ABOUT PLGBC

Polish Green Building Council (PLGBC) is a non-governmental organisation, which since 2008 has been carrying out a mission to radically improve the design, construction and use of buildings in Poland so that sustainable construction becomes standard.

We are part of a global community of around 70 green building councils within the World Green Building Council. We build a network of relationships with change-makers and consciously work towards a sustainable future. We successfully support a range of projects, activities and research in which the word ‘responsible’ plays a key role. We share knowledge. We stimulate innovative activities. We create coalitions and partnerships because we see the need for joint initiatives for sustainable construction.

As a member organisation, we are the united voice of current and future leaders in our industry. Together, we strive to carry out a significant transformation of the construction environment to make it healthy and sustainable. This is our response to climate change and care for the Planet.
Poland is a signatory to the Paris Agreement, which requires that global net anthropogenic greenhouse gas emissions reach zero by 2050. The European Union, as part of the European Green Deal, aims to reduce greenhouse gas emissions by 55% by 2030. These targets will be achieved by decarbonising all sectors of the economy. The construction sector is responsible for as much as 38% of global CO2 emissions - this is due to both the energy consumption of buildings (operational carbon) and the other activities of the construction industry related to the extraction of raw materials, the production of materials, the construction process or the demolition of buildings (embodied carbon). With progress in reducing the energy intensity of buildings, the importance of embodied carbon, which is often marginalised, will increase. It is also important to bear in mind that the existing Polish building stock is highly energy demanding and in need of deep retrofitting. Action in this area must be part of the decarbonisation plan (the European Green Deal flagship project is the renovation wave).

This report provides a ‘roadmap’ to help illustrate and navigate the complex challenge Poland faces to decarbonise the construction sector by 2050. At the same time, it is a call for concrete actions within a specific timeframe. Decarbonisation of buildings (over their entire life cycle) requires continuous engagement and cooperation of many parties and this cooperation is a key task for all stakeholders. These include: government and local authorities, developers, investors and building owners, designers (architects and civil engineers), manufacturers of building materials and technologies, contractors, building managers, financial institutions and NGOs, professional associations and academia.

The roadmap includes specific time-bound actions for all of these different stakeholder groups. These actions have been aligned to help facilitate the radical collaboration across the whole value chain that is needed to drive lasting change.

To achieve climate neutrality, the Polish buildings and construction sector must undergo a deep transformation process. There is a need to modify the approach to material production, design, the construction process and the energy sources used. The basis for these activities must be legislative changes, which will enable implementation and verification of intentions. Solutions that make it possible to construct buildings with a zero carbon footprint already exist - they must be promoted and supported by policies and finance. Effective implementation of the presented assumptions will depend on the involvement of the financial sector, therefore the active participation of commercial banks and international financial institutions in designing financial instruments supporting decarbonisation in Poland is crucial.
Buildings play a critical role in responding to the climate emergency and for the decarbonisation of the entire economy. The buildings sector, including construction, is responsible for about 38% of all global carbon emissions. Around 10% of these emissions are released upfront, during manufacturing, transportation of construction materials and the construction process itself, with 28% released during operation. In the EBRD region buildings are responsible for over 43% of GHG emissions. The global building stock is likely to double by 2050 and given that buildings are expected to deliver more and more in terms of comfort, convenience and entertainment, emissions will increase considerably if little or nothing is done to reduce carbon intensity. Decarbonising buildings is one of the most cost-effective ways to mitigate the worst effects of the impending climate breakdown.

The buildings and construction sectors also produce over one third of global waste and consume half of the raw resources. Addressing this requires adoption of principles of circular economy, new approaches for resources efficiency, as well as reuse and recycling of construction materials throughout the entire building life cycle.

The EBRD has targeted green buildings as one of the eight key priority areas in EBRD’s 2021-2025 green strategy (GET 2.1 Approach). The EBRD has extensive experience in green finance and has so far invested over EUR 35 billion in 2,000 projects in 38 countries of operation. Through dedicated financing instruments the Bank has delivered over EUR 4 billion of green finance in buildings, which helped to ensure the sustainability of an overall gross building area of over 35 million square meters to date.

The EBRD endeavours to work across the value chain to engage with the private sector using robust financing models and solutions. We also support governments on policy and regulatory issues and help mobilise donor and technical cooperation resources to provide financial incentives to address capacity constraints and market failures. The EBRD contributes to market transition of the building industry through its policy advice, strong track record of private sector engagement, public finance and outreach across the entire economy in its countries of operation.

Building partnerships and supporting initiatives set up by professional communities like the World Green Building Council (WorldGBC) is crucial in this journey towards decarbonisation. Decarbonisation of buildings will require substantial efforts and resources across the fragmented value chain and particularly in less developed markets.

We highly value the global Advancing Net Zero and European #BuildingLife initiatives of the WorldGBC. These give us a good template and guidance for action. Given the fragmentation of the building sector, it would be desirable for all of us - professionals, corporates, investors - to join forces and work together.

By networking and cooperating with professional communities, including the WorldGBC, the Bank leverages its support in the decarbonisation of the building sector and provides an example for investors and financing institutions in the region. Decarbonisation of buildings on the other hand can offer significant investment opportunities and support transition to a more sustainable circular economy in the region.

This has driven EBRD’s cooperation with the Polish Green Building Council (PLGBC) in the development of a national decarbonisation roadmap that, if actioned and followed by all relevant market stakeholders, would support decarbonisation of the building sector across its value chain and through the entire life cycle of buildings in Poland. This roadmap will be one of ten that WorldGBC’s Europe Regional Network is producing as part of the #BuildingLife campaign and showcasing at COP26, the UN Climate Summit in Glasgow in November 2021.

Poland has been selected for this pilot activity for a number of reasons:

- Dynamic growth of a sizeable sector, including both manufacturing of construction materials and products, as well as broader construction and real estate activities
- Strong, active and vocal professional community, including the PLGBC
- Relevance of decarbonisation for future growth of the economy and for strengthening competitiveness across the industry
- Potential for replicability of the lessons learned from development of the Roadmap in other countries.

We believe that the Polish Roadmap, developed with our support, will be used as a template for decarbonisation actions and development of similar national roadmaps in other countries across the EBRD region.

Remon Zakaria, Kerrie Law and Alex Hadziivanov
European Bank for Reconstruction and Development (EBRD)
VISION
The aim of the Paris Agreement, to which Poland is a signatory, is to keep the average global temperature increase well below 2°C (preferably 1.5°C). Limiting the global temperature increase to 1.5°C above pre-industrial levels requires global net anthropogenic greenhouse gas emissions to reach zero around 2050, meaning that no additional emissions are released into the atmosphere. The trajectory to achieve net zero is the result of a balance between reduced emissions through decarbonisation (-), carbon removal (-) and remaining carbon emissions (+), which are likely to occur even after 2050 for some geographic areas and processes.

The importance of construction in this process is immense. The most recent data show that buildings are responsible for 38% of global CO₂ emissions, of which 28% comes from the buildings' operation and the remaining 10% is due to the energy consumption required to produce the materials and technologies used in construction (the embodied carbon). As technologies develop to reduce the energy intensity of buildings during their operation, the importance of the embodied carbon, which is currently often marginalised, will grow.2

Responding to this challenge, the aim of this report is to create a roadmap of actions needed to decarbonise the Polish buildings and construction sector by 2050, to enable our country to achieve climate neutrality. This is a task facing every state signatory to the 2015 Paris Agreement and arising from the European Green Deal.

The vision for Polish buildings in 2050 developed here is as follows:

**All buildings** should have at least a **zero operational carbon** footprint, while **new and retrofitted buildings** should have a **whole life net zero carbon footprint** (considering embodied and operational carbon).
For this vision to be implemented, a number of changes must take place in the Polish construction sector in terms of the approach to materials, design, the construction process and the energy sources used. The basis for all these changes must be ambitious and will require far-reaching legislative changes that enable implementation and verification of plans.

By 2050:

The production and construction process must be highly resource-efficient. Low carbon solutions must not be an alternative, but rather the primary method of producing construction materials and carrying out construction projects. Construction waste must be reduced as much as possible, in line with the principles of a circular economy, which should be widely accepted and applied. Design for disassembly, reuse, recycling and upcycling should become the standard for structural elements at the end of a building’s life.

Buildings - both new and existing - must be highly energy efficient. They should have low (or even zero) energy demand, thanks to adequate insulation of the envelope, efficient ventilation, cooling and heating systems and energy management. They should also be equipped with energy-generating facilities to make them energy positive. In order to achieve the 2050 targets, the focus should not only be on reducing carbon emissions, but also on regenerative action, where the emphasis is both on reducing negative environmental impacts and on restoring them.

Regarding energy systems, different sources of renewable energy should be used to the maximum possible extent. In addition to fully decarbonise the building industry, the energy system will need to undergo a profound transformation in order for the buildings and construction sector to achieve this vision and energy sources must become carbon neutral.

The International Energy Agency (IEA) estimates that to achieve net zero carbon emissions from buildings by 2050, direct CO₂ emissions from buildings would need to fall by 50% by 2030 and indirect emissions from the building sector would need to be reduced by cutting emissions from energy generation by 60%. Emissions from the building sector would have to decrease by around 6% per year between 2020 and 2030.

Although global decarbonisation efforts are becoming more widespread, both in the energy and mobility sectors, progress towards net zero carbon buildings has been relatively slow. This indicates that the contribution that decarbonisation of buildings can make to national climate neutrality targets is not being fully recognised. Unfortunately, currently not even 1% of buildings are considered net zero carbon. It is estimated that in 2017 there were only 2,500⁷ net zero energy buildings worldwide (including 500 commercial buildings and 2,000 residential buildings). This number refers only to buildings that are officially recognised as net zero energy buildings, for example on the basis of multi-criteria certification. As this number is very low, zero carbon buildings are mostly seen as one-off pilot projects rather than scalable and widely implementable projects.

From a technical perspective, many of the solutions to decarbonise the sector already exist. The costs of generating renewable energy are falling rapidly, making them increasingly competitive with conventional grid electricity, while also creating new jobs and reducing pollution. The main barriers encountered are political, financial and legislative.

³ Many buildings that have achieved net zero energy but are not recognised as such, are omitted. Examples include uncertified buildings that use passive design principles and on-site renewable energy sources to achieve net zero emissions. This includes buildings in off-grid areas that are self-sufficient in energy through the use of their own renewable energy sources, or buildings supplied with 100% renewable energy from the local grid. (Accelerating Building Decarbonization, WRI).
NET ZERO
CARBON BUILDING
Given the multiplicity and definitions associated with the concept of zero carbon buildings, the following definition is adopted in this study:

**A NET ZERO CARBON BUILDING (NZCB)**
is a building whose operational and embodied carbon balance, over its entire life cycle, is zero.

The design and construction of buildings with a net zero carbon footprint should be based on a series of good practices that rely heavily on the introduction of circular economy principles into construction. These include:

- **Design for Disassembly**
  - Designing the building so that it is constructed from components that can be dismantled and reused, so that the whole building can be easily adapted for other purposes in the future. In this way, a building that has completed its life cycle in its current form can be a source of materials for the next investment, becoming a kind of material bank. The concept of a building as a material bank is now increasingly popular.

- **Building Reuse**
  - Finding a use for an existing building that requires little or no renovation or adaptation. This can significantly minimise the carbon footprint from the construction and conversion process.

4. Inventory is counted from the start of the investment, but should include all the life cycle stages, including those that happen before the investment (e.g., material production). Existing buildings are subject to the same carbon footprint calculation requirements as new buildings; however, for determining the carbon footprint, previous operational and embodied carbon (which are mostly impossible or very difficult to determine in existing buildings) will not be taken into account. Calculations will be based on all processes associated with the building since the inventory was performed.
The importance of the embodied carbon is repeatedly highlighted throughout this report. This is because the operational carbon footprint of buildings is already a widely accepted concept and the need to reduce it is understood and implemented. It is worth noting that as the operational carbon footprint decreases, the importance of the embodied carbon will increase and without appropriate action to reduce it, it will not be possible to decarbonise the building stock in Poland.

In many studies, the decarbonisation pathway for buildings focuses on zero emissions only in the context of a building’s use, i.e. improving the energy efficiency of existing buildings through thermal upgrades, energy management and switching to low or zero carbon heating sources and, in the case of new buildings, constructing them to near zero energy building standards. However, we must continue our efforts to emphasise the importance of the environmental impact of a building throughout its life cycle, including the materials used to construct it, the construction process itself, refurbishment and finally, demolition.

Sustainable construction is not simply choosing a material or building component with a lower carbon footprint, but looking at how a product will perform in the long term. For example, elements that are highly resilient, have a high coefficient of strength and are easier to adapt and reuse are a greener choice than products with a lower carbon footprint, but which are less durable, impossible to recycle or reuse.

Using natural, renewable materials also reduces the carbon footprint of buildings. Examples include wood (sustainably grown, such as FSC certified), or other natural materials such as hemp, flax or bamboo. Such materials are made from plants that sequester carbon dioxide from the atmosphere, further reducing the carbon footprint of products made from them. This even allows for a negative carbon footprint.
DEFINITIONS

For the purposes of this paper, the definitions that are needed to correctly interpret the issues raised here have been collected.

**DECARBONISATION**
Decarbonisation, in the light of the EU policy, means the process of reducing carbon dioxide (and other greenhouse gas) emissions into the atmosphere by the economies of all member states.

**CLIMATE NEUTRALITY**
Climate neutrality is the goal of the decarbonisation process, i.e., to achieve zero net greenhouse gas emissions (net zero carbon footprint).

**BUILDING LIFE CYCLE**
The definition of the specific life cycle stages of a building is defined in EN 15978. The life cycle phases include: A1-3 production phase, A4-5 construction phase, B1-7 use phase and C1-4 end of life phase (figure 1).

**BUILDING LIFE CYCLE ASSESSMENT (LCA)**
LCA is a method of analysing the environmental impacts of buildings throughout their entire life cycle. It assesses the impact against a range of environmental categories, one of which is the carbon footprint (global warming potential). The detailed procedure for applying the LCA method in the built environment is described in EN 15978.

**TYPE III ENVIRONMENTAL PRODUCT DECLARATION (EPD)**
An EPD is a document that provides information on the environmental impact of products during their life cycle. EPDs are widely used in the construction industry to perform building life cycle assessments (according to EN 15978) and to compare different products with similar functionality (according to EN 15804). The EPD should comply with international standards to ensure comparability and increase transparency.

**GREENHOUSE GASES (GHG)**
Greenhouse gases are components of the earth’s atmosphere that contribute to the greenhouse effect. The basic greenhouse gases recognised by the Kyoto Protocol include: carbon dioxide, methane, nitrous oxide, freons, water vapor and others.

**WHOLE LIFE CARBON**
Whole life carbon footprint is made up of the embodied and operational carbon. It includes all the major and immediate sources of a building’s carbon footprint (figure 1).

**DIED CARBON**
The embodied carbon covers the entire carbon footprint associated with material flows throughout the life cycle (e.g., construction, remodelling or demolition processes). It is a carbon footprint in the following life cycle stages: A1-3 production stage, A4-5 construction stage, B1-B5 use stage and end of life C1-4 stage (figure 1).

**OPERATIONAL CARBON**
The operational carbon refers to the emissions associated with the operation of a building and the resulting energy consumption. According to the life cycle stages (EN 15978) this only covers B6, Operational energy use (figure 1).

**CARBON FOOTPRINT OF THE BUILDING**
Carbon footprint is an estimate of the total greenhouse gas emissions over the entire life cycle of a building. It is expressed as a carbon dioxide equivalent per functional unit of the product (CO2e / functional unit) - e.g. per 1 building or per 1 m² of usable building area.

**UPFRONT CARBON**
The carbon footprint associated with the building construction process - from A1 to A5 - includes raw material extraction, material production, transportation and the construction process. It is part of the embodied carbon footprint.
**END OF LIFE CARBON**

Carbon footprint related to de-construction / demolition (C1), transport (C2), waste treatment (C3) and material disposal (C4). It is part of the embodied carbon (figure 1).

**BEYOND LIFE CYCLE**

This stage describes additional environmental impacts beyond the building’s life cycle, e.g. avoiding emissions from material reuse or recycling, or from renewable energy production - related to the Benefits and loads beyond the life cycle stage (D) (figure 1).

**CARBON OFFSET**

Where a certain quantity of carbon emissions is deemed too difficult or even impossible to mitigate directly within the building life cycle, the equivalent amount of emissions may be mitigated elsewhere, either by purchasing special certified carbon credits or by investing in carbon sequestration projects (e.g. reforestation).

**NEARLY ZERO ENERGY BUILDING (nZEB)**

A nearly zero energy building is a building in which energy demand has been optimised and reduced, and traditional (fossil) energy sources have been replaced as much as possible with renewable energy, including on-site or located nearby.

NOTE: According to Polish nZEB regulations, nZEB is a building with low energy consumption, meeting the requirements for energy saving and thermal insulation, included in technical and construction regulations, in force from January 1, 2021, (and for buildings occupied by and owned by public authorities from 1 January 2019).

---

5 Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast) introduces the following definition of nearly zero energy building: ‘Nearly zero energy building means a building with very high energy performance (...). Nearly zero or very low energy demand should come very highly from energy from renewable sources, including energy from renewable sources produced on or near site’.

6 The definition of a building with almost zero energy consumption is given for Poland in the National Plan for increasing the number of buildings with low energy consumption - Resolution No. 91 of the Council of Ministers of 22 June 2015 on the adoption of the ‘National Plan for increasing the number of buildings with low energy consumption’ (M.P. of 2015, item 614): ‘A building with low energy consumption shall be understood as a building which meets the requirements related to energy saving and thermal insulation contained in the technical and construction regulations referred to in Article 7(1)(f) of the Act of 7 July 1994 - Construction Law (Journal of Laws 2013, item 1409, as amended), i.e., in particular Section X and Appendix No. 2 to the Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location (Journal of Laws No. 75, item 690, as amended). In force since January 1, 2021, and for buildings occupied by public authorities and owned by them - since 1 January 2019.’

Figure 1. Lifecycle stages defined in EN 15978
OBJECTIVES OF THE REPORT
The main objective of the report is to indicate a pathway for decarbonisation of the Polish building environment towards achieving climate neutrality. It is based on the assumption that all buildings should have a minimum zero operational carbon footprint by 2050, while new and retrofitted buildings should have a whole life net zero carbon footprint.

To achieve climate neutrality, the Polish construction market must undergo a transformation process. It is necessary to modify the approach to materials production, design, construction process and energy sources used. The basis for these activities must be legislative changes which will enable the implementation and verification of intentions.

However, it should be emphasised that the report also presents other objectives related to this call to action. Some of these objectives are beyond the scope of this report, however, we believe that their implementation will translate into achieving climate neutrality.

The educational goals focus on providing sound knowledge about the decarbonisation process:
- Definition of terminology - the terms used to refer to sustainable buildings are often misunderstood or have many meanings. There is a need to clarify the meaning of all terms used.
- Creation of understandable instructions and catalogues of best practice solutions for reducing the carbon footprint for all parties involved in the investment process.
- A solid presentation of the challenges we face and how to combat climate change.
- Providing education on climate change and sustainability - working to improve existing education programmes by increasing the focus on climate change, sustainable buildings and circular economy.

The incentive targets focus on situations where incentives are needed to promote green transformation:
- Setting an example - showing good examples of how everyone can act to motivate others to follow.
- Supporting sustainable construction legislation - working on better regulation to help achieve the 2050 decarbonisation target.
- Motivating users to understand how buildings work and how to use them in the face of the climate emergency.
- Strengthening cross-sectoral cooperation.
- Rewarding individuals, organisations, companies and initiatives that move closer to the 2050 target.

The promotional objectives are aimed at a wide audience and focus on the promotion of appropriate attitudes and practices:
- Promotion of people, organisations, companies and initiatives working towards climate neutrality by 2050.
- Promotion of specific buildings, components and other works and products which are examples of good practice in the decarbonisation of the construction sector.
DECOUPLING ECONOMIC GROWTH FROM GREENHOUSE GAS EMISSIONS

The modern civilisation bases its existence on the extraction of finite fossil fuel resources, which are directly connected to greenhouse gas emissions. Scientific consensus says we need to urgently decarbonise the global economy and decouple its growth from carbon emissions. Political agreement about dealing with climate change was reached under the Paris Agreement in 2015 by the vast majority of countries in the world. This was a symbolic beginning of activities aimed at the complete decarbonisation of the world economy.

The Polish economy still has much to do to fully transition to a decarbonisation pathway. Historically, greenhouse gas emissions in our country grew significantly until 1988. With political changes, many industrial plants, especially heavy industry, were closed down, which was associated with a significant drop in emissions in the years 1988-1990. In subsequent years, together with a completely different economic situation, this drop slowed down significantly. And after a short period of growth in emissions during the political transformation, the ‘decoupling’ started. It is a positive phenomenon of breaking the trend of combining GDP growth with increased greenhouse gas emissions (figure 2). However, the current rate of reduction of greenhouse gas emissions in the Polish economy is not sufficient to meet the objectives of the Paris Agreement and to successfully combat the climate change.

Figure 2. Decoupling of CO2 emissions from GDP for Poland (source: Klimat dla Polski, Polska dla Klimatu)
The total area of buildings in Poland amounts to 1,562 million m$^2$. As much as 68% of this area belongs to the residential sector (figure 4).

**ENERGY EFFICIENCY AND BUILDINGS’ EMISSIONS**

Buildings are very diverse in terms of energy efficiency, looking at both the function of the building and the year it was put into use (figure 5). The energy standard of buildings in use is a consequence of their age, the way they are used, the construction works carried out, the technologies and construction products used and the requirements that applied during their construction. The gradual tightening of technical requirements (in particular the requirements for energy saving and thermal insulation, which have been tightened over the years) and technological progress, contribute to the energy efficiency of buildings.
However, while buildings commissioned after 2000 are characterised by relatively high energy efficiency, the older building stock has high energy demand (figure 6) and requires extensive renovation. For this reason, regulations to improve the condition of the existing building stock are very important in the context of decarbonisation efforts and a key planning element in this area is the Long Term Renovation Strategy (see section on "LEGISLATION").

In terms of energy consumption and greenhouse gas emissions of all building types, residential buildings also dominate (figure 7). 58% of the households (by floor area) are single-family and 42% are multi-family buildings.

**Figure 6.** Primary energy demand of buildings in Poland (source: Polish Long Term Renovation Strategy)

**Figure 7.** Breakdown of emissions by building category in 2016 (source: Klimat dla Polski, Polska dla Klimatu)
Approximately 42% of residential buildings in Poland were built before 1971 (figure 8). It is estimated that only 50% of these buildings have had an energy efficient renovation by 2012, and some of them do not meet current energy efficiency requirements. In the case of multi-family residential buildings, recent surveys indicate that 30% will still need to have an energy efficient renovation after 2020.

In the case of public buildings, it is estimated that about 45% of them have had an energy efficient renovation by 2019. Taking into account the projects currently carried out and those planned by public institutions until 2025, the percentage of buildings renovated will increase to an estimated 55-60%.

The dominant position of fossil fuels in the segment of heat supply results in the fact that the vast majority of residential buildings in Poland (77%) emit more than 50 kg CO₂/m² per year. Figure 9 shows the distribution of emissions of single- and multi-family buildings, taking into account the year of construction. When analysing both groups, it can be clearly seen that single-family buildings are characterised by lower emissions, although still only about 13% of them emit less than 40 kg CO₂/m² per year.

A particularly serious problem in Poland is the so-called winter smog, caused by the high proportion of heating systems using solid fuels, which are burnt in low class boilers. It is estimated that individual heating in residential buildings contributes up to 40% of PM₁₀ emissions, which is one of the main components of smog. In the top ten European cities with the highest number of days per year when the permissible concentration of PM₁₀ is exceeded, there are as many as six Polish cities.

---


9 Long Term Renovation Strategy.

10 Ibid.

11 An air pollutant consisting of small particles with a diameter less than or equal to 10 micrometre (about 1.7 the diameter of a single human hair). Their small size allows them to make their way to the air passages deep within the lungs where they may be deposited and result in adverse health effects. PM₁₀ also causes visibility reduction.

12 Księżopolski, K. (2017), Strategia walki ze smogiem [Strategy for fighting with smog].
SOURCES OF CARBON EMISSIONS IN BUILDINGS

The carbon footprint of buildings, as often highlighted in this study, goes far beyond the energy consumed by buildings. A key element in the context of decarbonisation is the embodied carbon, i.e. the carbon footprint related to the production of construction materials and products, transport and the construction process, as well as all processes related to renovation, conversion or thermal upgrading and the end of life carbon footprint related to the demolition of the building. The breakdown of the carbon footprint of the construction sector is shown in figure 10.

The manufacturing industry in Poland was responsible for 8% of national carbon emissions in 2018, while the emissions of all building-related sectors over their entire life cycle (construction and processing, heating and heating and electricity) accounted for as much as 53% of all carbon emissions in our country (figure 11).

An excellent example of the importance of the embodied carbon is the production process of the most commonly used building construction materials - cement and steel. Cement production emitted about 20 MtCO$_2$e in 2017, which accounted for 22% of the total emissions of the Polish industry, while steel production was responsible for 9% of these emissions (about 8 MtCO$_2$e).\(^1\) Approximate one quarter of CO$_2$ emissions from cement and steel production come directly from the technological process, with the remainder coming from thermal energy production (mainly high-temperature heat).\(^2\)

Waste generated by buildings and construction processes is another large source of carbon emissions. The carbon footprint in this case is created by three processes. The first is waste generated during the construction process. A large amount of waste is generated both during the processing and as a result of not using 100% of the materials supplied for construction. However, the problem can be minimised by, for example, using prefabrication. The second process is the demolition, which requires a large amount of energy itself, as well as transporting the waste to a landfill, which also involves emissions. These emissions can be reduced by not allowing the demolition process to take place at all, by designing buildings that are easily functionally adaptable, or if demolition is necessary, by maximising the reuse of demolition materials. The third process is the greenhouse gas emissions associated with chemical processes occurring in landfills, which are however mostly generated by organic matter. Statistics show that about 40% of solid waste comes from construction processes. Choosing technologies that promote reusability, a circular economy and an optimised production process can significantly reduce the negative environmental impact of this waste.

Figure 10. Global share of buildings and construction CO$_2$ emissions (source: 2020 Global Status Report for Buildings and Construction)

Figure 11. Structure of greenhouse gas emissions in Poland in 2018 (source: Jak Polska może osiągnąć zwiększone cele redukcji emisji gazów cieplarnianych do 2030 roku)
HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050

Whole life carbon roadmap for Poland
THE EU POLICY CONTEXT

The EU has set ambitious targets to progressively reduce its greenhouse gas emissions up to 2050. Currently the key climate and energy targets are set out in the 2030 climate and energy framework which includes EU-wide targets and policy objectives for the period from 2021 to 2030.

As part of the of the European Green Deal, the Commission agreed in December 2020 to raise the 2030 greenhouse gas emission reduction target, to at least 55% compared to 1990. This will help the European Commission realise its goal of a climate neutral Europe, as set out in the proposal for the first European Climate Law.

THE EUROPEAN UNION 2030 CLIMATE TARGET PLAN

A sustainable, realistic and prudent pathway to climate neutrality by 2050 requires a reduction in greenhouse gas emissions of at least 55% (relative to 1990 levels) by 2030.15

To achieve this goal, it is necessary to:

- Increase the share of renewable energy in total energy consumption to 38-40%16
- Reduce energy consumption by 36-41% (saving 36-37% of final energy and 39-41% of primary energy)17

---

15 This target was approved by the European Commission in December 2020 and finally adopted by the European Parliament on 21.04.2021.
16 At the time of publication of this report, an amendment to the Renewable Energy Directive (RED) is being prepared, which will set a final value for the use of energy from renewable sources.
17 At the time of publication of this report, an amendment to the Energy Efficiency Directive (EED) is being prepared which will set the final reduction values.
From a buildings perspective, the most relevant directives to realise these targets are outlined below. It is important to note that all these directives are subject to review in 2021 to ensure they are fit for purpose in reaching the goals of the Green Deal.

**ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)**

The EPBD covers a broad range of policies aimed at helping national governments in Europe boost the energy performance of buildings and improve the existing building stock. Such policies include:

- **RENOVATION STRATEGIES**
  EU countries must establish strong, long-term renovation strategies, aimed at decarbonising the national building stocks by 2050. The strategies should contribute to achieving the national energy and climate plans' (NECPs) energy efficiency targets.

- **PERFORMANCE REQUIREMENTS**
  EU countries must set cost-optimal minimum energy performance requirements for new buildings and for existing buildings undergoing major renovation.

- **NEARLY ZERO ENERGY BUILDINGS (nZEB)**
  by 31 December 2020, all new buildings are nearly zero energy buildings.

- **ENERGY PERFORMANCE CERTIFICATES**
  must be issued when a building is sold or rented and inspection schemes for heating and air conditioning systems must be established.

The EPBD will be reviewed by the end of 2021 to ensure it meets the additional requirement set out in the EU Green Deal and the Renovation Wave (discussed below).

**ENERGY EFFICIENCY DIRECTIVE**

The Energy Efficiency Directive (EED) establishes a set of binding measures to help the EU reach its 20% energy efficiency target by 2020.

The EED includes a number of measures aimed at improving energy efficiency in Europe, including:

- Obligation schemes for energy companies to achieve yearly energy savings of 1.5% of annual sales to final consumers,

- EU countries required to make energy efficient renovations to at least 3% per year of buildings owned and occupied by central governments,

- The preparation of national energy efficiency action plans (NEEAPs) every three years.

The EED is currently subject to review to ensure it addresses any ambition gap to 2030 energy efficiency targets and ensure synergies with other Green Deal initiatives such as the review of the Renewable Energy Directive and the Renovation Wave.

**RENEWABLE ENERGY DIRECTIVE**

The Renewable Energy Directive (RED) 2018/2001 establishes an overall policy for the production and promotion of energy from renewable sources in the EU. It requires the EU to fulfil at least 32% of its total energy needs with renewable energy by 2030. A specific target of 1.3% increase per year has been set for the share of renewables used for heating and cooling, which includes the use of waste heat in buildings.

The RED is also currently under review to ensure coherence with the EU Green Deal.
In addition to the directives outlined above, the EU Green Deal set out a series of complimentary policy initiatives aimed at supporting the transformation of Europe into a ‘modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use’.

The flagship policy of the EU Green Deal is the ‘Renovation Wave’, a strategy to at least double renovation rates and ensure that 35 million buildings across Europe are renovated by 2030. The Renovation Wave forms a key part of the EU’s recovery plan ‘Next Generation EU’ and the EU Green Deal. The wave will build on previously announced measures including the requirement for each EU country to publish a long-term building renovation strategy and building-related aspects of each EU country’s national energy and climate plans (NECP).

Among the measures announced in the wave are plans to propose mandatory minimum energy performance standards as part of the forthcoming revision of the Energy Performance Directive for Building and a commitment to create a 2050 roadmap for reducing whole life cycle carbon emissions in buildings.

Under the EU Green Deal, the commission has also published the Circular Economy Action Plan, which contains a commitment to publish a new comprehensive Strategy for a Sustainable Built Environment, aimed at ensuring coherence across relevant policy areas including climate, energy and resource efficiency, management of construction and demolition waste, accessibility, digitalisation and skills.

It will also explore the role of the Level(s) framework in integrating life cycle assessment in public procurement, the EU sustainable finance framework and the appropriateness of setting carbon reduction targets.

The above commitments and policy initiatives will likely be eventually integrated into existing directives and therefore transposed into national legislation.

### THE TAXONOMY

Europe will not meet its climate goals and 2030 targets unless financial investment is directed towards sustainable projects and activities. Therefore, in June 2020, legislation on the uniform classification of sustainable investments (taxonomy) came into law. This legislation lays down criteria for determining which financial products and investments may be declared ‘sustainable’.

Within the buildings sector, the aim is to apply clearly defined taxonomy criteria (‘thresholds’) to new buildings, renovation measures and the acquisition and ownership of buildings. The aim is to optimise the contribution of the buildings sector to Europe’s climate goal by transforming existing buildings and constructing new buildings to a net zero carbon standard.

The first ‘Delegated Acts’ that will implement these thresholds for climate change mitigation are expected to be published in the first half of 2021. Further criteria for circular economy in construction are in development and planned for publication later in 2021. These could help drive investment towards lowering embodied carbon in construction.

### THE FUTURE OF EUROPEAN BUILDING POLICY

In addition to the directives outlined above, the EU Green Deal set out a series of complimentary policy initiatives aimed at supporting the transformation of Europe into a ‘modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use’.

The flagship policy of the EU Green Deal is the ‘Renovation Wave’, a strategy to at least double renovation rates and ensure that 35 million buildings across Europe are renovated by 2030. The Renovation Wave forms a key part of the EU’s recovery plan ‘Next Generation EU’ and the EU Green Deal. The wave will build on previously announced measures including the requirement for each EU country to publish a long-term building renovation strategy and building-related aspects of each EU country’s national energy and climate plans (NECP).

Among the measures announced in the wave are plans to propose mandatory minimum energy performance standards as part of the forthcoming revision of the Energy Performance Directive for Building and a commitment to create a 2050 roadmap for reducing whole life cycle carbon emissions in buildings.

Under the EU Green Deal, the commission has also published the Circular Economy Action Plan, which contains a commitment to publish a new comprehensive Strategy for a Sustainable Built Environment, aimed at ensuring coherence across relevant policy areas including climate, energy and resource efficiency, management of construction and demolition waste, accessibility, digitalisation and skills.

It will also explore the role of the Level(s) framework in integrating life cycle assessment in public procurement, the EU sustainable finance framework and the appropriateness of setting carbon reduction targets.

The above commitments and policy initiatives will likely be eventually integrated into existing directives and therefore transposed into national legislation.

---

18 The first of these delegated acts was published on 21.04.2021 and introduces the first set of technical screening criteria to define which activities contribute substantially to two of the environmental objectives under the Taxonomy Regulation: climate change adaptation and climate change mitigation.

19 Voluntary reporting framework Level(s) provides a set of common indicators and metrics for measuring the environmental performance of office and residential buildings, which takes into account their full life cycle. It focuses on six key areas: greenhouse gas emissions, resource efficiency, water use, health and comfort, resilience and adaptation, and cost and value.
NATIONAL CONTEXT

The need to decarbonise the Polish construction sector and the buildings themselves results from the European Union’s long-term vision of achieving climate neutrality in 2050. The previous chapter presented EU regulations and plans for achieving this goal, while this part of the study will present Polish legal regulations and strategic documents shaping the buildings and construction sector.

NEARLY ZERO ENERGY BUILDINGS

As far as buildings are concerned, the most important legislation setting an obligation to improve energy efficiency and reduce greenhouse gas emissions is the recast of the Energy Performance of Buildings Directive (2010/31/EU), described in the previous chapter. Based on this, Polish legislation should ensure that after 31 December 2020, all new buildings will be nearly zero energy buildings (nZEB). The definition of nZEB is given in the National Plan for increasing the number of low energy buildings,\(^{20}\) according to which it is a building which meets the energy saving and thermal insulation requirements of the technical and building regulations\(^ {21}\) in force from 1 January 2021 and, for buildings occupied and owned by public authorities, from 1 January 2019. In terms of thermal protection and energy savings in buildings, the regulation contains information about the required level of insulation of the building fabric, which must be met for new and renovated buildings. In addition, new buildings must meet a level of the primary energy (EP) index reflecting the annual demand for non-renewable primary energy that characterises the building. The next revisions of the technical conditions are scheduled for 2023 and 2028, with the aim of defining a zero emission building.

The main legal acts in Poland concerning buildings and their energy efficiency are:

- Act of 07.07.1994 - Building Law
- Act of 29.08.2014 on the energy performance of buildings
- Act of 21.11.2008 on support for thermo-modernisation and repairs
- Ordinance of the Ministry of Infrastructure of 12.04.2002 on technical conditions to be met by buildings and their location
- Regulation of the Ministry of Development of 11.09.2020 on the detailed scope and form of a construction project
- Regulation of the Ministry of Infrastructure and Development of 27.02.2015 on the methodology for determining the energy performance of a building or part of a building and energy performance certificates
- Regulation of the Ministry of Investment and Development of 06.09.2019 amending the Regulation on the methodology for determining the energy performance of a building or part of a building and energy performance certificates
- Act of 20.05.2016 on energy efficiency

---

\(^{20}\) Resolution No 91 of the Council of Ministers of 22 June 2015 on the adoption of the ‘National plan to increase the number of low energy consumption buildings.’ (M.P. of 2015, item 614).

\(^{21}\) Article 7(1)(1) of the Act of 7 July 1994 - Construction Law (Journal of Laws 2013, item 1409, as amended), in particular Section X and Appendix No. 2 to the Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location (Journal of Laws No. 75, item 690, as amended)
Another key element arising from the Energy Performance of Buildings Directive is the obligation for each EU Member State to develop and implement comprehensive long-term renovation strategies to support the decarbonisation of the national building stock by 2050. Poland’s latest Long Term Renovation Strategy (LTRS) is, at the time of writing, subject to public consultation.

The document presents a projected renovation scenario focusing on reducing operational emissions of buildings, according to which the following actions are planned:

- **LARGE-SCALE HEAT SOURCE REPLACEMENT**
  (complete phase-out of coal use by 2030 in cities and 2040 in rural areas and near complete phase-out of natural gas use by 2050) combined with shallow thermal modernisation by 2030.
- **GRADUAL INCREASE IN THE SCALE OF DEEP RENOVATION**
  to about 3% per year over the next several years.

As a result of implementing the recommended scenario, by 2050, 66% of buildings will be brought to an energy-efficient standard. The remaining 13% of buildings, which for technical or economic reasons, cannot be modernised to such an extent, will fall into the 90-150 kWh/(m²·yr) efficiency range.

It should be emphasised that this scenario does not ensure the range.

The first of these documents is the **National Energy and Climate Plan for 2021-2030** (NECP). The NECP presents climate and energy objectives and targets and policies and actions in this area, covering 5 dimensions of the energy union and two of these areas in particular are important in the context of construction: energy efficiency and emissions reduction.

The plan states that one of the basic measures to reduce greenhouse gas emissions in the construction sector should be a gradual increase in energy standards and thermal insulation, as well as an increase in the use of renewable energy sources for newly built and buildings undergoing modernisation. In turn, the anticipated target value of energy savings for the years 2021-2030, related to taking action to improve the energy performance of buildings, should be 43 440.1 MWh, which corresponds to the annual primary energy demand of more than 4100 detached houses (according to current legislation).

The second key document relating to the long-term strategy to 2050 - is the **Strategy for Transformation to a Climate Neutral Economy**. The document has not been published yet, but it is known that it analyses 5 scenarios of transformation of the Polish economy. Four of them assume nuclear energy as an element of the decarbonisation plan.

In order to achieve the EU’s energy and climate goals for 2030 and the long-term 2050 goal, the EU has developed an Energy Union Governance Mechanism that enables the coordination of efforts at all levels, from EU, regional, to national planning, reporting and monitoring of energy and climate action.

The energy union management mechanism provides for the preparation of two strategic documents by the Member States:

- **INTEGRATED NATIONAL ENERGY AND CLIMATE PLANS**
  covering ten-year periods (current 2021-2030),
- **LONG-TERM STRATEGIES**
  with a minimum of 30 years (current until 2050).

The key for buildings is the transformation of the heating sector - by 2040, the heating needs of all households will be covered by district heating (increase of 1.5 million households connected to the heating network by 2030) and by zero or low emission individual sources (phasing out coal from individual heating in cities by 2030 and in rural areas by 2040). There will also be support for passive and zero emission buildings realised by the replacement of 3 million heat sources in homes by 2030 and construction or modernization of 1000 low emission public buildings by 2030.

Poland’s energy policy is particularly important in the context of buildings because the drive to decarbonise Polish construction is highly dependent on strategic government action in this area. The strategic document – Polish Energy Policy 2040 – setting the framework for energy transformation, was adopted on February 2nd 2021.

This strategy is based on three pillars: a just transition, a zero carbon energy system and good air quality. The ongoing transformation is intended to lead to a zero carbon energy system (development of offshore wind energy, implementation of nuclear energy and the growth of the role of distributed and civil energy). The key area for buildings is the transformation of the heating sector - by 2040, the heating needs of all households will be covered by district heating (increase of 1.5 million households connected to the heating network by 2030) and by zero or low emission individual sources (phasing out coal from individual heating in cities by 2030 and in rural areas by 2040). There will also be support for passive and zero emission buildings realised by the replacement of 3 million heat sources in homes by 2030 and construction or modernization of 1000 low emission public buildings by 2030.
It is important to mention here that decarbonisation of buildings in all EU countries, including Poland, will be very capital intensive, going far beyond what is and may be available from current and future building renovation support programmes provided by the EU.

In support, the EPBD foresees the importance of mobilised private investments and requires plans for aggregation of projects, reduction of perceived financial risk, accessible and transparent advisory services, and similar actions that may facilitate inclusion of private financing to building decarbonisation.

It is clear therefore that potential support from the EU level will have to be accompanied with significant private investments. Successful implementation of the Roadmap will therefore significantly rely on involvement of the financial sector. Designing financial instruments for supporting decarbonisation in Poland will require the active participation of commercial banks and international financing institutions (IFIs) (i.e., EIB, EBRD) as essential ingredients for the effective implementation of decarbonisation investments.

The focus of this section is presentation of selected financial instruments that could support decarbonisation of the sector across the value chain and from a life cycle perspective.

**REQUIREMENTS AT THE EU LEVEL**

Financial instruments should be tailored to support the decarbonisation of the building stock while at the same time fitting the requirements of the EU directives covering the field of energy efficiency and energy performance in buildings.\(^{26}\)

**Among these are:**
- Policies and measures that stimulate cost-effective deep renovations of buildings, including staged deep renovations,
- A forward-looking perspective to guide investment decisions of individuals, the construction industry and financial institutions,
- The aggregation of projects, including by investment platforms or groups, and by consortia of small and medium-sized enterprises, to enable investor access as well as packaged solutions for potential clients,
- The reduction of the perceived risk of energy efficiency operations for investors and the private sector,
- Use of public funding to leverage additional private-sector investment or address specific market failures,
- Investments into an energy efficient public building stock, in line with Eurostat guidance,
- Accessible and transparent advisory tools, such as one-stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments.

The EU Green Deal as well as the EU Recovery plan however goes beyond the mainstreamed requirements for deep energy efficiency renovations. They ask, in line with the EU Taxonomy, to review and assess further opportunities related to the introduction of circular economy concepts and adopt a life cycle approach. This encompasses addressing the overall life cycle carbon footprint of buildings as well as the upfront emissions associated with building design and construction and the use of environment-friendly construction materials.

**FUNDS AND ASSISTANCE AT EUROPEAN LEVEL**

The EU has developed a number of mechanisms and instruments to support and assist Member States across a range of areas. Of particular relevance to the decarbonization of buildings are:

- **Sustainable Europe Investment Plan**
  the new investment pillar of the European Green Deal. It aims to mobilise at least EUR 1 trillion of private and public sustainable investments over the upcoming decade through the EU budget and associated instruments.

**European Structural and Investment Funds (ESIF)**

Funds which aim to invest in job creation and a sustainable and healthy European economy and environment. Among the five main areas are support for a low carbon economy and sustainable management of natural resources.

**LIFE**

The EU’s financing instrument for the environment and climate action. One of the main activities of this instrument is to stimulate investment and support measures aimed at energy efficiency, particularly in European regions that are lagging behind in the transition to clean energy.

**Urban Innovative Actions (UIA)**

An initiative that provides urban areas across Europe with the means to test new solutions to urban challenges.

**URBACT III**

A programme designed to enable European cities to work together to develop solutions to the challenges they face and to share good practice, experience and solutions with all stakeholders involved in urban policy across Europe.

**EUROPEAN ENERGY EFFICIENCY FUND (EEEF)**

The fund provides tailored financing (both debt and equity instruments) for energy efficiency projects but also for renewable energy and clean urban transport projects. Beneficiaries are municipal, local and regional public authorities, or entities acting on their behalf.

**Programmes supporting the development of investment projects**

- **ELENA, JASPERS** and **URGIS**.

**CURRENT FINANCING**

**POLAND**

**FUNDS AND ASSISTANCE IN POLAND**

The Polish financial instruments available focus mainly on increasing the energy efficiency of buildings, eliminating low emissions and supporting the development of consumer renewable energy. The most important programmes are listed below:

- **Thermo-renovation and Repairs Fund** - the oldest Polish and one of the oldest European programmes, continuously operating since 1998. Its main objective is to grant financial support to investors implementing thermo-renovation (energy efficient renovation) undertakings in multi- and single-family buildings, however so far the main beneficiaries of the programme have been housing cooperatives and communities, which have undertaken energy efficient renovation of mainly multi-family buildings. The budget for the programme is set every year.

- **Programme ‘Clean Air’** (Polish: Czyste powietrze) - the programme focuses on co-financing the decommissioning of high-emission solid fuel heating sources and thermo-renovation of single-family residential buildings.

- **Programme ‘My Electricity’** (Polish: Mój prąd) - is an instrument dedicated to supporting the development of prosumer energy in the form of co-financing the photovoltaic micro-installation segment. The aim of the programme is to increase the production of electricity from renewable sources in Poland.

- **Programme ‘Energy efficient construction. Part 1) Reducing energy consumption in buildings’** - the most important objective of the programme is to improve air quality by reducing energy consumption in buildings (including through increased production of energy from renewable sources) and reducing CO2 emissions. The buildings covered by the programme are hospitals, care and treatment facilities, historic buildings, sacral buildings and buildings accompanying sacral buildings, student dormitories or buildings intended for cultural, religious, educational, nursing and scientific purposes.

- **Operational Programme Infrastructure and Environment, Measure 1.3 - supporting energy efficiency in buildings** - this is the programme provides subsidies for thermo-renovation investments in public utility buildings and in the form of repayable aid for thermo-renovation investments in the residential sector.

- **Regional Operational Programmes** - the funds available under these programmes are aimed at comprehensive, deep energy efficient renovation of multi-family residential buildings, with a preference for measures seeking to achieve a 60% energy saving rate.

- **Thermo-renovation relief** - an instrument in the form of a subjective income tax exemption addressed to a wide group of taxpayers who are owners of single-family buildings.
BARRIERS AND OPPORTUNITIES
In order to thoroughly investigate the issues related to the transformation process of the Polish construction sector towards achieving the goal of zero emissions by 2050, a SWOT analysis was conducted within the PLGBC working group, which is summarised in this chapter.

**AWARENESS**

Awareness of climate change and its impact on people is growing every day. This process can be seen, in events such as the climate strikes or in the spread of ecological approaches to everyday life. The public is also aware of the importance of the challenge facing people and companies in the construction industry - one of the strengths is the fact that the Polish market already has many specialists and companies that support the transformation process.

The activity and determination of NGOs is another strength that can contribute to achieving the decarbonisation goals. There are many NGOs that are actively working to address climate change. An example of such an organisation is the Polish Green Building Council (PLGBC).

There is a growing interest in sustainable development among companies in the construction industry and beyond, which translates into creating their own pathways to climate neutrality in the form of decarbonisation strategies.

The dire air quality in Poland and the fight against this phenomenon coincides with decarbonisation efforts. The public has been aware of the seriousness of the problem for many years, with many air quality improvement activities having a positive impact on the fight against climate change.

**SKILLS AND KNOWLEDGE**

Stakeholders highlighted problems in the area of skills and knowledge. One problem is the lack of availability and widespread use of tools for environmental assessment of buildings - a barrier for designers is the small number, as well as the high price, of tools that allow the carbon footprint calculation process to be carried out.

In the area of knowledge there is a lack of readily available information on the environmental impact of individual materials and solutions. Another problem is the uncertainty about how much the climate will change in the next few years. This raises questions about how buildings should be designed to be sufficiently resilient to climate change.

**LEGISLATION AND ADMINISTRATION**

A number of barriers were noted in the area of legislation and administration. One problematic area is the lack of clear and measurable climate targets in national policies - the transition to zero emissions is not easy to measure and quantify, as carbon footprint assessment is a time-consuming process, which can be demotivating for some. Also problematic is the lack of existing processes and practices for verifying the declared energy consumption of designed, constructed and existing buildings - there are no mechanisms for verifying design and calculation assumptions in the context of building energy efficiency. This results in two negative effects: first, a lack of feedback as to which design solutions actually work in the buildings being constructed, and second, a lack of encouragement for a reliable approach to energy efficiency.
The lack of any carbon footprint requirements in building law is however the biggest barrier. Until there are at least minimal requirements on the carbon footprint of buildings, a very large part of the construction sector will remain unaware of the importance of the problem. The issue of embodied carbon should be regulated if we want to have any chance to meet our Paris Agreement commitments and strong agreement among stakeholders and a lot more awareness should follow. However, it should be emphasised that Poland is a signatory to the Paris Agreement and thanks to our country’s declaration of participation in the plan to reduce carbon dioxide emissions ‘as soon as possible’, we should expect actions on the part of the government and local administration aimed at limiting climate change. In addition, the European Union’s activity in the field of climate neutrality also requires Poland to take action, thanks to which we can expect our country to participate in the implementation of the EU strategies for mitigation and adaptation to climate change.

**ENERGY SECTOR**

The Polish energy sector in its current form is an important limiting area for the decarbonisation of buildings. The transformation of the building sector depends on the transformation of the energy sector. This applies to both the operational and embodied carbon, as the carbon footprint of a large part of the processes in the building industry is derived from the energy source.

Through processes such as increasing energy efficiency and investing in renewable energy sources, an increasingly smaller proportion of the carbon footprint of processes in the construction industry is dependent on the carbon footprint of the energy sector. But it is important to highlight that this pace must accelerate significantly.

**TECHNICAL ASPECTS**

On the technical side, a limitation is the small number of products and building materials with environmental declarations available. Even when a designer or investor wants to realise an ecological investment, it is difficult to find low carbon products with a proven low environmental impact, e.g. in the form of a type III environmental declaration (EPD). Such declarations are a necessary element for carrying out a life cycle assessment of the building, by which the carbon footprint can be optimised.

With a warming climate and increasing levels of insulation in buildings, there may be a new technical problem to solve - the fight against overheating in buildings. Another aspect will be the integration of buildings, both new and retrofitted, into a smart grid allowing them to become energy sources and storage facilities, as well as charging stations for electric vehicles.

The possibilities of offsetting for investments in Poland are also very limited - in order to offset the carbon footprint of an investment, we usually have to rely on foreign offsetting projects.

**FINANCING**

The last category of barriers and constraints is financing. Investors very often put emphasis on the capital costs of the investment itself, without taking into account the whole life cycle of the building (most often the input costs are key in making investment decisions and not the costs related to the whole life cycle of the building, such as costs related to energy efficiency).

It is significant that the payback period for renewable energy investments is typically longer than acceptable, which discourages investors from considering such alternatives.

Different forms of ownership and investment models require different arguments. The multitude of forms of ownership and diversity of investment forms hinder the process of education and promotion of low carbon footprint construction. For example, housing companies tend to care more about the energy efficiency of their buildings, when they are built for rent than for selling. There is also a lack of support mechanisms from the state or local administration for zero carbon projects - there are currently no financial methods to support those who are considering investing in a zero carbon building. Existing programmes only support this process indirectly, e.g. by supporting energy efficiency.

An opportunity to support the decarbonisation process is funding that depends on ESG (environmental, social responsibility and corporate governance) indicators. ESG factors stem from the idea that companies should not be concerned only with their economic interest and their financing should be linked to non-financial indicators. For example, in their final recommendations, the EU’s Technical Expert Group on Sustainable Finance proposed that by 2025 embodied carbon thresholds should be integrated into the EU’s Green Taxonomy - the new classification system for sustainable finance.
THE ROADMAP

HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050
Whole life carbon roadmap for Poland
Cross-sectoral collaboration is also an important prerequisite for achieving climate neutrality and the roadmap has been developed in such a way as to make it easier for individual stakeholders to implement appropriate actions in successive intervals. Goals and objectives are intertwined, building a network of linkages and synergies.

A working group consisting of PLGBC members and partners, representing the majority of the building and construction sector stakeholders, participated in the development of this section of the report. In the course of numerous meetings and discussions, objectives and corresponding actions were developed for different stakeholder groups over different time periods, which should ensure the decarbonisation of the Polish building stock. The document with the developed objectives and actions was then subjected to external consultations with 40 representatives of all stakeholder groups. The feedback received allowed us to refine the objectives and create synergies between them.

This document is a call to action and illustrates how many tasks each stakeholder faces:
The role of this stakeholder group is crucial in the decarbonisation process. It is the government administration that is responsible for the national strategy as well as regulations. Through various mechanisms, it can accelerate and support the achievement of the goals.

Period until 2025

1. Create policy and regulations necessary to set Poland on a trajectory to achieve whole life net zero carbon buildings by 2050

   KEY ACTIONS:
   - Develop a national buildings decarbonisation strategy
   - Introduce an obligation to design and construct all new public buildings with a whole life net zero carbon footprint
   - Introduce a requirement for all new and retrofitted buildings to achieve a net zero operational carbon footprint
   - Implement renovation policy for the existing building stock that includes carbon footprint
   - Revise relevant legislation with establishment of intermediate carbon reduction targets
   - Establish a legal framework for a digital building logbook

2. Create and develop tools necessary to achieve whole life net zero carbon buildings

   KEY ACTIONS:
   - Establish and maintain a database with all the data necessary to calculate the carbon footprint of a building
   - Implement and develop a publicly accessible national building stock database containing, inter alia, information on emissions, energy consumption and energy savings (e.g. CEEB - Central Register of Building Emissions, Central Register of Final Energy Savings)
   - Reform the methodology for Energy Performance Certificates development, including introduction of energy classes
   - Develop, implement and organise a verification and certification system for whole life carbon footprint analyses in the form of building carbon footprint certificates
   - Create a publicly accessible tool for calculating the carbon footprint
   - Introduce financial incentives to support decarbonisation to stimulate the reduction of the carbon footprint of buildings:
     a) subsidies
     b) tax reliefs
     c) low interest loans and soft loans

3. Ensure access to low carbon energy sources

   KEY ACTIONS:
   - Revise the assumptions and implement the Polish Energy Policy 2040, enabling the achievement of common EU objectives
   - Create a system of subsidies and financial incentives to enable dynamic uptake of renewable energy sources

4. Enable the development of cost-effective construction and retrofit technologies needed for all buildings to have a net zero carbon footprint by 2050

   KEY ACTIONS:
   - Financing research and development of innovative technologies
   - Introduction of financial incentives for the use of reclaimed and recycled materials
   - Encourage the development of construction technologies and processes that aim to minimise the overall carbon footprint of a building
   - Development of energy management and building automation systems through appropriate regulatory changes and financial programmes

The above mentioned digital building logbook is the one proposed by the European Commission, extended to the context of decarbonisation plans of a building. It should be a record of the most important events and changes in the life cycle of a building, taking into account all the data on the building, the characteristics of the materials used, the Energy Performance Certificate, the carbon footprint certificate and the decarbonisation plan for the building.
All buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon)

**KEY ACTIONS:**
- Implement a decarbonisation plan for buildings owned or occupied by public authorities (new and retrofitted)
- Achieve net zero operational carbon in existing buildings occupied or owned by public authorities
- Update the existing regulations necessary to achieve net zero carbon buildings by 2050 and enforce their implementation

**DENMARK**
regulation of carbon footprint limits in the national building code

In March 2021, the Danish Parliament approved a new law introducing a class of buildings with reduced environmental impact. As a first step, the regulation will apply to buildings with a floor area of at least 1,000 m$^2$ and will apply from 2023. Smaller buildings, on the other hand, will initially be subject only to a mandatory demonstration of their carbon footprint. From 2025, the regulation will apply to all buildings and will be subject to review and a possible reduction of the limit value every two years.

**KEY ASSUMPTIONS:**
- To meet the minimum requirements for 2023, a building must achieve a carbon footprint level not exceeding 12 kg CO$_2$ eq./m$^2$·year. This value will be updated in subsequent years (2025: 10.5 kg CO$_2$ eq./m$^2$·year; 2027: 9 kg CO$_2$ eq./m$^2$·year; 2029: 7.5 kg CO$_2$ eq./m$^2$·year).
- A voluntary building class with an even further reduced carbon footprint of 8 kg CO$_2$ eq./m$^2$·year has been introduced. This value will be updated in subsequent years (2025: 7 kg CO$_2$ eq./m$^2$·year; 2027: 6 kg CO$_2$ eq./m$^2$·year; 2029: 5 kg CO$_2$ eq./m$^2$·year).
- The calculation of the carbon footprint must be done using the LCA methodology. Denmark has its own programme for calculating the carbon footprint of buildings: LCA-Byg. The first version of the programme was made available in 2015. Currently, the programme covers life cycle phases A1-A3, B4, B6, and C3-C4.
LOCAL GOVERNMENT ADMINISTRATION

In the face of increasing urbanisation, local governments will play an increasingly important role. By creating local spatial policies, local administrations can support the transformation of the building sector, not only by setting an example through measures such as pilot investments, but also by promoting the issue of decarbonisation.

Period until 2025

Develop and implement measures to reduce the total carbon footprint of public and private buildings

**KEY ACTIONS:**
- Educational activities for local government officials on carbon footprint, low carbon solutions and the circular economy
- Create a decarbonisation plan for the existing stock of public and private buildings (in line with the national strategy)
- Implement regulations necessary to achieve net zero carbon buildings
- New buildings developed by local authorities are constructed in accordance with the net zero carbon footprint targets
- Establish local and international partnerships to share experiences and jointly raise funds for investment and innovation

Period until 2030

Achieve a zero operational carbon footprint in buildings owned by local authorities

**KEY ACTIONS:**
- Carry out deep renovation and optimisation works of the existing municipal building stock
- Develop digital building logbooks for all existing municipal buildings

Verify and update progress towards net zero carbon buildings

**KEY ACTIONS:**
- Support the creation of digital building logbooks by private owners, creation of administrative and information facilities in this regard, update of local regulations
- Upgrade existing municipal assets in accordance with decarbonisation plans included in digital building logbooks

Support the implementation of the private building decarbonisation plan

**KEY ACTIONS:**
- Educate owners of private buildings in the municipality/city
- Introduce financial incentives and support programmes (in the form of subsidies, discounts, low interest loans)

Period until 2040

Implement a decarbonisation plan for buildings (new and retrofitted) owned by local authority

**KEY ACTIONS:**
- Carry out Life Cycle Assessment (LCA) and life cycle carbon footprint optimisation for all buildings owned by local authority
- Use materials with environmental impact information (e.g., using low and zero carbon footprint design specifications in public procurement

Develop and implement measures to reduce the total carbon footprint of public and private buildings

**KEY ACTIONS:**
- Educational activities for local government officials on carbon footprint, low carbon solutions and the circular economy
- Create a decarbonisation plan for the existing stock of public and private buildings (in line with the national strategy)
- Implement regulations necessary to achieve net zero carbon buildings
- New buildings developed by local authorities are constructed in accordance with the net zero carbon footprint targets
- Establish local and international partnerships to share experiences and jointly raise funds for investment and innovation
All buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon).

THE LONDON PLAN

The London Plan, which sets out a vision for a zero CO₂ emission city in 2050, came into force on March 2nd, 2021. It is a spatial development strategy for the Greater London region, which includes the City of London and 32 London boroughs. It is authored by the Mayor of London, Sadiq Khan, and implemented by the Greater London Authority (GLA).

Buildings have an important place in this wide-ranging plan. Chapter IX of the plan covers Sustainable Infrastructure (SI), with two regulations being key ones relating to the planning process for major investments.

Regulation SI2: Minimising greenhouse gas emissions

This regulation requires that for all projects that fall under the jurisdiction of the GLA (these are residential projects over 150 dwellings/homes, buildings over 30 m in height and public buildings over 2,500 m²), carbon emissions across the whole life cycle of the building must be calculated and the actions taken to reduce them must be demonstrated.

Regulation SI7: Reducing waste and promoting circular economy

The new London Plan supports development based on the principles of circular economy and a move towards net zero waste and requires a Circular Economy Statement from projects under the GLA’s jurisdiction.

A special guide for investors, developers and architects is also being developed on how to prepare a life-cycle carbon assessment that complies with the London Plan regulations.

CARBON REDUCTION IN BUILDINGS IN WAŁBRZYCH

In an effort to reduce carbon emissions and achieve a climate-neutral built environment by 2050, the European Bank for Reconstruction and Development (EBRD) is working with the city of Walbrzych to increase energy efficiency in the building sector and develop an action plan for sustainable financing.

Walbrzych is a former mining city with a population of approximately 112,000 inhabitants located in southwestern Poland. With investment loans from the EBRD, the city has committed to planning and implementing measures for a sustainable future.

Key characteristics

- The deep energy efficiency renovation of 52 municipal residential buildings, accommodating around 1,100 residents and 30,000 m² of floor area.
- Fuel-switch from coal to gas and electricity (by using heat pumps), resulting in energy savings of more than 60%. Resulting CO₂ emission savings are estimated at 80%.
- Use of advanced energy and water efficiency technologies at the highest global levels and integration of renewable energy (solar PV), significantly improving energy performance of the city.
- A trigger to further private sector investments in green buildings, and to the revitalisation and modernisation of the building sector.
- Support of city’s integration of environmental and sustainability principles into future urban planning processes.

DEVELOPERS, INVESTORS AND BUILDING OWNERS

Investors and owners are the key link in the entire roadmap. More often than not, they have the final say in most decisions related to the design of the building as well as its subsequent use and thus have a strong influence on the size of the carbon footprint of the building.
HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050
Whole life carbon roadmap for Poland

2030

1. Increase knowledge and awareness on decarbonisation
   KEY ACTIONS:
   • Voluntarily commit to report and reduce emissions in line with international standards (e.g. Science Based Targets, Carbon Disclosure Project, Net Zero Carbon Buildings Commitment)
   • Communicate to customers and other stakeholders about decarbonisation activities undertaken

2. Identify and implement measures to reduce whole life carbon footprint
   KEY ACTIONS:
   • Conduct analysis and optimisation of life cycle carbon footprint for most construction projects
   • Create design guidelines that take environmental issues into account (in particular the whole life carbon)
   • Use materials (for major product groups) with environmental impact information (e.g. EPD)
   • Measure the carbon footprint of the whole portfolio of owned buildings
   • Disclose data on the energy demand and operational carbon footprint of a building/apartment in sales and rental offers

3. Reduce the whole life carbon footprint of owned and designed buildings
   KEY ACTIONS:
   • Create a plan to decarbonise the investment portfolio

Implement the decarbonisation plan for the buildings’ portfolio
   KEY ACTIONS:
   • Conduct Life Cycle Assessment (LCA) and life cycle carbon footprint optimisation for all buildings in the portfolio
   • Use materials (for all product groups) with environmental impact information (e.g. EPD)
   • Establish design specifications that take whole life carbon reduction into account
   • Create digital building logbooks

2040

1. To have a portfolio of buildings with a significantly reduced total carbon footprint
   KEY ACTIONS:
   • Retrofit the existing building stock in accordance with decarbonisation plans contained in digital building logbooks
   • Deliver new building designs with a whole life net zero carbon footprint target taken into account

2. Achieve a net zero operational carbon footprint in new buildings

3. Confirm the implementation and disseminate the idea of whole life carbon footprint reduction
   KEY ACTIONS:
   • Use a common business practice of reporting and reducing emissions in line with international standards (e.g. Science Based Targets, Carbon Disclosure Project, Net Zero Carbon Buildings Commitment)
   • Disclose data on energy demand and whole life carbon of a building/apartment in sales and rental offers

2050

All owned buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon)

SKANSKA’S CLIMATE GOAL

Skanska’s climate goal is to halve its carbon emissions by 2030 and become carbon neutral by 2045. This target covers all Skanska operations, both at project and execution level, to ensure maximum synergies with the climate target.

Key assumptions:
• to reduce the carbon footprint of Skanska’s office operations by 50% by 2030 and achieve carbon neutrality by 2045,
• to become a leader in the delivery of office buildings that are designed to protect the environment while taking people’s needs into account.

Examples of actions:
• development in 2020, in the Polish subsidiary of the Group, of an internal roadmap setting the right direction to achieve the objectives set,
• further development of company’s long-standing experience in areas related to energy efficiency, which is a key aspect in terms of reducing its carbon footprint,
• introduction of innovations in the sustainable construction strategy adopted by Skansa’s office business in CEE - e.g. the use of perovskite technology, which enables the construction of zero-energy buildings
• regular cooperation with technological partners in testing and implementing solutions aimed at reducing carbon footprint.

Key assumptions:
• to reduce the carbon footprint of Skanska’s office operations by 50% by 2030 and achieve carbon neutrality by 2045,
• to become a leader in the delivery of office buildings that are designed to protect the environment while taking people’s needs into account.

Examples of actions:
• development in 2020, in the Polish subsidiary of the Group, of an internal roadmap setting the right direction to achieve the objectives set,
• further development of company’s long-standing experience in areas related to energy efficiency, which is a key aspect in terms of reducing its carbon footprint,
• introduction of innovations in the sustainable construction strategy adopted by Skansa’s office business in CEE - e.g. the use of perovskite technology, which enables the construction of zero-energy buildings
• regular cooperation with technological partners in testing and implementing solutions aimed at reducing carbon footprint.
DESIGNERS (ARCHITECTS AND CIVIL ENGINEERS)

A key stakeholder group in the transformation process is the wider design community. Architects, engineers and consultants, through their designs, material solutions and technologies, have a major influence over the carbon footprint of buildings in all phases of their life.

<table>
<thead>
<tr>
<th>Period until</th>
<th>2025</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>Increase knowledge and awareness on decarbonisation and circular economy</td>
<td>Scale up the use and publication of carbon footprint analyses for new and retrofitted buildings</td>
<td>Design only buildings with operational net zero carbon footprint</td>
<td>Design almost exclusively net zero carbon buildings</td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
<td>• Conduct analysis and optimisation of the carbon footprint in all phases of the building life cycle during the design process (based on data sources such as EPDs)</td>
<td>• Conduct analysis and optimisation of the carbon footprint in all phases of the building life cycle during the design process (based on data sources such as EPDs)</td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>• Conduct analysis of the carbon footprint in the projects, at least in B6 phase (operational carbon)</td>
<td>• Actively search for and use substitutes for materials with a lower carbon footprint</td>
<td>• Actively search for and use substitutes for materials with a lower carbon footprint</td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>• Increase knowledge on available materials and low carbon technologies in construction and on the circular economy</td>
<td>• Develop digital building logbooks for each project</td>
<td>• Develop digital building logbooks for each project</td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>• Participate in the development of catalogues of solutions and good practices for retrofit projects and new buildings</td>
<td>• Share the environmental analysis results with the publication of project information</td>
<td>• Share the environmental analysis results with the publication of project information</td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td>• Disseminate knowledge about the carbon footprint of buildings to clients</td>
<td>• Increase the uptake of BIM technology in design to calculate and reduce the whole life carbon of designed buildings</td>
<td>• Use available software and tools for carbon footprint analysis and cooperation for their adaptation to the Polish market</td>
<td>• Gain knowledge about the carbon footprint and how it is affected by design solutions, materials and technologies used</td>
</tr>
</tbody>
</table>

Implement design solutions for buildings with a negative carbon footprint (regenerative)

Design exclusively net zero carbon buildings

Design only buildings with operational net zero carbon footprint

Design almost exclusively net zero carbon buildings
SWECO: CARBON COST VISUALISATION & OPTIMISATION

Experts from Sweco have developed and are implementing tools which allow them, using BIM models, based on appropriate algorithms, to visualise the carbon footprint of individual components as well as the entire building over the full project lifecycle.

These tools also enable advanced optimisation of the carbon footprint, e.g. of building supporting structures, by using special algorithms, parametric design and machine learning with BIM models and Grasshopper software.

In addition, with the inclusion of cost data, the carbon footprint can also be linked to finance and can therefore allow further design optimisation.

Key characteristics
- Integration of data from the BIM models of architectural and infrastructure projects, cost data and carbon footprint data of materials (based on EPDs),
- Visualisation of the BIM model of the environmental aspects of a project, with particular focus on the carbon footprint of individual building components,
- Simple identification of building components with the largest carbon footprint over the entire building life cycle,
- Design optimization and configuration using algorithms,
- Semi-automated calculation tool.

WSP UK COMMITMENT

WSP UK, the engineering professional services consultancy, will halve the carbon footprint of all designs and advice provided to clients by 2030.

This commitment announced in October 2020 will cover all WSP UK’s business areas and will build on the company’s existing commitment to reduce operational carbon emissions to net zero by 2025.

- This is the first commitment in the engineering consultancy sector to address the carbon footprint of all designs and advice provided to clients – addressing the largest impact and opportunity of all professional services companies,
- This commitment requires that WSP UK halves the carbon footprint of its designs, including both the materials that are specified in any design as well as the in-use emissions where WSP is the lead designer for key emission sources, such as heating and cooling systems,
- Where WSP provides consulting support, the footprint is calculated as the percentage of WSP’s fee against the total development costs, multiplied by the whole life carbon footprint of the project.

WSP UK’s ambitious 50% target is an absolute figure and is aligned to a commitment to limit climate warming to 1.5°C. The implementation of this commitment will enable a new skills development programme at WSP UK, developing links with higher education institutions and collaborating with WSP colleagues around the world.

SAINT-GOBAIN AND CARBON NEUTRALITY

On September 23, 2019 in New York City, Saint-Gobain Group signed the UN Global Compact’s ‘Business Ambition for 1.5°C‘ declaration. Alongside many other companies, Saint-Gobain has committed to achieving carbon neutrality; that is, reducing net carbon emissions to zero by 2050, in line with the objective of limiting the rise in temperatures to less than 1.5°C on a global scale compared to the pre-industrial era. In November 2020, Saint-Gobain outlined the roadmap towards carbon neutrality. In line with the settled trajectory, Saint-Gobain has committed to reducing its Scope 1 and Scope 2 GHG emissions by 33% (absolute value) by 2030 and its Scope 3 emissions by 16% over the same period.

Saint-Gobain is working in these directions:
- Development and dissemination of solutions to reduce energy consumption,
- Development of solutions to support the transition towards a low-carbon energy system,
- Development of solutions that help reduce the negative impact of materials used, both in terms of greenhouse gas emissions and resource consumption intensity,
- Work on its own environmental impact and striving for carbon neutrality,
- Designing products and selecting their components with respect to their potential environmental impact,
- Energy efficiency of industrial processes,
- Improvement of the energy mix used (use of decarbonised energy sources),
- Actions related to raw material supply chain e.g.: selection of suppliers that will contribute to the reduction of consumption of non-renewable raw materials,
- Actions related to transport operators e.g.: selection of operators whose fleet has the lowest emissions,
- ‘Small daily gestures’ approach - actions within everyone’s reach on a daily basis,
- Carbon capture for residual emissions.

Carbon capture for residual emissions.

“Small daily gestures” approach - actions within everyone’s reach on a daily basis,

Energy efficiency of industrial processes,

Improvement of the energy mix used (use of decarbonised energy sources),

Actions related to raw material supply chain e.g.: selection of suppliers that will contribute to the reduction of consumption of non-renewable raw materials,

Actions related to transport operators e.g.: selection of operators whose fleet has the lowest emissions,

‘Small daily gestures’ approach - actions within everyone’s reach on a daily basis,

Carbon capture for residual emissions.
MANUFACTURERS AND SUPPLIERS

Manufacturers of building materials and suppliers of building technologies are responsible for the extent of the embodied carbon footprint. For this reason, this part of the construction sector is assigned with an important role on the road to achieving the 2050 headline target.

<table>
<thead>
<tr>
<th>Period until</th>
<th>2025</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increase knowledge and awareness on decarbonisation and circular economy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Voluntarily commit to report and reduce company emissions in line with international standards (e.g. Science Based Targets, Carbon Disclosure Project)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Produce and disclose Environmental Product Declarations (EPDs) for manufactured products, or at least product emissions data in accordance with the EN-15804 standard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Analyse and explore circular business models that can reduce the carbon footprint of products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Develop product carbon reduction plans</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Create a plan for the company to achieve net zero carbon emissions by 2050 or earlier</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Implement product carbon reduction plans</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Optimise the production processes, taking into account, inter alia, the maximum use of components with a reduced carbon footprint and renewable energy sources in the production process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Implement the principles of the circular economy throughout the organisation by adapting new circular business models, extended producer responsibility and changes in the production process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Produce and publish environmental declarations (EPD) for the highest emitting products in portfolio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Achieve planned reduction in carbon footprint during production and transportation of products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>KEY ACTIONS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Produce and publish Environmental Product Declarations (EPDs) for all products in the portfolio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Increase the use of energy from renewable or low carbon sources in production and transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• External verification/confirmation of achieved reduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Deploy circular processes and business models wherever possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2050**

**Achieve net zero carbon emissions from product manufacture and transport**

**KEY ACTIONS:**
- Use maximum energy from renewable or low carbon sources in production and transport
- Offset the remaining carbon footprint
- Fully align business models and production processes with the principles of a circular economy

**2025**

2025 2030 2040 2050

**Raise awareness and communicate progress against product carbon reduction plans**

**KEY ACTIONS:**
- Regularly report and disseminate progress against product carbon reduction plans in line with international standards (e.g. Science Based Targets, Carbon Disclosure Project)
- Create transparent and clear labelling of building products and collaboration to develop industry standards in this area
CONTRACTORS

The building and construction industry is responsible for the selection of solutions, both during the process of construction of new facilities and during renovation and reconstruction of existing facilities, which may be responsible for reduction of material and energy consumption, reduction of waste generation or time of construction process.

NEVER STOP INNOVATING

Interface Ecological Missions

Interface has been a leader in sustainability since 1994, building a business that is one step away from achieving environmental neutrality. The company has achieved Mission Zero®, a corporate goal to eliminate its negative impact on the environment by 2020.

With the implementation of Mission Zero®, several very ambitious goals have been achieved:

- Usage of 100% renewable energy for carpet tile manufacturing
- Reduction of the greenhouse gas intensity of Interface’s production facilities by 96%,
- Reduction of landfill waste by 92%,
- Reduction of water consumption at production facilities by 89%,
- Reduction in the carbon footprint of carpet tiles by 74%.

By implementing a new mission statement - Climate Take Back™ - the company has committed to operate in a way that not only minimizes but reverses the effects of global warming and stimulates a climate suitable for life. To achieve this goal, the company has defined four ways of doing business:

1. LIVE ZERO - use only what can be reused, recycled or remade.
2. LOVE CARBON - stop seeing carbon dioxide as the enemy and start using it as a resource. Driven by materials science, Interface uses new and innovative materials to create products with a much lower carbon footprint. Today, all Interface products are 100% carbon neutral. What’s more, in March 2021, the company launched its first-ever products with a negative carbon footprint.
3. LET NATURE COOL - support the biosphere’s ability to regulate the environment.
4. LEAD THE INDUSTRIAL RE-REVOLUTION - share knowledge and encourage others on their sustainability journey to create a climate fit for life.

*All numbers are calculated through to 2019 and applicable to the production of Interface carpet tiles only.

CEMEX’ CLIMATE GOAL

One of the strategic priorities of CEMEX, a global building materials manufacturer, is to contribute to climate change action. In its ambitious climate target, CEMEX committed to achieve a 35% reduction in CO2 emissions by 2030 a from its plants worldwide, per tonne of cement produced (compared to a 1990 baseline). European plants have already achieved this target in 2020, so the original target has been updated to an even more ambitious level of at least a 55% reduction in CO2 emissions by 2030. CEMEX has also set a new target of supplying its customers worldwide with zero CO2 concrete by 2050.

These goals will be achieved through:

- Moving away from fossil fuels towards alternative energy sources. The company’s rate of substituting coal for alternative fuels in cement plants in Europe now averages 85%, well above the European average of around 40%.
- Reducing the clinker index in cements (the percentage of clinker in cement), by gradually replacing clinker with alternative cementitious materials and using admixtures to increase the strength of the product.
- Increasing the use of decarbonised alternative raw materials.
- Developing low-carbon products, including the production of ready-mixed concrete with net zero carbon emissions.
- Increasing the share of renewable energy in Polish plants.
- Using new milling technologies to improve the efficiency of the cement production process.

HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050

Whole life carbon roadmap for Poland
Achieve low resource and highly energy-efficient construction sites
KEY ACTIONS:
- Create construction decarbonisation plans for each project
- Use low carbon or renewable energy sources in the construction process where possible
- Publicly disclose the carbon footprint reduction achieved in the construction process
- Prioritise low carbon construction vehicles and machinery use in the construction process
- Maximise reuse of materials and waste

Develop and implement measures to reduce carbon footprint of the company and projects undertaken
KEY ACTIONS:
- Create a plan for the company to achieve net zero carbon emissions by 2050 or earlier
- Actively identify and apply alternative materials with lower carbon footprint
- Use materials (for major product groups) with environmental impact information (e.g. EPD)
- Implement policies and procedures to reduce waste generation and promote recycling
- Identify practices that lead to the reduction of carbon footprint of the construction process
- Measure the carbon footprint of the construction process for each project

Increase knowledge and awareness on decarbonisation and circular economy
KEY ACTIONS:
- Gain knowledge about the carbon footprint and how decisions and implementation solutions affect the total carbon footprint of projects
- Educate employees of construction, renovation, installation companies, to provide them with knowledge and skills in energy efficiency, use of renewable energy for heat and power production, potential of decarbonisation of buildings through selection of appropriate technologies and materials, digital solutions for modern buildings
- Voluntarily commit to report and reduce company emissions according to international standards (e.g. Science Based Targets, Carbon Disclosure Project)
- Analyse and search for circular business models that can reduce the carbon footprint of the construction process

Implement measures to reduce carbon footprint
KEY ACTIONS:
- Report and reduce company emissions in line with international standards (e.g. Science Based Targets, Carbon Disclosure Project)
- Use materials (for all product groups) with environmental impact information (e.g. EPD)
- Implement the principles of the circular economy throughout the organisation by adapting new circular business models and changes in project delivery processes
- Implement decarbonisation guidelines contained in digital building logbooks

Achieve total decarbonisation of the construction process (for new and retrofitted buildings)
KEY ACTIONS:
- Achieve climate neutrality at company/operation level
- Complete transition to low carbon vehicle fleet and equipment (own or leased)
- Cooperation with zero carbon manufacturers/suppliers/subcontractors
- Fully align business models and construction processes to the principles of a circular economy

Reduce the carbon footprint of the construction process by at least half
KEY ACTIONS:
- Use of low carbon vehicle fleet and equipment (own or leased)
- Define requirements for subcontractors regarding the carbon performance of the services offered (based on specifications of the equipment used) or creation of a database of low carbon subcontractors
Facility Managers

Managers have a significant impact on the total carbon footprint of buildings as they make important decisions about their use and end of life. Very often it depends on them as to how the building stock is maintained and when it is renovated.

Period until 2025

1. Increase knowledge and awareness on decarbonisation
   - KEY ACTIONS:
     - Gain understanding of the carbon footprint and how managers’ decisions and solutions affect the whole life carbon footprint of buildings
     - Increase knowledge on available materials, solutions and low carbon technologies in construction

2. Provide information to owners and users about the managed buildings
   - KEY ACTIONS:
     - Provide information to owners and users about the operational carbon footprint of buildings
     - Monitor and analyse data on utility consumption in the managed buildings
     - Recommend solutions to owners and users to reduce the carbon footprint

2030

1. Implement measures to decarbonise the managed buildings
   - KEY ACTIONS:
     - Conduct a full analysis of the carbon footprint of the managed buildings
     - Carry out regular inspections and continuous monitoring of buildings’ performance, comparison of actual results with targets and implementation of necessary actions to improve the results if necessary
     - Update digital building logbooks and oversee their implementation
     - Provide information to owners and users on the impact of the measures taken on the whole life carbon footprint of the building

2050

All managed buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon)

1. Achieve significant reduction in the carbon footprint of managed buildings
   - KEY ACTIONS:
     - Optimise building management processes to reduce carbon footprint against targets
**FINANCIAL INSTITUTIONS**

Decarbonisation of buildings requires specific investments and financial instruments. Hence, the role of financial institutions cannot be overestimated here. The creation of financial tools and standards that require reducing the carbon footprint of ongoing building investments will greatly assist this process.

### Key Actions:

1. **Stimulate the market to take action to decarbonise the building stock**
   - Provide discounted financing for sustainable investments (in line with EU Taxonomy requirements)
   - Create and develop financial tools for the decarbonisation process
   - Provide information and facilitate access to European funds for sustainable investments

2. **Provide financing for investments with a defined carbon footprint**
   - As part of the application for mortgages for new and existing buildings: introduce an obligation to provide a digital building logbook to monitor the total carbon footprint of the building for new buildings and the operational carbon footprint for existing buildings

3. **Provide financing for investments with a reduced carbon footprint**
   - Adapt financing criteria to align with the required level of carbon footprint reduction according to an accepted method (recommended method based on the digital building logbook)

---

**EBRD GREEN CITIES PROGRAMME**

EBRD Green Cities is a sustainability programme that strives to build a more sustainable future for cities by identifying, prioritising and connecting their environmental challenges with sustainable infrastructure investments and policy measures.

The programme offers a systematic approach to investing in municipal infrastructure improvements addressing climate change and environmental challenges in cities.

**Key characteristics**

- Delivery of strategy and policy support through Green City Action Plans (GCAP), prepared according to the “Green City Action Plan Methodology”, which is developed in cooperation with the Organisation for Economic Co-operation and Development (OECD) and Local Governments for Sustainability (ICLEI).
- Facilitating and stimulating Green City infrastructure investments, in the water and wastewater, district energy, building energy efficiency, solid waste, renewable energy, and climate resilience sectors.
- Capacity building and technical assistance to support city administrators, local stakeholders, and successful implementation of investments.

As of 1st of April 2021, 45 cities have joined the Green Cities Programme, among which are Warsaw, Kyiv, Sofia, Sarajevo, Tirana, Tbilisi, Ulaanbaatar and Amman. 13 GCAPs have been approved by the respective City Councils. The Green Cities portfolio includes 41 projects signed to date with a total volume of EUR 759 million, reducing emissions by an estimated 742,000 tonnes of CO₂ e/year.
NGOs, PROFESSIONAL ASSOCIATIONS AND UNIVERSITIES

Very often it is these institutions that initiate the discourse on important processes, this roadmap report is an example of this. In addition, this group of stakeholders is responsible for a number of accompanying activities, such as analysing processes, looking for alternative solutions, creating strategies, and verifying accepted assumptions. Their very important role is also education and promotion.

Period until 2025

1. Increase knowledge and awareness on decarbonisation and circular economy

   **KEY ACTIONS:**
   - Implement educational activities to raise awareness among all stakeholder groups
   - Develop principles for verification (auditing) of carbon footprint analyses in cooperation with international institutions (e.g.
   - Develop case studies of complete carbon footprint calculations for educational purposes
   - Provide advice on development of design guidelines to reduce carbon footprint
   - Promote the concept and techniques of decarbonisation and circular economy (e.g. in architecture competitions)

2. Create a collaborative network for the decarbonisation of buildings and the construction industry

   **KEY ACTIONS:**
   - Create definition and principles of the decarbonisation process
   - Collaborate with all stakeholders to prepare detailed decarbonisation plans for specific areas, promoting and stimulating cross-sectoral collaboration for decarbonisation of construction
   - Create/modify performance standards (e.g. instead of demolition and new construction, use of redevelopment; participation of the designer in a post-occupancy evaluation of the building after one year of operation etc.)
   - Cooperate for dissemination, promotion and implementation of Environmental Product Declarations (EPDs)
   - Develop and implement training programmes/higher education curricula related to decarbonisation of construction

3. Disseminate and develop tools to support the construction process

   **KEY ACTIONS:**
   - Co-create and promote tools to support the process of calculation and reduction of the carbon footprint
   - Cooperate with national administration to develop digital building logbooks
   - Develop BIM technologies, including carbon footprint calculation and reduction
   - Establish and develop a publicly accessible database of solutions and good practices to reduce the total carbon footprint

HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050
Whole life carbon roadmap for Poland
Accelerate the decarbonisation process

**KEY ACTIONS:**
- Develop and disseminate design solutions to enable achievement of negative carbon footprint (regenerative) in construction of buildings

Develop and improve the quality of cooperation for decarbonisation

**KEY ACTIONS:**
- Revise decarbonisation assumptions and goals (update of this roadmap)
- Disseminate knowledge on best practices, as well as typical mistakes and problems in the implementation of net zero carbon buildings, based on previously conducted verifications

2030

2040

POLISH CIRCULAR HOTSPOT (activities in the construction sector)

The Polish Circular Hotspot is a public-private cooperation platform established to transform the economic model in Poland towards a circular economy. The platform brings together local governments, public administrations, researchers and businesses to share knowledge, experience and implement joint projects in line with the concept of a circular economy.

An industry for which the transition to a circular model is crucial is the construction sector. Decarbonisation of the Polish construction industry will be possible if this fundamental change - the transition from a linear to a circular model - is taken into account. Additionally, there is a huge potential (USD 1 trillion globally) for economic gains from circular transformation.

**Key assumptions:**
- every third entity that is a member of the Polish Circular Hotspot is connected to the construction industry,
- cooperation with other initiatives, embassies and the Circular Economy Stakeholder Platform, creating a pan-European community, also for the benefit of circular construction and decarbonization of the sector.

**Key objectives in the area of construction:**
- support of circular initiatives and presentation of good practices,
- social education,
- helping companies to use circular business models,
- research and analysis and the creation of strategies and roadmaps for the transition to circular models,
- support cities in their transition to circular models,
- encouraging dissemination of circular public procurement.

All buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon)
Update the existing regulations necessary to achieve net zero carbon buildings by 2050 and enforce their implementation.

Achieve net zero operational carbon in existing buildings occupied and owned by public authorities.

Implement a decarbonisation plan for buildings owned or occupied by public authorities (new and retrofitted).

Develop tools to monitor and verify whole life carbon of buildings.

Create policy and regulations necessary to set Poland on a trajectory to achieve whole life net zero carbon buildings by 2050.

Create and develop tools necessary to achieve whole life net zero carbon buildings.

Ensure access to low carbon energy sources.

Enable the development of cost-effective construction and retrofit technologies needed for all buildings to have a net zero carbon footprint by 2050.

GOVERNMENT ADMINISTRATION

Develop and implement measures to reduce the total carbon footprint of public and private buildings.

Provide financing for investments with a defined carbon footprint.

Stimulate the market to take action to decarbonise the building stock.

LOCAL GOVERNMENT ADMINISTRATION

Achieve a zero operational carbon footprint in buildings owned by local authorities.

Support the implementation of the private building decarbonisation plan.

Implement a decarbonisation plan for buildings (new and retrofitted) owned by local authority.

FINANCIAL INSTITUTIONS

Implement the decarbonisation plan for the buildings’ portfolio.

Achieve a net zero operational carbon footprint in new buildings.

Confirm the implementation and disseminate the idea of whole life carbon footprint reduction.

Develop and implement tools to monitor and verify whole life carbon of buildings.

Provide financing exclusively for investments with a whole life net zero carbon footprint.

DEVELOPERS, INVESTORS AND BUILDING OWNERS

To have a portfolio of buildings with a significantly reduced total carbon footprint.

Provide financing for investments with a reduced carbon footprint.

Achieve a net zero operational carbon footprint in new buildings.

Increase knowledge and awareness on decarbonisation.

Identify and implement measures to reduce whole life carbon footprint.

Reduce the whole life carbon footprint of owned and designed buildings.

Stimulate the market to take action to decarbonise the building stock.

Verify and update progress towards whole life net zero carbon buildings.

Verify and update progress towards net zero carbon buildings.

Verify and update progress towards net zero carbon buildings.

All buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon).

All buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon).

All owned buildings should have at least a zero operational carbon footprint, while new and retrofitted buildings should have a whole life net zero carbon footprint (considering embodied and operational carbon).

HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050

Whole life carbon roadmap for Poland
HOW TO DECARBONISE THE BUILT ENVIRONMENT BY 2050

Whole life carbon roadmap for Poland

**2025**
- Increase knowledge and awareness on decarbonisation and circular economy
- Develop product carbon reduction plans

**2030**
- Scale up the use and publication of carbon footprint analyses for new and retrofitted buildings
- Design only buildings with operational net zero carbon footprint
- Implement product carbon reduction plans
- Raise awareness and communicate progress against product carbon reduction plans

**2040**
- Design almost exclusively net zero carbon buildings
- Achieve low resource and highly energy-efficient construction sites
- Implement measures to reduce carbon footprint
- Achieve planned reduction in carbon footprint during production and transportation of products

**2050**
- Design exclusively net zero carbon buildings
- Achieve total decarbonisation of the construction process (for new and retrofitted buildings)
- Reduce the carbon footprint of the construction process by at least half
- Achieve significant reduction in the carbon footprint of managed buildings

**CONTRACTORS**
- Increase knowledge and awareness on decarbonisation
- Provide information to owners and users about the managed buildings
- Increase knowledge and awareness on decarbonisation and circular economy
- Develop and implement measures to reduce carbon footprint of the company and projects undertaken

**MANUFACTURERS AND SUPPLIERS**
- Increase knowledge and awareness on decarbonisation and circular economy
- Develop product carbon reduction plans

**FACILITY MANAGERS**
- Increase knowledge and awareness on decarbonisation
- Provide information to owners and users about the managed buildings
- Increase knowledge and awareness on decarbonisation and circular economy
- Develop and implement measures to decarbonise the managed buildings

**NGOs, PROFESSIONAL ASSOCIATIONS AND UNIVERSITIES**
- Increase knowledge and awareness on decarbonisation and circular economy
- Create a collaborative network for the decarbonisation of buildings and the construction industry
- Disseminate and develop tools to support the construction process
- Develop and improve the quality of cooperation for decarbonisation

**MANUFACTURERS AND SUPPLIERS**
- Scale up the use and publication of carbon footprint analyses for new and retrofitted buildings
- Design only buildings with operational net zero carbon footprint

**DESIGNERS (ARCHITECTS AND CIVIL ENGINEERS)**
- Increase knowledge and awareness on decarbonisation and circular economy
- Design exclusively net zero carbon buildings
- Implement design solutions for buildings with a negative carbon footprint (regenerative)

- Implement measures to reduce carbon footprint
- Achieve total decarbonisation of the construction process (for new and retrofitted buildings)
- Design exclusively net zero carbon buildings
- Implement exclusive net zero carbon buildings
SUMMARY

Let this motto become the watchword of the report you have just finished reading.

The role of the construction sector and building stock in achieving climate neutrality for Poland, Europe and the world cannot be overestimated. Major changes need to take place at global, European and national levels. Fortunately, the process of change has already begun. The EU’s pace of implementing the principles of the European Green Deal, on the one hand, fills us with optimism, on the other, shows how much still needs to be done. Regardless of the assessment of these actions, it should be emphasised that the European legal framework for the transition towards climate neutrality is emerging and the expected support for the transition by financial institutions, through the implementation of the taxonomy, will significantly streamline the whole process.

This is good news for Poland, but our country faces a daunting challenge. The implementation of appropriate legislative solutions must begin without any delay. There is no need to kick down an open door, as there are many leaders among the EU Member States implementing ambitious policies to decarbonise their building stock. Decarbonisation of buildings (over their entire life cycle) requires continuous coordination and cooperation between government institutions, social organisations and businesses. A key task will be ensuring extensive cooperation in this field. Each of the built environment stakeholder groups mentioned in this report should immediately get involved in the implementation of the presented objectives, starting with the promotion of knowledge and raising public awareness on decarbonisation and the closed-loop economy.

The path towards the decarbonisation of Poland’s building stock and construction sector presented in the report is undoubtedly very ambitious. However, without such bold visions, it is impossible to achieve climate neutrality. Secondly, ambitious visions must be translated into ambitious strategies, as only decisive, intensified and long-term action will allow the goals of the Paris Agreement and the European Green Deal to be met.

We count on this report to be the pivot for all the action we need to take.

TOGETHER, RIGHT NOW.

2. BAM (2020) Buildings As Material Banks. Available at: [https://www.bam.com/]


7. European Investment Advisory Hub (n.d.) EUBRIS. Available at: [https://www.eubris.org/about-the-platform]


13. European Investment Bank (n.d.) EFINA instrument do wsparcia inwestycji w efektywność energetyczną w budynkach mieszkaniowych. Available at: [https://www.eib.org/]

14. Finsen Institute. Available at: [https://www.finseninstitute.org]


16. Ministerstwo Rolnictwa, Pracy i Technologii (n.d.) Centralny rejestr charakterystyk energetycznych budynków. Available at: [https://eduroam.org/en/]


