



# Carbon Management Plan

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# Introduction

Indaver offers sustainable and safe waste management solutions to both industry and public authorities. In doing so, we focus on recovering as much raw material and renewable energy from waste as possible. We do this in an energy-efficient manner to avoid or limit the amount of CO<sub>2</sub> being emitted, respecting the highest environmental and quality standards. That is how we are playing our part in the transition to a sustainable circular economy. Closing the waste cycle is a key element of our mission. Therefore, we rely on a broad portfolio of different treatment techniques. Through our recycling installations, we prevent CO<sub>2</sub> being emitted, and with our Waste-to-Energy facilities, we limit CO<sub>2</sub> emissions.

The scope of this document regards the Indaver management of Green House Gases (GHG's). The most relevant being CO<sub>2</sub>, but we should not forget the other chemicals also impacting the Global Warming phenomenon. The most important being: methane (CH<sub>4</sub>; x30), nitric oxide (N<sub>2</sub>O; x300), freons (CFCs; x10000), ... The effect of the sum of these GHGs is expressed in CO<sub>2</sub> equivalents. In the further course of this policy we will refer to CO<sub>2</sub> as the sum of these GHGs, if relevant.



# Introduction

## The European Legislative Framework

In November 2019, the European Commission presented its Green Deal, the roadmap to a climate-neutral Europe in 2050. In all of its climate goals, the European Commission and the member states alongside it, use two years: 2030 and 2050. This Green Deal is focusing on, amongst others:

- Increasing the EU's climate ambition for 2030 and 2050;
- Alternative, cleaner sources of energy; more sustainable, more environmentally respectful production cycles;
- More sustainable means of transport;
- Measures to cut pollution rapidly and efficiently.

Europe's 2030 goal is to bring CO<sub>2</sub> emissions to 55% less in comparison to 1990 and to be carbon neutral by 2050. It is within this European legislative framework and its objectives that Indaver actively commits to further reduce its carbon footprint and avoid or limit emissions from its facilities as much as possible, contributing to the circular economy and preventing hazardous substances from waste ending up in the materials and food loops. This is why Indaver invests in new technology and teams up with partners in the field of recovering raw materials. It is our social duty to ensure that hazardous waste is treated safely. As with most industrial activities, waste treatment, and in particular the thermal treatment of waste products, involves CO<sub>2</sub> emissions, one of the main greenhouse gases that contribute to climate change.

However, the amount of waste that is treated thermally and the associated CO<sub>2</sub> emissions can be reduced through better separation at the source and optimum material recycling. It is Indaver's first priority to avoid CO<sub>2</sub> emissions. When that is not possible, Indaver is looking for ways to capture this (CC) and to find useful applications for it (CCU). With this Carbon Management Plan, Indaver is clarifying its strategy and offering insight into its efforts to reduce its share of CO<sub>2</sub> emissions as much as possible.

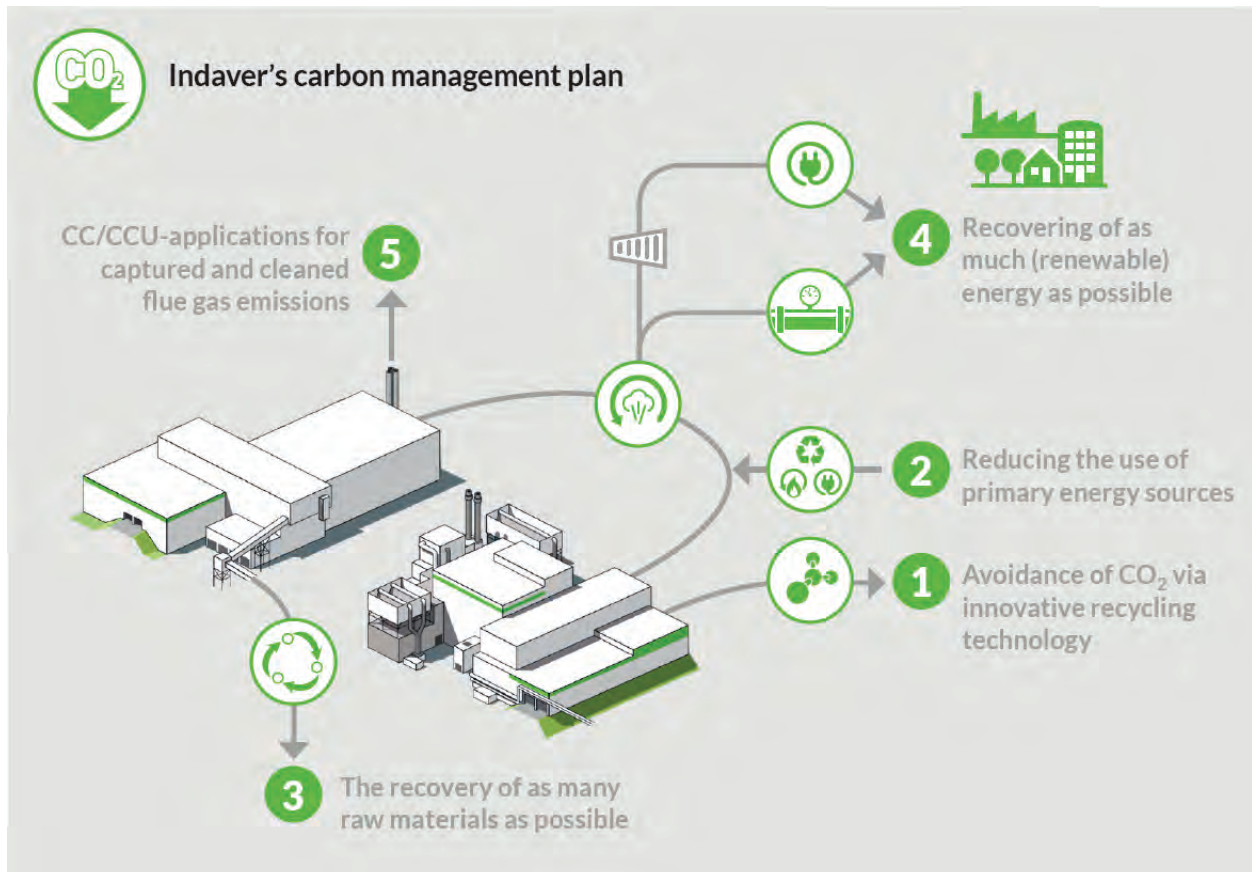


# The Carbon Management Plan

Keeping Europe's Green Deal key principles in mind, Indaver's Carbon Management Plan is focused on the following priorities:

1. Avoid CO<sub>2</sub> from being emitted by keeping the carbon in the chemicals via sustainable and safe recycling installations and not releasing it into the air.
2. Reducing the use of primary energy sources during our waste processing and management activities (such as fossil fuels, electricity from the public grid).
3. The recovery of as many high-quality materials as possible (including wood, plastics, metals, granulate, precious metals and water), avoiding the energy needed for the virgin production of these materials.
4. The recovery of as much energy as possible, including renewable energy from the waste streams treated in our treatment installations, e.g. waste-to-energy plants and steam networks.
5. As a last resort, Indaver will turn to CCS (Carbon Capture and Storage) and CCU (Carbon Capture and Usage) for its non-avoidable CO<sub>2</sub>-emissions, as soon as it is considered BATnec for our sector.

In this way, Indaver is contributing to the goals as stipulated within the EED<sup>(4)</sup>, WFD<sup>(5)</sup> and RED (6) legislation set by the European Commission.



# Our Environmental Sustainability Objectives

## Avoiding CO<sub>2</sub>: a priority

When building waste processing and recycling installations, Indaver sets CO<sub>2</sub> avoidance as one of its first priorities.

We retain the carbon in the recycled molecules so that it is kept in the material chain and thus not released as CO<sub>2</sub> into the atmosphere.

Indaver's investments in high-tech recycling installations illustrate the development towards prevention and more recycling of waste to avoid CO<sub>2</sub>.

## Energy and resource efficiency

We limit our CO<sub>2</sub> emissions by making our plants, processes, buildings, and transport as energy efficient as possible. We monitor the energy consumption of our facilities and processes constantly and look for potential points for improvement. Furthermore, we look into how we can reduce our energy consumption and, consequently, CO<sub>2</sub> emissions for all of our activities. This applies to everything from industrial treatment processes to our staff's mobility.

We are reducing the CO<sub>2</sub> emissions in our logistics step-by-step, as well as the CO<sub>2</sub> emissions from our staff's mobility.

Indaver applies as much as possible the waste-to-waste principles in order to avoid the use of raw materials and/or fossil fuels in their waste treatment facilities.

To reduce the amount of fossil fuels used in our thermal treatment installations as much as possible, Indaver uses an optimum waste mix in its energy-efficient plants. This means that we mainly add fuel to the waste to start the thermal process. By combining high-calorific waste with low-calorific waste, we hardly ever need to add fuel to keep the thermal process going. The high-calorific waste serves partly as a replacement for fossil fuels.

## Energy self-sufficiency

We use the steam and electricity generated by our thermal treatment plants for hazardous and municipal waste, primarily for our plant machinery and buildings. Consequently, we are quasi-autonomous in terms of our own energy supply.



# Our Environmental Sustainability Objectives

## The recovery of high-quality secondary materials

The recovery of high-quality secondary materials leads to avoided societal emissions. Because manufacturers make products out of raw materials. This production generates waste. At some point in time, the products themselves also become waste. These waste streams contain a lot of materials, which we recycle as efficiently as possible. Consequently, we have less need for primary and fossil feedstock. Indaver is contributing to the closure of material loops.

With our Molecule Management approach, we break down complex waste to a molecular level. Using innovative techniques such as chemical and thermal recycling, we recycle valuable materials from hazardous waste and convert them safely into new raw materials in such a way that they satisfy the quality requirements set by the market.

Examples of this are illustrated in our '2030 achievements and ongoing projects'. Other notable examples of non-hazardous waste are paper, plastics, metals, PMD, VFG, and granulates from bottom ashes.

By recovering all of these high-quality secondary materials from waste, we are preventing the CO<sub>2</sub> emissions released during the extraction and refining of these raw materials. This provides a huge environmental gain, in particular for minerals and metals (EU priority to recover materials such as rare earth metals and precious metals).

## The recovery of high-quality secondary energy

The recovery of high-quality secondary energy from waste heat leads to avoided societal emissions. Because Indaver offers a sustainable alternative for fossil fuels. We are always on the lookout for the most efficient use of this energy. It can be converted to electricity, but there is a significant conversion loss. A better option is to convert to high-temperature and high-temperature industrial steam. Heat networks are also considered, but we tend to connect this to industrial use, since heating networks are not used 24/7/52

Using a turbine, we also convert the steam into electricity, which we supply to the grid. Besides the energy we generate with our thermal treatment facilities, we also produce green gas from organic waste and electricity from landfill gas on our landfill sites.

With this waste-to-energy strategy, we are reducing the use of fossil fuels and CO<sub>2</sub> emissions considerably, referred to as 'avoided emissions'. We are also increasing our share in renewable energy, since a relevant part of the CO<sub>2</sub> emissions that occur during the thermal treatment of waste, is climate-neutral.

### *Neutral emissions*

The CO<sub>2</sub> emissions from thermal waste treatment plants are, in principle, easy to calculate: 1 tonne of waste = 1 tonne of CO<sub>2</sub> emissions, of which at least is 50% of biogenic origin, a growing amount as a result of the replacement of single-use plastics and increase of separate collection schemes for plastics. However, it is slightly more complex than that. More information on this topic can be found in our Sustainability Report, which is published on an annual basis.

# Indaver's Commitment

## 2030

In order to achieve the European 2030 target of 55% less CO<sub>2</sub> emissions, Indaver is making strong efforts to reduce CO<sub>2</sub>. Consequently, we are working to further reduce the amount of landfilled waste. We are also doing everything we can to make our processes even more energy-efficient by adapting our transport and logistics and continually measuring, qualifying, and, where possible, adjusting our work. In addition, we have a number of projects underway with partners to reduce our CO<sub>2</sub> emissions.

## Achievements

### Avoiding CO<sub>2</sub> by recovering materials

The two following examples illustrate that, through innovative recycling installations, we provide our customers with a constant and sustainable supply of valuable primary materials that do not have to be mined/produced somewhere else. This results in direct avoidance of CO<sub>2</sub>.

#### *Indaver Metal Processing: precious metals from industrial waste*

Precious metals are rare and valuable metals, such as palladium, rhodium, and platinum. They are used as industrial catalysts. It is therefore ecologically and economically beneficial to recover these metals. Indaver does that with Inda-MP (Indaver Metal Processing) at its site in Antwerp. This is a thermal process that separates precious metals from solvents in pharmaceutical waste and collects them in the residues.

#### *IndaChlor: HCl from chlorine residues*

A recycling installation in Dunkirk (France), that converts chlorinated waste into hydrochloric acid, which is supplied to the industry that uses it in their production processes. IndaChlor also recovers the heat from the treatment, and supplies it to neighbouring industry.

### Recover energy to reduce CO<sub>2</sub>

#### *Heat networks*

Energy and steam networks have already been built that help Indaver to reduce its CO<sub>2</sub> emissions. Our hazardous waste plant in Antwerp (Belgium), delivers steam directly to a neighbouring business. The waste treatment facility in Doel (Belgium) is a partner in ECLUSE, the steam network that supplies several Antwerp companies with steam, and the network can be expanded in the future. Our hazardous waste plants in Hamburg (Germany) are qualified with CHP (combined heat and power) that supplies steam and electricity for own use and for external supply. Additionally, in Meath (Ireland) the Waste-to-Energy plant supplies electricity to 50,000 households.





# Indaver's Commitment

## Landfill

It is the policy of Indaver to limit landfilling as a sink for non-recoverable inorganic waste streams. This means:

- Not to landfill biodegradable waste in order to maximally avoid the diffuse emission of methane.
- Not to landfill waste, which has a circular potential to recover energy.

Indaver has both active and closed, carefully capped landfills where non-hazardous waste is safely stored. On these landfills, greenhouse gases can be produced as a result of biological activity. We produce renewable electricity from these gases, which are collected selectively after end capping. Transfer to electricity in a gas motor results in the conversion of methane (ten times more potent than CO<sub>2</sub>) to CO<sub>2</sub>.

## Ongoing projects

A few of the circular projects that we are working on are:

### Plastics-to-Chemicals (P2C)

P2C is a safe recycling process for postconsumer plastics for which there are no proper recycling possibilities available today. Years of research and development resulted in a pilot plant. Through a depolymerisation process in which plastics are converted into high-grade recycled resources like styrene, naphtha, and waxes for the (petro)chemical industry, we will be able to supply high-quality secondary materials to the industry that are as good and as safe as the original material.

## Heat networks

The heat network in Antwerp North is an energy cluster that consists of windmills, wastewater, and a solar park and supplies energy to a large industrial business and a few residential areas near the Port of Antwerp.

In Cork (Ireland), we are linking a planned waste-to-energy plant to a heating network, which will supply steam from our facility to the pharmaceutical industry.

## Logistics

Indaver focuses on several areas in the field of logistics. With new builds, we always try to put our plant as close as possible to the customer or purchaser to reduce the need for transport as much as possible.

If transport is necessary, we use multimodal transport, with which we always choose the best, most sustainable option (modal shift). Our own vehicle fleet consists of the latest Euro engines, and where possible, we drive electric or hybrids. We supply the electric charging posts on our sites, with our own green electricity.

From a logistics perspective, we work with systems that guarantee maximum loads with intelligent route planning to reduce the number of kilometers driven. We train our drivers in energy-efficient and defensive driving.

We encourage our staff to use public transport, car sharing and bikes wherever possible, with various (financial and tax) incentives.

# Indaver's Commitment

## CO<sub>2</sub> capture and utilization (CCU) 2050

Indaver is first striving to build an economically-viable facility for capturing CO<sub>2</sub>. It is important to safeguard the ecological added value for society in relation to the possibilities to reuse the captured CO<sub>2</sub> as a resource in specific applications.

Indaver also invests in different research projects. Converting CO<sub>2</sub> into methanol for the chemistry sector and into stone for the construction industry are only a few examples of useful applications or 'utilisation' for the captured CO<sub>2</sub>.

### ■ Power-to-Methanol

Methanol is an essential raw material for the chemical industry. Until now, methanol has been produced using fossil raw materials. The Power-to-Methanol trial facility which will be operational in the Port of Antwerp from 2022, will produce sustainable methanol, with the help of captured CO<sub>2</sub> and sustainably-produced hydrogen. Indaver is working on this alongside a diverse number of partners.

### ■ ASH-CEM

A lot of CO<sub>2</sub> is released during cement production, so the quest to find alternative materials is very important. The results of a 4-year-long research project, ASH-CEM, in close collaboration with several institutes, suggest that CO<sub>2</sub> captured from flue gases is suitable for mixing with granulated slag and a CO<sub>2</sub> binder. High-quality construction materials and granules can be made from this, which can serve as an alternative for cement-based materials. The industrial prototype has now been tested and demonstrated. Our current task is to research the economic viability of this production.

In 2050, the member states of the European Union should be climate neutral. As a waste treatment company, Indaver is facing an enormous challenge to capture carbon dioxide and find a useful application for it. At this moment, it is assumed that carbon storage will be part of the solution to realize this objective, but new developments will create alternative solutions.

## R&D programmes

Working with renowned partners, Indaver studies the usable technologies that exist for capturing CO<sub>2</sub>. Furthermore, we take research issues to universities and research laboratories to find potential solutions for captured CO<sub>2</sub>. These R&D programmes are an initial and very necessary step towards the 2050 climate goals. We are also working with our partners on concrete research projects and trial facilities. Green energy and the existence of a sufficiently large market for it, are vital requirements for further investment in carbon capture and utilization. Indaver commits to comply with the EU strategy to further avoid and reduce CO<sub>2</sub>.

# Ensuring Transparency

So that we know where we stand, we monitor our water and air emissions constantly (24/7). We do this in line with the latest environmental standards. External, independent laboratories check our measuring instruments. We collect and quantify data regarding the avoided, reduced, and prevented CO2 emissions from our plants.

Indaver takes Europe's climate ambitions seriously.

We are committed to implementing this policy in all our activities and businesses, and to reviewing it regularly to ensure its effectiveness and improvement.

## Sustainability Report

Our performances are published in our yearly Sustainability Report". This report can be accessed on our website and publishes all of the actions and results, and our role in the circular economy, our activities, techniques, and processes.



