CARMEUSE

Carmeuse CO_2 Roadmap

Pathway to carbon neutrality

www.carmeuse.com

Message from our CEO

"Our pathway to carbon neutrality is both ambitious and achievable. At Carmeuse, we believe reaching net zero requires a multifaceted approach."

Climate change triggered by greenhouse gas emissions seems to be intensifying again recently with a lot of extreme weather events across the globe. Many scenarios aiming to limit global warming to 1.5°C are at risk if we do not accelerate global collaboration to reduce greenhouse gas emissions, with CO_2 reduction being key.

As a leading global lime supplier, we strive to contribute to a better world by delivering critical products that touch every aspect of daily life. Our high-quality products and services are critical to customers that supply solutions and materials essential to human development. For example, steel and construction are key for infrastructure and household equipment. Glass, water treatment, clean air, agriculture, base metals refinement or battery production are other important areas of human development that would not exist without our products and services.

Contributing to a better world for us also means we are committed to safe and responsible operations, ensuring that our solutions benefit our stakeholders and society over the long term. We understand we have a key role to play in reducing our carbon emissions, and helping our customers reduce theirs.

Our pathway to carbon neutrality is both ambitious and achievable. At Carmeuse, we believe reaching net zero requires a multifaceted approach. We consider technological innovation, supported by digital acceleration, a key lever of the decarbonization challenge.

We're on track to achieve our 2030 targets, but there is still a lot of work to be done. By focusing on execution and continuing to collaborate with industry partners and stakeholders, we will further seek to create momentum and support, reaching our objective of net zero by 2050.

Sébastien Dossogne
Chief Executive Officer

Lime – positive impact on everyday life

In ways that we often do not immediately see, lime is used almost everywhere and is essential to the quality and progress of our daily lives. It is a key ingredient in cement and plaster. It acts as a flux to remove impurities in steel making. It softens water and reduces impurities in water treatment, making it safe for drinking.

It is used as a critical ingredient for the process of many other applications such as flue gas treatment, soil improvement for crop yield improvement, road stabilization, glass production for solar panels and food applications, and in metal production for batteries. In short, lime is a key building block for the sustainable progress of society.

The challenge and opportunity of the lime cycle

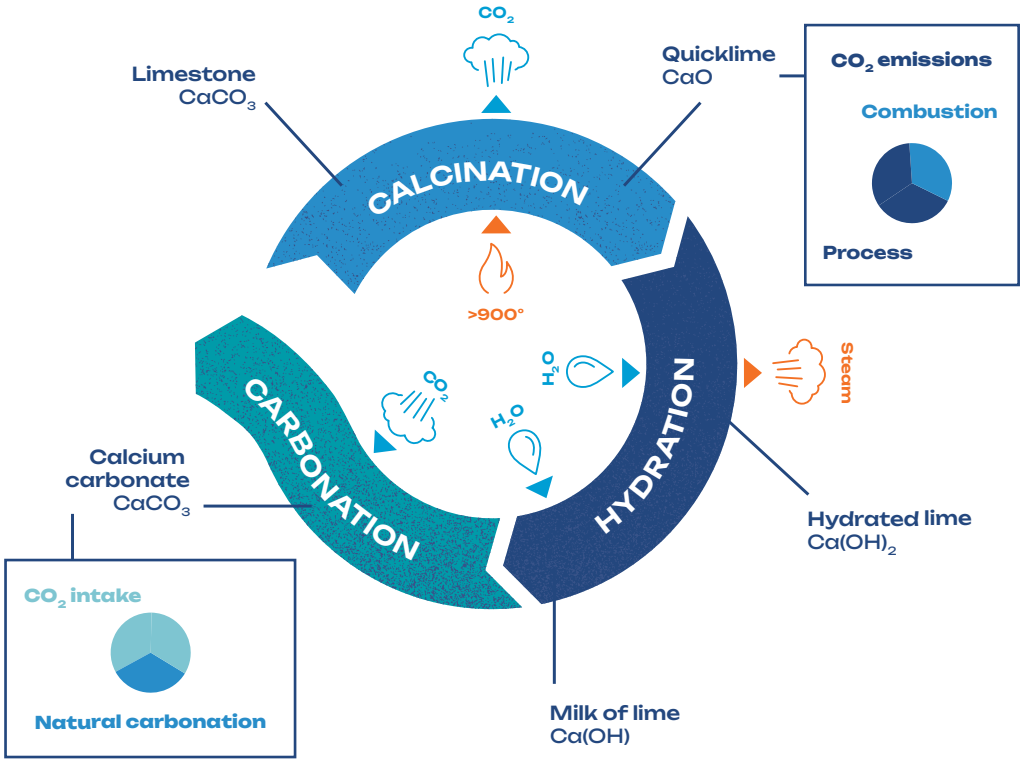
Climate change is undeniable. Limiting greenhouse gas emissions is one of the largest and most urgent challenges of our times. The lime industry accounts for on average 1% of global industrial CO_2 emissions. Most of these emissions originate directly from the lime production in the kilns. As this process consists of decarbonizing limestone by heating it at temperatures above 900°C, there are two sources of direct (scope 1) emissions.

Direct CO_2 emissions:

- **Combustion emissions.** These originate from burning fossil fuels to obtain the required heat. Depending on the kiln technology and the type of fuel, combustion CO_2 emissions account for 25% to 40% of the total direct CO_2 emissions.
- **Process emissions.** These result from the chemical reaction (calcination, the decomposition of limestone to lime by releasing the embedded CO_2) that occurs when limestone is heated. The thermal decomposition releases the CO_2. More specifically, for each tonne of lime 0.78t of CO_2 is emitted. This is what we call the process emissions, which represent 60% to 75% of the direct CO_2 emissions and cannot be avoided.

The unavoidable process emissions pose the biggest challenge to Carmeuse and the lime industry as a whole since, to date, there is no other long-term solution than to capture and sequester (CCS) or utilize (CCU) them. As a hard-to-abate sector, the lime industry will need to get access to CO_2 infrastructure to transport this CO_2 to the sequestration fields.

And so, lime production is carbon-intensive. But lime can also capture ambient CO_2 and act as a carbon sink. This is called carbonation (or mineralization by carbonation) and happens in many uses of lime. On average, 33% of process CO_2 emissions from lime production are captured back through carbonation. This provides future potential offset opportunities for Carmeuse and its customers.



Where and when do the carbon emissions take place?

$CaCO_3$ + fuel combustion => CaO + CO_2p + CO_2c

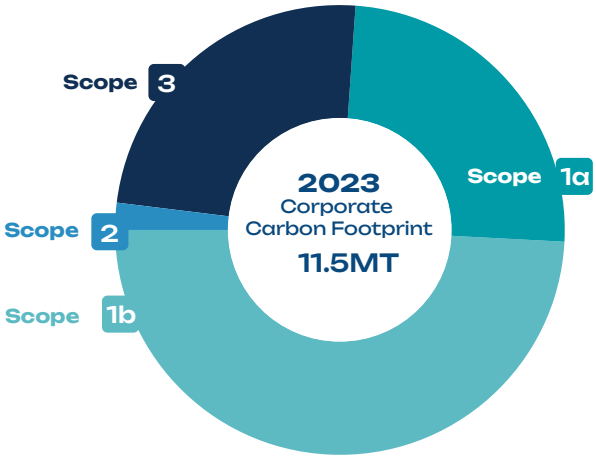
Lime is an essential product in daily life and a key enabler to many industries, but its production emits unavoidable CO_2. To produce lime (CaO) from limestone ($CaCO_3$), the process is to remove the CO_2 by heating the stone at high temperature in a kiln. During this process, CO_2 is released from the stone and transforms from solid to gaseous state, and is then released into the atmosphere, along with nitrogen and oxygen used for the combustion. These process emissions represents a large share of Carmeuse's emissions; the balance comes mainly from the fuels used to heat the stone and the supply chain.

Our climate impact: Scope 1-2-3 CO_2 emissions

Carmeuse has been thoroughly calculating its carbon footprint (scope 1-2-3) at group level since 2019, compliant with the GHG Protocol. Our direct (scope 1 process and combustion) emissions represent most (~74%) of our impact, compared to indirect emissions from purchased energy (scope 2 ~2%) and value chain emissions (scope 3 ~24%).

"Decarbonization is a major challenge for humanity. At Carmeuse, we embrace and try to own this challenge by continuously pushing for innovation and exploring new business models and ways of working to achieve sustainability. We believe in the power of collaboration to achieve our goals."

Ilse Kenis
Chief Carbon Officer & General Manager
Carmeuse Technologies



Scope 1
Direct emissions from our own operations
(**1a** - combustion emissions /
1b - Process emissions)

Scope 2
Indirect emissions from purchased energy (electricity emissions)

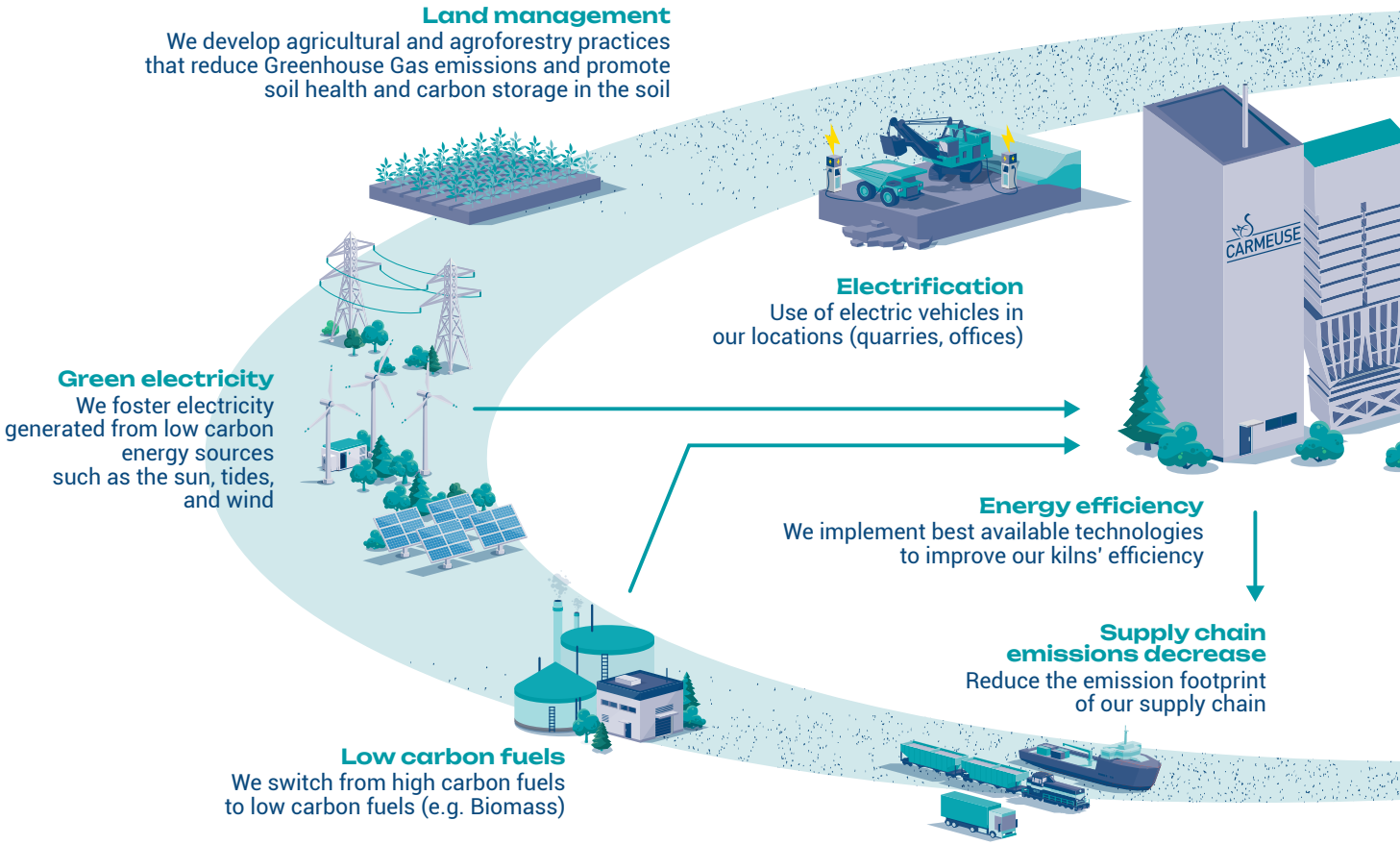
Scope 3
Upstream and downstream emissions (indirect emissions)

Carmeuse Group roadmap CO_2 aims to achieve carbon neutrality by 2050

2030
-25% CO_2 combustion emissions intensity
(t combustion CO_2/t lime)

2050
Net zero

Carmeuse CO_2 Roadmap
2050 Carbon Net Zero

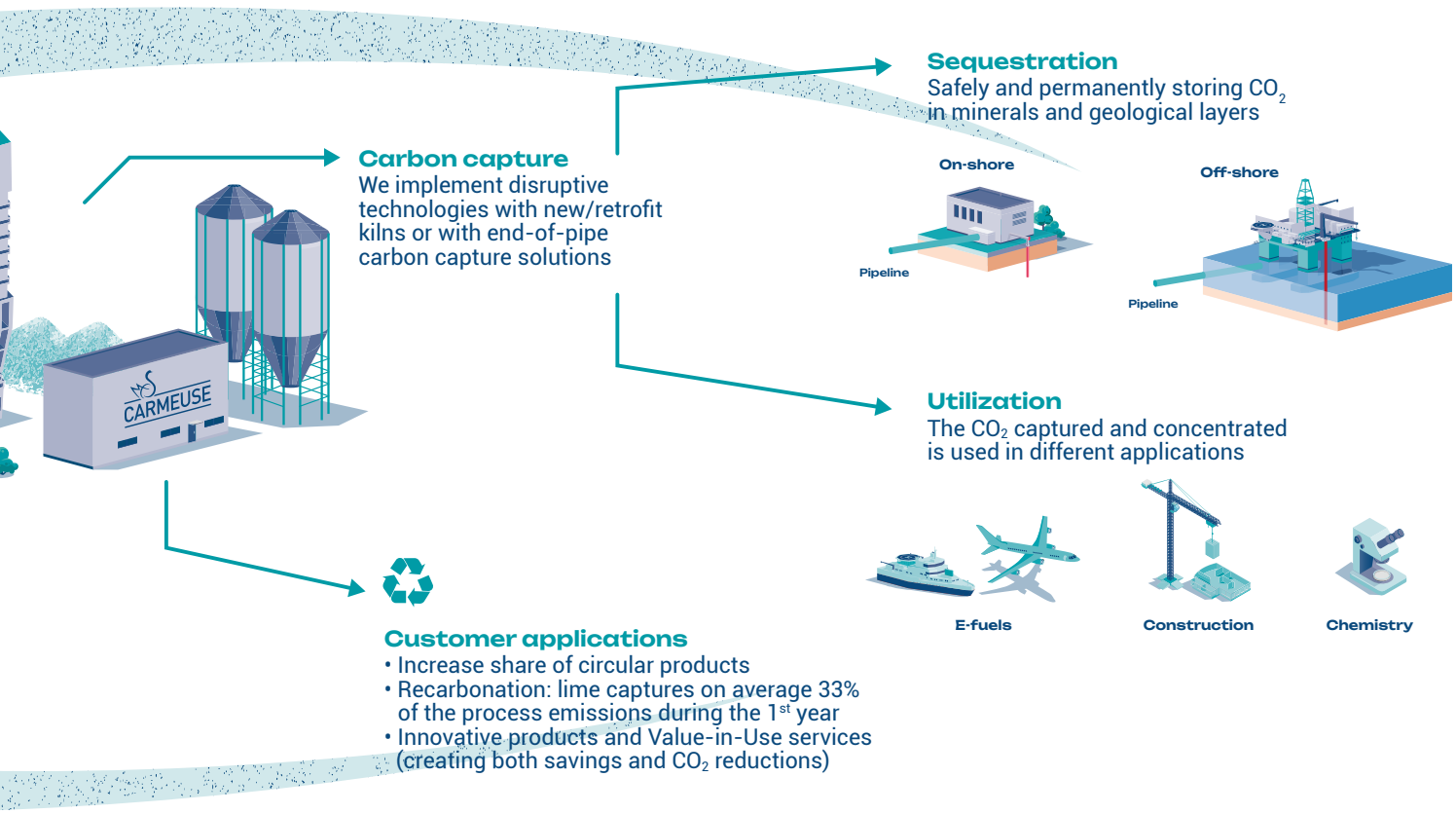


Following our purpose of contributing to a better world, we have made a commitment to net zero emissions by 2050. To continuously reduce the climate impact of our products in our customer's processes, we defined an immediate and long-term action plan and targets. In 2021, we set the ambition to reduce our direct emissions by 30% in Europe and 20% in North America compared to a baseline of 2019.

This ambition remains unchanged and is complemented by new quantitative and qualitative targets that should keep us further on track to meet our objectives.

Our CO_2 roadmap is our compass and outlines our strategic levers in 4 different areas (combustion emissions, process emissions, electricity and value chain).

An underlying project pipeline linked to each of the levers in these areas paves the way to meet our ambitions. The projects represent a mix of in-house innovation and collaboration with technical partners, suppliers, customers, academia and public authorities and reflect local variations in terms of market maturity, regulations and, availability of resources.



Our primary focus with the roadmap lies on our direct emissions (scope 1) from our operations with:

Short to medium term actions that should reduce our global combustion emission intensity by 25% by 2030 by:

- Conversion to lower carbon fuels (conversion to biomass, conversion of solid fuel to natural gas)
- Energy efficiency initiatives (best available technologies, process innovation, etc.)
- Electrification of our operational equipment and transportation

Being ready to implement carbon capture technologies by 2030 through:

- Achieving CCS technoreadiness by 2028, enabled by further investment in R&D and partnerships
- In parallel investigating techno-economic feasibility of implementation of these technologies at industrial scale in geographies that are actively working on establishing the required infrastructure to transport and sequester the CO_2

Focus on increasing the share of green electricity to 75% in Europe:

Our indirect emissions through electricity consumption (scope 2) today only represent a very small portion of our total footprint. Nevertheless, with carbon capture technologies expected to significantly increase that footprint we are executing a gradual conversion to green electricity (target 75% in Europe by 2030). The target will be achieved through power purchase agreements and further onsite investments in renewable energy infrastructure.

Engaging with our suppliers:

We understand we will have to go beyond managing our own CO_2 emissions. Our main sources of value chain (scope 3) emissions come from the purchase of materials and equipment and through the transportation of our products from our plants to our customers. We have started to work on improved monitoring of our performance in this field first and are working on a methodology to encourage emission reduction commitments of our suppliers.

Reducing our own CO_2 emissions

to minimize our operational climate impact

Rechargeable electric trucks at the Soma quarry in Turkey

Electrification

Decarbonization of the industrial fleet and on-site transportation continues. Some examples include the use of rechargeable electric trucks at the Soma quarry in Turkey, an autonomous electric train at the Cedarville quarry in the US and a five-year transition plan of electric trucks and other quarry vehicles has commenced implementation in Thailand in 2024.

"We are excited to see what we can learn from the electric train project that is being pursued at our Cedarville Operation in Michigan."

Melissa Simon
Mining Director
Carmeuse Americas

Carmeuse and Intramotev have successfully launched the world's first independently driven battery-electric railcar in revenue service. By electrifying the Bush Bay rail line at our Cedarville Operations, Carmeuse has eliminated the need for a second diesel locomotive to transport materials. This initiative aligns with Carmeuse's sustainability goals to reduce both diesel consumption and CO_2 emissions.

Electrical trains at Cedarville Operations

PFR kilns at Kosice (Slovakia)

Best Available Technologies (BAT)

Carmeuse has been progressively reducing combustion CO_2 emissions over the past decades through energy efficiency initiatives such as the installation of best available technologies (BAT) and fuel mix changes towards a higher share of lower carbon fuels.

The solutions we apply vary from location to location, depending on the market specifications, the type of kiln and the local fuel markets. From a technological perspective, we have been investing in the best available technologies (BAT) for kilns, the Parallel Flow Regenerative kilns.

Carmeuse has developed its own PFR technology allowing to integrate maximum operational efficiencies.

Low carbon fuels - Biomass

We continue to convert kilns to biomass (in Central and Eastern Europe so far) and natural gas (mainly in North America). As part of this fuel switch, we have worked on an important milestone: the design of a new biomass dosing system for the vertical kilns, allowing for better combustion performance.

Regarding the origin, Carmeuse favors waste biomass and by-products with low environmental impact and that are not in competition with more noble uses, such as food.

Green electricity

Target 2030

75%

of our electricity will be generated from renewable sources
in Europe

By 2030, we have pledged to source at least 75% of electricity from renewable sources in the European region.

To achieve this, the team is actively exploring renewable energy options, such as solar, wind, and other clean energy projects. Moreover, going forward, all our decarbonization projects will be powered with 100% carbon-free electricity.

In Thailand, solar energy projects are being extended, resulting in a total of 4.0MW installed capacity.

In North America, the Real Estate team undertook a comprehensive solar energy analysis of all North American locations. Key sites have moved to a second phase of verification to assess the feasibility of developing optimal solar projects and reduce scope 2 emissions.

Solar farm at Aisemont (Belgium)

Decarbonization technologies: forward-thinking solutions

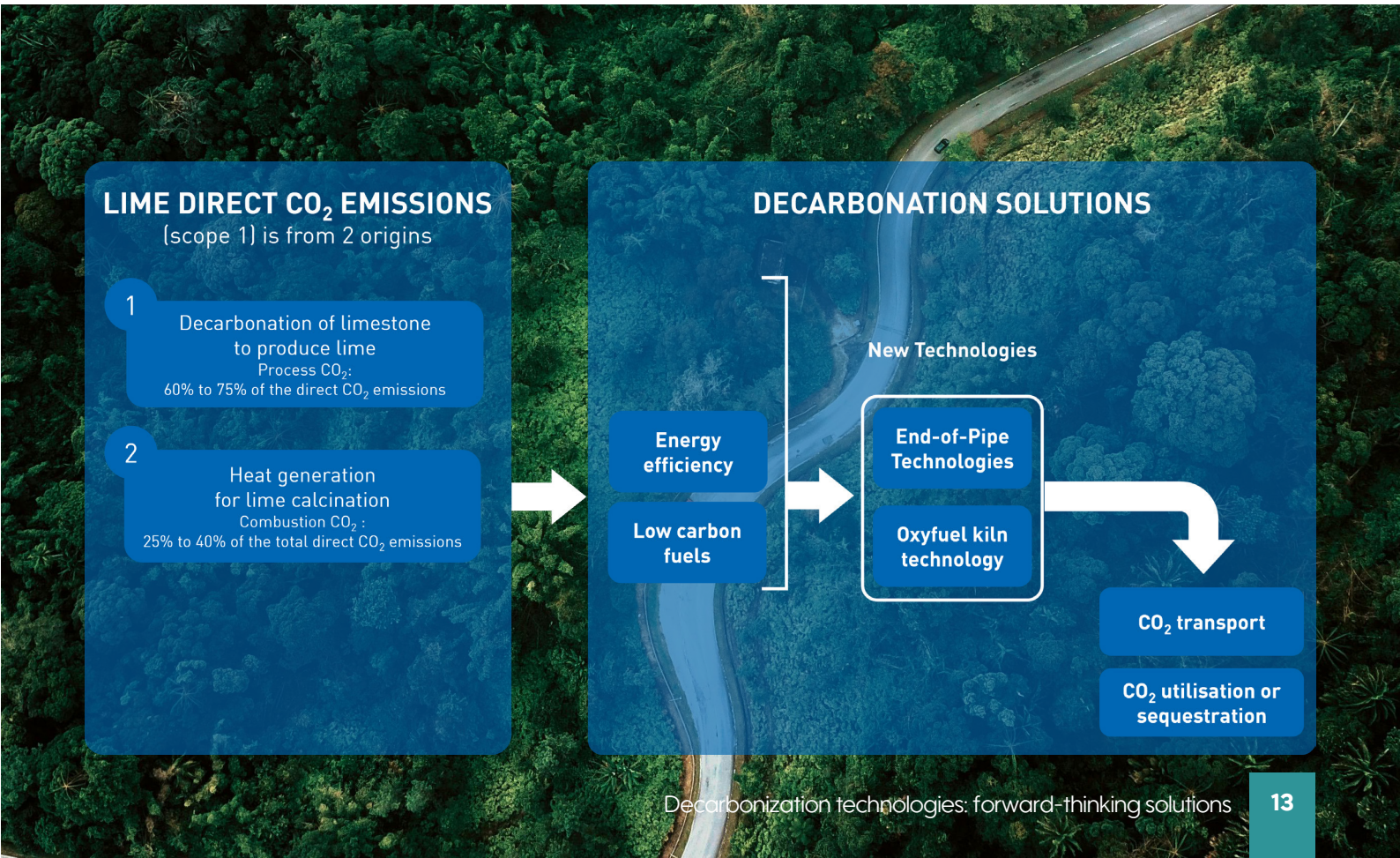
For a company like Carmeuse, R&D and technology are at the core of our solutions as most of our CO_2 emissions are derived from the production process of lime. While we continue to innovate in the field of energy efficiency and fuel switch, most of the solutions to reduce combustion emissions already exist today and are available for implementation. For our unavoidable process emissions these solutions still need to further mature.

Carmeuse is taking an active role in developing the new generation of kilns that will allow us to concentrate and capture our process emissions.

Concentrating our CO_2 from 15-20% to over 95% is done by means of a carbon capture solution. Our ongoing research and development covers a broad technical solution space including both combustion (oxyfuel) and post-combustion (end-of-pipe) solutions.

With our engineering company, Carmeuse Technologies, we have set up a carbon capture technology development program with the objective to be **CCS techno-ready by 2028** through groundbreaking innovation and partnerships.

Target
CCS techno-ready by 2028



Butterfly project in Seilles (Belgium)

Butterfly: new wings for the future of kilns

Butterfly is the project name for an industrial pilot of a parallel flow regenerative oxyfuel type of kiln that targets to capture and concentrate CO_2 directly at the level of the lime manufacturing process. Achieving a highly concentrated CO_2 stream at the exit of the kiln will make it more suitable for subsequent sequestration or uses (CCUS). Construction of the industrial demonstrator started in June 2023. The first trial campaign started Q4 2024. The innovative concepts that will be implemented and tested on the industrial demonstrator will target both new kiln designs and the retrofit of existing kilns. This project is a collaboration between Carmeuse, CRM Group, University of Liège, CTI, EBC, CORETEC, VOCSens and the University of Mons and has received funding support by the Walloon Region and the European Union -NextGenerationEU.

Funded by the European Union
NextGenerationEU

"We are passionate about our work, focusing on effective and cost-efficient solutions. It's great to see our team moving ahead in the right direction, with a positive mindset. We should be proud of the progress we're making in developing our own decarbonization technologies."

Charles Robin
Director Decarbonization Technologies
Carmeuse Technologies

Saturn: addressing end-of-pipe concentration

Meanwhile, progress has continued on the Saturn project, with a focus on the concentration of CO_2 at the end of the production process (called end-of-pipe technologies). Saturn is a cross-industry collaboration between different players that are pooling their experience and together testing different end-of-pipe systems for carbon capture. A first pilot will be tested in the Aisemont plant in the first half of 2025. This project is funded by the European Union and executed in collaboration with seven partners (Aperam, AGC, Prayon, CRM Group, Vocsens, UMONS and ULiège).

Funded by the European Union
NextGenerationEU

Maximize customer solutions to reduce CO_2 emissions

A customer-oriented decarbonization approach

The ultimate objective of our CO_2 roadmap is driven by neutralizing, and potentially creating a net positive climate impact through our customers' processes.

As well as leveraging the effect on our products of the decarbonization of our operations, we are actively partnering with key customers to help them lower their footprint and support them in meeting their climate goals.

In collaboration with them, our sales and application experts are developing new products and defining new service and business models. Together with our customers, we push ourselves to radically re-think the processes involved and set up new partnerships with suppliers, universities and other parties.

How do our customers use lime to reduce environmental challenges?

An increasing number of lime applications contribute to the efforts towards a greener planet, such as:

In **agriculture**, lime and limestone products can be used as a natural amendment to increase the pH of soils, which reduces the need for fertilizers

Lime is mixed to discharged **water** in **treatment** plants to lower its acidity before being released into the water system

Lime is used in **flue gas treatment** to clean industrial smokestacks by neutralizing acidic gases

CAVA lime: new products using best available technology

The use of the best available kiln technology can lead to carbon savings further down the value chain. Carmeuse recently developed CAVA lime, an enhanced product characterized by its controlled delayed reactivity, particularly useful as insulation in the autoclaved aerated concrete (AAC) market.

CAVA technology enables Carmeuse to use PFR kilns (recognized as the best available technology) to produce delayed reactivity lime. The same kiln can produce both "normal" and delayed reactivity lime with a reduced energy and carbon footprint compared to other kiln technologies.

CarboCalco® Solution: safer, leaner sugar production

Carmeuse and the sugar industry go back a long time. Our deep understanding of the use of lime in sugar purification processes allowed us to co-develop an innovative solution called CarboCalco® to externalize the usual captive lime production in sugar beet production. The solution streamlines the process on the customer side and totally eliminates the environmental emissions and safety risks linked to captive lime production.

WESS Project: getting the circular economy on the road

Carmeuse is playing a role in reducing the carbon footprint for earthworks, through the Western Europe Soil Stabilization (WESS) project. Our new state-of-theart blending station in Aisemont produces blended products based on quick lime and paper ash, a by-product of the paper industry. Blended products are enlarging our market opportunities and are even proving to be more efficient for certain soil types versus quick lime.

Improving quality and reducing the carbon footprint for Milk of Lime

Until recently, a chemical manufacturer in Eastern Europe was buying Carmeuse Milk of Lime (MoL) for its water treatment process from a third party.

In 2023, Carmeuse built a dedicated MoL production unit on the customer's premises and now produces and delivers the MoL by pipeline. A team of five employees manage the facility 24/7. This allows the manufacturer to receive MoL on demand.

Shortening the value chain and building a brand-new installation allowed the manufacturer to:

- Improve product quality
- Reduce energy consumption, while implementing the most energy efficient and automated equipment
- Meet the highest safety and housekeeping standards
- Reduce dust emissions
- Reduce CO_2 scope 3 emissions

"We've started this project (MoL) with the focus to be a partner for our customer, ***bringing our expertise into their business by designing the production line and adapting the product according to their specific needs, but at the same time protecting the environment by eliminating dust and reducing energy consumption and waste.*** *Also, together with our customer we have identified new synergies to continue co-developing sustainable projects."*

Romeo Jakubik
Customer Solution Manager
Romania

Mineral Loop Project

The idea of a mineral loop is simple: to recover by-products or waste flows and produce, through carbonation, a recycled calcium carbonate product that can be used in construction or environmental applications. This avoids the current waste management route, mainly landfilling or incineration.

The first project phase has included the material selection and the carbonation reaction optimization. The current phase includes the construction of a carbonation pilot with a CO_2 capture capacity of up to 3,000 tons per year.

This will allow Carmeuse to expand its portfolio of sustainable products. The project consortium consists of Belgian Walloon industrial partners (Revatech, Tradecowall, Lessine) alongside research centers and academic institutions (Centre Terre et Pierre-CTP, University of Liège). The project is subsidized by the Walloon Region through GreenWin.

Mineral LOOP

PROJET FINANCÉ PAR LA RÉGION WALLONNE

CARMEUSE

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