



# CO<sub>2</sub> NEUTRALITY IN THE BUILDING SECTOR

## **Opportunities**

for the flooring industry in the transition  
towards a zero-emissions construction sector



# INTRODUCTION

## CO<sub>2</sub> NEUTRAL

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### FACT

Over the past 50 years, the average global temperature has increased at an unprecedented rate.

**This whitepaper explores the relationship between climate change and the present and future actions of the building sector – a major contributor to global CO<sub>2</sub> emissions.**

**In the context of sustainable building practices, it sets out some of the challenges on the path to hitting international targets for climate action, as well as some of the opportunities and solutions available to CO<sub>2</sub>-conscious market players.**





## THE ROOTS OF CLIMATE CHANGE

### FACT

‘Carbon dioxide (CO<sub>2</sub>) is the primary greenhouse gas emitted through human activities.’<sup>1</sup>

‘The global annual temperature has increased at an average rate of 0.07°C per decade since 1880, and over twice that rate (+0.18°C) since 1981.’<sup>2</sup> This phenomenon, known as global warming, is widely believed to be a consequence of our own actions: ‘97 per cent or more of actively publishing climate scientists agree [that] climate-warming trends over the past century are extremely likely due to human activities.’<sup>3</sup>

Global warming is the effect caused by an accumulation of so-called greenhouse gases such as carbon dioxide (CO<sub>2</sub>) and methane in the earth’s atmosphere. These gases effectively form a blanket around the earth, trapping in heat and causing the surface of the planet to get hotter.

Carbon dioxide is a naturally occurring gas that is released and then absorbed by the land and oceans as part of a natural cycle. This cycle achieved a steady balance of CO<sub>2</sub> uptake versus emissions, until the concentration of carbon dioxide in the atmosphere became problematic due to increases in human-generated - or industrial - CO<sub>2</sub> emissions. and decrease of forestry to uptake CO<sub>2</sub> emissions.

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<sup>1</sup> EPA, *Greenhouse gas emissions*,

<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

<sup>2</sup> NOAA, 2020, *Climate change: global temperature*,

<https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature>

<sup>3</sup> NASA, *Scientific Consensus: Earth’s climate is warming*,

<https://climate.nasa.gov/scientific-consensus/>



'87 per cent of all human-produced CO<sub>2</sub> emissions comes from the burning of fossil fuels like coal, natural gas and oil.'<sup>4</sup> This human contribution to carbon dioxide has upset the natural carbon cycle, leaving an excess of the CO<sub>2</sub> to linger in the atmosphere as a blanket, that holds the sun radiation...and warms up the earth.

Increasingly, science is emerging that links global warming to the likes of rising sea levels, coastal erosion and more extreme weather conditions: from heat waves and droughts to floods and hurricanes. These climatological events have knock-on effects for human health, food supplies and infrastructure across the globe.

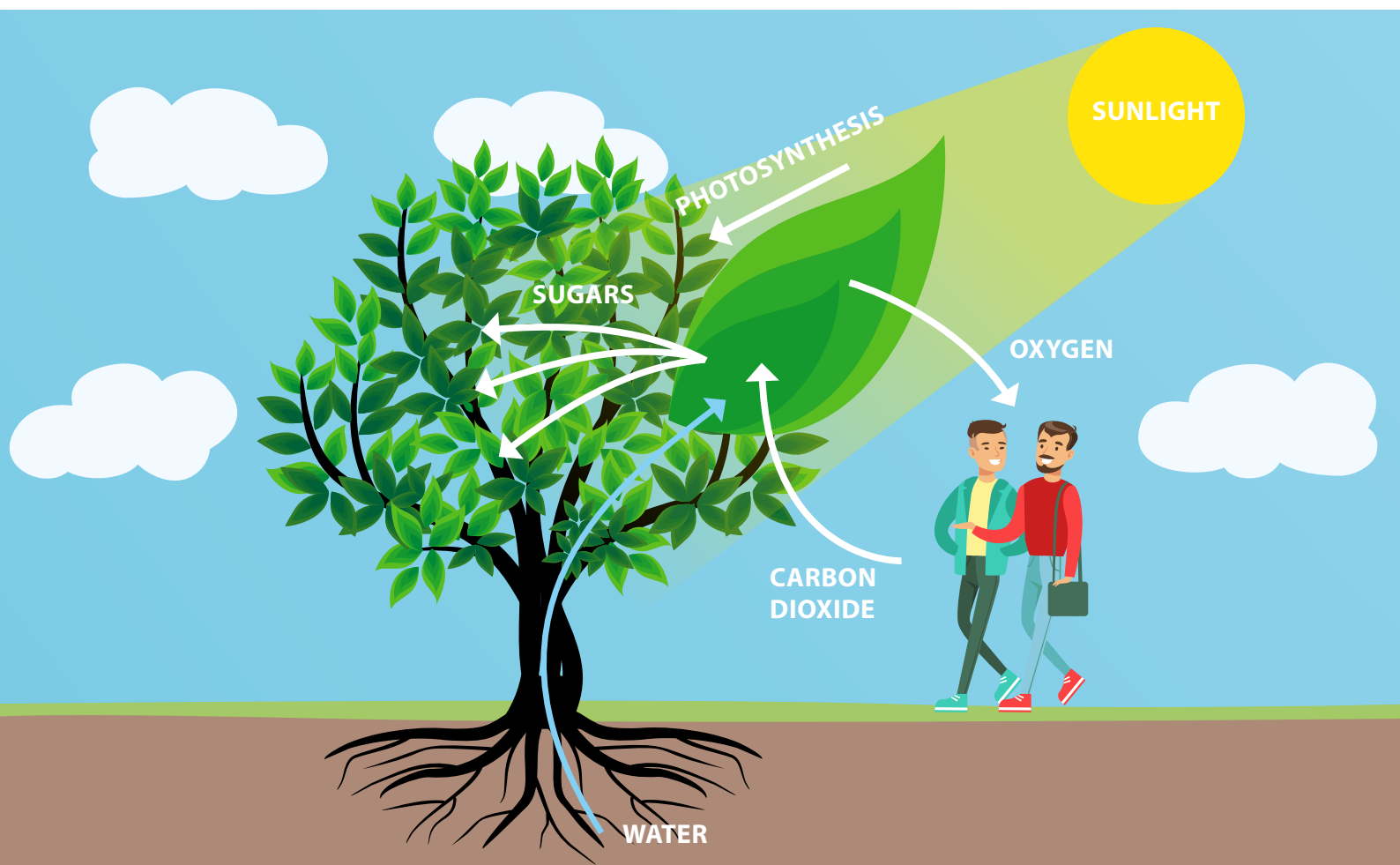
The United Nations describes the consequences of climate change as 'global in scope and unprecedented in scale. Without action today, adapting to these impacts in the future will be more difficult and costly.'<sup>5</sup> Curbing carbon dioxide emissions is the most obvious and effective way to take that action. In practice, this means enforcing concrete CO<sub>2</sub> reduction targets as part of government sustainability strategies.

<sup>4</sup> CHE 2017, *Main sources of carbon dioxide emissions*,

<https://www.che-project.eu/news/main-sources-carbon-dioxide-emissions>

<sup>5</sup> United Nations, *Climate Change*,

<https://www.un.org/en/sections/issues-depth/climate-change/>



# INTERNATIONAL AGREEMENTS FOR CLIMATE ACTION

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## FACT

The Paris Agreement sets the goal of keeping a global temperature rise well below 2 degrees Celsius above pre-industrial levels.

Fighting climate change requires a global approach that, at its core, involves a reduction in the overall amount of energy consumed and the replacement of fossil fuels with renewable energy sources.

On 22nd April 2016, parties to the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement: a legally binding framework for tackling climate change. Specifically, the Paris Agreement sets the goal of 'keeping a global temperature rise this century well below 2 degrees Celsius' above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.<sup>6</sup>

To achieve the Paris Agreement's ambition, the world must essentially reduce greenhouse gas emissions to the point that the volume being emitted is no greater than the volume being sequestered. Sequestration is 'the removal and storage of carbon from the atmosphere in carbon 'sinks' (such as

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<sup>6</sup> United Nations Climate Change, *The Paris Agreement*,  
<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>



oceans, forests or soils) through physical or biological processes, such as photosynthesis.<sup>7</sup> Afforestation is one example of how this can be achieved, but there are also technology-driven solutions, such as carbon capture and storage (CCS) that prevents CO<sub>2</sub> from entering the atmosphere.

Under the Paris Agreement, nations are required to outline and regularly report on adaptations they plan to make within their economies to counter climate change. These are set out in 'nationally determined contributions' or NDCs. The success of the Paris Agreement will depend on each coun-

try satisfactorily reducing its domestic greenhouse-gas emissions, as set out in these NDCs.

Ratification of the Paris Agreement has meant that development of energy reduction and renewable energy schemes has accelerated. National governments have to fulfill their climate pledge and it is likely that they will do this through carbon taxes. Additional measures might include the introduction of specific legislation and greener regulations in carbon-intensive industries such as the transport and building sectors.



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<sup>7</sup> Greenfacts.org, *Carbon sequestration*,

<https://www.greenfacts.org/glossary/abc/carbon-sequestration.htm>





## CLIMATE ACTION IMPLICATIONS FOR THE BUILDING SECTOR

### FACT

Building and construction industries are responsible for 39% of all carbon emissions in the world.

Combined, the building and construction industries are responsible for 39% of all carbon emissions in the world. With such a considerable contribution to climate breakdown, 'decarbonising the sector is one of the most cost effective ways to mitigate the worst effects.'<sup>8</sup>

Operational emissions – from energy used to heat, cool and light buildings – account for 28% of those carbon emissions. The remaining 11% comes from embodied carbon emissions.<sup>9</sup> Embodied carbon represents the carbon footprint of a particular material throughout its lifecycle. For a building, embodied carbon encompasses the total emissions from the entire supply chain of all materials used to build it and contained within it, plus emissions from the construction process and those emissions involved in demolishing and disposal at the end of the building's life. Reducing CO<sub>2</sub> in the building and construc-

tion sector therefore not only implies lowering energy consumed during a building's operational phase, but also reducing the emissions attributable to the building's materials and interior fixtures and fittings; before the building is even used (upfront carbon).

Global building stock is expected to double by 2060,<sup>9</sup> only adding to the already unsustainably high percentage of emissions attributed to the sector. Without drastic and immediate sector-wide change, the impacts of such growth are almost unthinkable. Having previously lurked somewhat in the background, the issue of upfront and embodied carbon is demanding a greener approach.

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<sup>8</sup> World Green Building Council, 2019 *Bringing Embodied Carbon Upfront*, p.7, <https://www.worldgbc.org/embodied-carbon>

<sup>9</sup> World Green Building Council, p.16

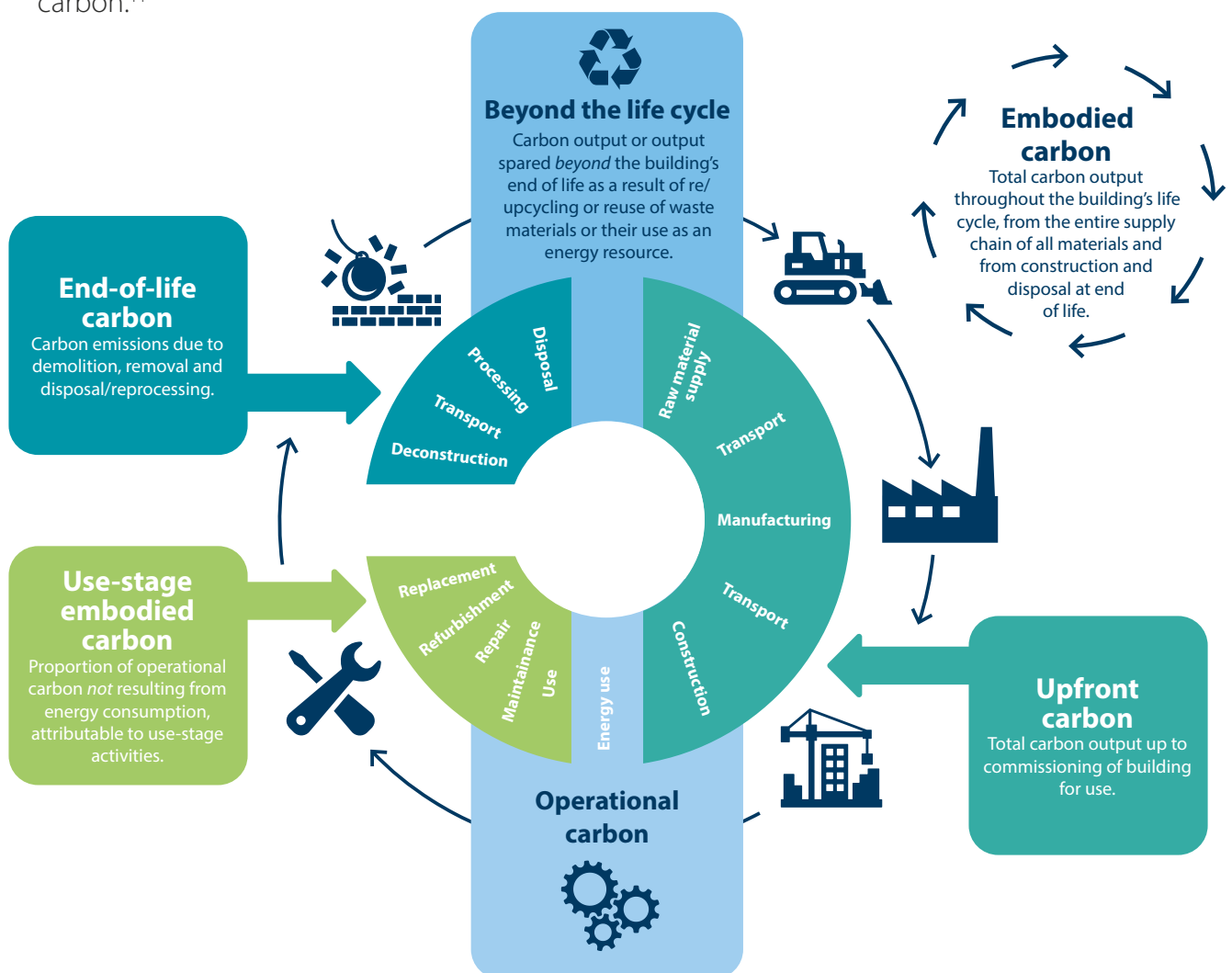
<sup>10</sup> World Green Building Council 2019, *New report: the building and construction sector can reach net zero carbon emissions by 2050*, <https://www.worldgbc.org/news-media/WorldGBC-embodied-carbon-report-published>

A report by the World Green Building Council sets out a vision for the future:

- By 2030, all new buildings, infrastructure and renovations will have at least 40% less embodied carbon with significant upfront carbon reduction, and all new buildings must be net zero operational carbon;
- By 2050, new buildings, infrastructure and renovations will have net zero embodied carbon, and all buildings, including existing buildings must be net zero operational carbon.<sup>11</sup>

The World Green Building Council's definition of a net zero carbon building is a building that is 'highly energy efficient [and] fully powered from on-site and/or off-site renewable energy sources and offsets.'<sup>12</sup>

Net zero buildings are a tall order, and one that can only be met with the full commitment and cooperation of all stakeholders.



Source: World Green Building Council

<sup>11</sup> World Green Building Council, *Bringing embodied carbon upfront* Sept 2019, p.16

<sup>12</sup> World Green Building Council, *The net zero carbon buildings commitment*, <https://www.worldgbc.org/thecommitment>



# SUSTAINABLE SOLUTIONS IN THE FLOORING SEGMENT

## FACT

Choosing a floor that lasts more than 20 years is preferable to installing a new floor every few years.

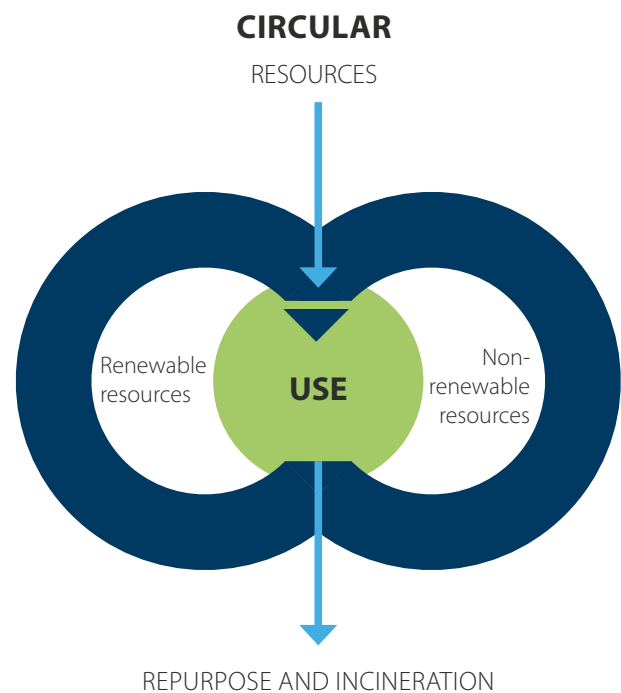
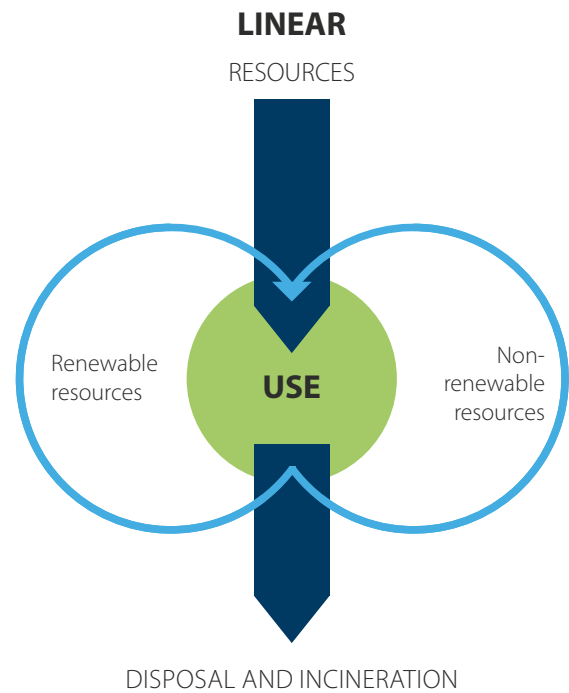
Companies operating in the worlds of building and construction wanting to lead the way in offering sustainable solutions will need to do more than minimise the use of fossil-based energy alone: reducing carbon footprint calls for bigger thinking.

Within the flooring segment, there are three key prospects to consider:

1. circular solutions
2. offsetting
3. CO<sub>2</sub> neutral materials

## Circular solutions

'A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems.'<sup>13</sup> From this definition, it follows that a circular building is 'a building that is developed, used and reused without unnecessary resource depletion, environmental pollution and ecosystem degradation.'<sup>14</sup> The implications of circularity for the building sector can be distilled down to the efficient use of materials, continuous reuse of materials, extending the lifetime of products and preventing 'waste' once materials reach end-of-life.



<sup>13</sup> Ellen MacArthur Foundation, *What is the circular economy?*, <https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy>

<sup>14</sup> Urbact, *Transition to circular economy: the "power" of the building sector towards better cities*, <https://urbact.eu/transition-circular-economy-%E2%80%98%E2%80%99power%E2%80%99%E2%80%99-building-sector-towards-better-cities>



Traditionally, floors have been made according to a linear process: raw materials are extracted, treated and processed, converted into a floor covering, used, then removed and put into landfill. In a circular approach, waste is prevented from being created in the first place. Choosing a floor that lasts more than 20 years is preferable to installing a new floor every few years, for instance. If that is not possible, the next best thing would be to choose a floor that can be removed rather than destroyed. That floor could then be used elsewhere, or at least recycled. Recycling can, however, have a high energy expenditure associated to it, resulting in low yields and meaning that a circular solution may not always be the most ideal.

### **Offsetting**

The manufacturing processes involved in producing certain flooring types, such as carpet, PVC, rubber along with many PVC-free options, generate CO<sub>2</sub>. Furthermore, for the most part, these products contain no natural ingredients. If technical or design motives

dictate a preference for such products, participating in carbon offset schemes can be an initial step in the right direction.

Carbon offset schemes allow a business to 'offset' the carbon emitted as a result of their own activities through investing in schemes that remove carbon from the atmosphere, or that limit future emissions. The CO<sub>2</sub> emissions are not reduced during the production process itself, but instead offset – or neutralised – through other climate initiatives, such as afforestation or investment in green technologies elsewhere in the world.

This way, a company achieves a carbon neutral position, and greenhouse gases are reduced. But the offsetting approach does not reduce a company's own carbon footprint directly. At present, offsetting represents a quick win. But ultimately, industry will have to come up with real solutions.

### **CO<sub>2</sub> neutral materials**

Whereas carbon neutral was once perceived as the ultimate goal to aspire to, it is becoming increasingly clear that carbon neutral – or even carbon negative – will instead become the standard of the future.

CO<sub>2</sub> is emitted at each stage of a product's life cycle: from raw material extraction and manufacturing to transport, usage, cleaning and end-of-life disposal. Each stage in the process should be optimised for carbon footprint limitation. This can be achieved by using renewable energy for fabricating a floor from a waste stream product, or by using rapidly renewable natural raw materials that capture CO<sub>2</sub> in their original state.

The ideal point of departure for carbon neu-

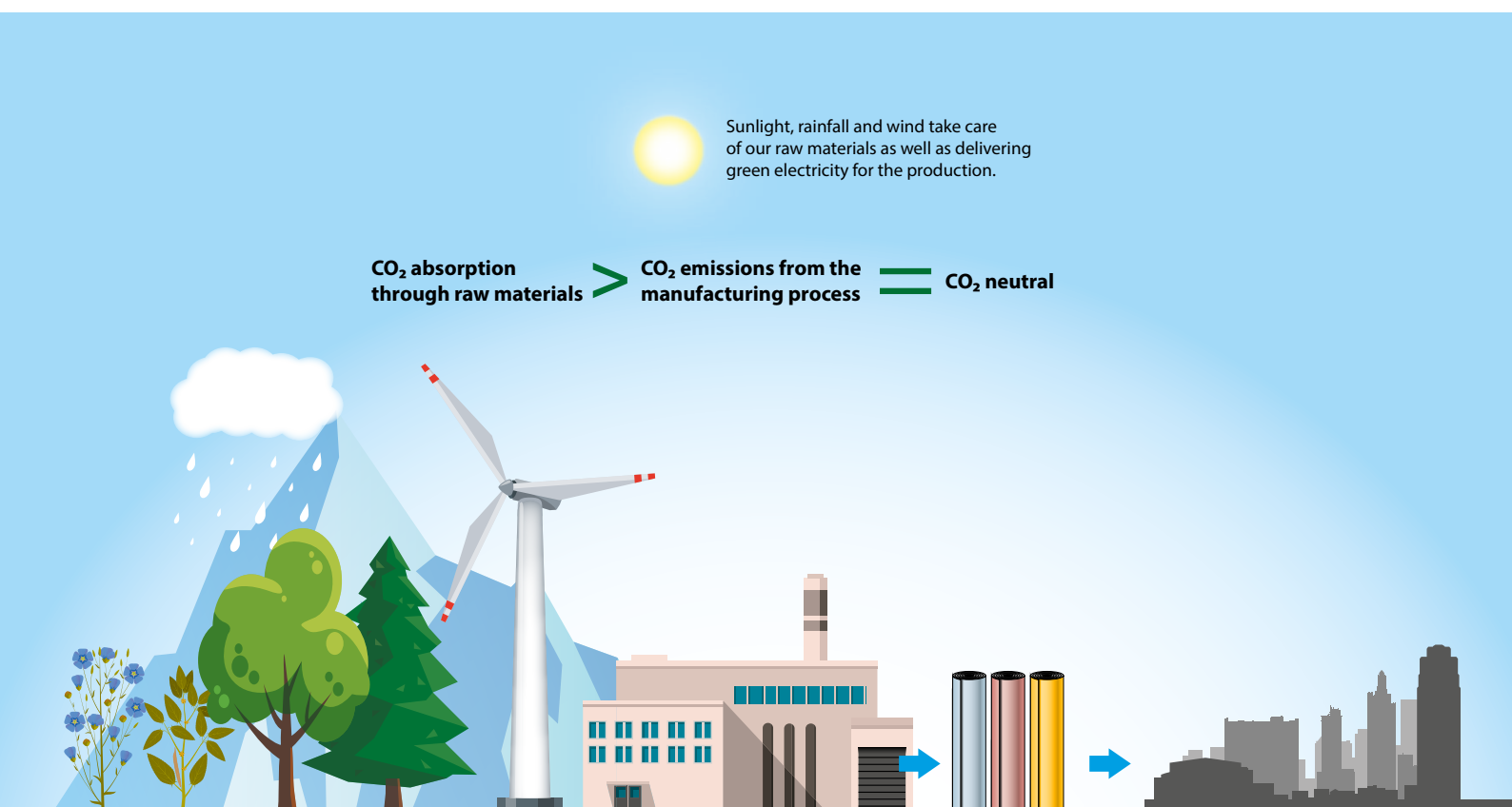


trality is a product which, during its production phase – i.e. from raw material extraction to leaving the factory gate as an end product – does not emit carbon dioxide. A floor labelled as natural or biobased does not by definition lead to a CO<sub>2</sub> neutral floor. Often, only a small percentage of all raw materials used in a product are from a rapidly renewable natural resource. In addition, the processing of the raw materials themselves can require a lot of energy, leading to greater CO<sub>2</sub> output than was captured in the first place.

A CO<sub>2</sub> neutral product is produced in such a way that the carbon dioxide emissions are balanced out and no additional carbon

dioxide enters the environment. In floors containing natural raw materials that absorb CO<sub>2</sub>, it is a combination of the 'surplus' of CO<sub>2</sub> in these materials and the CO<sub>2</sub> released during production that evens out to zero and makes a floor CO<sub>2</sub> neutral.

Bamboo, cork and wooden floors generally score well on this balance due to their extreme high 'natural content' and normally low processing footprint. Linoleum also has good potential, but only if the rapidly renewable natural content is high and the CO<sub>2</sub> emissions from the production process are reduced sufficiently by the manufacturer.





## MAKING **CO<sub>2</sub>-CONSCIOUS CHOICES**

### **FACT**

An LCA is a measurement tool used to assess environmental impact throughout a product's lifetime.

How do you make sustainable choices when it comes to deciding on a floor covering? What basis is there for responsible and informed decision-making?

Independent, third-party verification such as eco-friendly labels and certifications offer sustainability assurance. An Environmental Product Declaration (EPD) is another helpful tool for comparing the environmental credentials of one product over another. An EPD 'communicates transparent and comparable information about the life-cycle environmen-

tal impact of products.'<sup>15</sup> It provides information such as CO<sub>2</sub> footprint, raw materials used and their origin, the amount of biobased or circular materials and type of energy used. EPDs are accredited by a programme operator in accordance with the ISO 14025 and EN 15804 standards and are independently verified by a third party. In some cases they can be self-declared.

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<sup>15</sup> EPD, *What is an EPD*,

<https://www.environdec.com/What-is-an-EPD/>

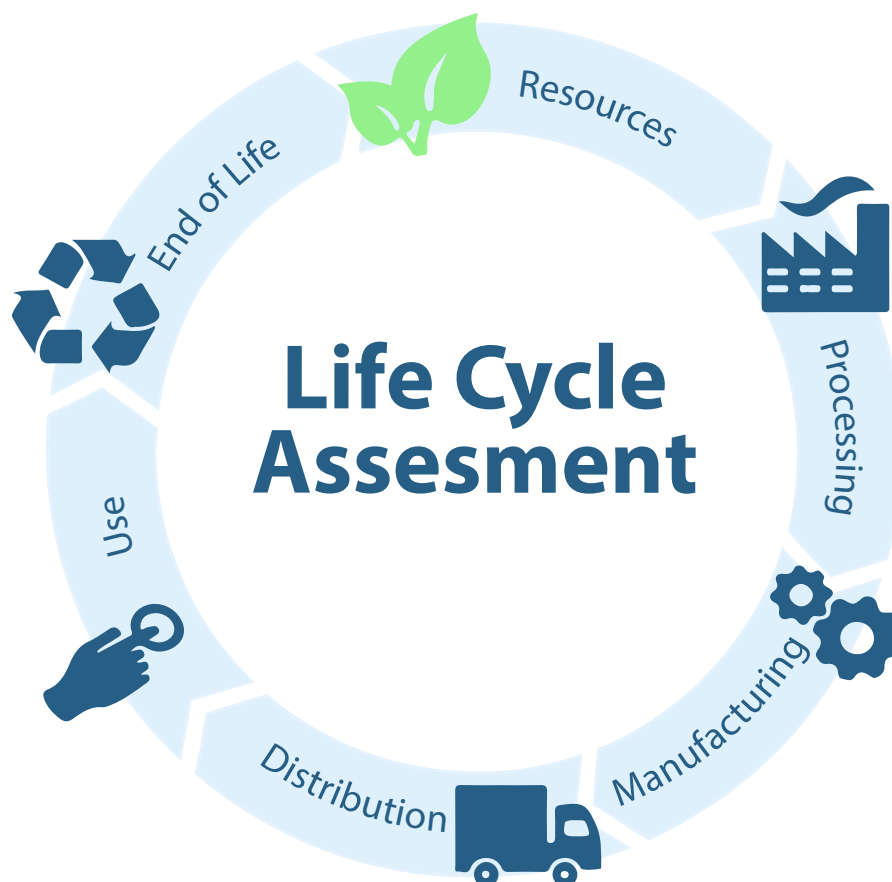


An EPD is based on a product Life Cycle Assessment (LCA): a measurement tool that assesses a product's environmental impact throughout its life cycle. A standard LCA will assess five stages: production (including raw material extraction), transportation, installation, use and end-of-life.

The scope of the LCA is important to define, as there are a number of variants when it comes to which processes are included or not:

- Cradle-to-gate: LCA of product up until it leaves the factory gate, before being distributed to the customer
- Cradle-to-grave: linear life cycle assessment through to disposal
- Cradle to cradle: LCA with an up/recycling process at the end of the use phase

Third-party verified labels and certifications are especially pertinent when it comes to choosing materials for green building schemes, as they provide evidence of a product's environmental performance. Currently, there are no credits awarded for using a CO<sub>2</sub> neutral product in either the LEED or BREEAM rating systems. However, credits in both schemes can be earned by using products that have an EPD. It is expected that future building schemes will be based around carbon credits in a whole-life context, or in the context of the life of the building.



# CONCLUSION

## FACT

The building sector is a huge contributor to global CO<sub>2</sub> emissions.

The building sector is a huge contributor to global carbon dioxide emissions; not only due to operational energy consumption, but also as a result of embodied and upfront carbon. If global climate action targets are to be met, decarbonisation of the building sector will need to intensify over the coming years.

Among others, this will require conscious effort and commitment from all stakeholders in the form of policy and education, cleaner solutions, innovative products and designers

advocating products with low carbon footprints. The deliberate choice for CO<sub>2</sub> neutral floors in new projects can contribute to minimising the upfront carbon footprint of a building before it is commissioned.

Whilst the transition towards carbon neutrality may be challenging, opportunities are opening up for those organisations that stay ahead of the curve to reap the rewards of a new circular economy.





#### Useful links:

[https://www.youtube.com/watch?v=SLI\\_x50OVcE](https://www.youtube.com/watch?v=SLI_x50OVcE)  
[www.forbo-flooring.com/co2neutral](http://www.forbo-flooring.com/co2neutral)

creating better environments

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