WHOLE LIFE CARBON

POSITION PAPER

SEPTEMBER 2021

Dutch
Green Building
Council

DGBC.nl

Colophon
Dutch Green Building Council
Zuid Hollandlaan 7
2596 AL The Hague

Publication date
September 2021
version 1.1

This Position Paper was realized with the ambassadors of the #BuildingLife project:

André Hekma	Energy Transition Advisor	Arcadis
Anja Köhler	Sustainability Innovation Manager	EDGE
Arjan van Eijk	Sustainability Analyst	Colliers
Hermen Smelt	Architect/Creative Engineer	Inbo
Janneke Leenaars	Sustainability Manager	Interface
Jeroen Loots	Climate Senior Advisor	ASN Bank
Mantijn van Leeuwen	Director	NIBE
Niels van Geenhuizen	Business Lead Sustainable Built Environment	Arcadis
Peter Buurman	Senior Advisor	Deerns

Whole Life Carbon Position Paper is part of the #BuildingLife Project

Design: Supervisie Reclame - Productiebureau
Photo credits: Shutterstock

DGBC.nl

INTRODUCTION

The construction sector is facing a major sustainability challenge. This task goes further than just reducing CO_2 in the use stage. The construction process and the use of materials also cause a CO_2 impact. This will require a new perspective on how the construction industry is becoming more sustainable. We call this the Whole Life Carbon approach. This approach is part of the European #BuildingLife program. This position paper explains what is understood by a Whole Life Carbon approach.

Furthermore, this report addresses the following aspects:

1. The urgency of CO_2 reduction for the Dutch built environment and the assumptions for allocating an emission budget to the built environment;
2. The relationship of DGBC programs in terms of Whole Life Carbon;
3. A method of classifying the different emissions;
4. Challenges in the various construction projects;
5. Current regulations in relation to operational and embodied carbon;
6. The impact of various stages of the construction process, influence of materials and impact of different parts of a building;
7. A first step in guiding principles;
8. The various orders of magnitudes in dealing with emissions;
9. We conclude with a BuildingLife project description and the definitions used (10).

This report is the first step in a process of sustainability according to this new principle.
We are also working on a calculation tool that helps to achieve these objectives. This is based on the current regulations in the Netherlands (MPG). A roadmap is then drawn up for each target group in the chain and building type, showing which steps are needed to work towards concrete objectives. The whitepaper, the roadmaps with objectives and the calculation protocol are explained at a conference on February 15, 2022.

The DGBC has drawn up this position paper based on input from the Ambassadors of the BuildingLife project and stakeholders from the entire construction column.

TABLE OF CONTENTS

01 CO_2 REDUCTION IN THE BUILT ENVIRONMENT

On August 9 2021, the IPCC independent panel of United Nations climate scientists presented the first part of a three-volume climate report informing governments on shaping climate policy[1]. This report was also cited as the climate alarm signalling the immediate threats of climate change and loss of biodiversity. In this report, based on the analysis of more than 14,000 scientific publications, the IPCC states that it is incontrovertibly established that human activity is causing climate change, making extreme weather - including extreme heat waves, heavy rainfall and severe drought - more frequent and more severe. In addition, climate change is already evident in every region of the world.

However, there is still hope according to the scientists that within a few decades we will be able to limit future warming. If we manage to reduce greenhouse gas emissions quickly, deeply, radically and permanently now and global net zero emissions are by 2050, then it is very plausible that global warming can be kept well below 2 degrees.

The scientists have made it perfectly clear that every ton of CO_2 emissions adds to global warming. The climate that we and our (grand)children will experience in the future depends on our decisions in the here and now!

COP26 EU Green Deal and Fit for 55% Action

At COP26 in Glasgow, countries will discuss and debate national climate action plans. Given the IPCC report, we see this as a critical milestone in addressing climate change and the pressure will be on world leaders to actually take firm steps forward prior to and during COP 26.

Over the past two years, the European Commission has taken on a governing role for the EU and has with the EU Green Deal the ambition to be the first CO_2 neutral continent by 2050.
To achieve this, it recently raised the CO_2 reduction target for 2030 from 49% to 55% and on July 14, with the Fit for 55 Plan, presented a series of proposed adjustments on EU climate, energy, transport and taxation policies to achieve this 55% reduction target with the Green Deal[2].

EU renovation wave

With respect to the built environment, the EU is mainly focusing on the renovation and large-scale preservation of houses and buildings with the "renovation wave" because it saves energy, protects against extreme heat or cold and can address energy poverty. In addition to housing, public buildings also need to be renovated to make them more sustainable and energy efficient.

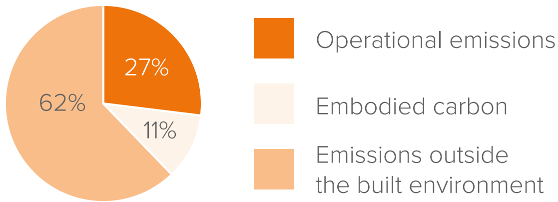


Figure 1: Percentages of CO_2 emissions from the built environment in the Netherlands (KEV, NIBE)

Role of the built environment

The built environment is responsible for 38% of all Dutch CO_2 emissions. This consists of operational emissions (27%), the emissions related to energy use by using the building, but also embodied carbon (11%), the emissions related to materials and (construction) processes[3].

1) https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/
2) https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_nl (viewed August 9, 2021)
3) https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_nl (viewed August 9, 2021)

Working towards a budget approach for construction

If we want to use the baseline scenario for 1.5 °C degree warming[4], we still have a total global emissions budget of 400 Gt CO_2-e[5]. There are many ways to further allocate this budget. The subdivision we use here for further allocation is based on population, where for the Netherlands we arrive at a budget of 909 M tons of CO_2. The emissions of the Netherlands in 2018 were 188.2 M tons CO_2 (source: RIVM emission registration). Without reduction, with these emissions, the budget would be used up in 5 years. Five years, so before 2030.

What part of the CO_2 budget should be available for construction? There are no reliable figures for the CO_2 impact of the total production of the building products used. Many of the figures for the built environment (EIB[6], CBS, TNO) are about the total CO_2 footprint, and in this the energy consumption in the built environment takes a significant portion, but for this budget approach we are looking at the embodied carbon. We estimate total embodied carbon from construction (including civil engineering works) based on our figure per m² and estimated construction volumes using data from CBS and Economisch Instituut voor de Bouw (EIB) [Economic Institute for the Construction Industry].

We thus arrive at an estimate of embodied carbon for new construction and renovation of 17.0 M tons CO_2 eq. per year, 11% of Dutch CO_2 emissions[7].

Assuming an 11% share of the construction sector in Dutch emissions today, we could say that the embodied carbon from construction should remain within 11% of the Dutch carbon budget. In a 1.5-degree scenario, that leaves room for 100 M tons of embodied carbon budget for Dutch construction targets. This would allow the construction target to fall within the Paris Agreement.

4) With 66% certainty
5) IPCC.: Climate Change 2021: The Physical Science Basis. sl : IPCC, 2021.
6) Material flows, environmental impact and energy consumption in residential and non-residential construction (Economisch Instituut voor de Bouw, Metabolic, SGS Search, 2020). Data from 2014.
7) This is also consistent with the global estimate of embodied carbon for construction, established by the IEA in the 2019 Global Status Report for Buildings and Construction.

02 TOGETHER TOWARDS A PARIS PROOF BUILT ENVIRONMENT

Different targets have different focus points. For example, the focus is on reducing operational emissions for existing buildings, while significant attention must also be paid to embodied carbon when sustainably renovating these existing buildings. For new construction, the focus is on reducing embodied carbon. The various targets can be traced back to the emissions over the entire lifetime of a building, as shown in Figure 2.

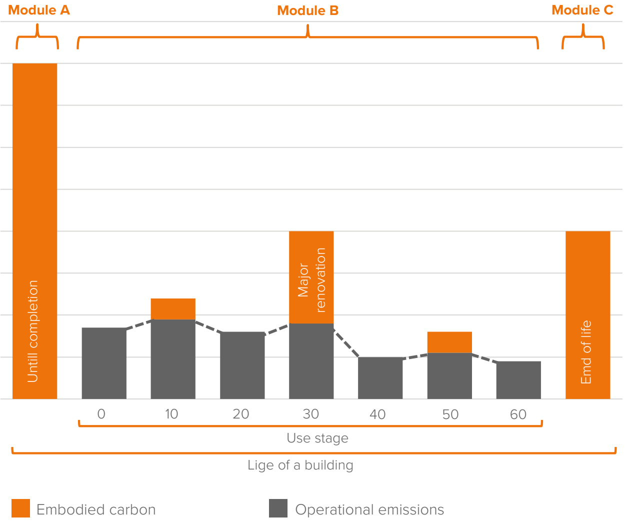


Figure 2: Whole Life Carbon over the life of a building

Existing buildings: The pathway for operational emissions is elaborated on in the Paris Proof theme in the Sustainable Renovation Delta Plan

Together towards a sustainable built environment without CO_2 emissions: a Paris Proof built environment in 2040. This is the ambition of DGBC's Delta Plan for Sustainable Renovation and means that energy consumption of the built environment must be reduced by two thirds compared to the current average. By 2050, 1/3 of current energy demand will be available from carbon neutral sources.

The December 2015 Paris Climate Accord prompted the development of the Delta Plan for Sustainable Renovation for non-residential and residential buildings. Two-thirds reduction is a firm but necessary ambition to achieve the goals of the Paris Climate Agreement in the Netherlands.

A step further in renovation: Factoring embodied carbon into the journey to a Paris Proof built environment

Thus, to renovate to a Paris Proof built environment by 2020, we must not only reduce 2/3 of the current energy consumption, but also take into account the embodied carbon associated with it. Therefore, from the perspective of a CO_2 budget approach, we will have to reserve a portion for renovation. Furthermore, an integrated approach (or, in other words, a Whole Life Carbon approach) is needed here, and this is what we are elaborating on within the BuildingLife project (see Section 10).

Paris Proof
Rations: all energy from sustainable sources

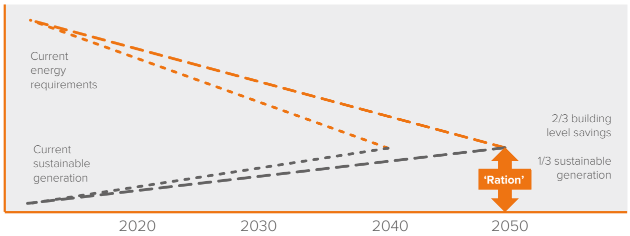


Figure 3: Paris Proof Rations: All energy from sustainable sources

New buildings: The pathway for embodied carbon is elaborated on in the BuildingLife process

Embodied carbon can be minimised by carefully examining where reduction can take place throughout the entire chain. In new construction in particular, this is an area of concern given the new construction targets we are facing. We will further elaborate on this within the BuildingLife program.

03 WHICH COMMON LANGUAGE CAN WE USE?

Operational carbon and embodied carbon together form the whole of CO_2 emissions of the built environment and are also known as Whole Life Carbon (emissions over the entire life of a building). By the Whole Life Carbon approach, we mean the integrated approach to operational energy consumption expressed in terms of CO_2 emissions and embodied carbon;

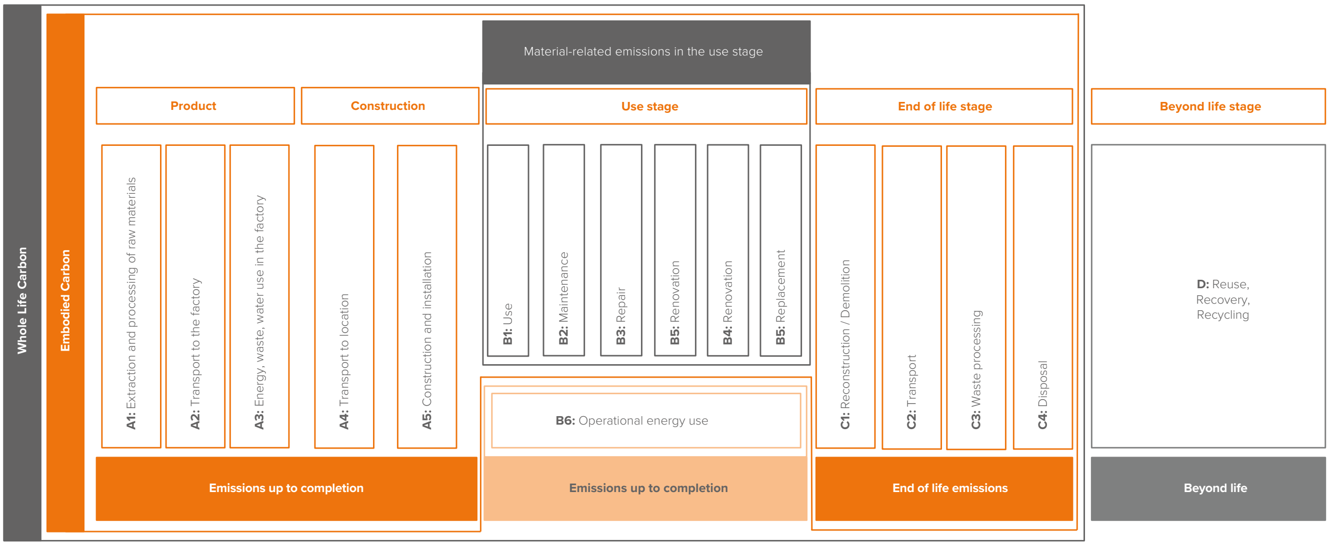


Figure 4: Schematic representation of the Whole Life Carbon principle based on the LCA methodology (EN 15978)[8]

Whole Life Carbon = Operational carbon + embodied carbon

We use the schematic representation of the European standard EN15978 for this purpose.

System boundaries

The life cycle of a building is divided into different life stages from A to D, which in turn are divided into modules. Figure 4 shows the schematic representation of these system boundaries as used by the WorldGBC. Just like us, they do not take module D into account. An important change compared to EN 15978 is that we do not include operational water consumption. This falls outside the Whole Life Carbon scope and for this reason we have not included it in the diagram.

We have added several terms to this framework to make easier classifications based on emissions;

- Emissions up to completion (Upfront carbon) (A1 to A5)
- Embodied carbon in the use stage (B1 to B5)
- Operational emissions (B6)
- End of life emissions (C1 to C4)
- Beyond life (D)

Taking Module D into account

Module D contains important information about any benefits and (positive) impact through reuse, recycling potential and export of energy, or recovery of energy not yet rated in Module A-C.

The WorldGBC presents Module D separately to provide consistency in accounting if a product goes through multiple life cycles to avoid double-counted positive impacts. This is different when compared with the Dutch assessment method for the Environmental Performance of Buildings (MPG), where module D is integrally considered alongside A to C.

8) Bringing Embodied Carbon Upfront, WGBC (2019)
https://www.worldgbc.org/sites/default/files/WorldGBC_Bringing_Embodied_Carbon_Upfront.pdf

04 CHALLENGES OF EXISTING BUILDINGS, SUSTAINABLE RENOVATION VERSUS NEW CONSTRUCTION

The challenges for new buildings are completely different from those for existing buildings. After all, new constructi-on still needs to be built, which in turn is associated with embodied carbon that is still emitted.

Existing construction has already emitted these emissions, but here again the challenge lies in reducing operational emissions through sustainable renovation.

In order to examine where the greatest opportunities lie in these various challenges, we therefore make a distinction in this section between the greatest gains to be made in existing construction, sustainable renovation and new construction.

Reduction of operational energy in existing buildings

Operational energy is still responsible for around 27% of total Dutch emissions. Approximately 71% of emissions in the built environment come from operational energy use. Within this, approximately 65% percent is accounted for by residential and 35% by non-residential properties[9]. In addition, it is good to realize that 80% of the current buildings today, will still exist in 2050.

Here, the urgency to save energy, especially in the built environment and based on the real energy consumption of a building, emerges as a very important message. If energy conservation is then taken to the utmost, renovation for energy conservation should then also be included as an option.

Reduction of Whole Life Carbon in renovation projects

Based on climate policy, we are working towards a complete renovation target in 2050. This means that by 2030 we have renovated around 1.5 million homes[10] and around 190 million m² for commercial use. This renovation target also requires the addition of materials in buildings, with their associated emissions. It is therefore important to consider the measures in renovation projects and whether they will have the desired effect.

9) Material flows, environmental impact and energy consumption in residential and non-residential construction (Economisch Instituut voor de Bouw, Metabolic, SGS Search, 2020). Data from 2014.

10) Climate policy and the built environment (Economisch Instituut voor de Bouw, 2018)

This line of thinking is also well reflected seen in a CAPEX (Capital Expenditures, cost of development, one-time investment) versus OPEX (Operating Expenditures, recurring costs) trade-off.
Embodied carbon in this comparison is CAPEX and OPEX operational carbon.
From this perspective, renovation to zero meter may not be the best approach. Embodied carbon cannot be offset over the life cycle; they contribute immediately to emissions now.

Reduction of embodied carbon in newly built homes and non-residential properties

In the new construction target, much attention has been paid to operational energy use and, through the implementation of measures such as the Nearly Zero Energy Buildings (BENG) requirements, the progress required has also been made in this regard.
As a result, the share of embodied carbon increases, which is clearly visible in Figure 4. Globally, the share of embodied carbon in new construction by 2030 is 74%, making the need to reduce these emissions a priority.

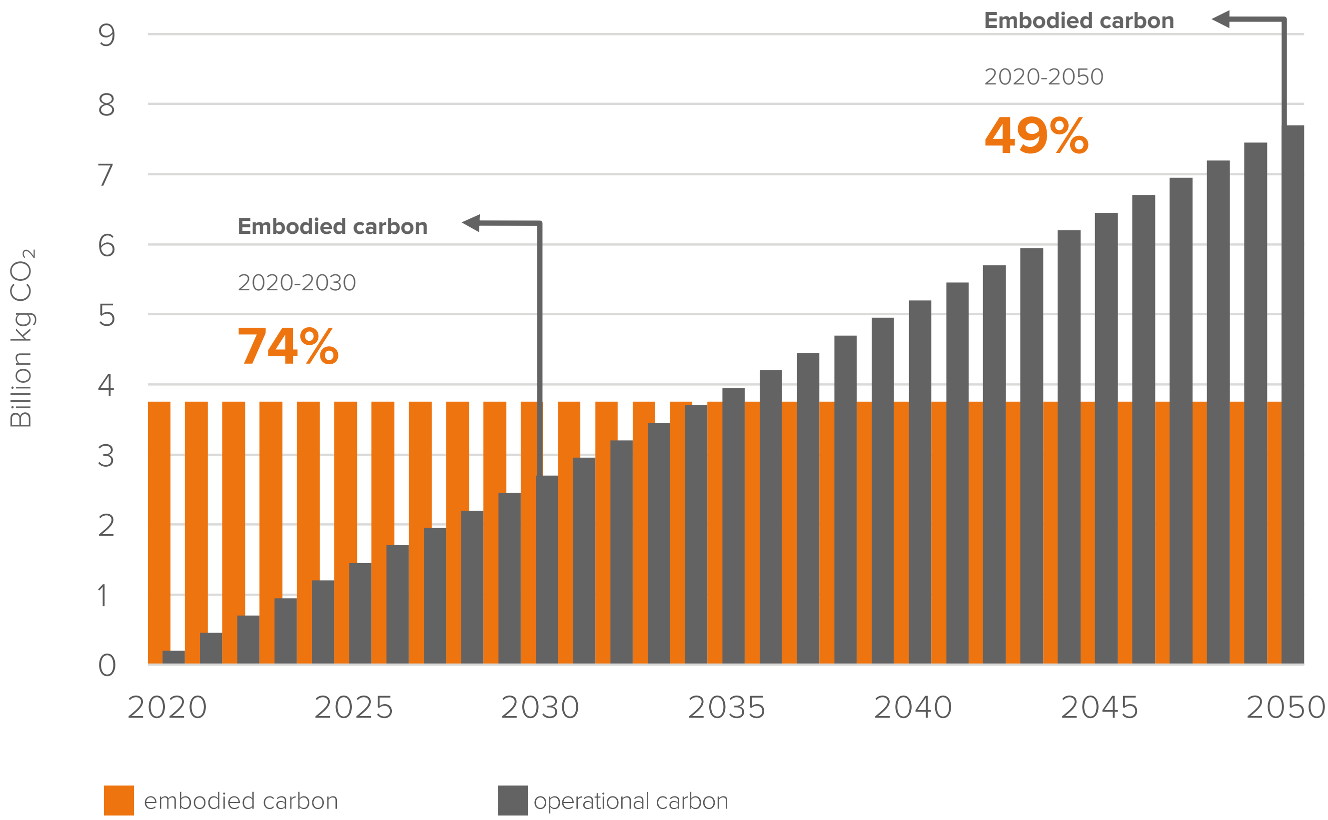


Figure 5: Total cumulative emissions worldwide for new construction in 2020-2050 at business as usual[11]

11) Architecture2030, https://architecture2030.org/new-buildings-embodied/

05 OBJECTIVES FOR OPERATIONAL AND EMBODIED CARBON

Dutch regulations steer towards reducing operational and embodied carbon in various ways.

Operational emissions with BENG and WENG

BENG requirements are linked to new construction, so operational emissions in this regard are already largely under consideration. In addition, DGBC is striving to achieve a Truly Energy Neutral Building (WENG).
The starting point is the actual energy consumption of a building. A WENG has an Actual Energy Intensity indicator (WEii) equivalent to 0 kWh usage[12] and is used in the Paris Proof approach.

Label C in existing buildings

In addition to new construction, there will also be stricter rules for existing buildings, starting with offices. By 2023, they must have energy label C or better. If this is not the case, the office should in principle be shut down. However, half of them do not meet the requirements or have a label. The moderate score of the government is notable. They do not score better than the rest of the Netherlands, for example, 40% of municipal office space will not be ready by 2023 and for the Central Government Real Estate Agency, this applies to 1/3 of the buildings[13].

Embodied carbon with the MPG

The Environmental Performance of Buildings (MPG) calculation is mandatory for every application for an environmental permit for the functions of office buildings larger than 100 m² and new homes and indicates the environmental impact of the materials used in a building. The MPG of a building is the sum of the shadow costs of all materials used in a building. Through this MPG, the Dutch government is aiming for a reduction in the environmental impact of new construction, but not yet for all functions or for renovation projects.

Embodied carbon accounts for approximately 11% of total Dutch emissions. In order to steer more emphatically towards concrete short-term climate objectives, the MPG can serve as a means of gaining insight into direct CO_2 emissions from the materials and to set additional targets for this. Per project (or building), or per company (activities) or portfolio. In this way, structured steps can be taken to stay within the set budgets, because after all, we need to reduce emissions now and we cannot and should not postpone this to the future.

Energy use standards for new construction have been adequately managed in recent years. As a result, operational emissions for new buildings are being superseded as a challenge by emissions resulting from production of building materials.
On the one hand, there is control over the CO_2 levy on industry through the European Trading System (ETS) and on the other hand, requirements are set for environmental performance in the built environment through the MPG.

Approximately 60% of the environmental indicators concern CO_2 and with this the MPG also aims to reduce CO_2 emissions. Since the MPG is a key figure, the underlying calculations from a recognized MPG calculation tool with NMD 3.0 or higher are required. This is explained in the calculation protocol, in which we use the MPG to link objectives to material-related impacts. In doing so, we start with new construction and renovation for residential and non-residential properties generically, eventually broadening and deepening into specific functions.

The bridge between BENG, WENG and the MPG

In the current regulations, there is a hard line dividing operational and embodied carbon.
However, as indicated in Section 4, there is a need to make choices integrally in order to arrive at the most efficient solutions. Blindly focusing on (operationally) energy neutral buildings can have a negative impact on emissions now. Policies should also take this into account.

12) More information can be found at https://www.weii.nl/.

13) Making offices in the Netherlands more sustainable, Colliers (2021)

Impact of new developments on emissions in the built environment

The current status of the built environment cannot be extended linearly into the future. The energy mix will change in the coming years due to implementation of policies, resulting in an expected renewable share of 14.8% in 2022, 19.4% in 2025 and 25.0% in 2030. This affects the operational emissions of the built environment. Operational CO_2 emissions from the built environment will fall from 2.8 megatons in 2019 and 18.0 megatons in 2030.
Operational CO_2 emissions from households will fall from 15.9 megatons in 2019 and 13.5 megatons in 2030 according to the estimate with proposed policy.
Operational CO_2 emissions from the services sector will fall from 6.8 megatons in 2019 and 4.5 megatons in 2030 according to the proposed policy. Embodied carbon is influenced by making industry more sustainable. Industry will reduce its emissions by approximately 7% between 2019 and 2030. In addition to the above, developments such as Carbon Capture and Storage (CCS) can also affect net CO_2 emissions[14] [15].

14) Climate and Energy Outlook 2020, Netherlands Environmental Assessment Agency (2020)

15) The specification of the largest emission groups for embodied carbon (steel and concrete) is explained in the BuildingLife Roadmap.

06 THE IMPACT OF THE DIFFERENT STAGES IN THE CONSTRUCTION PROCESS, CHOICE OF MATERIALS AND DIFFERENT PARTS OF A BUILDING

The construction industry can be classified in many different ways. In this section, we want to give an overview of the broad outlines of the Roadmap, where further exploration will also take place.

The different stages of the construction process

The impact can be determined at the beginning of a project by answering two questions:

- New construction, or renovation?
- What will be demolished and what can be reused?

If the decision is made to build a new building, the greatest impact is until completion of the building (Figure 2 in Section 2), towards which we are also working using objectives. In the process, it is important to start taking the impact of embodied carbon into account as early as possible. The further the process goes, the higher the costs of reducing embodied carbon. Players at the beginning of the chain, the clients, developers, builders and architects, have the most impact on the phase up to completion.

By applying the principles of reducing and optimizing, the impact can be reduced. As an example, the functionality of certain parts of a building can be examined. Less use of materials means less embodied carbon.

Materials

The budget approach underlines the need to reduce now. In terms of materials, that means a choice of materials with as little impact as possible.

Steel, iron (41%) and concrete (17%) have the most impact. The need for suppliers of these materials to take rapid steps towards sustainability in extraction and production is high here, as is the need for designers of buildings to determine when which materials can be used.

Biobased materials are a good answer for reducing embodied carbon [16].

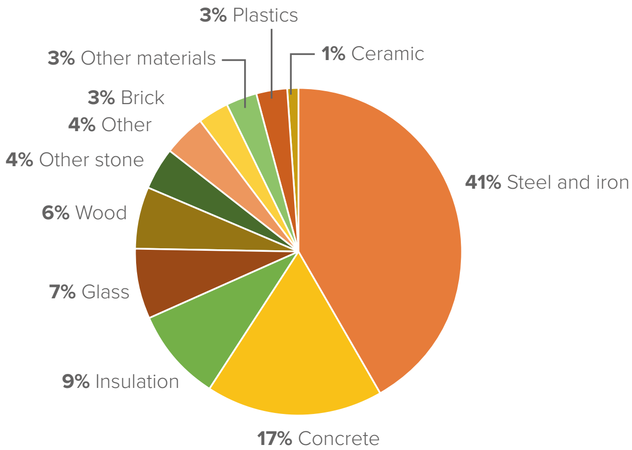


Figure 6: Impact of materials in the built environment[17]

The different parts of a building

The longevity, material selection, and material-related impacts are interrelated. A classification can be made at the element level by life, as shown in Figure 7: The 6 layers of a building.

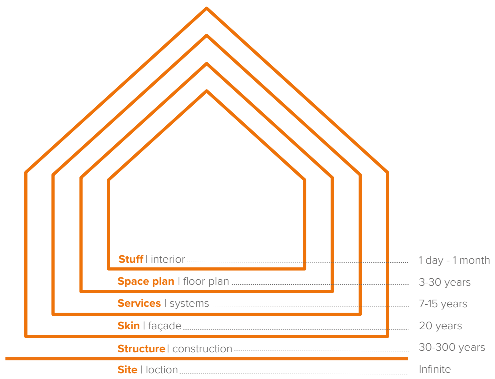


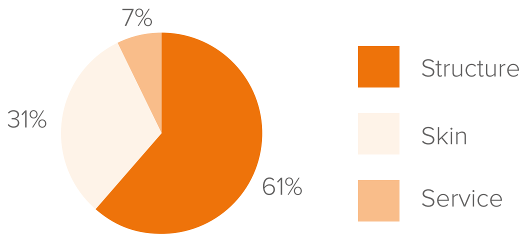
Figure 7: The 6 layers of a building (Brand[18])

16) ASN Bank and Climate Cleanup have a measurement method for CO_2 storage of biobased building materials, Construction Stored Carbon (CSC): climatecleanup.org/constructionstoredcarbon

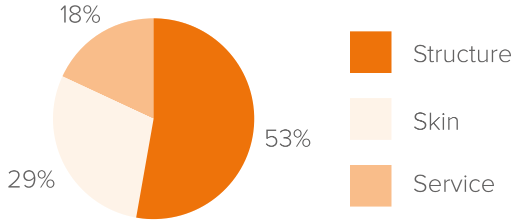
17) Material flows, environmental impact and energy consumption in residential and non-residential construction (Economisch Instituut voor de Bouw, Metabolic, SGS Search, 2020). Data from 2014.

18) How buildings learn: What happens after they're built (Brand, 1994)

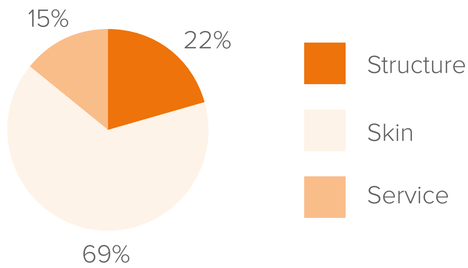
New homes



New non-residential buildings



Residential renovations



Non-residential renovations

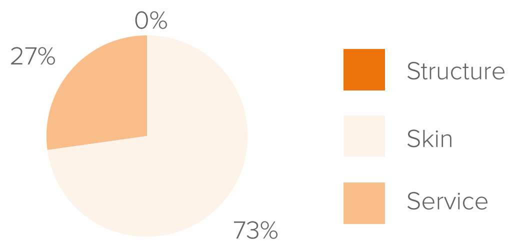
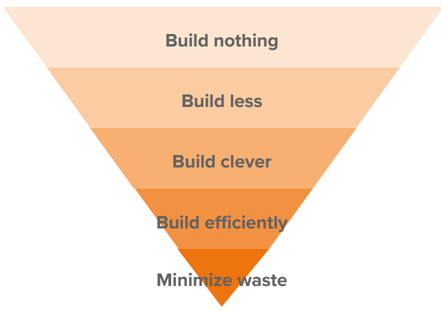


Figure 8: The impact of embodied carbon over the layers of a building in residential and non-residential buildings for the different new construction and renovation.

In non-residential construction, much of the embodied carbon is emitted by the structural work (Structure) but also a large part by the foundation and the finishing (Skin).
Precisely in the foundation and structure, materials often last a long time in a building, as seen in Brand's model. Therefore, it is important to reduce CO_2 there as soon as possible, given the large share of emissions. Then looking at the layout, circularity principles such as detachability are the most important.
This has to do with different life spans. A material has a technical life cycle and a useful life cycle.
If the technical life is longer than the useful life, the extent to which the materials can be recovered from a building and put to good used is important. When this is the other way around, it is important to focus on retention and reduction in particular. If so, now is the only time to keep the CO_2 out of the air.

On the one hand, we all want to build new, but on the other hand, the trick is actually not to do so. In the end, not building yields the most environmental benefits. This requires a different way of looking at the demand, level of comfort and lifestyle. What requirements do we set for our buildings? Can we do with less, or can we deal with the current buildings in a different way?



07 GUIDING PRINCIPLES

How can you focus on reducing operational emissions? And how to reduce embodied carbon? A schematic overview.

Operational emissions

Focus on actual energy consumption	• Simplicity: Readable from meters and controllable, without calculations. • Focus on measurement. • Stay within the sphere of influence of the building owner and user. Encourage energy conservation, through measures, energy generation on the building and behaviour. • Set clear targets by building type for total energy use - building - and use-related energy use in kWh/m². • Compensate within your portfolio if a particular type of building becomes less energy efficient.
2/3 **Reduce current energy consumption by 2/3**	• Use sustainable energy. By 2050, 1/3 of current energy demand will be available from carbon neutral sources.
Reduce CO_2 emissions as quickly as possible	• Use hybrid intermediate solutions if this accelerates CO_2 reduction.
Sustainable use of energy	• Any remaining energy consumption will eventually only be sourced from renewable energy.

Embodied carbon

Preservation	• Preserve as many materials and products as possible.
& **Reduction and optimization**	• Intensify the use of materials and products. • Reject preventable material and product flows. • Reduce the demand for primary raw materials.
Circular inflow	• Increase the proportion of secondary raw materials in incoming materials and products. • Increase the share of renewable resources in incoming materials and products. • Reduce dependence on critical raw materials. • Reduce the environmental impact of incoming materials and products or interventions
Sustainable generation in both our own organization and the chain	• Take steps to reduce energy demand during the production and construction process. • Use sustainable energy for the remaining energy demand.
Compensation as a last resort	• As a last resort, offset the remaining emissions within the project or organizational boundary. • Compensate by following the Oxford Principles.

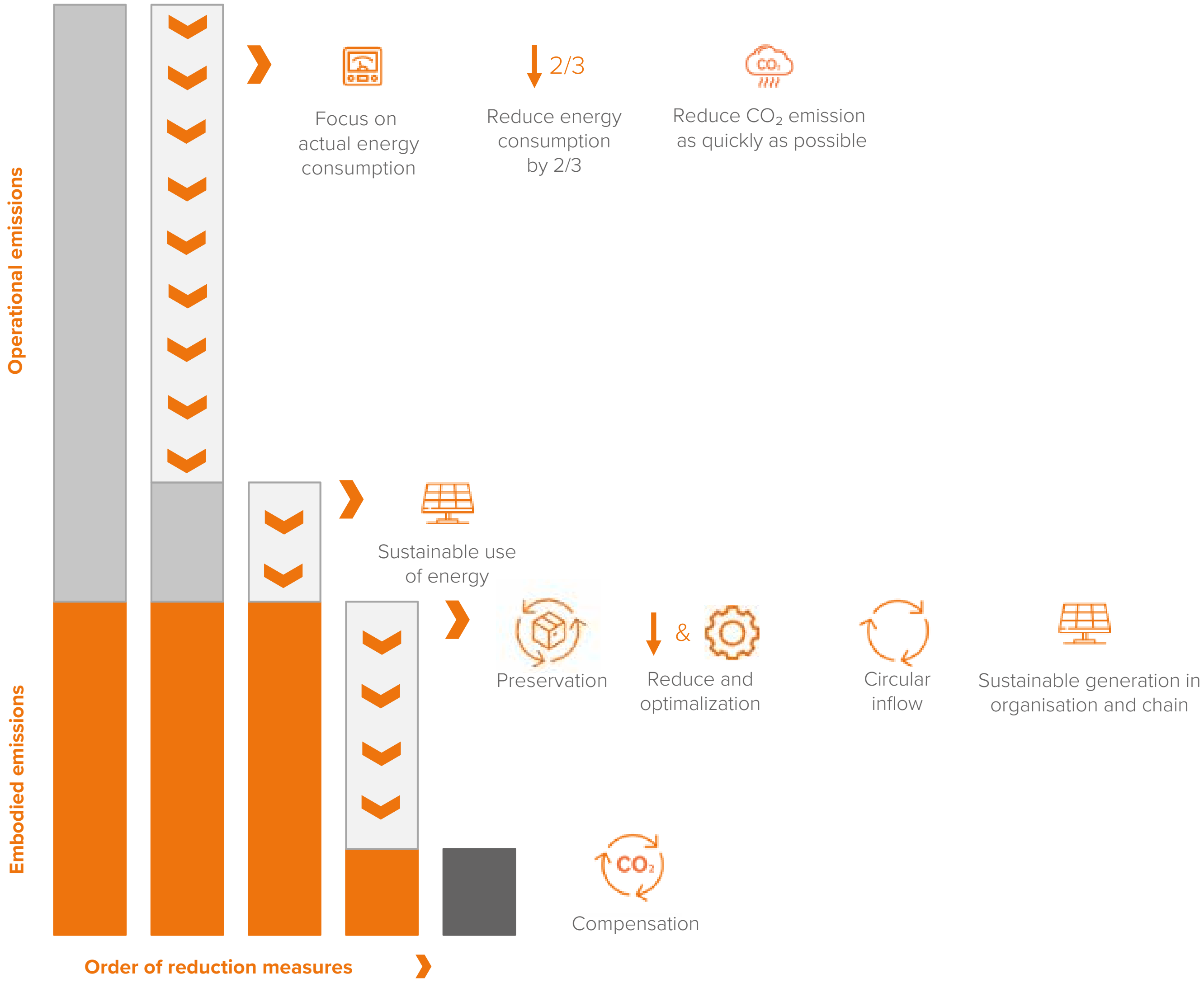


Figure 9: Route to a CO_2-neutral construction column

08 THE IMPORTANCE OF A CLEAR STARTING POINT: PRODUCT, PROJECT, PORTFOLIO OR ORGANIZATION?

Different perspectives are communicated on the impact of the built environment and the sphere of influence of organizations in the built environment. For example, one can look from the perspective of the impact of a product, represented in an Environmental Product Declaration (EPD). A project/building is represented by an MPG and WEii classes, BENG score, or energy label.

For investors, but also for other stakeholders in the construction chain, a portfolio approach can be interesting. With this approach, all buildings are examined together and choices are made for emission reduction.

The Carbon Risk Real Estate Monitor[19] (CRREM) can be used for operational emissions. The CRREM supports the industry in preventing assets (buildings) from "stranding" by not meeting future energy efficient standards and for which assets it is no longer financially interesting to renovate sustainably.

CO_2 emissions from the organizational perspective: Scopes 1, 2 and 3

A common way for organizations to communicate what they emit is to break it down into the different scopes. The concept of these scopes was introduced by the Greenhouse Gas Protocol (GHG Protocol), defining how an organization has control over the emissions it directly or indirectly affects. Scope 1 includes direct emissions from sources that are managed or part of the organization, for example emissions released by an organization's plant. Scope 2 are the indirect emissions from the generation of purchased energy, steam, heat and cooling. The emission then does not take place directly at the organization itself, but as a user of energy, the organization is still responsible for these emissions from an energy supplier. Scope 3 are the indirect emissions that are not directly managed by or belong to an organization, but are in the organization's chain through purchasing (upstream) or sales (downstream), as well as through business travel by employees.

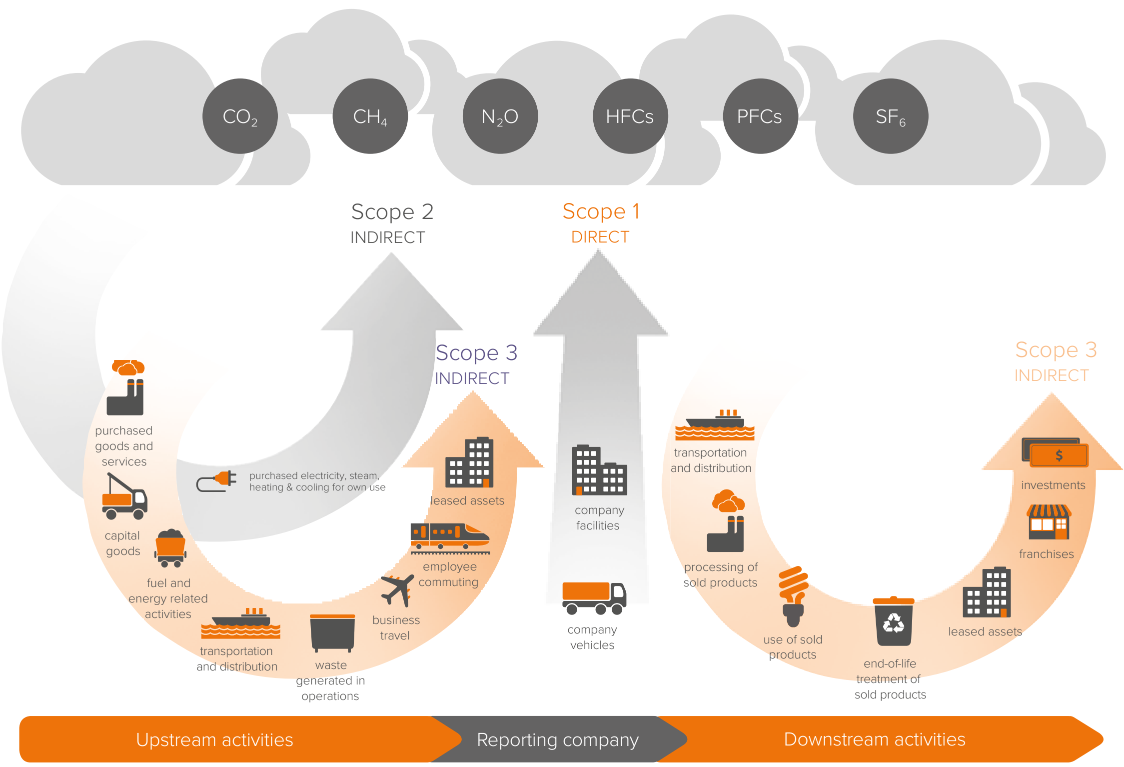


Figure 10: Schematic representation of Scopes 1, 2 and 3 (GHG Protocol)

19) More information about the CRREM can be found at https://www.crrem.eu/

Science Based Targets initiative and the CO_2 Performance Ladder

An international initiative that addresses the different scopes is the Science Based Targets initiative (SBTi). SBTi defines and promotes examples with scientifically substantiated objectives. They do this by having organizations focus on commitments and tested objectives and having organizations report on them annually. However, organizations can still choose here for the inclusion of scopes. Some Dutch companies such as Arcadis, Interface, Redevco B.V. and Royal Schiphol Group have committed to targets for a maximum global warming of 1.5 Celsius.

In the Netherlands, the CO_2 performance ladder of the SKAO Foundation is widely used as a CO_2 management system and as a procurement tool. This ladder consists of 5 levels, with all scopes being worked on for levels 4 and 5. Certified companies can get a discount on the registration price of their tenders with the government.

09 BUILDINGLIFE

This paper was written as part of the BuildingLife project. In the run-up to COP26, WorldGBC convened ten European Green Building Councils, Croatia, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland, Spain and the UK to stimulate climate action in the built environment.

Addressing the integrated carbon approach in the construction sector in Europe requires leadership and collaboration across the sector.
The project aims to achieve the mix of action, awareness, behavioural change and transition of the private sector and public policy needed to address all CO_2 impacts from buildings.
The project started in December 2020 and will run for 2 years. DGBC is the organization in the Netherlands that implements this for the Dutch context. The elaboration for the embodied carbon has extra focus within the DGBC, given the focus on operational energy consumption in the Paris Proof theme.

Follow up

This position paper is part of the #BuildingLife project. In addition to this position paper, the Paris Proof Embodied Carbon targets and a calculation protocol are released by NIBE.
These objectives and calculation protocol will be tested in the market and deposited in a consultative group during the period September - November 2021.

In addition, we are developing the Roadmap. The first version of this will also be presented at the end of November 2021. Further elaboration will take place from November 2021 to September 2022, which will be released in November 2022.

10 DEFINITIONS

Operational emissions | Operational Carbon

CO_2 emissions related to the operational energy consumption of a building. Energy consumption is converted here to its CO_2 equivalent. How to do this can be found on the WEii[20] website.

Embodied Carbon

CO_2 emissions related to materials and processes in the entire building chain: from production of building materials, transport, installation, and demolition and reuse at the end of the building's life.

Whole Life Carbon

CO_2 emissions from both material-related and operational emissions over the entire life cycle of products and/or buildings.
This corresponds to emissions from Modules A to C.

CO_2 equivalent (CO_2) / Global Warming Potential (GWP)

Unit of measurement used to represent the warming potential (Global Warming Potential) of greenhouse gases.
CO_2 is the reference gas, against which other greenhouse gases are measured. E.g., because for the same mass of gas the warming potential of CH4 is 25 times higher than that of CO_2, 1 ton of CH4 corresponds to 25 tons of CO_2 equivalents.

Emissions up to delivery | Upfront Carbon

CO_2 emissions related to materials and processes up to the completion of a building: raw materials, transport and production, transport to the construction site and construction (construction waste, construction site and machinery).
This corresponds with the emissions from Module A.

Embodied carbon in the use stage

CO_2 emissions related to the user phase of a building (excluding energy consumption): use, maintenance, repair, renovation and replacement. This corresponds with the emissions from Stages B1-B5.

End of life emissions

CO_2 emissions related to the end-of-life phase of a building: deconstruction, demolition, transport, waste disposal.
This corresponds with the emissions from Module C.

Environmental Performance Buildings (MPG)

The Environmental Performance of Buildings (MPG) calculation is mandatory for every application for an environmental permit and must be below 0.8 for homes since July 1, 2021, and 1.0 for offices. For other functions (such as healthcare, education and industry), as well as conversions, renovations and transformations, the MPG is not yet applicable.
The MPG indicates the environmental impact of the materials and processes used in a building. The MPG consists of 19 environmental impact categories expressed in the shadow costs of a building in euros/m²/year, where CO_2 emissions have an important weighting factor (ca. 40%?). The MPG is calculated by multiplying the environmental impact from the EPDs for each building material by the quantity in a building.

Life Cycle Analysis (LCA)

LCA is a method for analyzing the environmental impacts of buildings throughout their life cycle. It assesses the impact on a range of environmental categories, including carbon footprint (global warming potential). The detailed procedure for applying the LCA method in the built environment is described in EN 15978.

20) Weii.nl

Environmental Product Declaration (EPD)

An Environmental Product Declaration (EPD) is a standardized document that informs about the potential impact of a product on the environment and human health. The basis of an EPD is contained in an LCA. It is normally supplied by the manufacturer of the product and must be checked by an independent expert. A EPD normally has a validity period of 5 years. Building materials in the Netherlands should follow the Determination Method, an instruction on how to perform LCA calculations.

Near Zero Energy Building (BENG)

For all new construction, both residential and non-residential, permit applications must meet the requirements for Nearly Energy Neutral Buildings (BENG) starting January 1, 2021. Those requirements stem from the Energy Agreement for Sustainable Growth and the European Energy Performance of Buildings Directive (EPBD).

Truly Energy Neutral Building (WENG)

WENG stands for Truly Energy Neutral Building. WENG was initially created with the idea of assessing claims related to energy neutral buildings. The starting point is the actual energy consumption of a building. A Truly Energy Neutral Building has a WEii equal to 0 kWh usage.

Dutch
Green Building
Council

Zuid Hollandlaan 7
2596 AL The Hague

+31 (0)88 55 80 100
info@dgbc.nl

DGBC.nl