | ND                |
| B4                                | ND              | ND                  | ND                |
| B5                                | ND              | ND                  | ND                |
| B6                                | ND              | ND                  | ND                |
| B7                                | ND              | ND                  | ND                |
| <b>End of life stage</b>          |                 |                     |                   |
| C1                                | ND              | ND                  | ND                |
| C2                                | ND              | ND                  | ND                |
| C3                                | ND              | ND                  | ND                |
| C4                                | ND              | ND                  | ND                |
| <b>Benefits &amp; loads</b>       |                 |                     |                   |
| D                                 | ND              | ND                  | ND                |

## End of life – output flows

| Impact category                   | Components for re-use | Materials for recycling | Materials for energy rec | Exported energy | Exported energy –Electricity | Exported energy – Heat |
|-----------------------------------|-----------------------|-------------------------|--------------------------|-----------------|------------------------------|------------------------|
| Unit                              | kg                    | kg                      | kg                       | MJ              | MJ                           | MJ                     |
| <b>Product stage</b>              |                       |                         |                          |                 |                              |                        |
| A1                                | 3,72E-06              | 0,00E+00                | 0,00E+00                 | 0,00E+00        | 0,00E+00                     | 0,00E+00               |
| A2                                | 0,00E+00              | 0,00E+00                | 0,00E+00                 | 0,00E+00        | 0,00E+00                     | 0,00E+00               |
| A3                                | 3,10E-07              | 0,00E+00                | 0,00E+00                 | 0,00E+00        | 0,00E+00                     | 0,00E+00               |
| A1-A3                             | 4,03E-06              | 0,00E+00                | 0,00E+00                 | 0,00E+00        | 0,00E+00                     | 0,00E+00               |
| <b>Construction process stage</b> |                       |                         |                          |                 |                              |                        |
| A4                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| A5                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| <b>Use stage</b>                  |                       |                         |                          |                 |                              |                        |
| B1                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B2                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B3                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B4                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B5                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B6                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| B7                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| <b>End of life stage</b>          |                       |                         |                          |                 |                              |                        |
| C1                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| C2                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| C3                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| C4                                | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |
| <b>Benefits &amp; loads</b>       |                       |                         |                          |                 |                              |                        |
| D                                 | ND                    | ND                      | ND                       | ND              | ND                           | ND                     |

# Environmental impacts – EN 15804+A1, CML / ISO 21930

| Impact category                   | Global Warming Pot.  | Ozone depletion Pot.    | Acidification        | Eutrophication                   | POCP ("smog")                      | ADP-elements | ADP-fossil |
|-----------------------------------|----------------------|-------------------------|----------------------|----------------------------------|------------------------------------|--------------|------------|
| Unit                              | kg CO <sub>2</sub> e | kg CFC <sub>-11</sub> e | kg SO <sub>2</sub> e | kgPO <sub>4</sub> <sup>3</sup> e | kg C <sub>2</sub> H <sub>4</sub> e | kg Sbe       | MJ         |
| <b>Product stage</b>              |                      |                         |                      |                                  |                                    |              |            |
| A1                                | -2,95E+02            | 5,82E-08                | 3,95E-02             | 9,19E-03                         | 2,40E-03                           | 8,51E-06     | 5,84E+01   |
| A2                                | 2,39E+01             | 3,43E-07                | 2,17E-01             | 3,13E-02                         | 1,26E-02                           | 5,38E-05     | 3,15E+02   |
| A3                                | 4,60E+01             | 3,93E-07                | 2,38E-01             | 1,15E-01                         | 1,82E-02                           | 1,35E-03     | 4,70E+02   |
| A1-A3                             | -2,25E+02            | 7,95E-07                | 4,95E-01             | 1,55E-01                         | 3,32E-02                           | 1,41E-03     | 8,43E+02   |
| <b>Construction process stage</b> |                      |                         |                      |                                  |                                    |              |            |
| A4                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| A5                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| <b>Use stage</b>                  |                      |                         |                      |                                  |                                    |              |            |
| B1                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B2                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B3                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B4                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B5                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B6                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| B7                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| <b>End of life stage</b>          |                      |                         |                      |                                  |                                    |              |            |
| C1                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| C2                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| C3                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| C4                                | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |
| <b>Benefits &amp; loads</b>       |                      |                         |                      |                                  |                                    |              |            |
| D                                 | ND                   | ND                      | ND                   | ND                               | ND                                 | ND           | ND         |

## Additional indicator – GWP-GHG

| Impact category                   | GWP-GHG <sup>9)</sup> |
|-----------------------------------|-----------------------|
| <b>Unit</b>                       | Kg CO <sub>2</sub> e  |
| <b>Product stage</b>              |                       |
| A1                                | -2,85E+02             |
| A2                                | 2,41E+01              |
| A3                                | 8,72E+01              |
| A1-A3                             | -1,74E+02             |
| <b>Construction process stage</b> |                       |
| A4                                | ND                    |
| A5                                | ND                    |
| <b>Use stage</b>                  |                       |
| B1                                | ND                    |
| B2                                | ND                    |
| B3                                | ND                    |
| B4                                | ND                    |
| B5                                | ND                    |
| B6                                | ND                    |
| B7                                | ND                    |
| <b>End of life stage</b>          |                       |
| C1                                | ND                    |
| C2                                | ND                    |
| C3                                | ND                    |
| C4                                | ND                    |
| <b>Benefits &amp; loads</b>       |                       |
| D                                 | ND                    |

<sup>9)</sup> This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCCAR5 (IPCC2013). In addition, the characterisation factors for the flows - CH<sub>4</sub>fossil, CH<sub>4</sub>biogenic and Dinitrogen monoxide - were updated in line with the guidance of IESPCR1.2.5 Annex 1. This indicator is identical to the GWP-total of EN15804:2012+A2:2019 except that the characterisation factor for biogenic CO<sub>2</sub> is set to zero.

## Scenario documentation

### Data sources

#### Manufacturing energy scenario documentation

1. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0165 kgCO<sub>2</sub>e/kWh
2. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0165 kgCO<sub>2</sub>e/kWh
3. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0165 kgCO<sub>2</sub>e/kWh
4. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0165 kgCO<sub>2</sub>e/kWh
5. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0165 kgCO<sub>2</sub>e/kWh
6. Electricity grid mix scenario 2030, Germany, GaBi, 0.36 kgCO<sub>2</sub>e/kWh

# Third-party verification statement

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

## Verified tools

**Tool verifier:**

Magaly Gonzalez Vazquez

**Tool verification validity:**

27 March 2025 – 26 March 2028

Elma Avdyli, as authorized verifier acting for EPD HUB Limited 23.06.2026



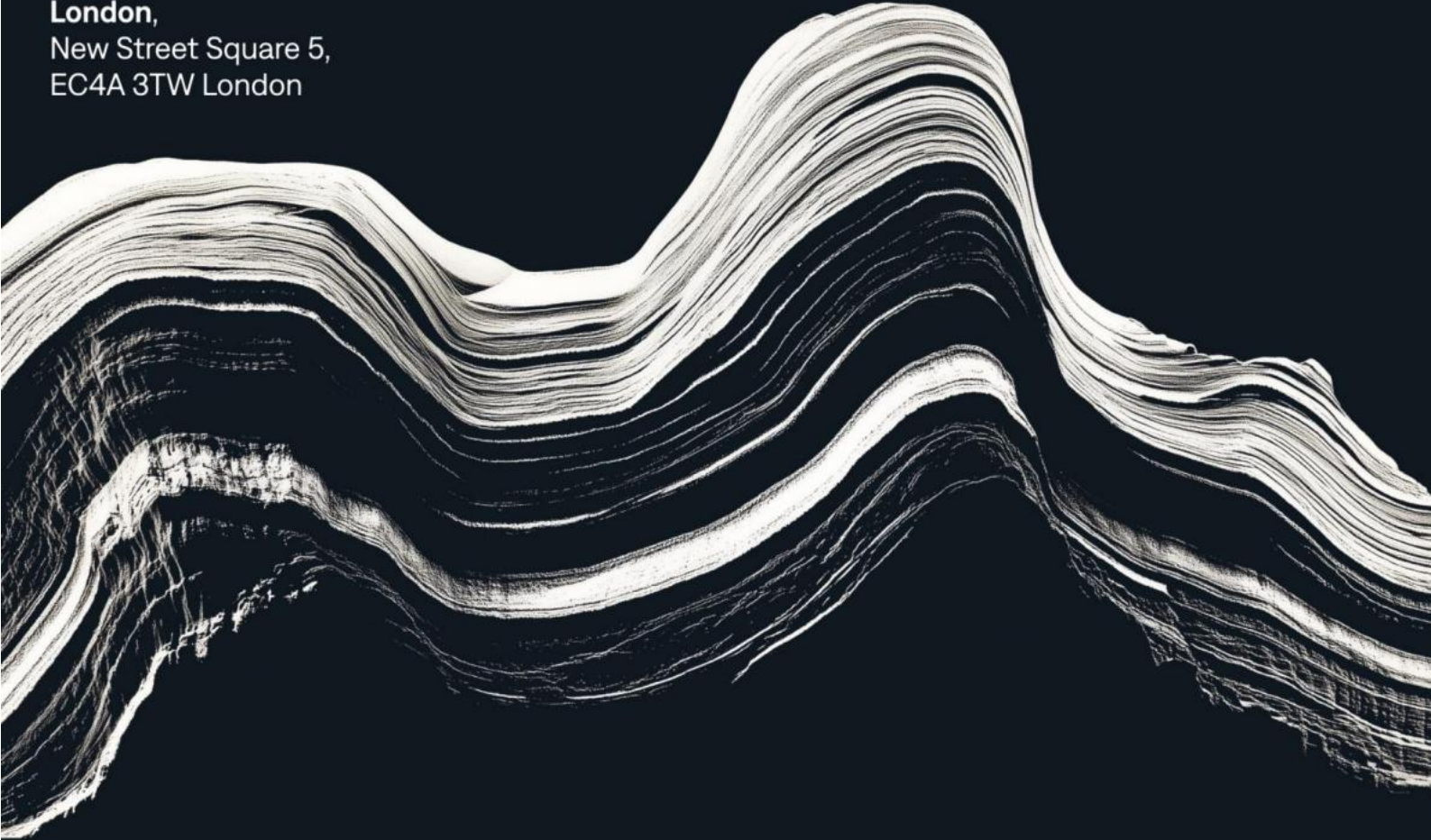
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**Rotterdam,**  
Scheepsbouwweg 29,  
3089 JW Rotterdam

**Stockholm,**  
Kungsgatan 10,  
111 43 Stockholm

**Helsinki,**  
Sofiankatu 4,  
00120 Helsinki

**London,**  
New Street Square 5,  
EC4A 3TW London



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