

Carbon2x – Sustainable materials from CO₂ emissions of waste incineration

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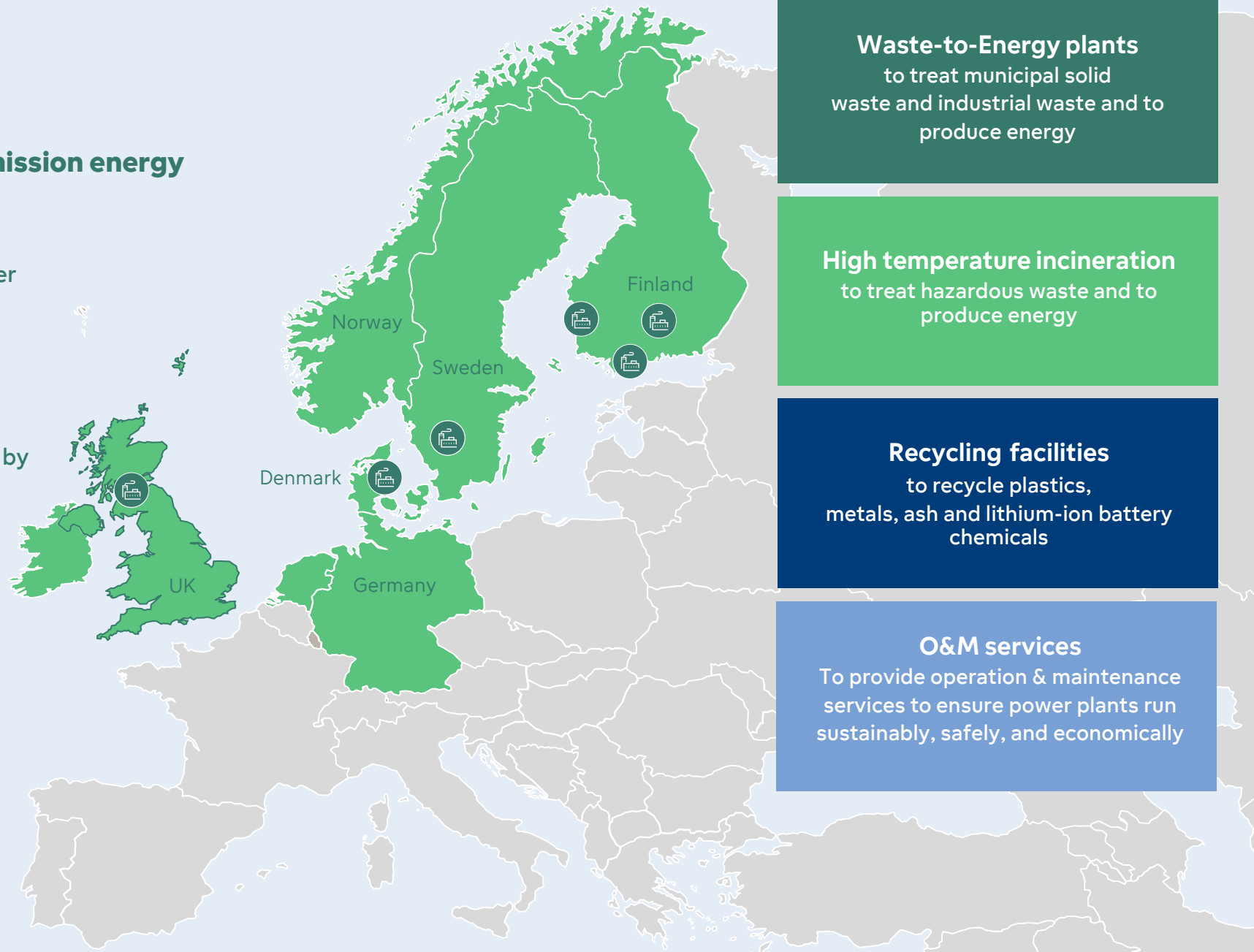
Fortum Recycling & Waste

Leading the change towards a low-emission energy system and optimal use of resources

We have a strong Nordic presence, and we offer our services globally.

Today we have over **1000** employees and a comprehensive network of around **30** offices.

Our goal is to support our customers' business by conserving natural resources and promoting circular economy.



Waste-to-Energy plants
to treat municipal solid waste and industrial waste and to produce energy

High temperature incineration
to treat hazardous waste and to produce energy

Recycling facilities
to recycle plastics, metals, ash and lithium-ion battery chemicals

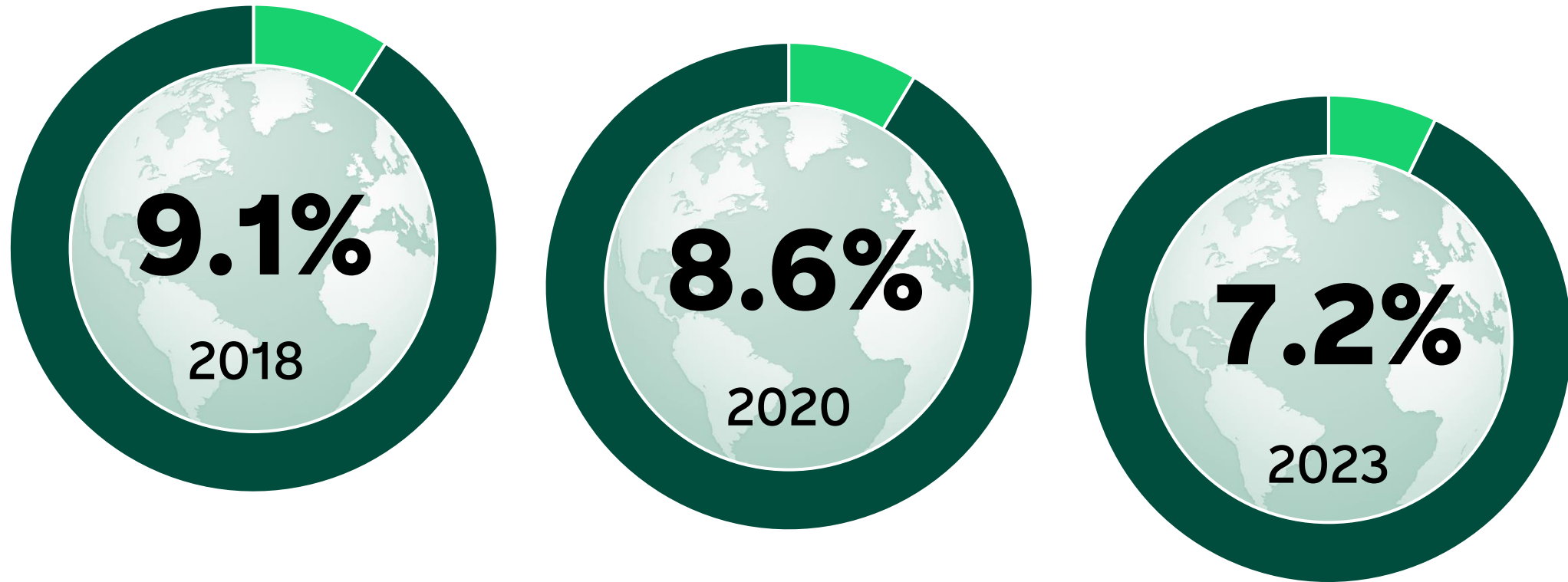
O&M services
To provide operation & maintenance services to ensure power plants run sustainably, safely, and economically

From Waste-to-Energy to Waste-to-Materials

Building the next generation of circular economy – by rethinking CO2

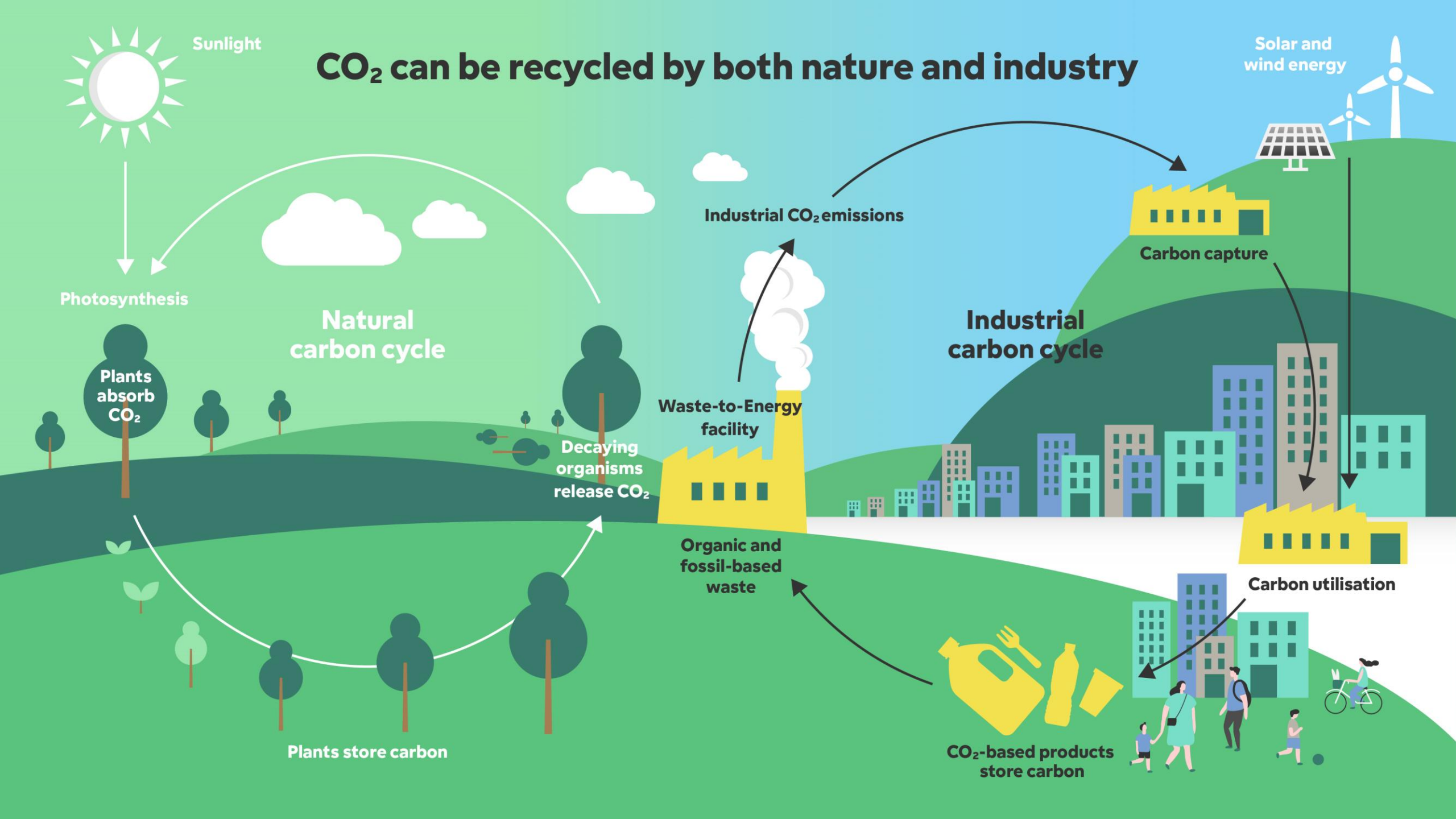
Scarcity of raw materials

Rising material extraction has shrunk global circularity – this leaves a huge circularity gap



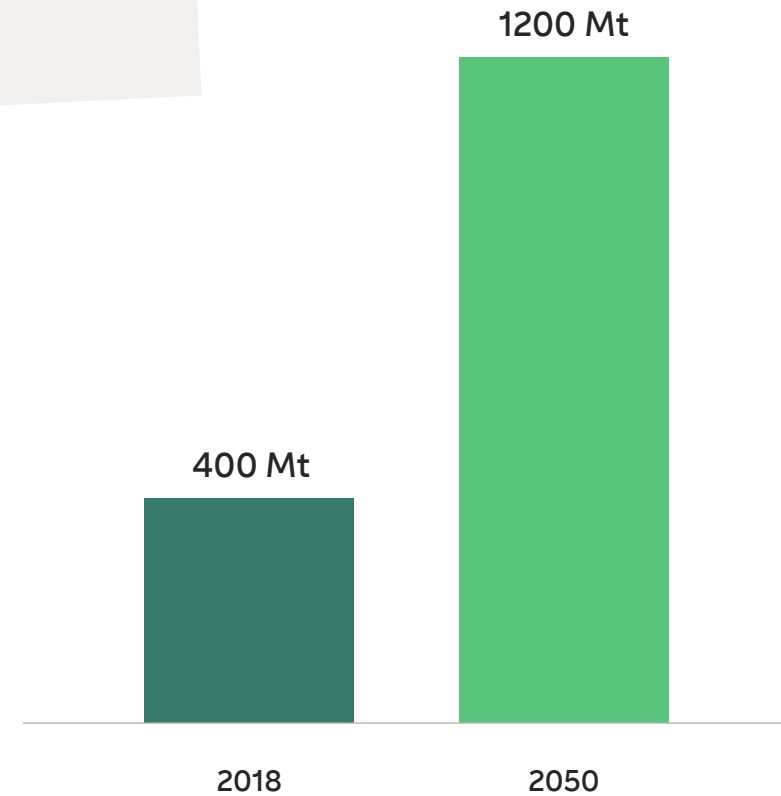
Materials that are cycled back into the global economy after the end of their useful life, otherwise known as secondary materials, account for only 7.2% of all material inputs into the economy.

CO₂ can be recycled by both nature and industry



Why Do We Need to Recycle CO₂ ?

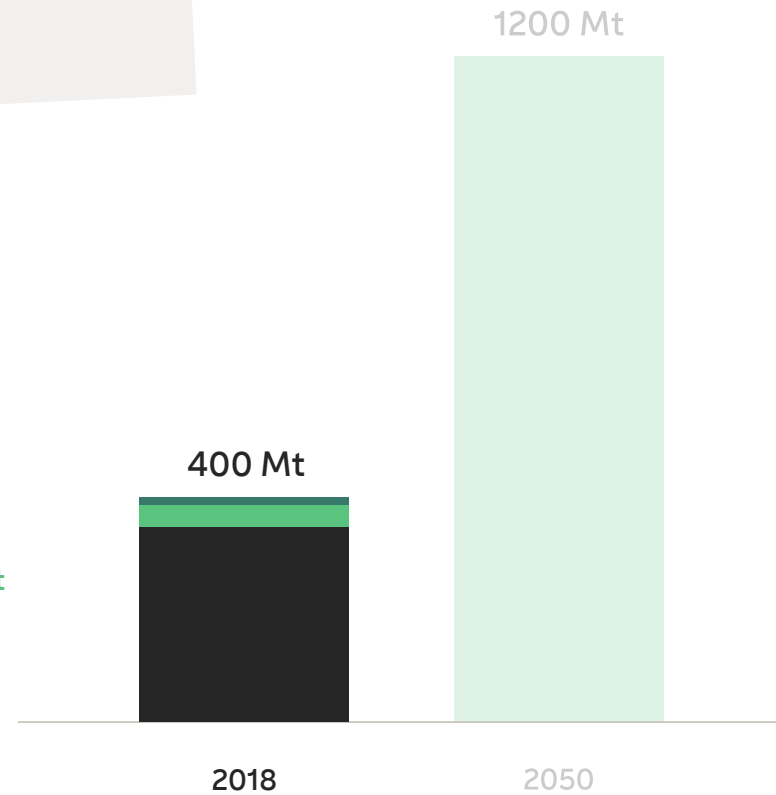
Global demand for plastics is expected to grow **threefold by **2050**.**



Why Do We Need to Recycle CO₂ ?

90% of plastics today are produced from fossil feedstock.

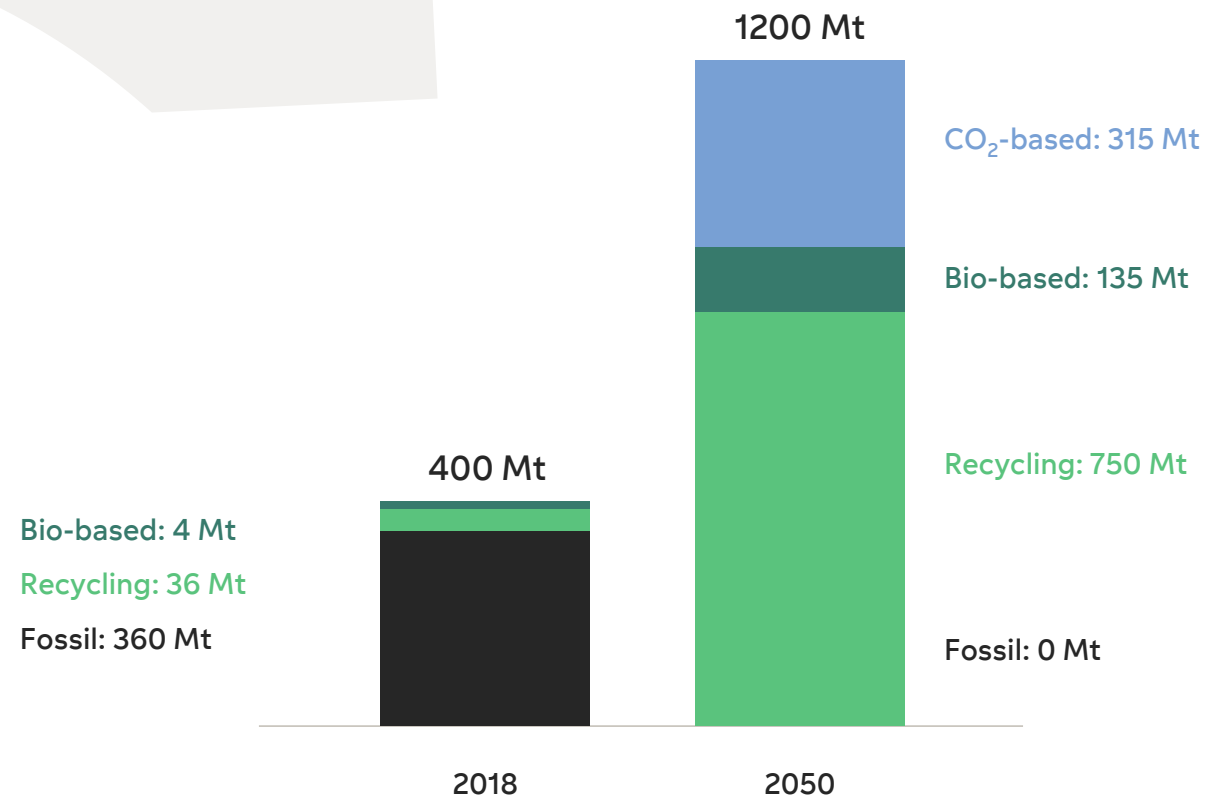
Bio-based: 4 Mt
Recycling: 36 Mt
Fossil: 360 Mt



Why Do We Need to Recycle CO₂ ?

Fossil-free plastic production requires alternative feedstocks in addition to recycling.

Carbon capture and utilisation are part of the solution.





RECYCLED MATERIALS FROM WASTE

Key Benefits of Carbon2x



Circularity

Carbon2x increases the circulation of materials by complementing mechanical recycling. There will always be materials that cannot be recycled – at all or anymore. As they are used as energy, Carbon2x captures the CO₂ released in incineration and turns it into new raw materials.



New sustainable materials

Carbon2x turns waste into valuable feedstock for new products, such as high-quality plastic than could be used for food and pharmaceutical packaging. This has not been possible with mechanically recycled plastic due to hygiene reasons.



Climate action

Carbon2x enables a lower carbon footprint by capturing and recycling carbon (CCU) from waste incineration. It can help decarbonize hundreds of waste-to-energy plants in Europe alone.

Carbon2x pilot in Riihimäki, Finland



- The Riihimäki pilot in 2022 was **one of the worlds first CCU projects** ever demonstrated on a WtE plant
- The goal of the pilot was to **test the carbon capture and utilization** of Fortum's Riihimäki waste-to-energy plant's carbon dioxide (CO₂) emissions.
- The pilot looked specifically at the production of **methane as an intermediate step** by combining the plant's CO₂ emissions with hydrogen
- The results of the pilot have boosted Fortum's **3-year research project** that aims to produce CO₂ based plastics out of our captured CO₂



PHASE I

Carbon2x concept development and pilots



PHASE II

Converting our own CO₂ into products we can sell



PHASE III

Selling Carbon2x as a service for industries

Roadmap for Waste-to-Materials Program



CH₃OH

Thank You!

Fortum Recycling & Waste

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