FEFCO
Corrugated Packaging

CIRCULAR BY NATURE

# Climate Neutrality Roadmap 2050

For the Corrugated Cardboard Industry

CLIMACT

Report authored by Climact for FEFCO

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**The European corrugated cardboard sector[1] has the ambition to achieve climate neutrality by 2050 at the latest. This ambition covers the sector's full carbon footprint (scope 1 to 3) and aims to work with the entire value chain to achieve this goal (cradle-to grave). To put the sector on a credible pathway towards climate neutrality, a Climate Neutrality Roadmap was developed by Climact, in close cooperation with FEFCO and its members. This executive summary covers the main findings and key messages of the roadmap.**

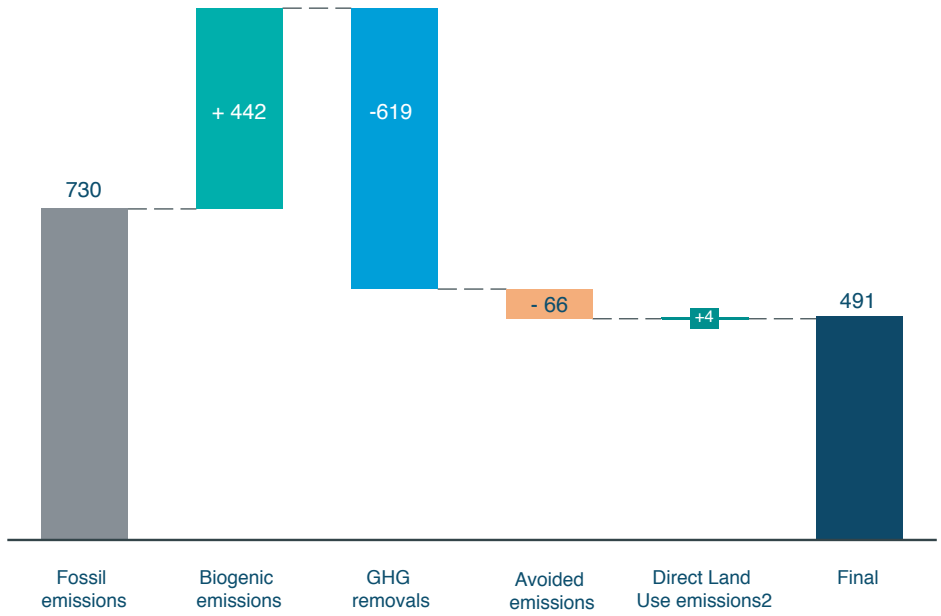
## INTRODUCTION: THE CORRUGATED CARDBOARD SECTOR TODAY

In 2021, the European corrugated cardboard industry produced 55,7 Billion $m^2$ of corrugated board in approximately 700 plants located all over Europe. The industry is represented by approximately 400 companies employing directly 100 000 persons.

Corrugated cardboard is widely used as a packaging material, protecting about 75% of all goods on their journey from producer to customer. As a packaging material, it scores strong on several sustainability dimensions. For example, it is a highly circular and easy-to-recycle material. According to FEFCO statistics, corrugated products have on average 88% of recycled content. According to Eurostat 2019 data, about 82% of all paper and board packaging is recycled at the end-of-life. Finally, corrugated cardboard is made from a renewable, biobased feedstock, and is biodegradable.

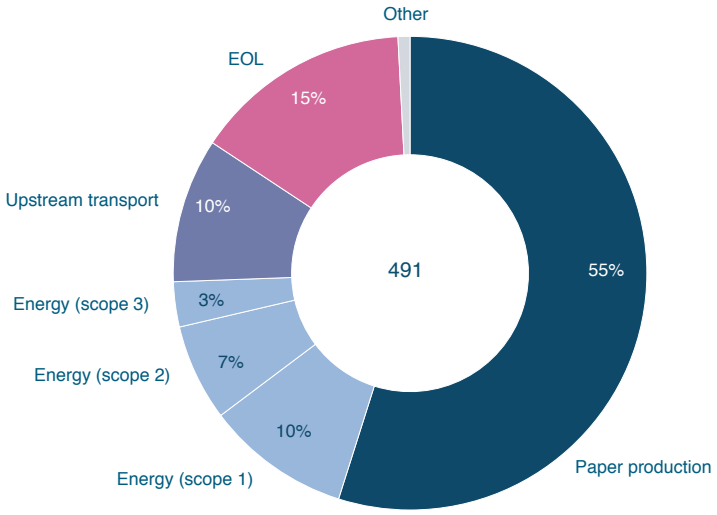
Regarding climate change, the production, transport and end-of-life treatment of corrugated cardboard packaging leads to GHG emissions and removals throughout various steps in the supply chain. In 2020, the total carbon footprint was 491 $kg_{CO2,eq}$ per ton of corrugated cardboard[2] .

**Figure 1: Corrugated cardboard packaging carbon footprint per emission category (in kg $CO_{2eq.}$/t nsp)**




1 Represented through FEFCO and its members. In geographical terms, this roadmap covers the EU27 + EEA countries + the UK.
2 Based on LCA studies performed for FEFCO. See https://www.fefco.org/lca/ Including fossil emissions, biogenic emissions, emission removals, avoided emissions and Direct Land Use emissions. The very limited Direct Land Use emissions (4kg CO2eq./t nsp) are not considered in the roadmap for simplification purposes.

**Figure 2: Current carbon footprint per emission source (in kg $CO_{2eq.}$/t nsp)**




When looking at the different sources of emissions throughout the supply chain, upstream emissions from paper production are by far the largest source of GHG emissions (55%), followed by the sector's own energy use (20%), upstream transport (10%) and incineration at end-of-life (15%, mainly biogenic emissions).

By approximation[3], the sector's aggregated carbon footprint amounted to 11,5 million tonnes of $CO_2$eq. in 2020.

## THE SECTOR'S AMBITION: CLIMATE NEUTRALITY BY 2050

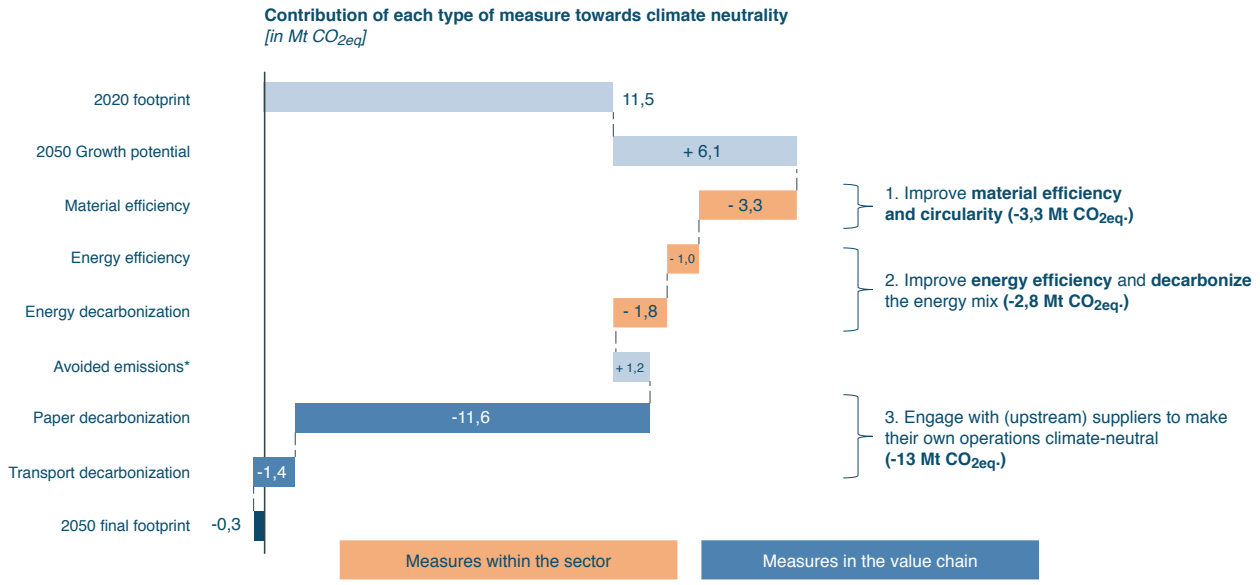
The sector's output is expected to increase considering the social economic and demographic changes and growing market demand. Without additional efforts, this could increase the sector's footprint to 17,6 Mt $CO_2$eq. by 2050. However, the sector has the ambition to decrease its total carbon footprint, and to achieve climate neutrality by no later than 2050. This means that throughout its supply chain, the sector does not release more (fossil or biogenic) greenhouse gases into the atmosphere than the amount of greenhouse gases that are removed from the atmosphere because of the sector's activities.

Achieving this ambition will require significant efforts – both by the sector and its suppliers and customers - across three dimensions:

- The material efficiency and circularity of the sector can be further improved. This can reduce the sector's footprint by 3,3 Mt $CO_2$eq. (or 19%) in 2050 compared to Business-as-Usual (BAU);
- The sector can further improve its energy efficiency and decarbonize its energy mix. This would reduce the sector's footprint by a further 2,8 Mt $CO_2$eq. (or 16%) in 2050 compared to BAU; and
- Supplier engagement: the bulk of the reductions will however have to be achieved upstream, and by reducing the climate footprint of paper production. If the paper sector reduces its (fossil) carbon footprint by -80% by 2050 (in line with the CEPI Roadmap[4]), this would allow the corrugated cardboard sector to achieve climate neutrality. If the paper sector fully phases out its fossil emissions, the corrugated cardboard sector could even become climate negative.

3 Approximation by multiplying the average footprint per tonne of product with the total production volumes as published on the FEFCO website.
4 CEPI, 2017, Investing in Europe for Industry Transformation. 2050 Roadmap to a low-carbon bioeconomy. Retrieved from: https://www.cepi.org/wp-content/uploads/2020/11/Roadmap-2050-Final-2017.pdf

**Figure 3: Contribution of different measures to achieve a climate-neutral corrugated cardboard sector (in Mt $CO_2eq$.)**




* Avoided emissions refer to the emissions related to fossil-based power generation which is avoided elsewhere in the economy due to energy recovery at the EOL stage (incineration). Because under the climate neutrality scenario it is assumed that the EU electricity grid is fully decarbonized by 2050, these avoided emissions drop to 0, resulting in a 'loss' of avoided emission compared to the BAU scenario.

## REQUIRED ACTIONS OVER THREE DIMENSIONS

Main actions to be taken along each of these three dimensions are briefly summarized below.

### Dimension 1: improving material efficiency and circularity

The main benefit of the corrugated cardboard packaging is 'Fit for purpose', which means meeting the requirements set by the customer using the minimum amount of materials while optimally protecting the product, with the highest degree of recycled content and further improvements are possible. Optimal results can be achieved by optimizing both the value chain (how packaged goods are transported, stored and handled), the design of packaging solutions and production processes. This requires the sector to actively engage with its customers, who should actively participate in the effort. By optimising the amount of material used to meet its customer's demands, the corrugated carboard sector can lower its carbon footprint throughout the value chain:

- Optimum amount of material used implies less material to be produced. As upstream emissions from paper production account for +- 55% of the total footprint, a lighter paper or/and more efficient paper use can significantly reduce the corrugated cardboard sector's carbon footprint.
- Increased material efficiency can also reduce the energy demand within the corrugated cardboard sector itself, as there is a direct relation between energy consumption and tonne of production.
- Furthermore, material efficiency can also reduce upstream (and downstream) transport emissions, which account for another 10% of the total footprint[5];
- Finally, a lower material intensity and a higher recycling rate can reduce end-of-life emissions.

As a result, further improving material efficiency could already reduce the sector's footprint by 19% compared to BAU.

5 Downstream transport is excluded due to lack of data but estimated to be limited (< 5% of total) as corrugated plants are generally within a 250km radius of their clients.

One key focus area is to further improve recycling rates, by avoiding or minimizing the combined use with other, non-paper materials. This can be done by 1) replacing non-paper materials with new, innovative alternatives, 2) facilitating the separate waste collection of corrugated cardboard materials and 3) further raising awareness amongst end users about the importance of separate waste collection.

In alignment with the principles of circularity, packaging design plays a vital role in using less material or keeping materials in use for as long as possible. Re-use of corrugated cardboard packaging is a challenge, as it is designed to be easily recycled, and extensive infrastructure is built for recycling systems. Re-use of packaging in a Fast-Moving Consumer Goods ("FMCG") environment is also difficult to achieve in the long-established, highly efficient supply and recycle loops that exist today. Also, the variety in destinations (customer, retail, industry…) makes the recollection of the boxes for reuse even more difficult. That being said, the sector will need to continue its work to maximize the re-use potential of corrugated cardboard packaging.

### Dimension 2: improving energy efficiency and decarbonizing the energy mix

The corrugated cardboard sector has been consistently reducing the average required thermal energy per tonne of produced unit over the last 15 years, and has also largely phased out dirtier energy sources such as coals and liquid fossil fuels. On the other hand, the electricity intensity of the sector is on the rise, mainly due to more electro-intensive converting machinery. To achieve its climate neutrality ambitions, it needs to further improve its energy efficiency and fully phase out fossil fuels from its energy mix.

Several solutions are possible to further improve the energy efficiency. **Existing technologies and well-known practices** (e.g. electric boiler and steam network improvements, LED lighting, compressed air leak detection) can be used to further improve the efficiency and reduce heat losses in the sector. Furthermore, the sector's machinery suppliers (corrugators and converting machinery) need to develop solutions to **improve the efficiency of the machinery** used in the sector, both for new as for existing (via retrofitting) machinery. Finally, in the longer term, there could be some **breakthrough technologies** which could significantly reduce the energy need of the sector, for example development of adhesives which bond at a lower temperature than the starch-based compounds currently used in the sector. To achieve the objectives of the roadmap, the sector plans to **reduce its thermal energy use by 40% and its electricity use (for non-heat purposes) by 33% by** 2050 compared to 2020 (per tonne of nsp).

Similarly, several solutions exist to decarbonize the energy mix and in particular the heat supply within the sector. Different options were assessed in the context of the roadmap, from which **two main pathways** have emerged: the **electrification** of the heat supply (mainly via electric boilers) and the **use of (gaseous) biofuels**[6]. Which of those two pathways is most suitable will depend on the availablity, affordability and security of supply of (decarbonized) electricity and gaseous biofuels. Regarding the **decarbonisation of the electricity supply**, a corrugated cardboard plant can produce between 10% and 40% of its current electricity needs with **onsite renewables** (depending on its location). To achieve its long-term ambitions, the sector counts on **a full decarbonisation of the EU electricity grid** to be achieved by 2050 at the latest.

### Dimension 3: supplier engagement

Regarding supplier engagement, there **are three types of suppliers** that will need to play a key role in achieving a climate neutral corrugated cardboard sector**: paper**, **transport, logistics** and **machinery** suppliers.

As paper accounts for +/- 55% of the total carbon footprint of corrugated cardboard packaging, successfully **decarbonizing the paper sector** is **a prerequisite** to achieve the ambitions of this roadmap. The European paper sector – represented by CEPI – has developed clear roadmap and committed to reduce

6 Other solutions such as the large scale use of solid biomass, (green) hydrogen based fuels or high-temperature heatpumps have also been considered but have been assessed to be less suitable or likely due to technical or economic reasons. Nevertheless, these technologies could also play a role for specific plants based on their local circumstances.

its carbon footprint by 80% by 2050, compared to 1990 (CEPI, 2017 [4]) If this ambition is achieved, it will enable the corrugated cardboard packaging sector to become climate neutral. A strengthening of the CEPI climate ambitions could even allow the corrugated cardboard packaging sector to achieve a net-negative carbon footprint. The European corrugated cardboard packaging sector will therefore **encourage the paper industry to achieve the ambitions of the CEPI climate roadmaps**.

Upstream **transport** – covering the transport between paper mills and corrugated plants – accounts for another 10% of the current carbon footprint, and will also have to be decarbonized by 2050[7]. This can be achieved through several levers. **Optimizing transport streams** is already a common practice, and most of the transport is already being routed via **softer transport modes** (rail 41%, maritime 23%), but further improvements might be possible. Furthermore, **vehicle efficiency** can be and is expected to be improved, driven amongst other things by EU standards and norms. Finally, to achieve full decarbonization, a switch to **new powertrain technologies** (battery electric and/or fuel cells) and/or **climate-neutral fuels** (advanced biofuels and/or synthetic) will be required. Decarbonizing Europe's transport system is an objective mainly out of the control of the corrugated sector, but as a fairly significant user of logistics systems, FEFCO and its members will support this transition wherever possible.

Finally, as described under dimension 2, to achieve the ambitions of this roadmap, the corrugated cardboard sector **counts on machinery suppliers** (corrugators + converting machinery) to develop solutions to **improve the (energy) efficiency of machinery**. As machinery has a long lifetime (25 years or more), these should also include solutions to **retrofit existing machinery**. Such improvements should allow the thermal energy consumption of corrugators to be reduced by at least 40%, and the electricity consumption of converting lines by at least 30%.

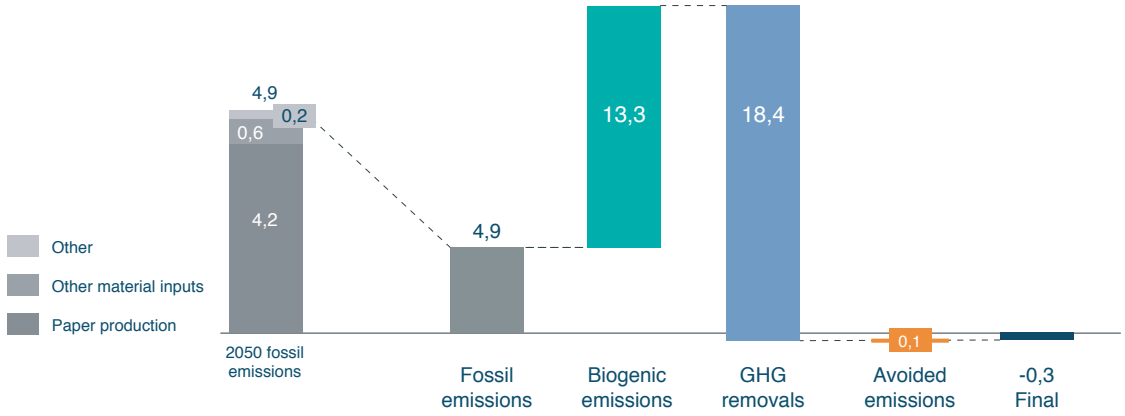
## PROJECTED EMISSIONS AND ENERGY USE

### Emission projections under the Climate Neutrality Roadmap

If all actions as described above are successfully implemented, the corrugated cardboard sector could achieve climate neutrality by 2050 throughout the value chain, as shown in Figure 4 below. Some fossil emissions would remain, mainly upstream in paper production (based on the 80% reduction ambition of the CEPI roadmaps). In addition, a significant amount of biogenic emissions would persist, mainly due to the use of biomass fuels in the paper production process and incineration of corrugated cardboard packaging at end-of-life which are not sent to recycling. However, these emissions would be more than compensated by greenhouse gas removals linked to the renewable production of biomass which is used in corrugated cardboard (wood, starch). As a result, the sector would achieve carbon neutrality and even slightly net-negative emissions by 2050. A further decarbonisation of upstream activities (mainly paper and starch production) would further reduce the fossil footprint and could enable the sector to achieve deeper net-negative emissions.

7 Downstream transport – from the corrugated plant to the customer – is not included in this roadmap due to lack of data on transport distances. However, the corrugated sector is very local with plants within a 250km radius of their customer base. A conservative approximation suggests that the emissions from downstream transport are therefore limited, between 15 and 20 kg $CO_{2eq}$./t nsp.

**Figure 4: Projected total carbon footprint by 2050 under the Climate Neutrality Roadmap (in Mt $CO_{2eq.}$)**



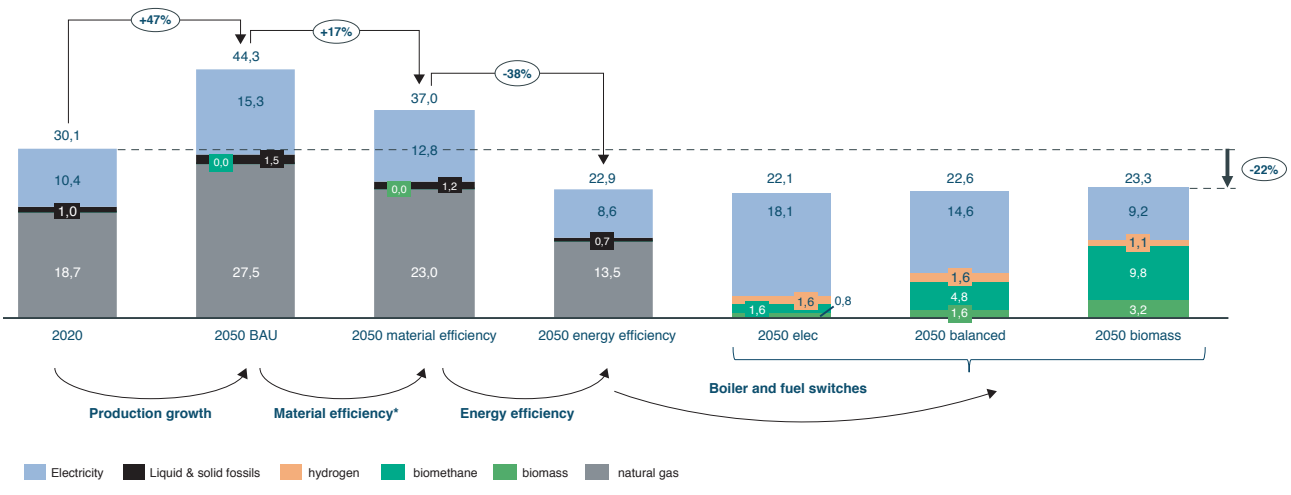

Future energy use depends on the eventual technology and fuel mix which will be used to supply the sector with the required energy. Given the uncertainty about the eventual fuel mix, three scenarios were developed for the Roadmap: an 'Electrification' scenario with a strong focus on electric boilers, a 'Biobased' scenario with a strong focus on biogas/-methane (and to a smaller extent, solid biomass), and a 'Balanced' scenario where both pathways are combined.

## Energy consumption projections under the Climate Neutrality Roadmap

In 2020, the sector consumed around 30 PJ's of energy, of which +/- 2/3 natural gas and 1/3 electricity. Under BAU, increased production would increase the energy consumption by +/- 45% by 2050. However, improvements in material and energy efficiency could significantly reduce the energy consumption compared to BAU, by 17% and 38% respectively. This would enable the sector to reduce its energy consumption by 22% even if production increases.

Even with a reduction in energy consumption, implementing the roadmap would significantly increase the demand for climate-neutral energy carriers. Electricity demand could increase between 45% and 80%, except in the Biobased scenario with high levels of biofuel consumption. Demand for (mainly gaseous) biofuels could increase to 2,4 to 5,4 PJ by 2050, or even 13 PJ under the Biobased scenario. Hydrogen-based fuels are only expected to play a minor role, for those plants where neither electrification nor biofuels can provide a solution due to local limitations (e.g. grid capacity or security of supply).

**Figure 5: Projected energy consumption in 2050 (in PJ)**



## INVESTING FOR THE TRANSITION

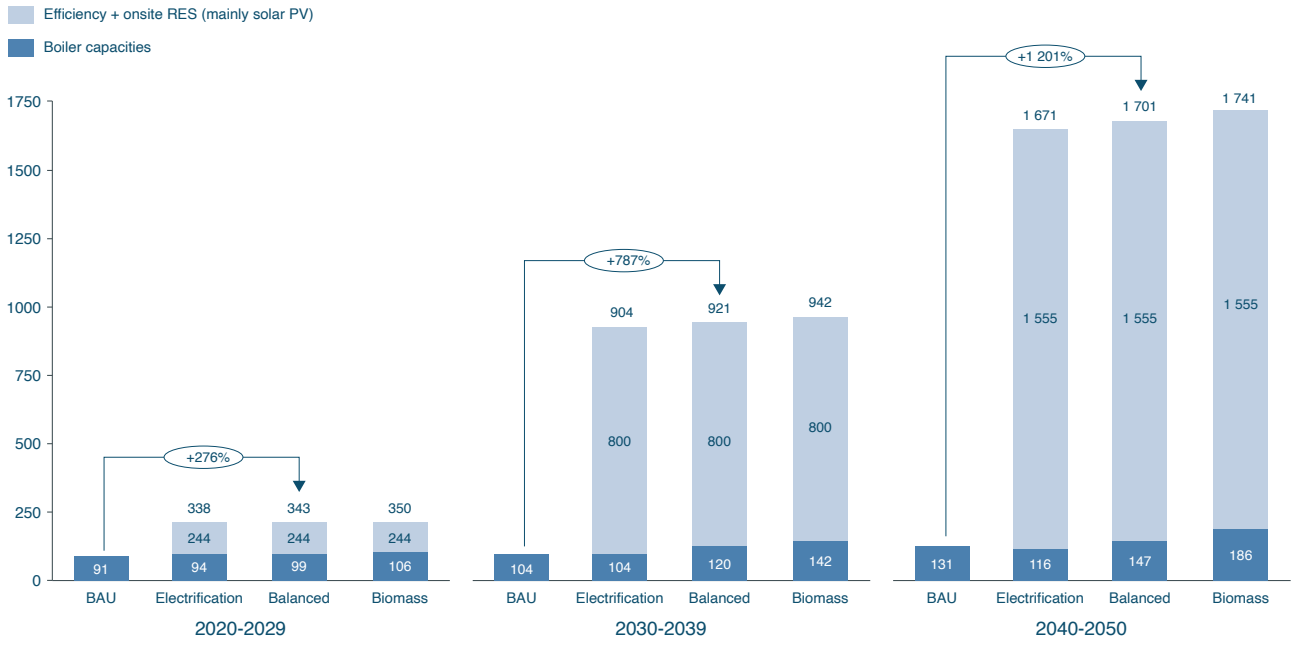
Assessing the cost implications of the transition is a complex and uncertain exercise, in particular due to the uncertainty regarding the impact of decarbonisation measures on the price of paper (which is one of the main cost drivers of the corrugated cardboard sector). Also, cost projections were calculated prior to the energy crisis in Europe.

Despite this uncertainty, it is clear that achieving the ambitions of the roadmap will require significant investments, both within the corrugated cardboard sector as throughout the value chain (mainly decarbonisation of paper mills and the switch to Low and Zero-emission trucks).

The objective of this roadmap was to provide the sector with a clear pathway to climate neutrality while evaluating the investments required to reach this objective. Further research building on the methodology and assumptions used here will be useful to estimate more precisely the costs and the relative differences between scenarios.

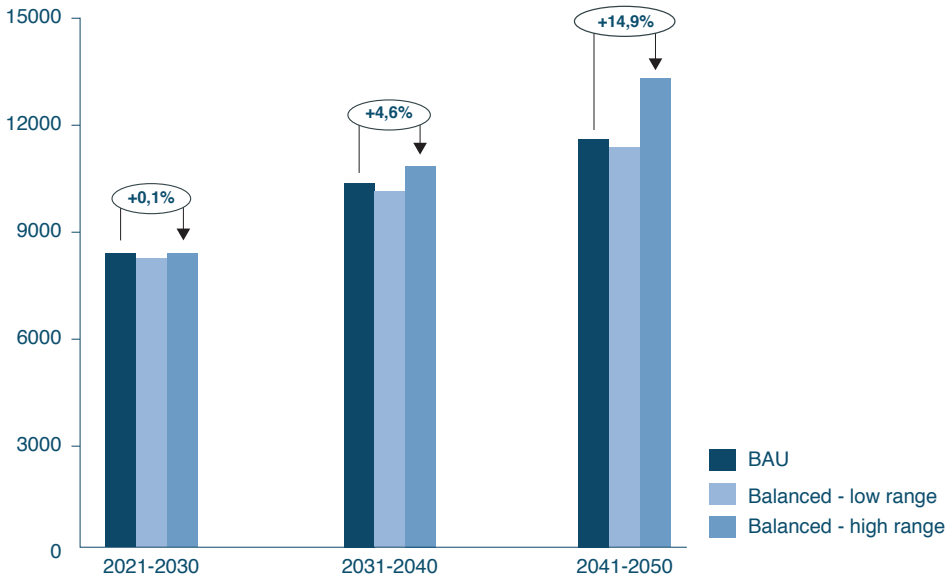
Within the sector, energy-related investments (in new boiler types and in energy efficiency improvements) are expected to increase significantly, with an increase x4 in this decade, and by more than a tenfold in the following decades (see Figure 6). This increase is mainly driven by required investments in ambitious efficiency improvements (light-blue area below).

**Figure 6: Projected energy investments in the corrugated cardboard sector (in € million, cumulative per decade)**




Whether these investments are fully paid back by lower energy expenditures highly depends on the future market prices of (climate-neutral) energy carriers. We have assessed the total energy costs (investments + expenditures) under both a low and a high energy price scenario (see Figure 7).

**Figure 7: Projected total energy costs (CAPEX + OPEX) in the corrugated sector (in € million, cumulative per decade)**




Results show that if low/zero-emission energy carriers are available at low costs, the sector's investments in efficiency and boiler switches can be paid back by lower energy expenditures. However, in case of higher prices for climate-neutral energy carriers, total energy costs are projected to increase by 5% in the next decade and +15% in the decade after.

## ENABLING CONDITIONS AND POLICY RECOMMENDATIONS

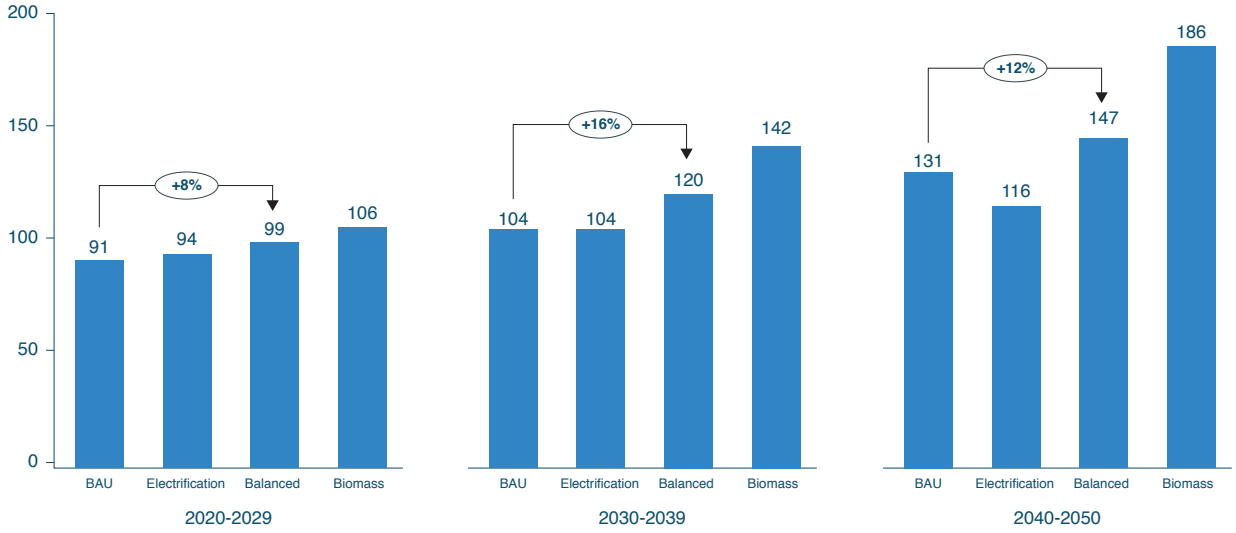
The ambitions of the corrugated cardboard sector's Climate Neutrality Roadmap can only be achieved if a set of enabling conditions are met.

### Predictable and stable regulatory framework to steer investments

The corrugated cardboard sector will have to make significant investments to achieve climate neutrality, in particular to improve its energy efficiency and decarbonize its energy supply. Despite a lower energy consumption, required investments in boiler capacities are projected to increase compared to BAU across most climate neutral scenarios.

A stable and predictable regulatory framework is required to support and steer investments in boiler and fuel switches. In particular, the sector needs to have clarity and certainty regarding the zero-rating (and related applicable conditions) of bio- and synthetic fuels before committing to large investments in these pathways.

Figure 8: Projected CAPEX for boiler capacities - cumulative per decade (in € million)




## Availability and affordability of climate-friendly energy carriers

Despite ambitious energy efficiency improvements, achieving climate neutrality will significantly increase the sector's demand for climate-neutral energy carriers as described above, in particular decarbonized electricity and gaseous biofuels. Today, these energy carriers are available at a fraction of the levels required and/or are more expensive than fossil fuels. To enable achievement of climate neutrality by 2050, policy makers need to put measures in place to **ensure a sufficient, secure and affordable supply of climate neutral energy carriers**, by

- Ensuring a further **integration of the EU energy market** and pursuing **market reforms** which allow consumers to benefit from the decreasing costs for renewable electricity production;
- **Reforming the energy taxation frameworks**, which in many member states put high taxes and levies on electricity and low taxes and levies on fossil fuels;
- Implementing **supportive and simplified permitting rules** to accelerate the deployment of renewable energy sources; and
- **Providing R&D and investment support** for technologies which have not yet achieved full maturity (e.g. green hydrogen, biomethane production, large-scale battery storage).

## Adequate and robust energy infrastructure

In addition to sufficient supply, existing **energy infrastructure needs to be reinforced and extended** to enable the transport of climate-neutral energy vectors, and to cope with intermittency of renewable energy sources.

The corrugated cardboard sector is very local with **plants widely dispersed to provide fast service to their customers and avoid unnecessary transport**. This means that many factories are located outside of large industrial clusters. The corrugated sector therefore calls on policy makers to not only focus on large industrial clusters of energy-intensive industries when considering investments in energy infrastructure, but to also provide sufficient access to that infrastructure for industries with a lower energy-intensity but high added value, such as the corrugated carboard sector.

## Policies and measures to enable the decarbonisation of the paper sector

As stated above, achieving a climate neutral corrugated cardboard sector largely depends on the ability of the paper sector to decarbonize. The corrugated cardboard sector therefore supports the policy recommendations as put forward in the CEPI roadmap, including:

- Integrating the objective of obtaining **a vibrant bioeconomy** in all relevant EU strategies;
- Supporting **research and innovation**, in particular for demonstration plants and breakthrough technologies;
- Applying the **cascading principle for biomass**
- Ensuring the availability of a **skilled workforce** through (re)education and easing mobility of workers; and
- Facilitating access to finance, including by decreasing the administrative complexity of existing support mechanism.

### Policies and measures to enable the decarbonisation of the transport sector

Similarly, the corrugated cardboard sector counts on policy makers as well as logistics providers to implement the required measures and investments to fully decarbonize the EU's transport system by 2050. These include:

- setting **ambitious emission standards for Heavy-Duty Vehicles**, amongst other things via the revision of the Regulation on $CO_2$ emission standards for Heavy Duty Vehicles;
- ensuring **sufficient (charging) infrastructure** to switch to zero- and low-emission vehicles, including via the proposed Regulation on the deployment of alternative fuels infrastructure;
- investing in **low-carbon transport modes** (rail, maritime), and addressing bottlenecks for transnational trajectories for such modes such as non-harmonized standards and regulations; and
- Increase the share of **renewable energy sources** in the transport sector (including via the revision of the Renewable Energy Directive) and supporting **the development of climate-neutral fuels** for hard-to-electrify transport segments (via the proposed FuelEUMaritime regulation).

### Recycling policies to improve quality of waste streams

The corrugated cardboard sector has the most recycled product among all paper & board packaging, which overall recycling rate is already the highest in EU (82% in 2019 according to Eurostat data), However, the **quality of the recycling can be further improved**, mainly by avoiding contamination of waste streams with non-recyclable materials. The sector can take own actions (by innovating to avoid the use of non-recyclable materials) and calls on policy makers to support this effort through:

- Mandatory separate collection of paper & board packaging, including corrugated, to support high quality recycling.
- Ensuring the required **infrastructure exists** (separate waste bins in the public domain and easy-to-use systems for municipality and rural collection) to enhance the separate collection and sorting of waste streams.
- **Awareness and educational campaigns towards consumers** that promote the proper sorting of waste materials. These should focus on the negative impact of mixing board waste with other materials (e.g. plastic components, food waste); and

## CONCLUSION

The European corrugated carboard sector has the ambition to achieve climate neutrality by 2050 at the latest. This ambition covers the sector's full carbon footprint (scope 1 to 3) and aims to work with the entire value chain to achieve this goal (cradle-to grave). To put the sector on a credible pathway towards climate neutrality, a Climate Neutrality Roadmap was developed by Climact, in close cooperation with FEFCO and its members.

In 2021, the European corrugated cardboard industry produced 55,7 Billion $m^2$ of corrugated board. As a packaging material, it scores strong on several sustainability dimensions as it is a highly circular and

easy-to-recycle material. Regarding climate change and GHG emissions, the production, transport and end-of-life treatment of corrugated cardboard packaging leads to GHG emissions and removals throughout various steps in the supply chain. In 2020, the total carbon footprint was 491 $kg_{CO2}eq$[8] per ton produced. When looking at the different sources of emissions throughout the supply chain, upstream emissions from paper production are by far the largest source of GHG emissions (55%), followed by the sector's own energy use (20%), upstream transport (10%) and incineration at end-of-life (15%, mainly biogenic emissions). By approximation[9], the sector's aggregated carbon footprint amounted to 11,5 million tonnes of $CO_2$eq. in 2020.

The sector's output is expected to increase considering the social economic and demographic changes and growing market demand. Without additional efforts, this could increase the sector's footprint to 17,6 Mt $CO_2$eq. by 2050. However, the sector has the ambition to decrease its total carbon footprint, and to achieve climate neutrality by no later than 2050.

Achieving this ambition will require significant efforts – both by the sector and its suppliers and customers - across three dimensions: (1) **The material efficiency and circularity of the sector can be further improved**. This can reduce the sector's footprint by 3,3 Mt $CO_2$eq. (or 19%) in 2050 compared to Business As Usual (BAU). (2) **The sector can further improve its energy efficiency and decarbonize its energy mix**. This would reduce the sector's footprint by a further 2,8 Mt $CO_2$eq. (or 16%) in 2050 compared to BAU. (3) The bulk of the reductions will however have to be achieved upstream, and in particular by reducing the climate footprint of paper production. If the paper sector reduces its (fossil) carbon footprint by -80% by 2050 (in line with the CEPI Roadmap), this would allow the corrugated cardboard sector to achieve climate neutrality. If the paper sector fully phases out its fossil emissions, the corrugated cardboard sector could even become climate negative.

Regarding energy consumption, improvements in material and energy efficiency could significantly reduce the energy consumption. They enable the sector to reduce its energy consumption by 22% even if production increases by 45%. Still, even with a reduction in energy consumption, implementing the roadmap would significantly increase the demand for climate-neutral energy carriers, such as renewable electricity and bio-based fuels.

The ambitions of the corrugated cardboard sector's Climate Neutrality Roadmap can only be achieved if a set of enabling conditions are met. First, as the corrugated sector will have to make significant investments to achieve climate neutrality (in particular to improve its energy efficiency and decarbonize its energy supply) a **stable and predictable regulatory framework is required to support and steer investments** in electric boiler and fuel switches.

Second, despite ambitious energy efficiency improvements, achieving climate neutrality will significantly increase the sector's demand for climate-neutral energy carriers. Hence, policy makers need to put measures in place to **ensure a sufficient, secure and affordable supply of carbon neutral energy carriers**. Besides, existing **energy infrastructure needs to be reinforced and extended.**

Finally, as most of the corrugated cardboard's carbon footprint comes from indirect emissions within its value chain, **key policies and measures are needed to improve the quality of waste streams and to enable the decarbonisation of the paper and transport industry**.

8 Based on LCA studies performed for FEFCO. See LCA report Including fossil emissions, biogenic emissions, emission removals, avoided emissions and Direct Land Use emissions. The very limited Direct Land Use emissions (4kg CO2eq./t nsp) are not considered in the roadmap for simplification purposes.

9 Approximation by multiplying the average footprint per tonne of product with the total production volumes as published on the FEFCO website.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