



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 CO₂ 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 CO₂ being emitted and with our Waste-to-Energy facilities we limit CO₂ emissions.

The scope of this document regards the Indaver management of Green House Gasses (GHG's). The most relevant being CO₂⁽¹⁾, but we should not forget the other chemicals also impacting the Global Warming phenomenon. The most important being: methane (CH₄; x30), nitric oxide (N₂O; x300), freons (CFCs; x10000), ... the effect of the sum of these GHGs is expressed in CO₂ equivalents. In the further course of this policy we will refer to CO₂ as the sum of these GHGs, if relevant.

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 CO₂ 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, avoid or limit emissions from its facilities as much as possible, contributes to the circular economy and prevents 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 CO₂ emissions, one of the main greenhouse gases that contribute to climate change.

However, the amount of waste that is treated thermally and the associated CO₂ emissions can be reduced through better separation at source and optimum material recycling. It is Indaver's first priority to avoid CO₂ emissions. When that is not possible, Indaver is looking for ways to capture this (CC)⁽²⁾ and to find useful applications for it (CCU)⁽³⁾.

With this Carbon Management Plan, Indaver is clarifying its strategy and offering insight into its efforts to reduce its share of CO₂ emissions as much as possible.

(1) Global warming gases expressed in CO₂

(2) Carbon Capture

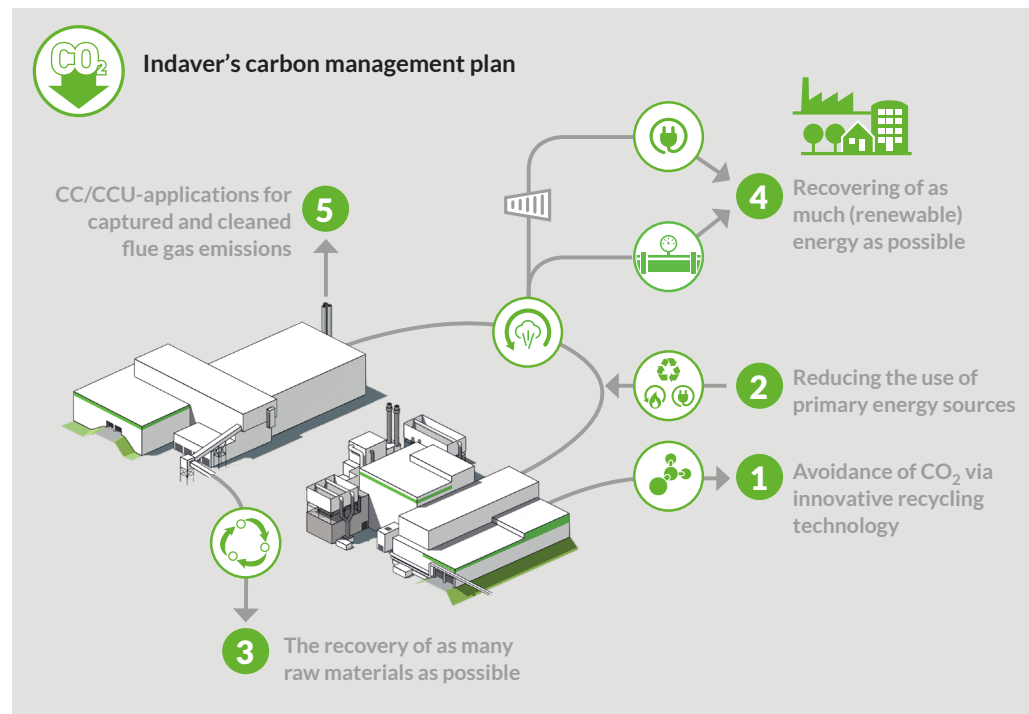
(3) Carbon Capture and Utilisation

THE CARBON MANAGEMENT PLAN

To combat climate change we should reduce emissions rapidly – for example, by ramping up renewable energy, boosting energy efficiency, halting deforestation. But we also need to avoid, remove, store and utilize carbon from the atmosphere.

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

1. Avoid CO₂ from being emitted by keeping the carbon into the chemicals via sustainable and safe recycling installations and so 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, 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. Carbon Capture (CC) and Carbon Capture & Utilisation (CCU).



- (4) Energy Efficiency Directive
- (5) Waste Frame Directive
- (6) Renewable Energy Directive

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



Our Environmental Sustainability Objectives

Gatekeeper of the circular economy

Indaver operates high temperature incinerators (HTI) for hazardous waste to the strictest emission limits of any industry in the EU in conformity with the BREF Waste Incineration 2019 and resulting BAT's ⁽⁷⁾, this with a proven destruction efficiency for POP's ⁽⁸⁾ amongst others the GHGs, subject of this policy.

The HTI sector in the EU compensates more than its direct CO₂ emissions by destruction of Ozone Depletion Substances (ODS) & other fluorinated gases, which are an unavoidable result of the overall waste destruction (see website Eurits ⁽⁹⁾).

Avoiding CO₂: a priority

When building waste processing and recycling installations, Indaver sets CO₂ avoidance as one of its first priorities. That does not only mean generating renewable energy sources. Indaver avoids CO₂ in two ways:

- *We retain the carbon in the recycled molecules so that it is kept into the material chain and thus not released as CO₂ into the atmosphere.*
- *We generate the energy for the recycling and treatment processes based on renewable sources so that the release of CO₂ is avoided here as well.*

Indaver's investments in hightech recycling installations and several heat networks illustrate the development towards prevention and more recycling of waste to avoid CO₂.

To use fewer primary energy sources

We limit our CO₂ 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 into potential points for improvement. We look into how we can reduce our energy consumption and consequently CO₂ emissions for all of our activities. This applies to everything from industrial treatment processes to our staff's mobility.

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.

We are reducing the CO₂ emissions in our logistics step-by-step, as well as the CO₂ 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 off 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.

(7) Best Available Techniques

(8) Persistent Organic Pollutants

(9) Eurits, the European Union for Responsible Incineration and Treatment of Special Waste (www.eurits.org)



To recover high quality secondary materials

Manufacturers make products out of raw materials. This production generates waste. At some moment 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 materials 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 for 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 CO₂ 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).

In addition, our facilities use pure water for flue gas processes, for example. We re-use the process water whenever possible. In view of the desired level of purity of the water, the biggest savings come from efficient water consumption.

Recover as much (renewable) energy from waste as possible

Indaver offers a sustainable alternative for fossil fuels. We recover energy from waste through thermal treatment. We supply this energy to industry and residential areas through heating and electricity networks. They use the electricity or heat supplied as processing heat for industries and heating for buildings (district heating). For our customers, we are a reliable supplier of alternative, green, affordable and sustainable energy.

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 CO₂ emissions considerably, referred to as 'avoided emissions'. We are also increasing our share in renewable energy, since a relevant part of the CO₂ emissions that occur during the thermal treatment of waste, is climate neutral.

Neutral emissions

The CO₂ emissions from thermal waste treatment plants is, in principle, easy to calculate: 1 tonne of waste = 1 tonne of CO₂ emissions of which at least 50% is of biogenic origin, a growing amount as 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 to 55% less CO₂ emissions, Indaver is making strong efforts to reduce CO₂. 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, 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 CO₂ emissions.

Achievements

Avoid CO₂ 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 CO₂.

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 IndaMP (Indaver Metal Processing) at its site in Antwerp. This is a thermal process that separates the 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 process to be self-sufficient and to deliver it to a neighbouring alcohol distillery.

Recover energy to reduce CO₂

Heat networks

Energy and steam networks have already been built that help Indaver to reduce its CO₂ emissions. The Indaver 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 (D) are qualified with CHP (combined heat and power) that supplies steam and electricity for own use and for external supply. Additionally, in Ireland (Meath) the waste-to-energy plant supplies electricity to 50,000 households.



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 result of biological activity. We produce renewable electricity from these gases which are collected selectively after endcapping. Transfer to electricity in a gas motor results in conversion of methane (tenth times more potent than CO₂) to CO₂.

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 which will consist of windmills, wastewater and a solar park, will supply 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 kilometres 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.



*CO₂ has value
for anyone
who makes it
disappear and
a cost for anyone
who makes CO₂
appear.*

CO₂ capture and utilization (CCU)

Indaver is first striving to build an economically-viable facility for capturing CO₂. It is important to safeguard the ecological added value for society in relation to the possibilities to re-use the captured CO₂ as resource in specific applications.

Indaver also invests in different research projects. Converting CO₂ 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 CO₂.

■ 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 CO₂ and sustainably-produced hydrogen.

Indaver is working on this alongside a diverse number of partners.

■ ASH-CEM

A lot of CO₂ 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 CO₂ captured from flue gases is suitable for mixing with granulated slag and a CO₂ 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.

2050

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 to 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 also that new developments will create alternative solutions.

R&D programmes

Working with renowned partners, Indaver inventories the usable technologies that exist for capturing CO₂. Furthermore, we take research issues to universities and research laboratories, to find potential solutions for captured CO₂. These R&D programmes are an initial, 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 utilisation.

Indaver commits to comply with the EU strategy to further avoid and reduce CO₂.

3

OPEN AND TRANSPARENT

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 inventory and quantify the avoided, reduced and prevented CO₂ emissions from our plants.

Performances published in Sustainability Report

We publish all of the results, our role in the circular economy and our activities, techniques and processes in our annual sustainability report, which can be read on our website. This report covers the domains People, Planet, Prosperity and Partnerships.

