

# The next generation of sustainable plastics



# INGN

Plastics born from CO<sub>2</sub>

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NG Nordic

**NG**  
Nordic

# NG Nordic at glance



&

**FORTUM**  
Recycling & Waste



**14 Bn Revenue NOK / 1.2 Bn Revenue €**



**+ 90 waste and processing facilities**



**Full value chain**



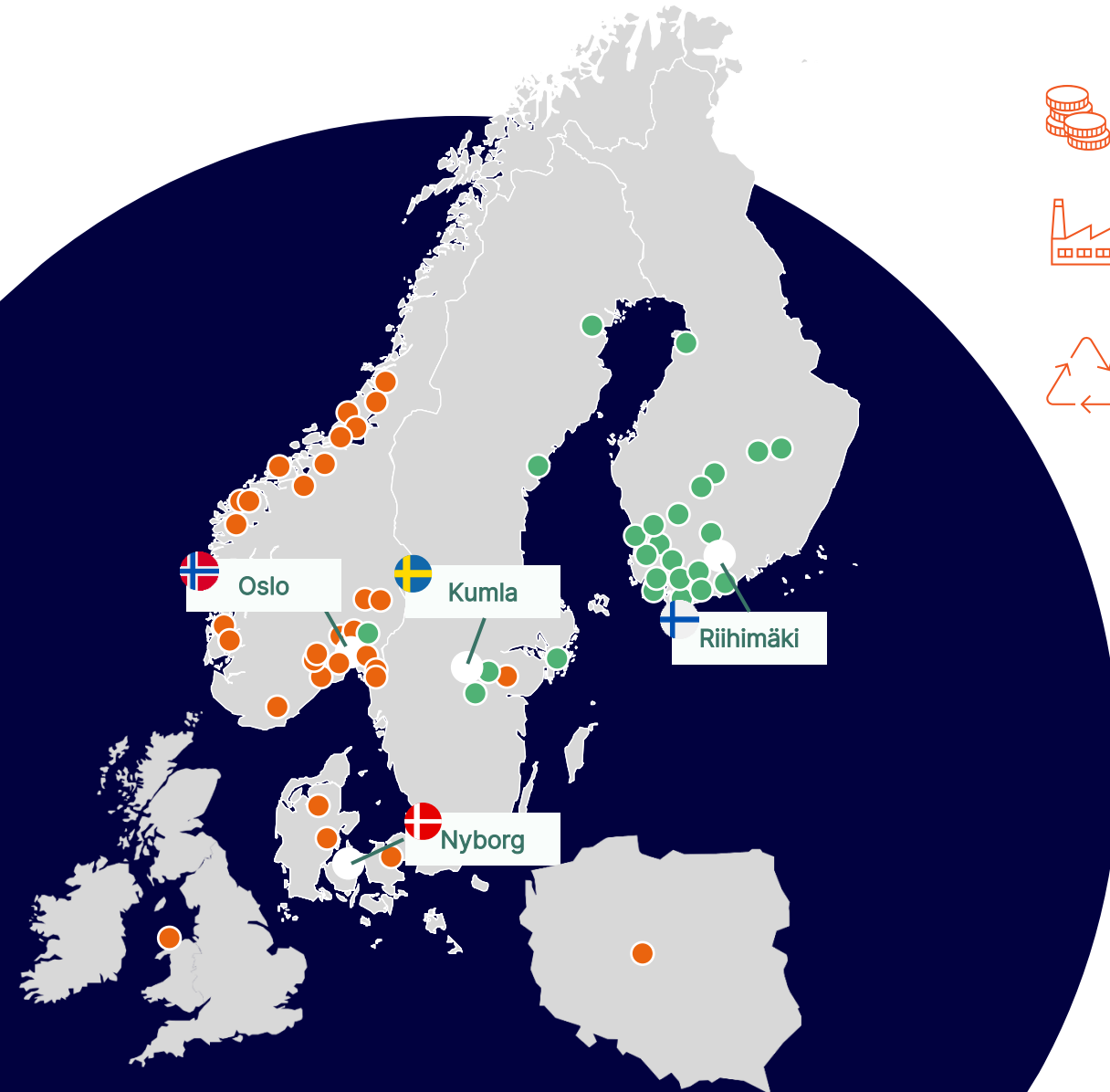
**~ 4.4m tonnes waste**



**~ 3500 people**



**Nordic +**



We **are a leading Nordic provider** of circular solutions and environmental services, tackling the urgent challenges of climate change and resource scarcity.

By **transforming waste into valuable resources** and removing hazardous substances from circulation, we are avoiding emissions and protecting natural ecosystems.

Through reuse, collection, recycling and depollution, **we scale access to circular raw materials** and help decarbonize society.

# Concept in a nutshell



A new way to cycle materials back to global economy – even the waste that is not recyclable



CO<sub>2</sub> captured from waste incineration can be utilised as raw material for new innovative materials



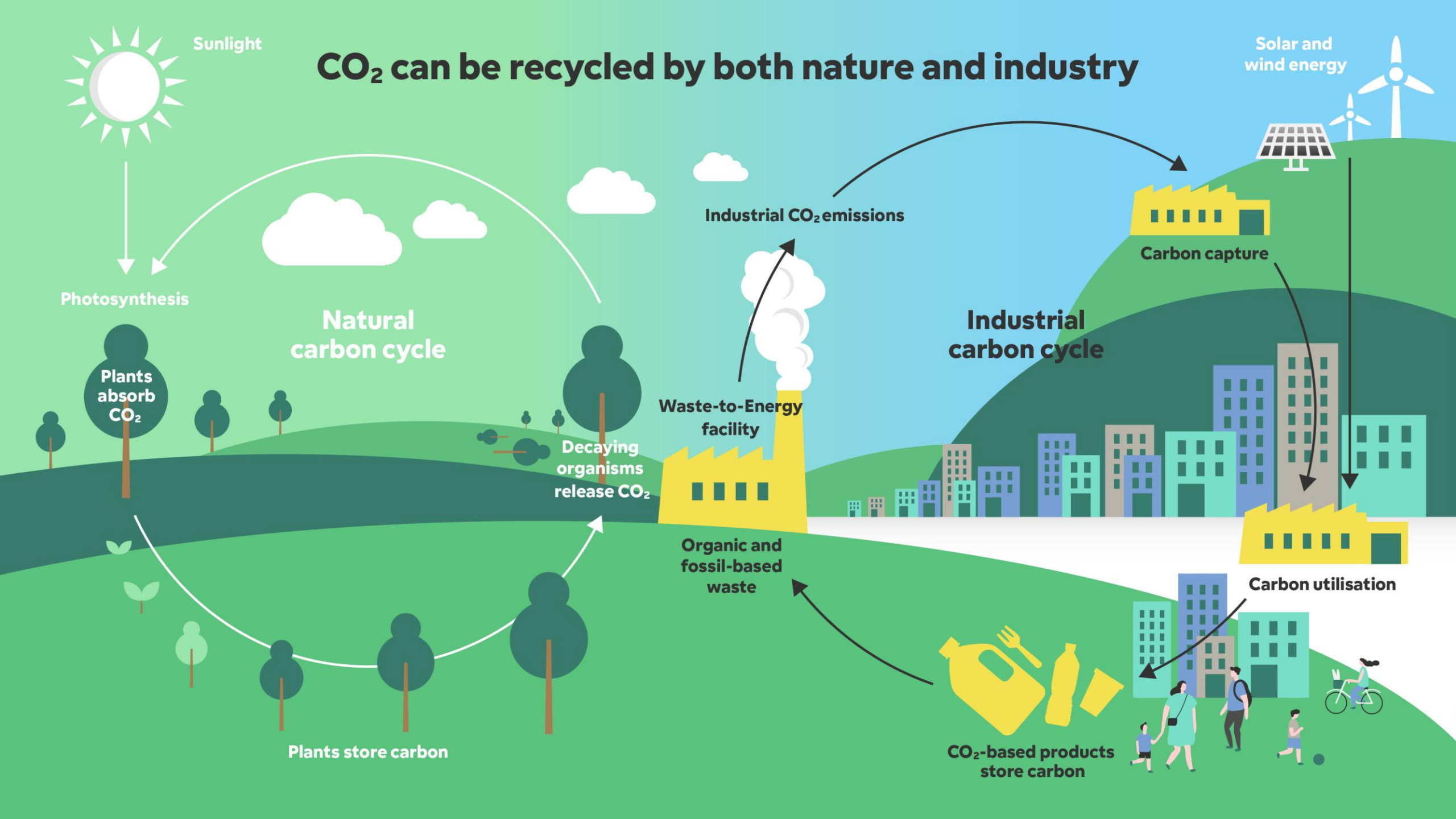
Cuts CO<sub>2</sub> emissions from the waste incineration




CO<sub>2</sub> based materials can replace fossil materials in different industries (for example in plastics)










***“it is estimated that the **supply** of sustainable biomass falls 40-70% short compared with projected demand by 2050.**”*

Source: European Commission: “Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU”

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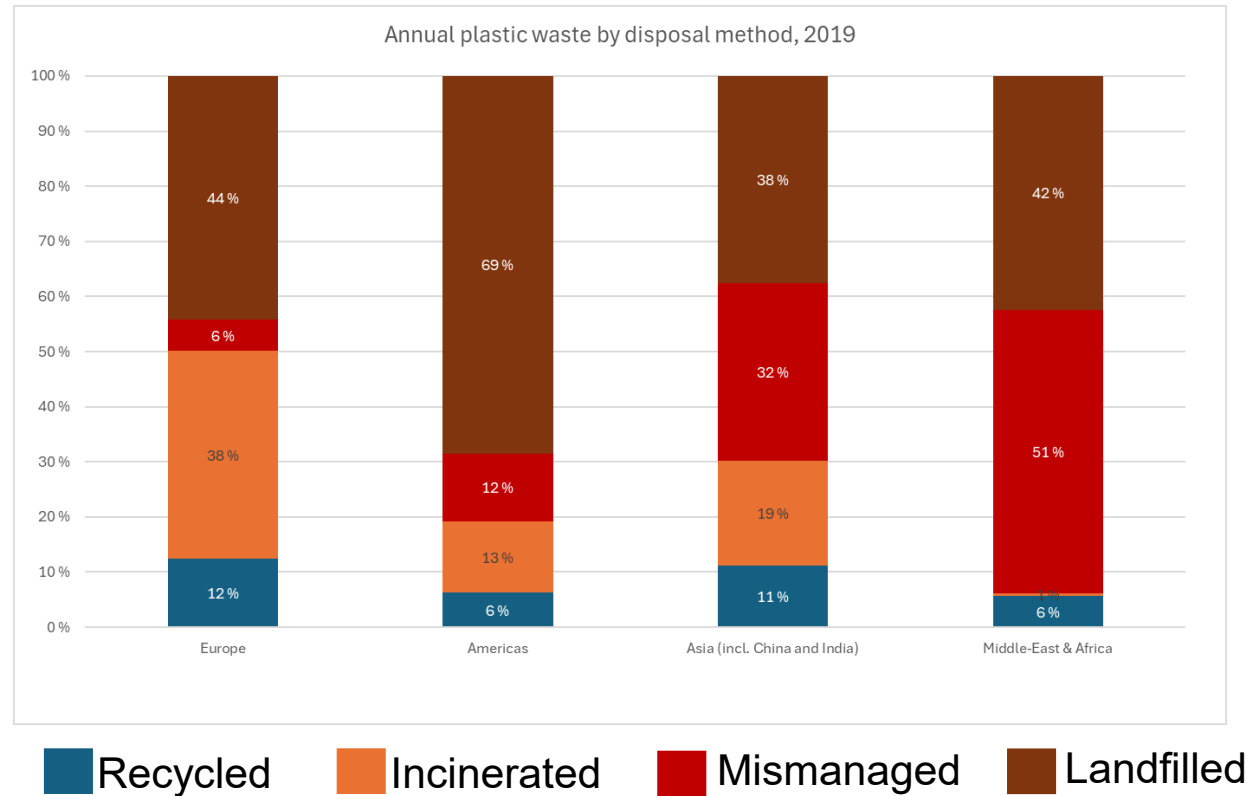


*“it is estimated that the **supply of sustainable biomass falls 40-70% short** compared with projected demand by 2050.*

*This makes the use of additional renewable carbon sources such as recycled waste or captured carbon necessary. “*

Source: European Commission: “Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU”

Plastics  
resistance to  
degradation  
causes  
environmental  
pollution



Source: <https://ourworldindata.org/grapher/plastic-fate?time=2019..latest&country=~Sub-Saharan+Africa&tableSearch=sub+saha>

# Plastics resistance to degradation causes environmental pollution



**BBC: Wildlife Photographer of the Year 2025**

**Title:** Toxic Tip

**Photographer:** Lakshitha Karunaratna (Sri Lanka)

**Location:** Ampara, Eastern Province, Sri Lanka

Source: [Wildlife of the Year Award 2025 – the best pictures so far](#)



These challenges  
demand  
innovative,  
science-driven  
solutions



**INGN**  
**Plastics born from CO<sub>2</sub>**

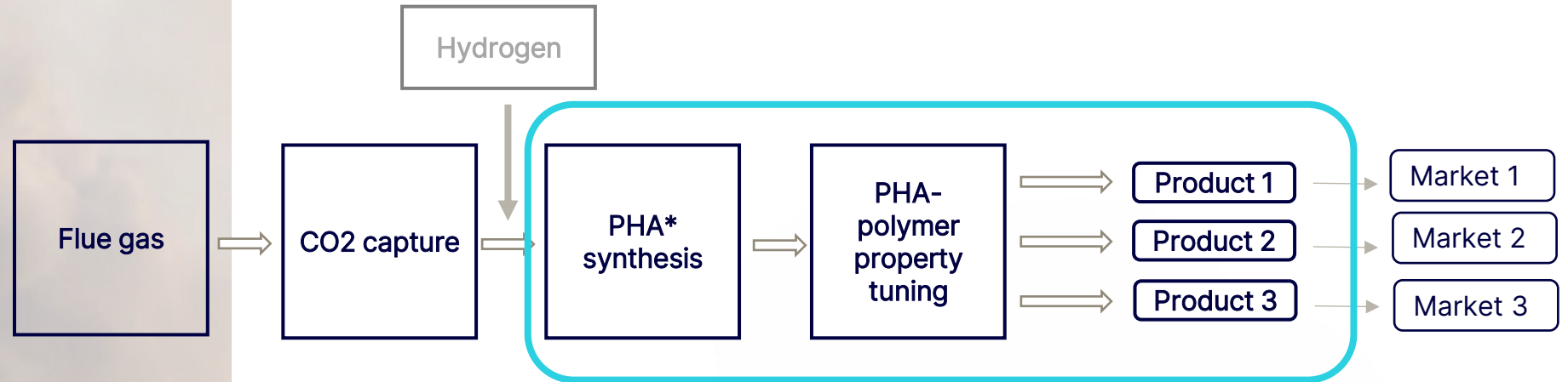
The background of the right side of the slide features a large, faint illustration. At the bottom, a small dark blue silhouette of a factory with three smokestacks emits a thick, billowing cloud of white smoke that rises towards the center. In the upper right corner, a white plastic jar with its lid removed is shown, surrounded by numerous small, translucent white spheres and a few larger, solid blue spheres, suggesting a process of transformation or recycling.

# What is INGA ?

It is a plastic called  
**PHA** (PolyHydroxyAlkanoate)



# INGA is made from emissions



\*PolyHydroxyAlkanoate



# Biodegradable Polymers in Various Environments

According to Established Standards & Certification Schemes

proven biodegradability

proven biodegradability for certain grades

biodegradability not proven

The biodegradability of plastics derived from all other biodegradable polymers can only be guaranteed if all additives and (organic) fillers are biodegradable, too. Dyes and fillings of refractive fibres, for example, may prevent their biodegradation in the environment.

Biodegradation depends on the complex biotechnological conditions at each testing site (e.g. temperature, available nutrients and oxygen, microbial activity, etc.). Therefore, these generalised claims about biodegradability can only serve as approximations and need to be confirmed by standardised testing under lab conditions. In this behaviour can vary depending on the mentioned conditions, color of the plastic, grade of the polymer and other factors. For instance, biodegradation testing is often performed after charring, showing the inherent nature of the material to biodegrade. In reality, the same level of biodegradability will be obtained, but it possibly without a sufficient timeline.

**SLOWER BIODEGRADING POLYMERS**

The polymers shown in the poster are rapidly biodegradable in the labelled environments, while the one frame of the corresponding standards or certificates. Some biopolymers, such as PHB or PLA in soil and also lignin-based for virtually all environments, also biodegrade, but (much) more slowly.

Full biodegradability can take several years to develop to be achieved. In addition, for some applications it was already in a certain environment (e.g. garments), too rapid biodegradation is not desired, so that function should first be given for a few years. However, for these cases no standard exist so far.

<sup>1</sup> incl. PHB, PBA, PBAT, PBS, PHBH, PHBDH, PHBHHX, PHBHDH, PHBHDH, PHBHDH

<sup>2</sup> PLA is likely to be biodegradable in thermophilic anaerobic digestion at temperatures of 50°C within the time frame mentioned in standards. This does not apply to mesophilic digestion.

**Cellulose**  
(Lignin <5%)

**Cellulose Acetate**  
and other Derivatives

**PBAT**

**PBS**

**PBSA**

**PCL**

**PHB and Copolymers<sup>1</sup>**

**Starch**  
and other natural  
Polymers

**PLA**

"is thermally degradable"

**ENVIRONMENTS**

**IMPORTANT TEST CONDITIONS, CERTIFICATION SCHEMES AND STANDARDS**

For more details, refer to the original documents.

**MARINE ENVIRONMENT**

Temperature 20°C, 90 % biodegradation within a maximum of 6 months.  
Certification: TÜV AUSTRIA OK biodegradable MARINE and DIN CERTCO (China) biodegradable in marine environment, the latter is based on ISO 22463, the standard going requirements for marine biodegradability.

**FRESH WATER**

Temperature 20 °C, 90 % biodegradation within a maximum of 90 days.  
Certification: TÜV AUSTRIA OK biodegradable WATER. Research on standards (especially on requirements) is ongoing.

**SOIL**

Temperature 23°C, 90 % biodegradation within a maximum of 90 days.  
Certification: TÜV AUSTRIA OK biodegradable SOIL, and DIN CERTCO (China) biodegradable in soil. DIN CERTCO biodegradable in soil is based on the European standard EN 15428 and/or for much films but can be used for other products as well.

**HOME COMPOSTING**

Temperature 23°C, 90 % biodegradation within a maximum of 12 months.  
Certification: TÜV AUSTRIA OK compost HOME and DIN CERTCO (China) biodegradable Home Compostable.

**LANDFILL**

No European standard specifications or certification schemes available since this is not a preferred end-use for biodegradability.

**ANAEROBIC DIGESTION**

Thermophilic: 50°C / Mesophilic: 37°C  
A specific European standard in certification schemes for anaerobic digestion is not yet available. Anaerobic digestion in a biogas plant is mentioned in EN 15428 and in DIN EN 15959. 50 % biodegradation within two months, usually followed by aerobic digestion.

**INDUSTRIAL COMPOSTING**

Temperature 50°C, 90 % biodegradation within a maximum of 6 months.  
Certification: TÜV AUSTRIA OK compost INDUSTRIAL, DIN CERTCO (China) compost Industrial Compostable and both "Seedling". EN 15428 and EN 15959 are the European reference standards and the basis of these certifications schemes.

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- Source: <https://renewable-carbon.eu/>
- and Certification Schemes – Graphic (PDF, current version) |
- INGA**  
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Source: Biodegradable Polymers in Various Environments According to Established Standards and Certification Schemes – Graphic (PDF, current version) | Renewable Carbon Publications

INGA is the **world's first**  
biodegradable plastic born  
entirely from CO<sub>2</sub>



INGA can be both **stiff** and **flexible** as well as **easily moldable**, making it suitable for different processing methods, such as **injection molding** and **coating**





# Where can INGA be used ?



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COATING FOR  
PAPER AND  
CARDBOARD



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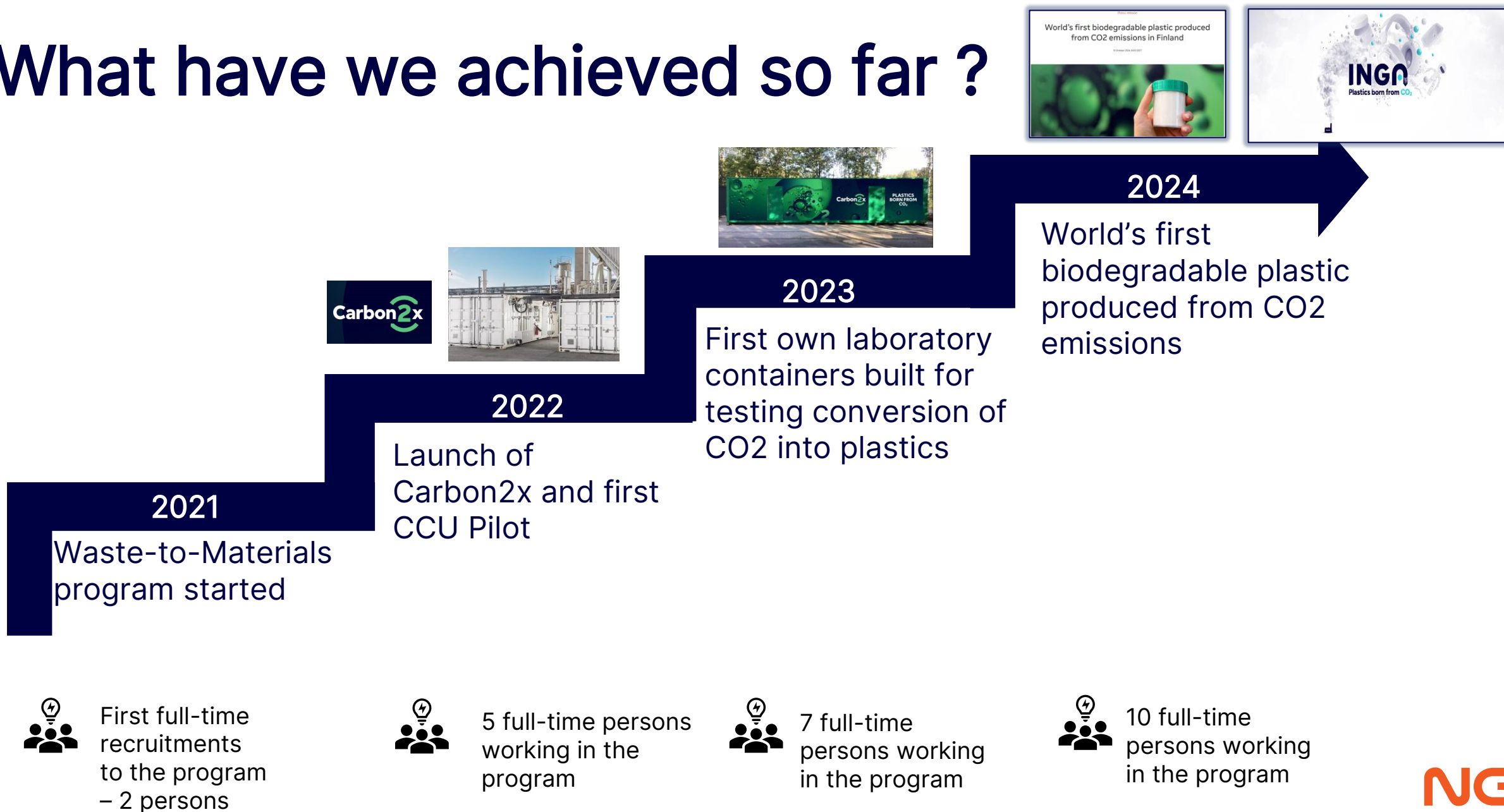
COSMETICS



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ELECTRONICS

# What have we achieved so far ?



# This is our plan towards commercialization



**2023**

Ramp-up of Laboratory Pilot containers for production of raw – materials for CO2 based plastics

**Investment size:**

< 2 M€

**Production quantity:**

Technology piloting



**2025**

Piloting of entire production process of CO2 based plastics

**Investment size:**

10 M€

**Production quantity:**

< 1 ton/year



**2028-2029**

Demo scale industrial plant for CO2 based plastics production

**Investment size:**

TBD

**Production quantity:**

> 1 500 tonnes /year



**2035**

Large scale industrial plant for production of CO2 based plastics production

**Investment size:**

TBD

**Production quantity:**

> 10 000 tonnes /year



# INGA – Key benefits

**1.**

It turns  
emissions into raw material

Since it uses CO<sub>2</sub> as a  
feedstock

**2.**

It is  
Biodegradable

The only polymer type  
that breaks down in all  
tested environments

**3.**

INGA leverages  
novel process technology  
that allows

- continuous process
- flexibility to adjust the polymer design to influence the end properties



# Call to action

We're looking for **visionary partners** - early adopters - who believe in turning carbon dioxide into a resource, not a liability.

Join us in shaping the future of materials

