CZECH GREEN BUILDING COUNCIL
CZGBC

ZERØ CARBON ROADMAP

Pathway to Climate-Neutral Buildings in the Czech Republic

Information on EBRD financing and WGBC patronage

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Table of Contents

01

Executive summary

This document is a detailed roadmap for decarbonising the building stock by 2050. The aim is for the country to have a coherent national strategy for energy, climate and building transformation. At the same time, conditions will be created for buildings to have a climate neutral impact in terms of their construction, use, maintenance and renovation, as well as their final disposal.

In order to achieve the set objectives, the following measures need to be implemented:

- At the strategic level, it is essential that the Government of the Czech Republic clearly formulates a **comprehensive national strategy** for climate protection, energy and construction transformation and ensures **coherence of the sub-policies** and strategies. In cooperation with ministries, the **necessary data should be monitored and collected**, specific action plans developed and their implementation monitored.
- At the legislative level, it is crucial to ensure a **predictable legal environment**. This requires timely and high-quality transposition of the relevant directives, definition of the **interpretation of the EU Taxonomy rules** and regulation of the rules for financing energy saving projects.
- In the area of **implementing energy savings**, it is essential to significantly **accelerate high-quality renovation of** existing buildings. It is necessary to **coordinate the** conditions with different ministries and ensure **continuity of** relevant **subsidy programmes** and to involve the financial sector more significantly. These steps need to be supported by the creation of a national contact centre that would ensure that building owners are made aware of the options for implementing energy savings effectively.
- **State and local governments need to embrace this agenda, take responsibility and lead by example** as model investors and stewards of environmentally friendly properties. An important part of this is a systematic promotion of quality planning and preparation of environmentally friendly public procurement, including the use of alternative methods of procurement and financing of investment projects.
- In the area of **reducing embodied emissions**, it is essential to provide building material manufacturers with systematic support aimed at developing and implementing decarbonisation plans for production, non-financial reporting and the development of EPDs. Technical standards need to be updated to increase the use of natural, recycled and other low carbon footprint materials. The use of these materials should be encouraged through bonuses in subsidy programmes. For designers and architects, there is a need to legislate rules for reporting greenhouse gas emissions in buildings and to create a database of embodied emissions of building materials and products. It is also necessary to promote the development of calculation and optimisation tools to support building design.
- In the area of **low carbon energy** development, it is important to continue to support the implementation of renewable energy for all building types and owners. A key component of decarbonising communities is to strongly support the transformation of existing and the construction of new heating systems using low carbon energy sources and the implementation of pilot projects of energy positive neighbourhoods.
- It is necessary to align existing planning instruments (territorial energy concepts, local energy concepts and action plans for sustainable energy and climate) into one coherent plan for energy transformation and the transition to sustainable economy. In addition, it is necessary to ensure a **systematic methodological and project support from the regional levels** to smaller territorial areas in terms of conceptual long-term planning and implementation of investments in high-quality new building construction and building renovations.
- It is essential **to step up support for technical research** on smart grids, energy storage, the development of new materials with a low carbon footprint, new carbon capture and utilisation and storage (CCUS) technologies and piloting energy positive neighbourhoods. In the socio-economic area, it is necessary **to ensure a systematic monitoring of the society's perception of energy transition and sustainability**, and a good understanding of target groups, to facilitate communication and motivation to implement energy saving measures. In parallel, the economics of programmes, measures and incentives for key players need to be continuously evaluated.
- **In the field of education, it is essential to reinforce the themes of sustainability, decarbonisation and energy savings at all levels of education.** Existing courses of study need to be expanded and new ones introduced at both the secondary and higher education levels to generate workforce with sufficient expertise and technical skills. In the fields of sustainability, clean energy, circular economy and construction digitalisation, lifelong learning capacities must be expanded to enable re-qualification of existing employees.
- It is essential to ensure a **systematic, long-term information and education campaign to raise awareness of possible measures to** reduce greenhouse gas emissions. The campaign will focus on increasing demand for low-emission solutions in the construction, renovation and operation of buildings and on providing information regarding decarbonisation to construction companies. The format shall be tailored to specific target groups on the basis of systematic sociological research and discussions with experts, industry organisations, professional associations and non-profit organisations.

The transition to sustainable energy and environmentally friendly construction sectors requires a comprehensive and coordinated approach. Some companies have already started to take steps towards this goal. At this point in time, it is essential to secure the cooperation with and support of government institutions, as they have a role in establishing favourable conditions for the implementation of measures aimed at sustainability and decarbonisation of the construction sector in the Czech Republic.

All measures are detailed in chapter 7 of this study.

Zero Carbon Roadmap

Pathway to Climate-Neutral Buildings in the Czech Republic

National strategy:

Comprehensive strategy for climate protection, transformation of energy and construction industry

Legislative environment:

A transparent environment motivating the implementation of eco-friendly projects.

Realization of energy savings:

Quality renovation, systematic support with the involvement of the financial sector.

Examplary role of state:

High-quality construction and operation of real estate of state institutions with respect to the environment.

Reducing embodied emissions:

Support for materials with a low carbon footprint.

Development of low-emission energy:

Renewable energy sources, low-emission heating systems, smart grids, energy positive neighborhoods.

Education and research:

Sustainability, clean energy, sustainable materials.

Public awareness:

Systematic awareness campaigns on reducing emissions.

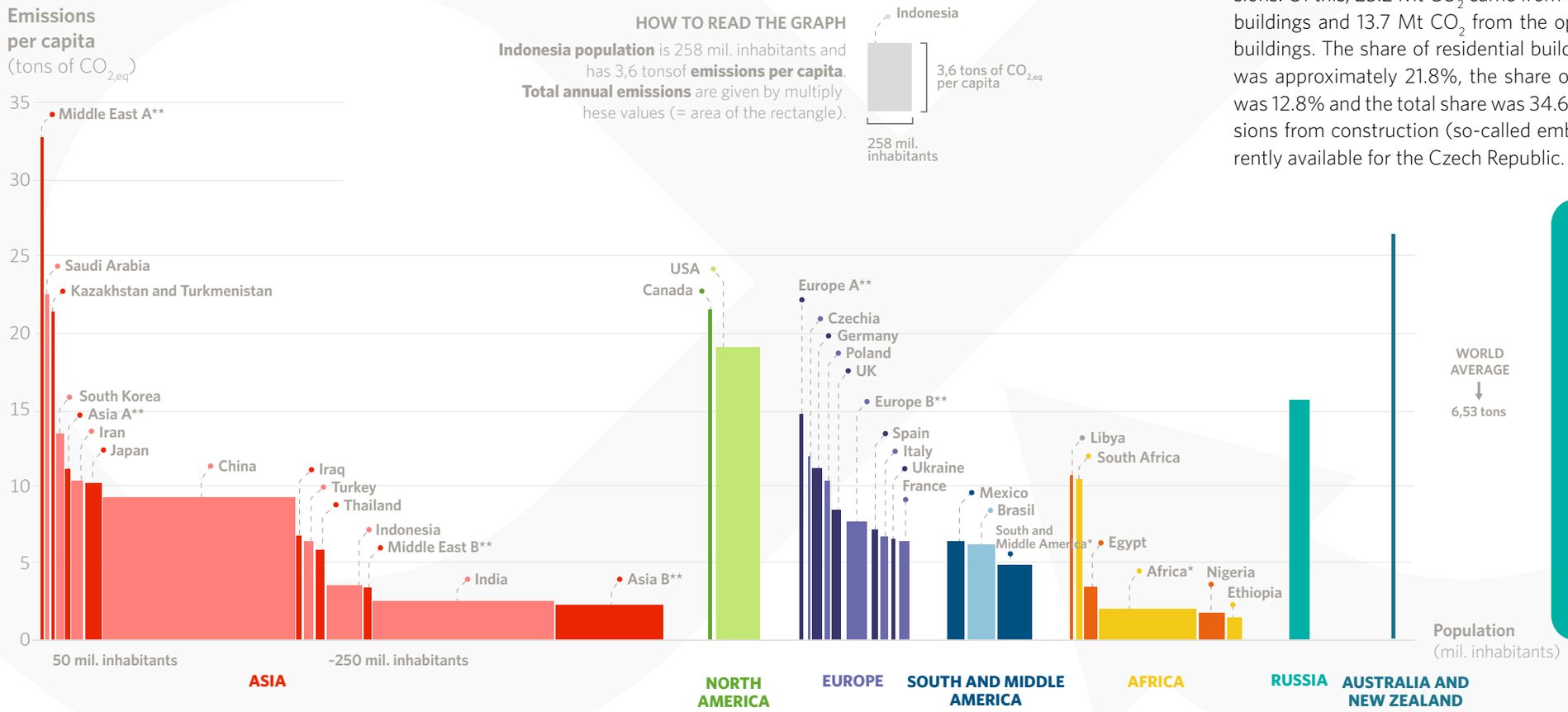
02

/ Introduction

World regions emissions per capita

Comparison of chosen countries and World regions by GHG emissions per year per capita in 2015 in tons of $CO_{2,eq}$.

Continents (plus Russia) ordered according total GHG emissions.



Source: VERZE 2020, Licence CC by 4.0, faktaoklimatu.cz/emise-svet-na-osobu
Data source: Společné výzkumné středisko Evropské komise a Světová banka

With 12 tonnes of $CO_{2,eq}$ per capita per year, the Czech Republic is a significant producer of greenhouse gases. This value is twice the world average and 1.4 times higher than the EU average.

For the Czech Republic, the Chance for Buildings Alliance, in cooperation with the Czech Technical University, quantified the CO_2 emissions associated with the operation of the Czech building stock in 2016 to a total of 36.9 Mt CO_2, i.e. 34.6% of national emissions. Of this, 23.2 Mt CO_2 came from the operation of residential buildings and 13.7 Mt CO_2 from the operation of non-residential buildings. The share of residential buildings in national emissions was approximately 21.8%, the share of non-residential buildings was 12.8% and the total share was 34.6%. However, data on emissions from construction (so-called embodied emissions) are currently available for the Czech Republic.

$CO_{2,eq}$: In energy, transport and other sectors where fuel combustion is essential, these are direct CO_2 emissions. In agriculture and waste management, these are mainly emissions of methane (CH_4) and nitrous oxide (N_2O) converted to the amount of CO_2 emissions, which would have the same warming effect.

Zero Carbon Roadmap

Minimizing carbon footprint of building in the Czech Republic

2.1. Objectives of the Roadmap

The main objective of the roadmap is to clearly summarise which changes need to be made in order for the construction, renovation, refurbishment, subsequent operation and demolition of buildings to contribute to the decarbonisation commitments. The document clearly summarises the current state of the Czech building sector in the context of emissions and presents possible scenarios leading to a climate-neutral building stock. Based on annual consulting with key stakeholders, it identifies the main barriers to decarbonisation in the building sector and proposes the necessary steps to overcome them. The individual measures, including the necessary timeframe, are summarised in the form of a roadmap that includes tasks for stakeholders.

2.2. The roadmapping process

The framework content specification was agreed with the World Green Building Council (WorldGBC) and the European Bank for Development Research (EBRD), which provided support and funding. A Steering Committee was established which asked the authoring team to prepare the document.

The outline content of the document and the workflow was initially established in collaboration with the Steering Committee and subsequently agreed with the WorldGBC and EBRD. The work involved intensive collaboration with the Council members and other invited experts through interactive workshops, individual discussions with experts and representatives of industry organizations and government. The progress was discussed with the Steering Committee on an on-going basis.

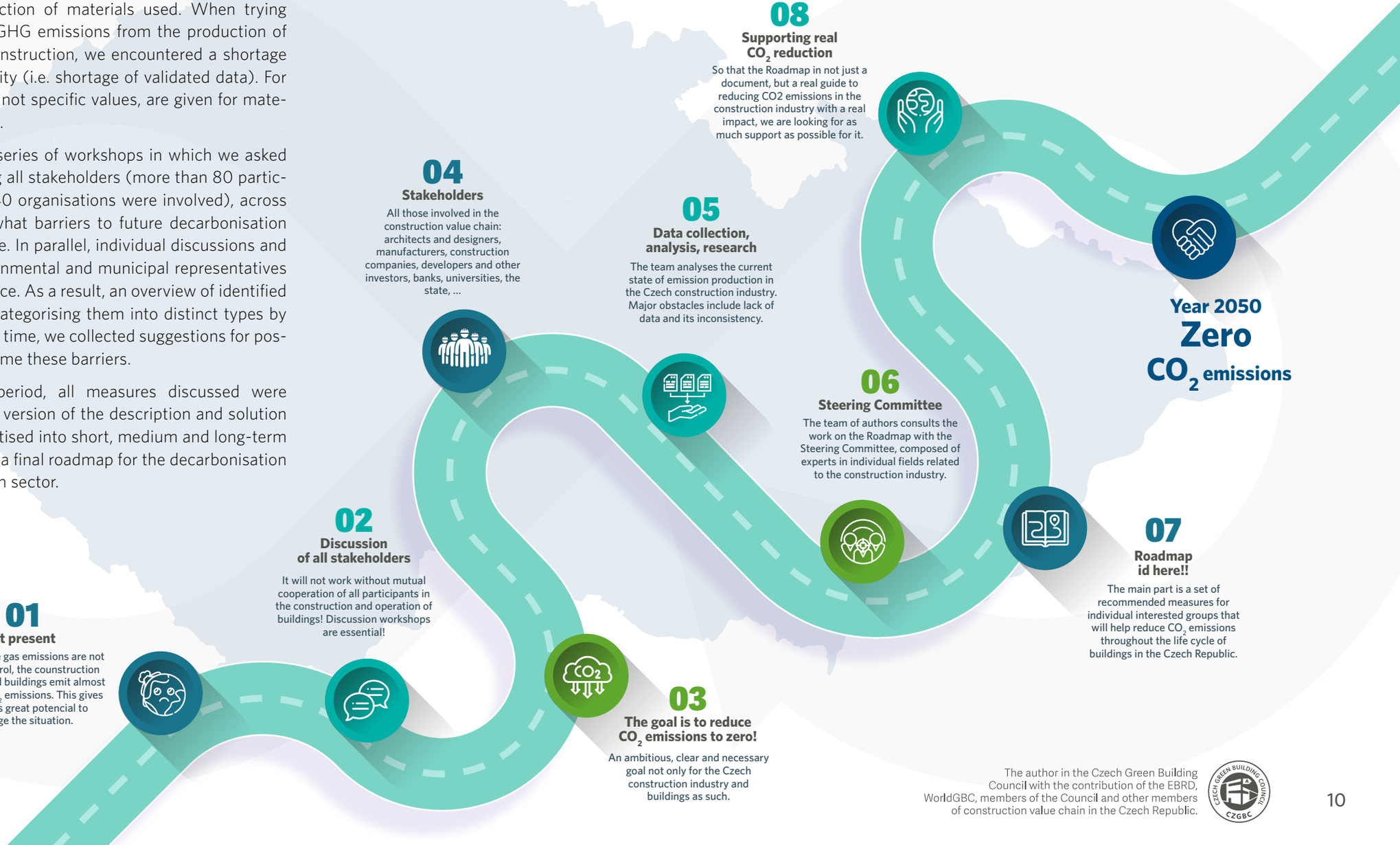
Initial activities included the collection of data on the building sector in the Czech Republic, their emission intensity in terms of operation and production of materials used. When trying to quantify the current GHG emissions from the production of building materials for construction, we encountered a shortage of data of sufficient quality (i.e. shortage of validated data). For this reason, only ranges, not specific values, are given for material flows to construction.

This was followed by a series of workshops in which we asked participants representing all stakeholders (more than 80 participants from more than 40 organisations were involved), across the building life cycle, what barriers to future decarbonisation of buildings they perceive. In parallel, individual discussions and consultations with governmental and municipal representatives and other actors took place. As a result, an overview of identified barriers was compiled, categorising them into distinct types by their nature. At the same time, we collected suggestions for possible measures to overcome these barriers.

During the comment period, all measures discussed were back-validated. The final version of the description and solution of the barriers was prioritised into short, medium and long-term plans and organised into a final roadmap for the decarbonisation of the Czech construction sector.

Zero Carbon Roadmap

Minimizing carbon footprint of building in the Czech Republic



The author in the Czech Green Building Council with the contribution of the EBRD, WorldGBC, members of the Council and other members of construction value chain in the Czech Republic.

03

Czech construction industry in the context of climate commitments

3.1. International strategic documents and policies on decarbonisation of the construction sector

The Paris Agreement[1], as the cornerstone document for decarbonisation measures, sets out an action plan to limit global warming, i.e. governments have set a target to keep the increase in global average temperature below 2°C compared to pre-industrial levels and will continue to strive to keep it below 1.5°C. The EU countries are moving towards the goal of becoming the first climate neutral region by 2050.

The current decarbonisation policy is based on a set of policy initiatives, notably the Green Deal for Europe, which expresses the EU's commitment to achieving climate neutrality by 2050, with a sub-target of 55% reduction in greenhouse gas emissions in 2030. These ambitious new targets, accompanied by additional transformation measures in seven areas (energy, transport, buildings, industry and circular economy, agriculture, biodiversity and ecosystem restoration, zero pollution) and mainstreaming sustainability into all EU policies (financing, investment and equitable transformation), are designed to ensure the transformation of the economy and its full decarbonisation.

In construction-related areas, the Green Deal aims to deliver: renovated, energy-efficient buildings; clean energy and cutting-edge clean technology innovations; longer-lasting products that can be repaired, recycled and reused; and a globally competitive and resilient industry.

[1] The Paris Agreement was adopted by the Parties to the UN Framework Convention on Climate Change in December 2015. It entered into force on 4 November 2016, with at least 55 countries collectively responsible for at least 55% of global greenhouse gas emissions meeting the condition for ratification. All EU countries have ratified the agreement.

It is these ambitions that the European Commission has reflected in the "Fit for 55" package, which for the building sector includes: the EU ETS and its extension to buildings and transport, the revision of the Energy Taxation Directive, the Carbon Border Adjustment Mechanism (CBAM), the revision of the Effort Sharing Regulation, the revision of the Energy Efficiency Directive, the revision of the Renewable Energy Directive.

In addition to the "Fit for 55" package, a "New Circular Economy Action Plan" has been adopted in addition to the Green Deal for Europe, given the need to address the significant environmental burden of resource extraction and processing[2], or the "EU Action Plan for Heat Pumps". The main objective of the Circular Economy Action Plan is to preserve the value and extend the life cycle of materials, reduce the amount of waste produced and produce and use more sustainable products. It also includes a regulation on construction products. The proposed Construction Products Regulation sets out harmonised EU rules for the marketing of construction products (circular economy, longer life, easy reparability, recyclability). The European Circular Economy Action Plan is reflected to in the Czech Republic's Circular Economy Strategic Framework 2040 as an implementation document.

Another emerging document supporting the reduction of the environmental burden in terms of energy efficiency in the decarbonisation of the heating and cooling sector is the "EU Action Plan for Heat Pumps".[3]

In line with the objectives of the EU Green Deal, the REPowerEU plan calls for investment in renewable energy sources and energy efficiency. It aims to reduce the import of fossil fuels, double the current rate of deployment of heat pumps in buildings and accelerate the deployment of heat pumps in large district heating and cooling networks. The European Commission's 2022 report on the competitiveness of clean energy technologies states that the deployment of all types of heat pumps is necessary to meet the set climate targets.

In the framework of Environmental Social Corporation Governance (ESG), the Corporate Sustainability Reporting Directive (CSRD) will also be complemented by the Corporate Sustainability Due Diligence (CSDD) directive.

[2] According to the European Commission, the construction ecosystem represents almost 5.5% of EU GDP and employs around 25 million people in more than 5 million companies. There are 430 000 companies in the EU construction products industry with a turnover of €800 billion. These are mainly SMEs. Buildings account for around 50% of the extraction and consumption of natural resources and more than 30% of all waste each year. Buildings also account for 40% of energy consumption in the EU and 36% of energy-related greenhouse gas emissions.

[3] https://energy.ec.europa.eu/topics/energy-efficiency/heat-pumps_en

3.2. National strategic documents and policies on decarbonisation of the construction sector

The development of the construction sector as a separate topic is not anchored in any overarching strategic document in the Czech Republic. Individual tasks for the construction sector as such, and for its sub-areas related to sustainability or more efficient use of material and energy resources, are included in a number of other strategic materials.[4]

The overarching strategic document for environmental protection is the **State Environmental Policy of the Czech Republic 2030** with a view to 2050 (SPŽP 2030[5]), which defines, among other things, cross-sectional measures to increase energy efficiency. The main measures here include reducing the energy intensity of buildings, achieving energy savings in heating, promoting highly efficient combined heat and power production or efficient thermal energy supply systems.

[4] DoubleDecker project Status Quo Analysis; https://database.craftedu.eu/cs/vystupy

[5] https://www.mzp.cz/C1257458002F0DC7/cz/statni_politika_zivotniho_prostredi/$FILE/OPZPUR-statni_politika_zp_2030_s_vyhledem_2050-20220615.pdf

The Climate Protection Policy in the Czech Republic[6] defines the main objectives and measures in the field of climate protection at the national level in order to ensure that greenhouse gas emission reduction targets are met in relation to the obligations arising from international agreements (in particular the Paris Agreement and the EU legislation). This strategy focuses on the period 2017 to 2030, with a view to 2050, and should thus contribute to the long-term transition to a sustainable low-carbon economy in the Czech Republic.

Climate protection policy includes cross-sectional themes, sectoral measures as well as measures in the areas of research and development, monitoring and international development cooperation.

The National Energy and Climate Plan of the Czech Republic is the basis for the Czech energy policy and the outline for the implementation of the Green Deal objectives in the field of energy savings, RES use and environmental protection. The Plan contains the objectives and main policies of the so-called Energy Union, according to which Member States are obliged to report on their national contribution to the agreed European targets in the field of greenhouse gas emissions, renewable energy sources, energy efficiency and interconnectivity of the electricity/transmission system[7]. The final version of the Plan is expected to be available in mid-2024.

The 2015 State Energy Concept (SEC) defines 5 strategic priorities for the next 25 years. These priorities include a balanced mix of primary energy sources and sources of electricity generation using all available domestic resources, increasing energy efficiency, strengthening international cooperation and integration of electricity and gas markets in the region, and promoting research, development and innovation. The current government has committed to update the State Energy Concept in 2024. The basis for its elaboration, which includes the commitments of the Fit for 55% package, is available on the MIT website[8].

Buildings are specifically addressed in the **Long-Term Building Renovation Strategy**[9], which was developed by the Chance for Buildings Alliance to support the renovation of the stock of residential and other buildings, public and private. The strategy includes an assessment of the building stock and model scenarios of possible evolution of building renovations with indicative milestones for 2030, 2040 and 2050.

Increasing the use of recycled materials in construction products will also contribute to reducing greenhouse emissions in the construction sector, which will be supported by the **Circular Czech Republic 2040 Action Plan for the period 2022—2027**[10].

In this context, MPO will also update the Secondary Raw Materials Policy for the next period in 2024.

In the future, decarbonization can also be helped by the introduction of BIM, robotization, the use of additive technologies, digital twins and digitalization in general, which are also effective tools for optimizing construction processes, leading to a reduction in material consumption, or a reduction in the carbon footprint (BIM concept).

[6] https://www.mzp.cz/cz/politika_ochrany_klimatu_2017

[7] https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/vnitrostatni-plan-ceske-republiky-v-oblasti-energetiky-a-klimatu--252016/

[8] https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/vychodiska-aktualizace-statni-energeticke-koncepce-cr-a-souvisejicich-strategickych-dokumentu--273672/

[9] https://www.mpo.cz/assets/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/2020/6/_20_III_dlouhodoba_strategie_renovaci_20200520_schvalene.pdf

[10] https://www.mzp.cz/C1257458002F0DC7/cz/news_20230621_Cirkularnimu--Cesku-jsme-o-krok-bliz-Vlada-schvalila-prvni-Akcni-plan-pro-cirkularni-ekonomiku-do-roku-2027/$FILE/AP_C%C4%8C_2040.pdf

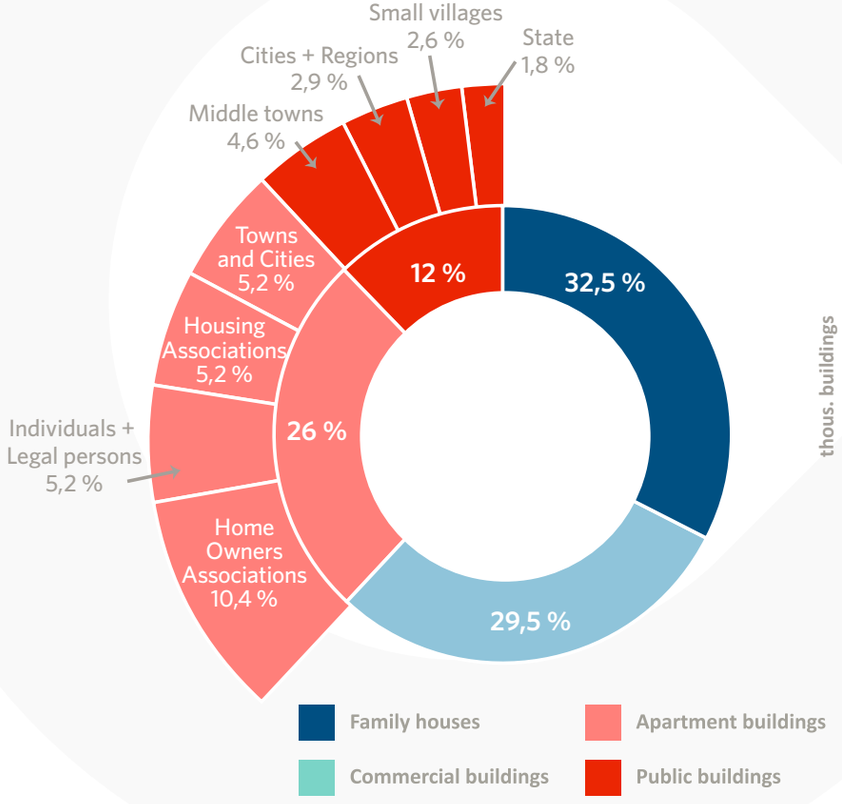
04

Baseline analysis

4.1. The national building stock and its development

The following chart shows the current breakdown of the building stock in the Czech Republic in terms of ownership and typology.

Floor area of buildings in the Czech Republic



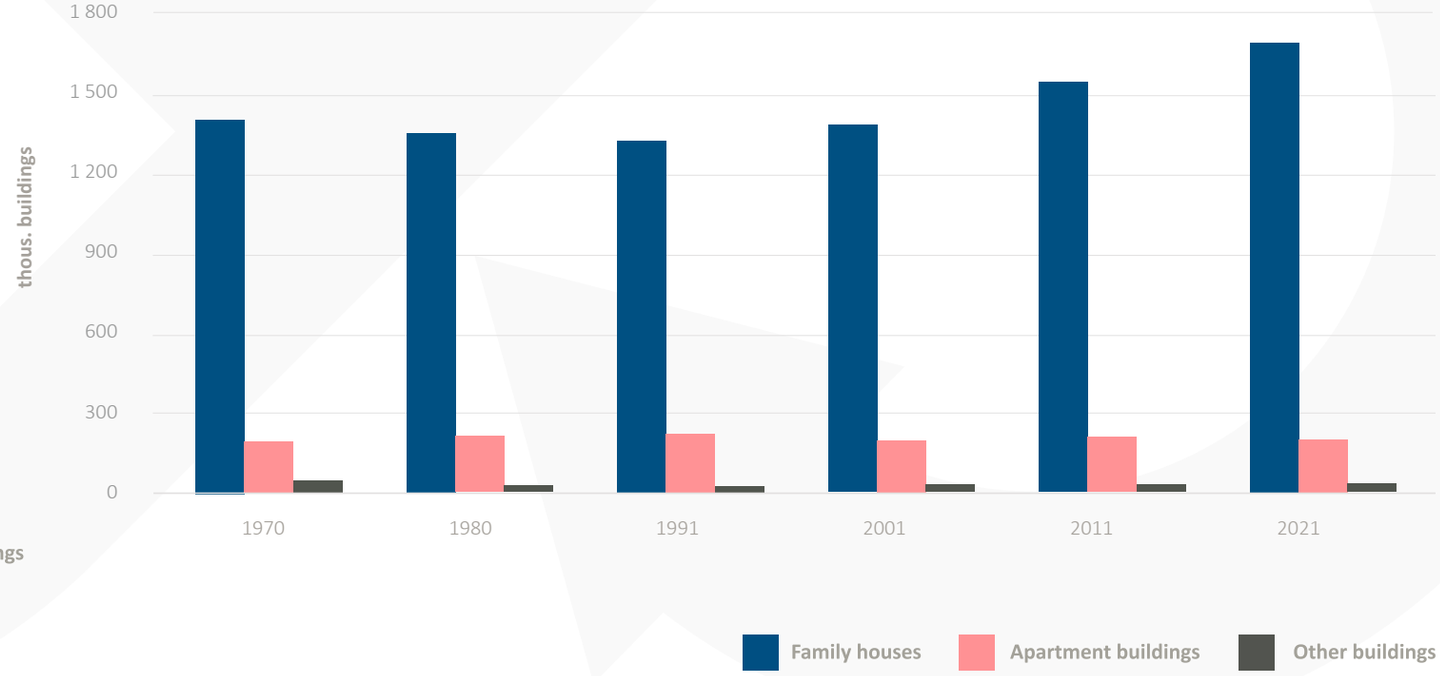
Source: Šance pro budovy, Dlouhodobá strategie renovace budov v České republice, aktualizace květen 2020

4.1.1. Residential sector in the Czech Republic — current status

According to the most recent data found in the latest Census of Houses and Flats (2021) the number new houses and flats increased by 159,000 as compared to the data of 2011. The total number of occupied dwellings, i.e. over 1.9 million, consisted of more than 1.7 million single-family houses, just under 208,000 apartment buildings and more than 35,000 other buildings.[1]

The total average number of rooms in an apartment was 3.9 and the average floor area was 87.6 m^2. The average number of persons living in an apartment was: 2.3 persons, with 35.7% of the apartments occupied by only one person.

Development of the structure of residential buildings in the Czech Republic



[1] https://www.czso.cz/csu/scitani2021/druh-domu

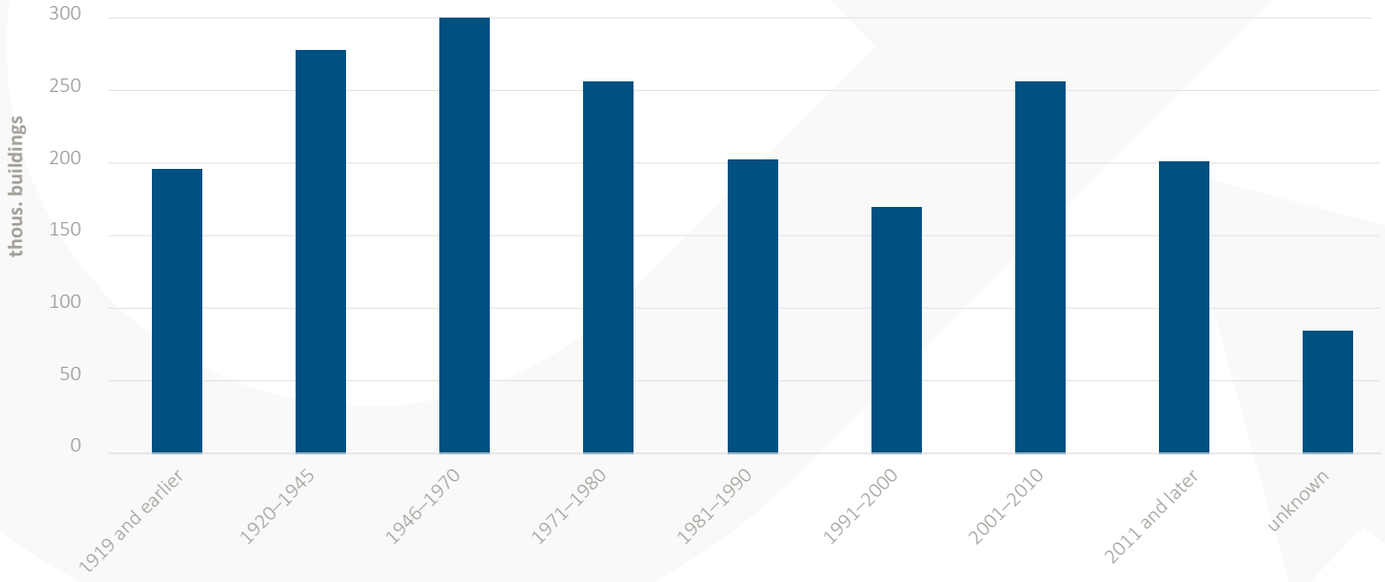
4.1.1.1. Residential sector of the Czech Republic — reconstruction

The CZSO data shows the development of renovation of floor area of apartment buildings from 2016 to 2020 and indicates that the total floor area of unrenovated buildings is decreasing very slightly.[2]

In 2020, more than 100 million m^2 of the total floor area of 250 million m^2 was completely unrenovated. The value decreased by approximately 20 million m^2 since 2016. The renovations that were completed were mostly shallow and partial. Profound renovations account for only about one tenth of the total renovations in the long term.

The results of the 2021 Census show a distribution of buildings by period of construction or reconstruction. The results indicate that the highest proportion of newly built or renovated buildings over the last ten years are located in the Central Bohemia Region, specifically one in four. The Central Bohemian Region also has the highest proportion of occupied buildings built or reconstructed after 1991 (42.5%) of all regions. In the Zlín and Moravian-Silesian Regions, about half of the completed or reconstructed inhabited buildings date from the period 1946—1990. Relatively the largest number of inhabited buildings built before 1920 are located in the Liberec Region (19.8%) and the Ústí Region (19.3%).

Residential buildings by period of construction or reconstruction



[2] https://www.czso.cz/documents/10180/20541251/1804110518_23.pdf/
https://www.mpo.cz/assets/cz/energetika/energeticka-ucinnost/2020/4/_III_dlouhodoba_strategie_renovaci_200331_final_MPR.pdf

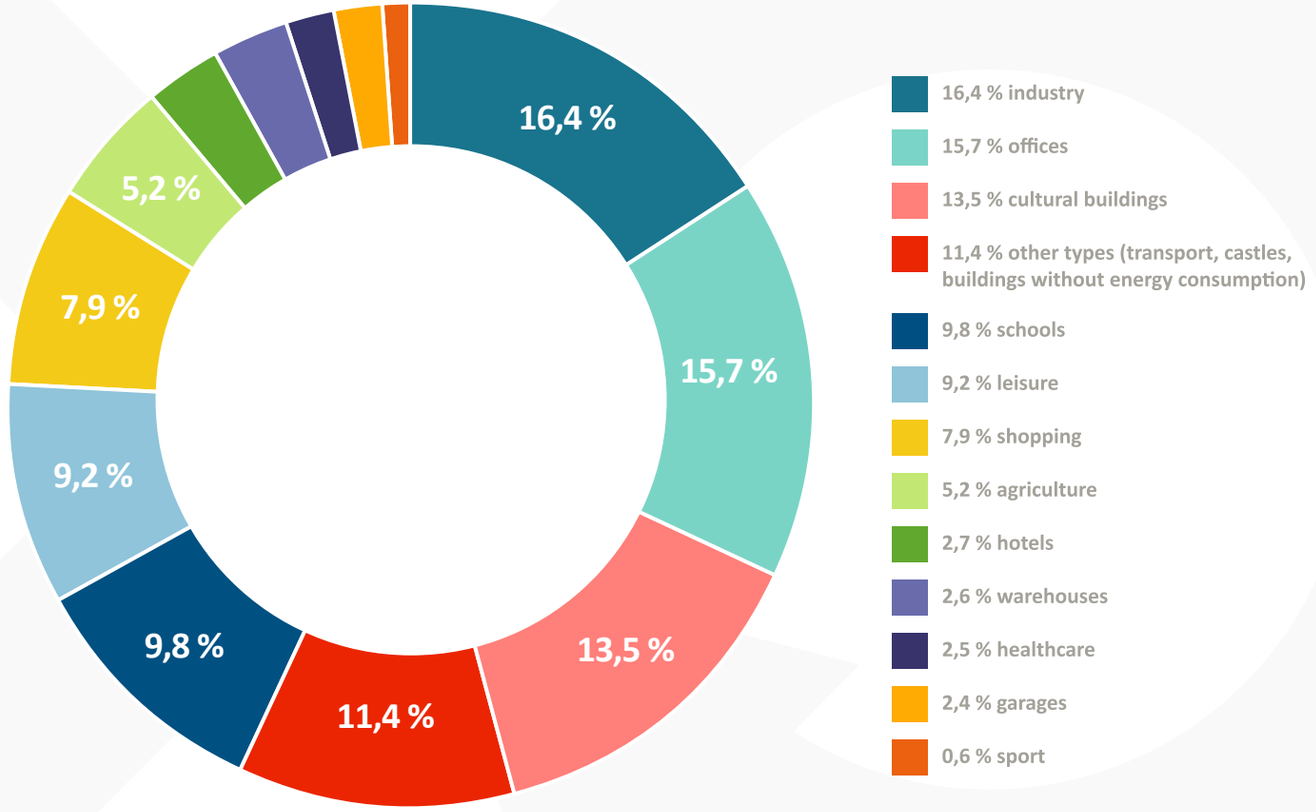
4.1.2. Non-residential sector — current status

Buildings in the service, industrial and agricultural sectors are recorded by the Czech Statistical Office only if they have a house number. The numbers of these buildings are shown in the table below. An estimate is also given regarding the percentage of heated buildings in each category. Based on the average floor area of the buildings, which is known, the total floor area of all buildings and the total are a of heated buildings have been estimated.[3]

The total number of non-residential buildings in the Czech Republic is approximately 613,000. For only 4% of them the floor area is known.

The total area of non-residential buildings is 251.2 million m^2 Subtracting the categories of buildings that are considered unheated (the garage, castles and manor houses and the "no energy consumption" category) and subtracting 50% of the area of warehouses, recreation and "unspecified" category (this is an estimate of the percentage of unheated buildings in this category) provides an estimate of the floor area of heated buildings of 215.9 million m^2. In the next step, a correction was made between the floor area reported by the statistical data and the actual (estimated) energy reference area of 15%. The total area of heated non-residential buildings for determining the potential savings is therefore considered to be **248.3 million m^2**.

Composition of the non-residential building stock in the Czech Republic in 2016, specifying % of total floor area (source Chance for Buildings[4])



Source: Chance for Buildings

[3] A survey of the stock of non-residential buildings in the Czech Republic and savings opportunities in them; 2016; http://sanceprobudovy.cz/wpcontent/uploads/2018/04/pruzkum-nerezidencnich-budov-v-cr.pdf

[4] For the non-residential sector, the "Buildings 1—99 Survey of Non-Residential Buildings and Selected Residential Buildings" was used and supplemented with data from the Register of Territorial Identification, Addresses and Properties and Building Authorities.

The state owns 45% of the buildings in the non-residential sector, larger municipalities own 33% and small municipalities, cities and regions own the remaining 22%.[5]

Similarly as for the residential sector, the development of non-residential building renovation is only gradual.[6] In 2020, approximately 40% of the total floor area was fully unrenovated. Completed renovations were mostly shallow and partial.

4.2. Energy consumption in buildings in the Czech Republic

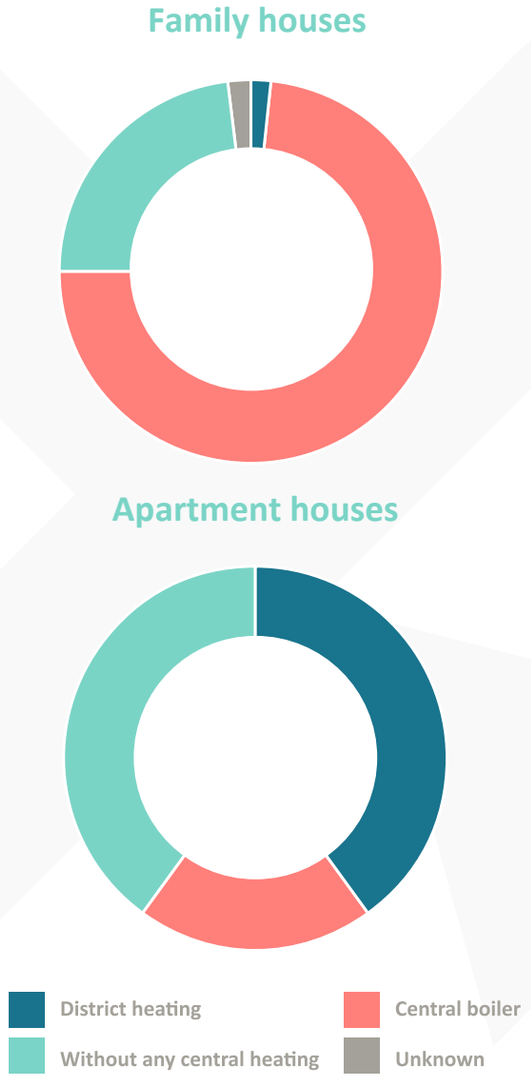
Energy consumption in buildings in the Czech Republic is divided into consumption in the residential sector (family and apartment buildings) and in the non-residential sector.

4.2.1. Development of final energy consumption in the residential sector

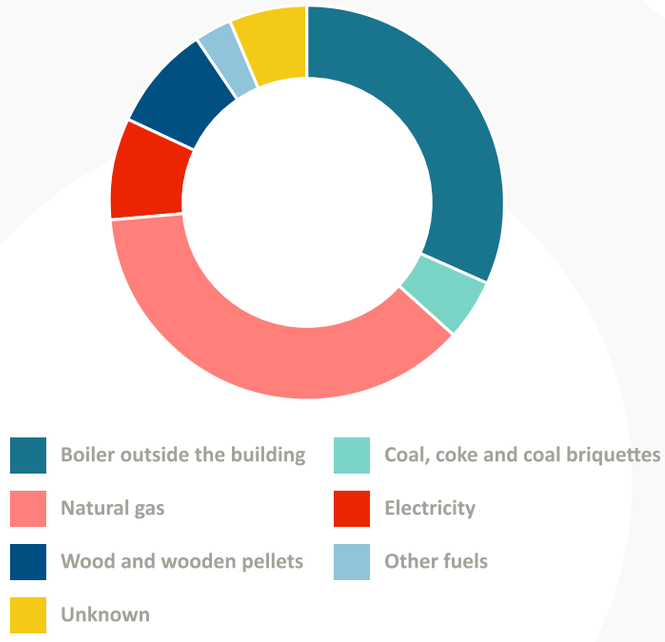
More than two-thirds (68.0%) of the occupied buildings, where information on the heating method is available, had central domestic heating from an in-house boiler. Approximately one in twenty (5.6%) occupied buildings were heated by central heating from an external boiler or heating plant. More than a quarter (26.4%) of occupied buildings did not have central heating.[7]

The main source of energy for heating residential buildings is natural gas (37%), the second largest share is boiler rooms outside the house (36%). Electricity was the main source of heating for less than a tenth of the apartments, as well as wood and wood pellets.

Occupied buildings by heating type in 2021



Occupied buildings by fuel type in 2021



The largest share, specifically 30% of the total final energy consumption in the Czech Republic, is accounted for by households, i.e. family and apartment buildings. For 2011, the final energy consumption in residential sector was at the level of 246 to 252 PJ (according to different methodologies), in 2017 the final energy consumption in households was already at the level of 307 PJ[8], and in 2020 it was 299 PJ[9].

[5] For the non-residential sector, the "Buildings 1—99 Survey of Non-Residential Buildings and Selected Residential Buildings" was used and supplemented with data from the Register of Territorial Identification, Addresses and Properties and Building Authorities.

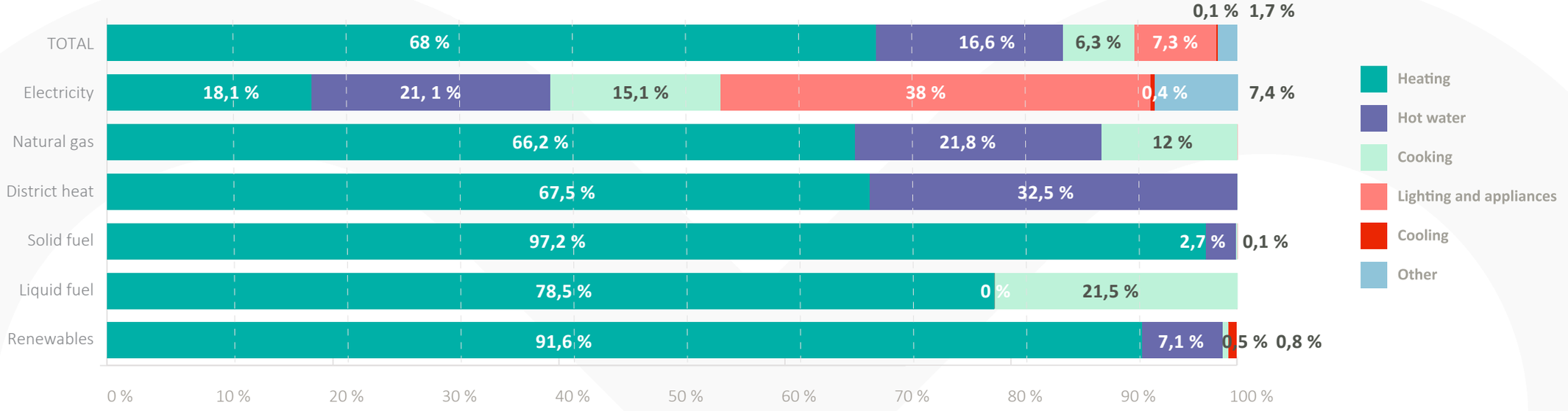
6 https://www.mpo.cz/assets/cz/energetika/energeticka-ucinnost/2020/4/_III_dlouhodoba_strategie_renovaci_200331_final_MPR.pdf

[7] https://www.czso.cz/csu/scitani2021/zpusob-vytapeni

[8] https://energy.ec.europa.eu/system/files/2020-06/cz_2020_ltrs_0.pdf

[9] According to CZSO calculations from the international household questionnaire

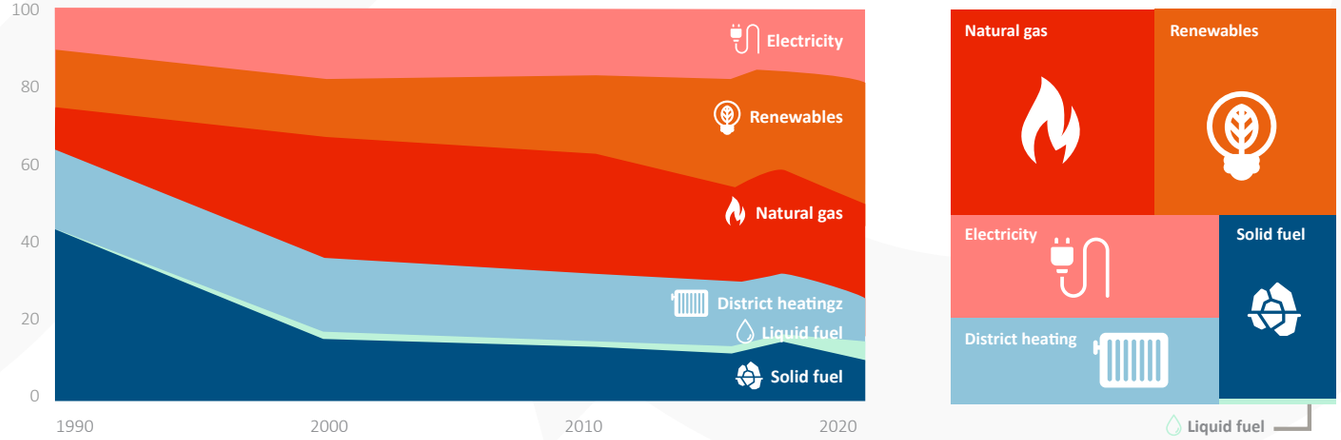
Final energy consumption by purpose of use in 2020 and by fuel type (ENERGO 2021)



Heating currently accounts for the largest share, followed by water heating, lighting and appliances, as shown in the figure below (ENERGO 2021 data[10]). While these three types of end use currently dominate the energy demand, the biggest increase in demand over the last decade has been recorded for cooling and cooling appliances (e.g. refrigerators, washing machines, televisions and air conditioners). According to the International Energy Agency (IEA), energy demand for cooling is projected to triple between 2016 and 2050 (IEA 2018).[11]

The following figure shows the evolution of the different sources of energy supplied to buildings between 1990 and 2020. Renewable sources have a relatively large representation, and biomass combustion is also counted in this category. A significant proportion comes from the direct use of fossil fuels — coal, oil and natural gas.

Development of fuel and energy consumption in households (ENERGO 2021)



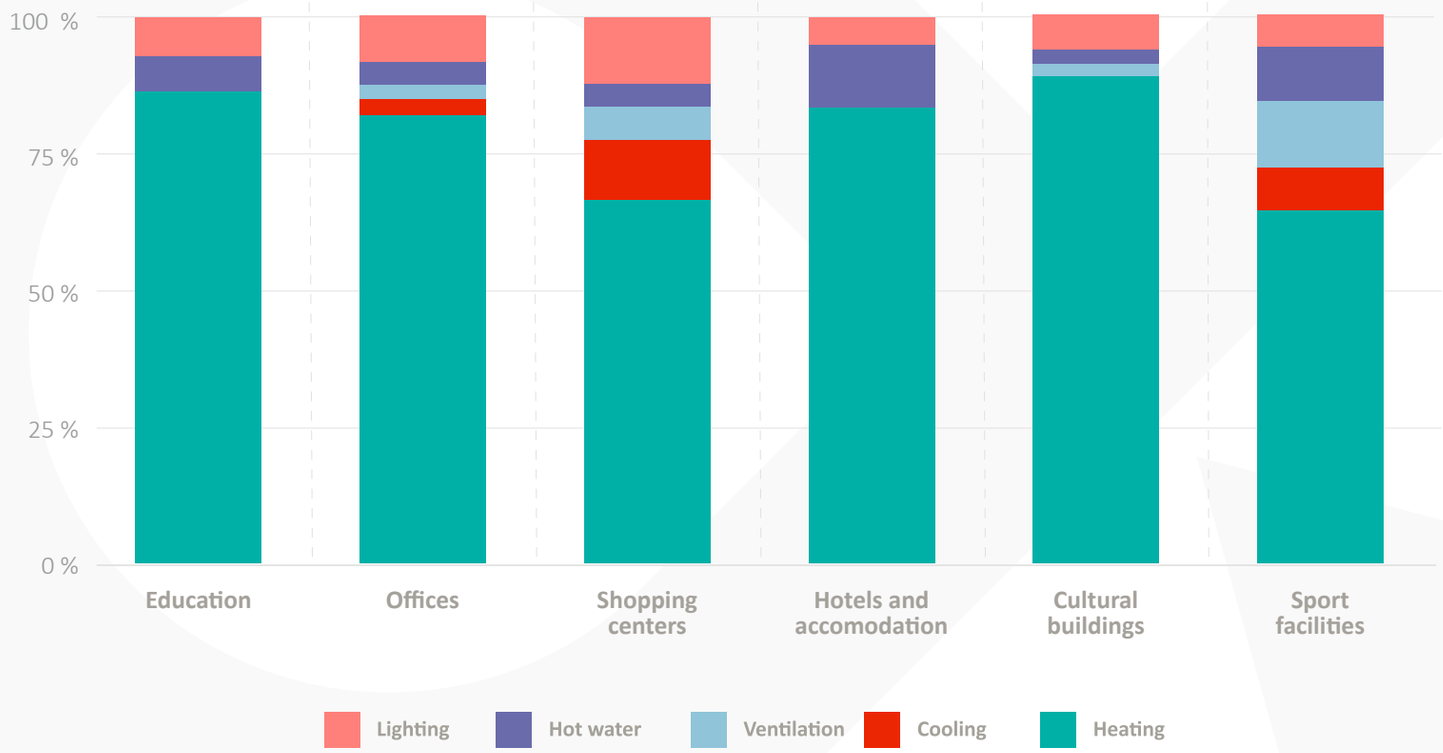
[10] https://www.statistikaamy.cz/2017/02/23/co-ukazalo-energo-2015/

[11] https://unfccc.int/sites/default/files/resource/UNFCCC%20Compendium%20GhG%20Building%20Sector.pdf

4.2.2. Development of final energy consumption in the non-residential sector

According to the Long-term Renovation Strategy document, the final energy consumption in 2011 was approximately 126 PJ in the service sector and 23 PJ in the agricultural sector. In 2017, 133 PJ in the service sector and 26 PJ in the agricultural sector.[12]

Percentage distribution of supplied energy for different types of non-residential buildings[13]



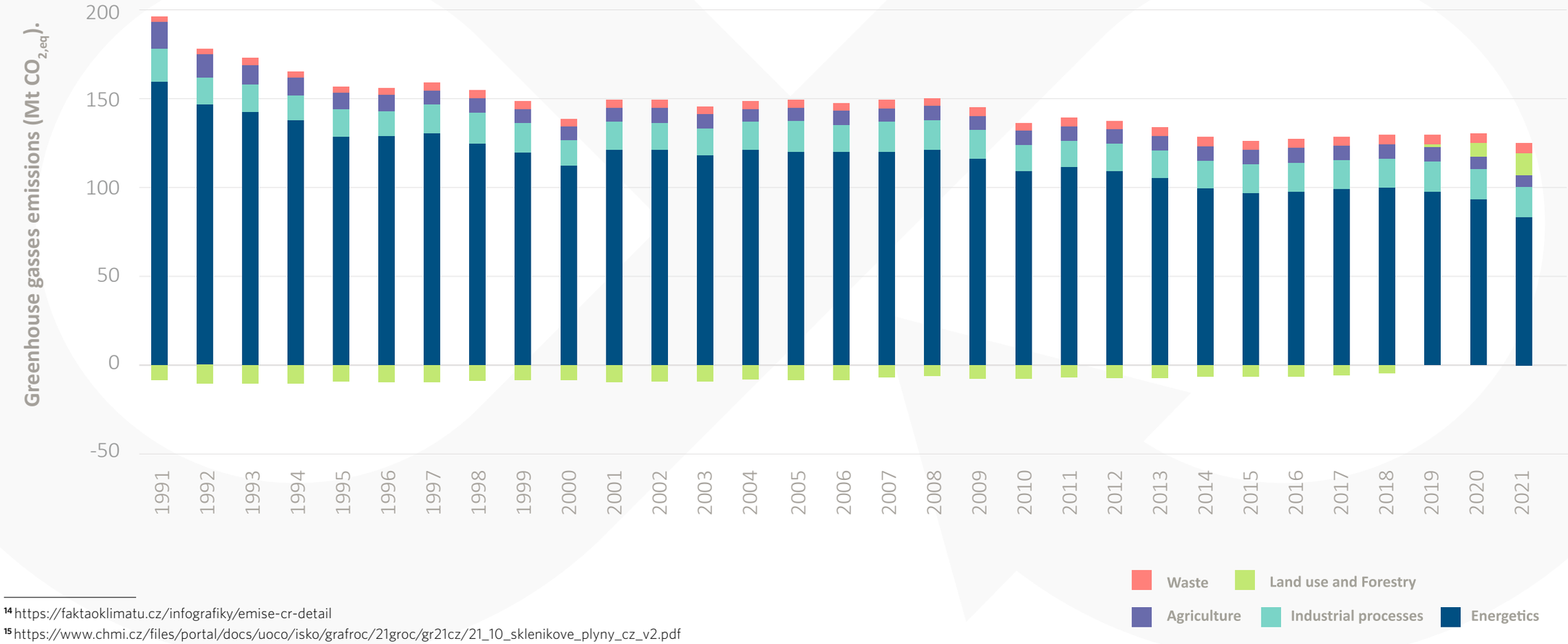
[12] https://www.mpo-efekt.cz/upload/7799f3fd595eeee1fa66875530f33e8a/4515_sance_pro_budovy_analyza-fondu-nerezidencnich-budov-v-cr-a-moznosti-uspor-v--nich-spb-15-1-2015-final.pdf

[13] https://www.mpo-efekt.cz/upload/7799f3fd595eeee1fa66875530f33e8a/4515_sance_pro_budovy_analyza-fondu-nerezidencnich-budov-v-cr-a-moznosti-uspor-v--nich-spb-15-1-2015-final.pdf

4.3. Greenhouse gas emissions in the Czech Republic

Czech greenhouse gas emissions are regularly reported to the UN by the Czech Hydrometeorological Institute (CHMI). According to the latest available report, the Czech Republic emitted a total of 113 Mt $CO_{2,eq}$ in 2020 (92 Mt CO_2; this is the value excluding emissions from forestry and land use, i.e. excluding LULUCF). On a per capita basis, this is 10.63 tonnes of $CO_{2,eq}$.[14]

Share of Greenhouse gasses emissions in 1990—2020[15]



[14] https://faktaoklimatu.cz/infografiky/emise-cr-detail

[15] https://www.chmi.cz/files/portal/docs/uoco/isko/grafroc/21groc/gr21cz/21_10_sklenikove_plyny_cz_v2.pdf

4.4. Greenhouse gas emissions in buildings

Emissions generated by buildings can be divided into emissions related to the operation of buildings (operational emissions) and emissions related to the extraction of raw materials, production of building products, their transport, installation and demolition (embodied emissions).

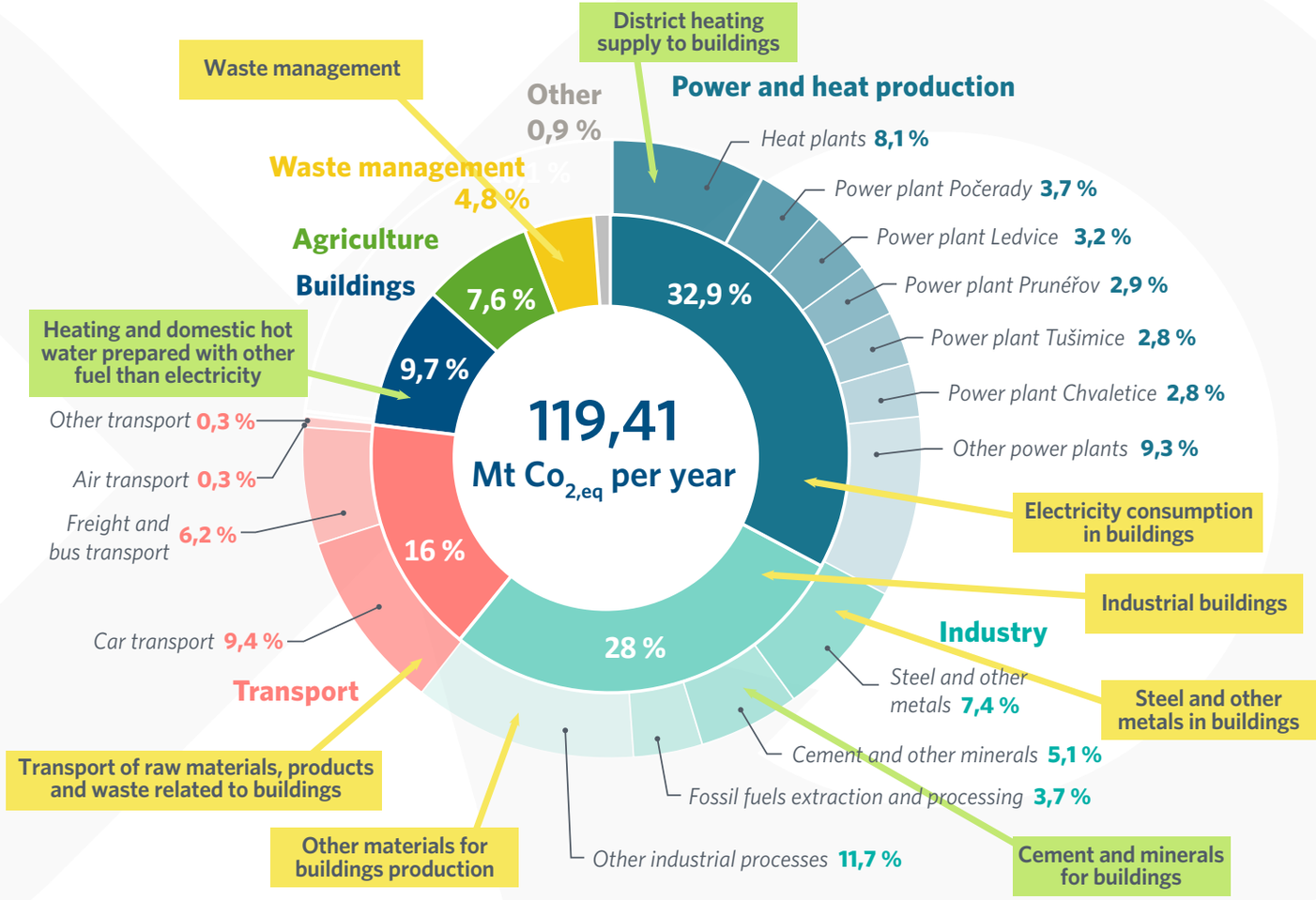
Operational emissions in buildings are by far the most significant (embodied emissions are growing in importance). The two main emission sources are mainly related to the combustion of fossil fuels for heating, cooking (direct emissions) and the use of energy such as electricity or district heating from external sources (indirect emissions).

The extraction, processing of raw materials and production of the final products used in the construction of buildings is an energy and carbon intensive process. The most important components of modern construction are cement and cement products. Other important materials include metals such as steel and aluminium. These materials have a significant impact on the total amount of embodied emissions. Wood is also increasingly used, which, provided it comes from sustainably managed forests, is a renewable material and is generally considered to be associated with low or zero greenhouse gas emissions.

The construction and operation of buildings is not separate categories in terms of statistics and economic activities, so it is difficult to clearly define building-related emissions. However, the following charts show the total sources of GHG emissions and highlight the categories that are directly related to buildings.

In the Czech Republic, greenhouse gas emissions come from several dozen of the largest emitters. These are mainly power plants, thermal power plants, followed by iron and steel works, refineries, lime and cement plants (The emitters shown on the map account for 87% of emissions from the Czech Republic's emission permits, which cover 48% of total Czech emissions).

GHG emissions in the Czech Republic by sector in 2021
(Source: Fakta o klimatu)

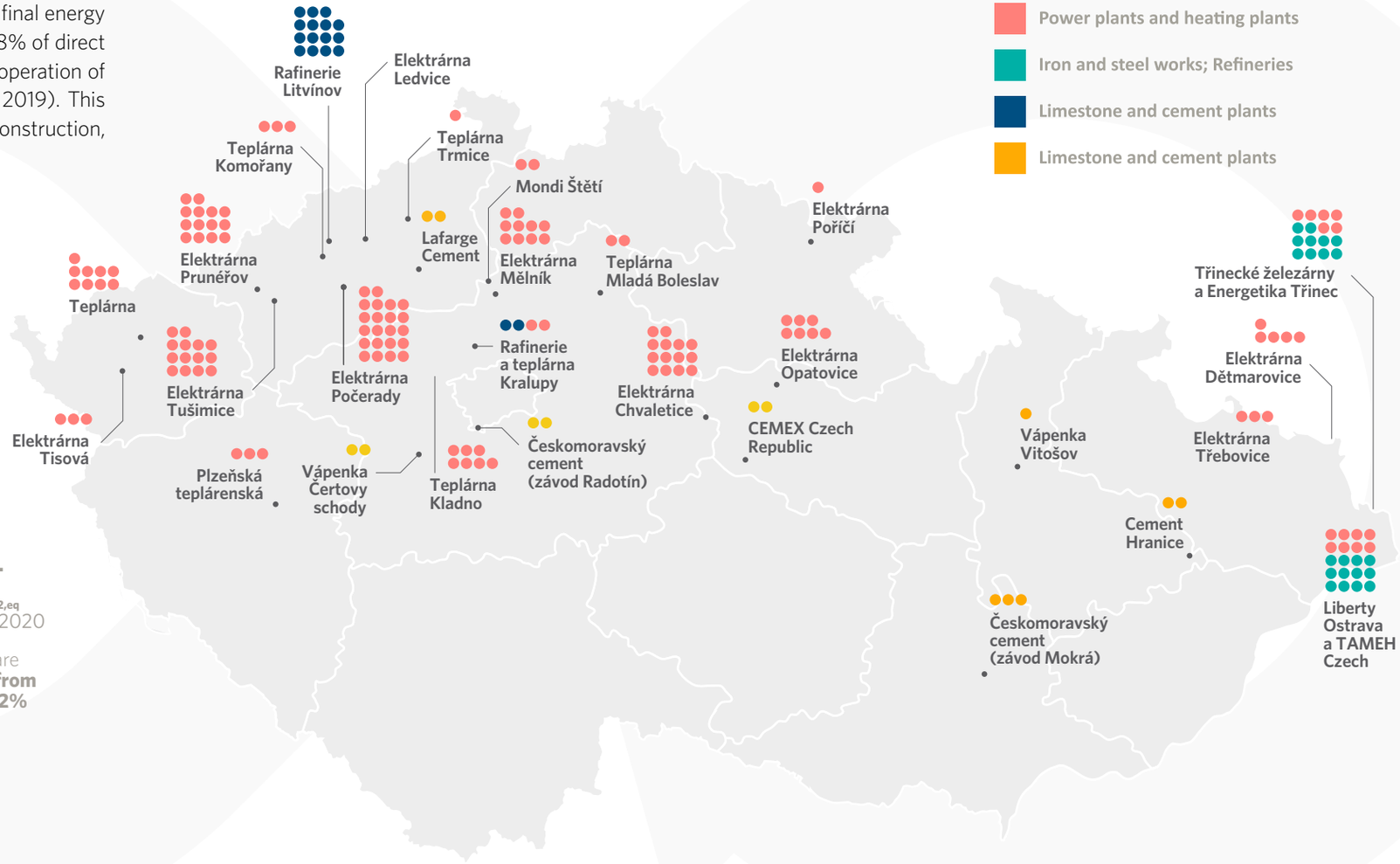


Green bubbles = The whole segment relates to construction and buildings.
Yellow bubbles = Only a part of the segment relates to construction and buildings

Several tens of the biggest sources share 42% of all Czech GHG emissions.

Taking into account the overall environmental impact, construction and operation of buildings globally account for 35% of final energy consumption (according to the UNFCCC report) and 38% of direct and indirect CO_2 emissions from the construction and operation of residential and non-residential buildings (Global ABC 2019). This makes the construction sector, including new building construction, the largest energy consumer and the largest emitter.[16]

The biggest CO_2 Emitters in the Czech Republic in 2020



Emission allowances cover **48% of all annual emissions.**

48 % — **113,7 Mt $CO_{2,eq}$** emisí v roce 2020

87 % — **Emitters identified in the map** are responsible for **87% emissions from these allowances.** It equals to **42% of all Czech GHG emissions.**

Source: VERZE 2020, Licence CC by 4.0, faktaoklimatu.cz/emise-svet-na-osobu

[16] https://unfccc.int/sites/default/files/resource/UNFCCC%20Compendium%20GhG%20Building%20Sector.pdf

4.4.1. Operational greenhouse gas emissions from buildings

Emissions from building operations were quantified by Chance for Buildings in 2020[17]. Specifically, these were the CO_2 emissions related to the operation of the Czech residential and non-residential stock based on statistics from 2016. Unfortunately, data for the GWP indicator are not available.

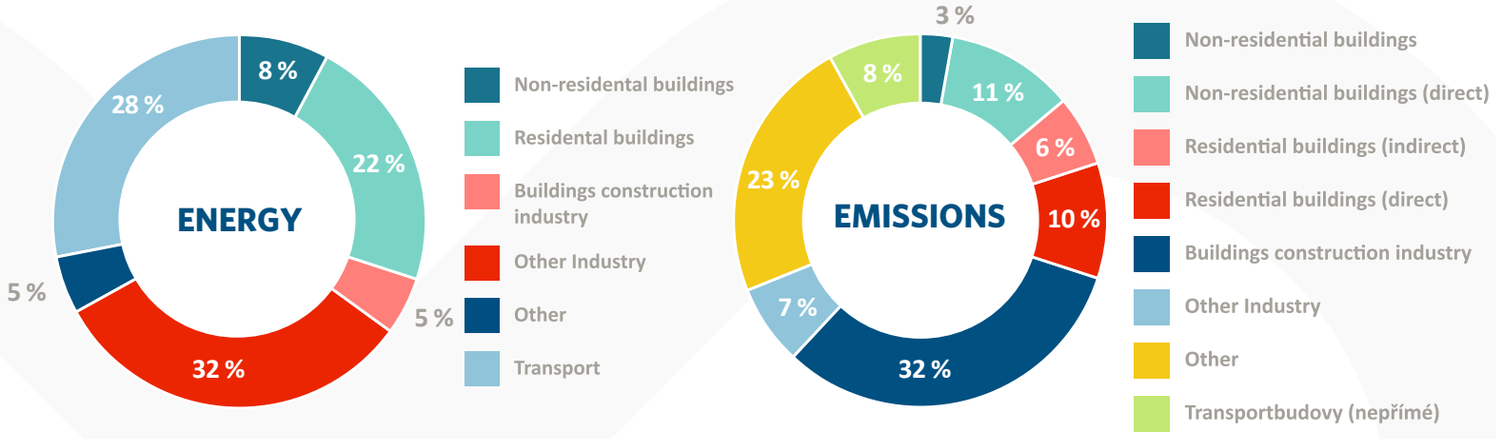
The results of the calculations show that the building stock produced a total of 36.9 Mt CO_2, with residential buildings producing 23.3 Mt CO_2 and non-residential buildings producing 13.7 Mt CO_2. The total floor area of buildings in 2016 was 599.49 m^2, and the average emission intensity for the entire building stock was 61.6 kg CO_2/(m^2 year). In the same year, the national emissions were 106.6 Mt CO_2, which means that the share of operating the building stock in total national emissions was approximately 34.7%. The share of residential buildings in national emissions was approximately 21.9% and the share of non-residential buildings was 12.9%.

4.4.2. Embodied emissions

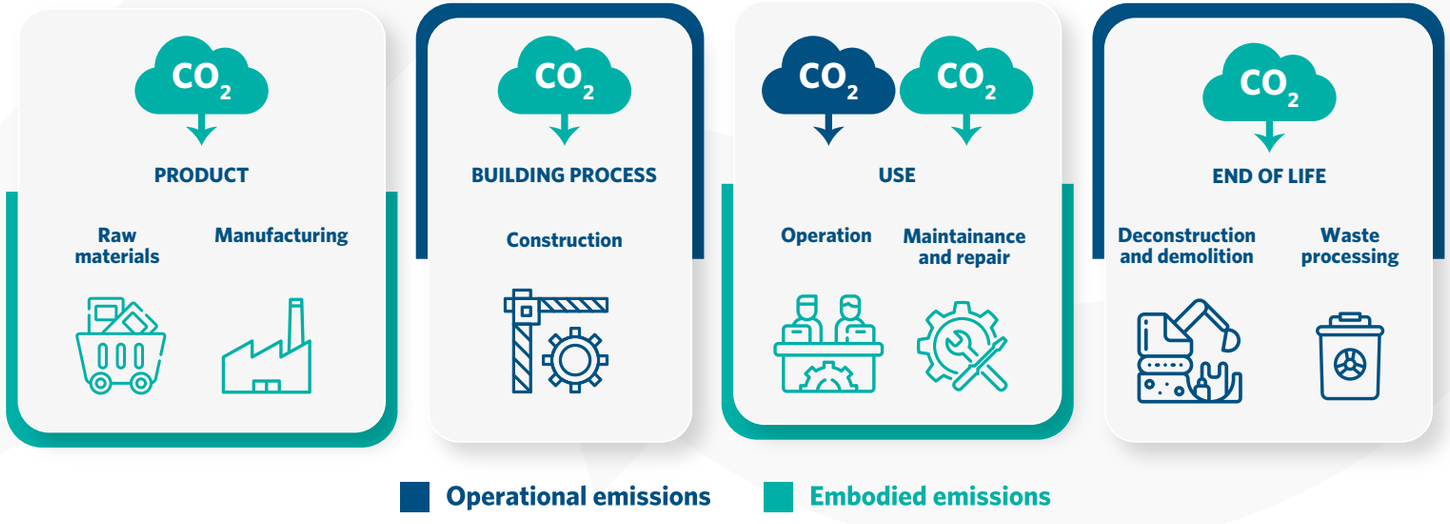
Not only the operation of buildings, but also the entire life cycle of the materials used in the construction sector affect the total amount of CO_2 emissions in this sector. Embodied emissions are emissions that include the production of the materials used for the construction of the buildings, the construction phase and end-of-life related emissions. A representation of operational and embodied emissions is shown in the following figure.

[17] Šance pro budovy, Dlouhodobá strategie renovace budov v České republice, aktualizace květen 2020

Global share of buildings and construstion final energy and emissions
2019



Operational and embodied emissions (BPIE)



Embodied emissions from building construction and renovation can account for 20—25% of the building total life cycle emissions (in the EU). The average embodied emissions in new buildings in Europe are 600 kg $CO_{2,eq}/m^2$, of which 70% is emitted during the material production and construction phase[18]. With the decline in operational emissions from buildings, embodied emissions are projected to account for more than half of total construction emissions by 2035. Embodied emissions are currently not regulated and their measurement and mitigation within the construction sector is usually voluntary. The current revision of EPBD IV is expected to bring the first obligations for GWP measurement of buildings including embodied emissions.

Importance of embodied carbon grows proportionally as the energy demand is reduced and energy sources are decarbonized.

The relationship between operational and embodied carbon reduction[19]

Over time, the operational energy decarbonizes

Operational carbon (energy)

Embodied carbon (materials)

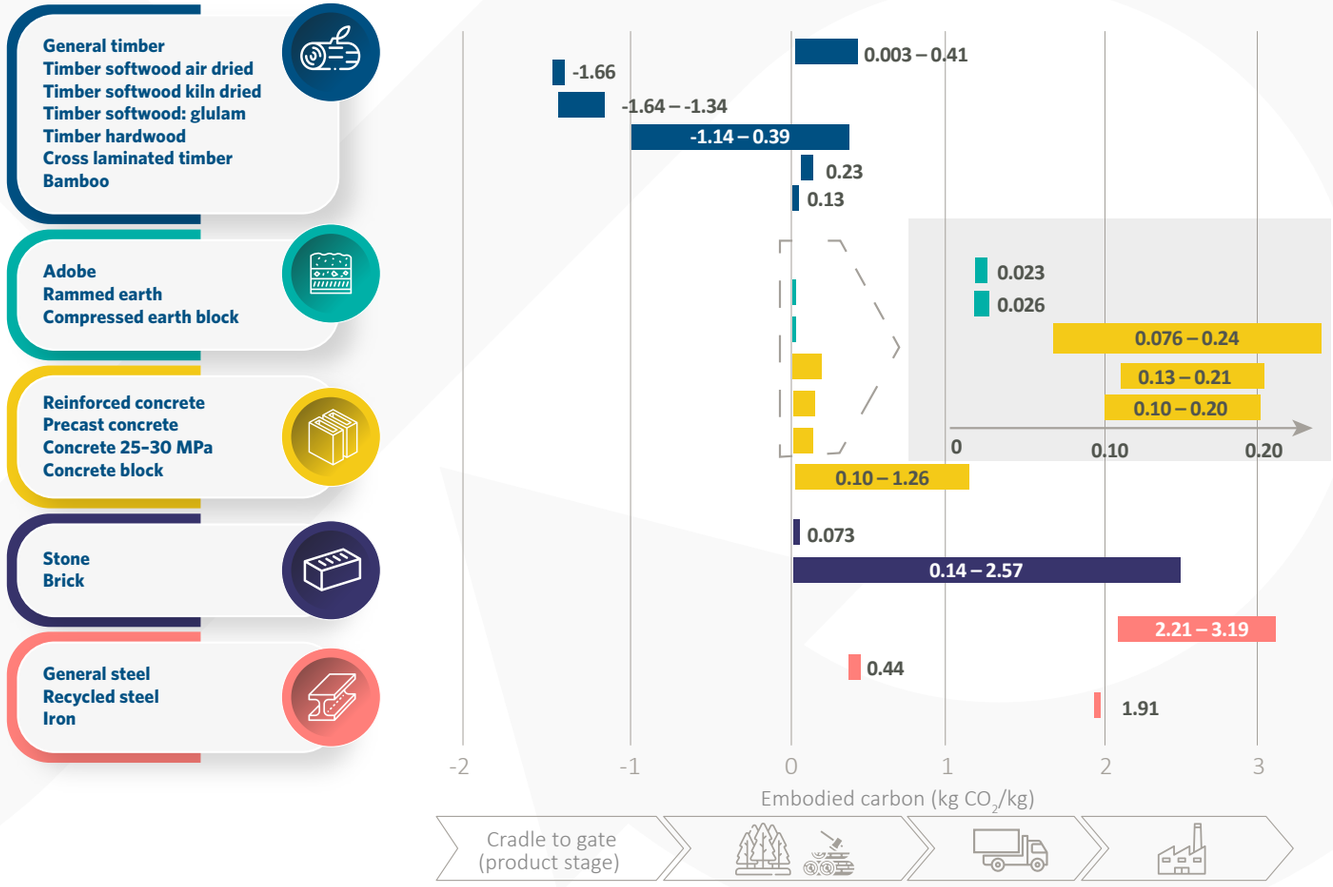
[18] The role of the circular economy in the decarbonisation of industry (Incien 2022)

[19] WBCSD, Decarbonizing construction — Guidance for investors and developers to reduce embodied carbon

4.4.3.Emissions associated with the production of the main building materials

Embodied carbon emissions associated with construction can be summarised into several basic material types, namely: concrete, steel and iron, other metals (especially aluminium), insulation, plaster, cement, mortar, glass and wood. Steel is the material with the highest embodied emissions. Embodied emissions in masonry are higher than in concrete. Wood and wood products have the lowest value, typically around 0.01 kg CO_2 per kg of material. In some methodologies, wood is counted as a biogenic carbon sink and for this reason its emission factors can be negative.[20]

Values range of embodied emissions of chosen building materials[21]



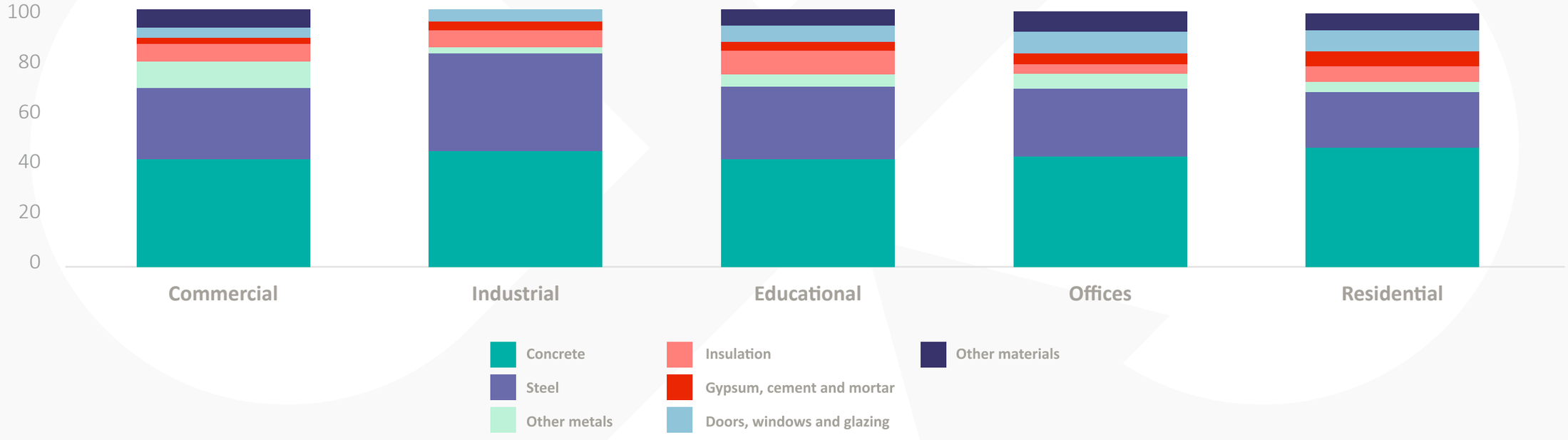
[20] IPCC: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_09.pdf, https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter9.pdf

[21] https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter9.pdf

Historically, stone and wood were the most used building materials. Gradually, stone was replaced by fired and non-fired bricks. Wood was replaced by concrete and steel because of the need for stronger and more durable materials. In recent years, the number of timber buildings has again increased.

Focusing specifically on the EU region, a report was published in 2021 on embodied emissions in building materials of specific buildings (1000 European buildings from the Carbon Heroes Benchmark Programme). Cement and steel account for the majority of embodied emissions in all key sectors of the building sector. In the remaining material categories the most dominant were insulation, other metals (including aluminium), doors, windows and glass products, gypsum, cement and mortar.

Embodied emissions by used material for chosen building types (values for the whole Europe)[22, 23]



[22] https://globalabc.org/sites/default/files/2021-07/Decarbonizing_construction_Guidance_for_investors_and_developers_to_reduce_embodied_carbon.pdf
[23] https://incien.org/wp-content/uploads/2022/10/incien_study_CZ_DIGI.pdf

4.4.3.1. Steel

Steel is one of the most produced materials globally. Approximately 40% of total production is used for construction. Globally, 72% of steel was produced from pig iron in 2022 and 28% from secondary sources, but this proportion varies significantly by region.[24] The specific energy intensity of steel production varies by technology (blast furnace — basic oxygen furnace, electric arc furnace...). In 2021, the steel industry generated 3.7—4.1 Gt CO_2 (depending on Scopes).

The steel industry accounts for 7% of global man-made greenhouse gas emissions and 5% of total EU emissions. The Czech Republic is at the top of the world rankings in steel production per capita. The country produces 4—5 million tonnes annually, mainly from two steel mills, Třinecké železárny and Liberty Ostrava. Total steel consumption (finished steel products) in the country in 2021 was 8.2 Mt, the third highest weight per capita globally after South Korea and Taiwan. The average emission factor of steel production is approximately 2 kg CO_2 /kg steel (Třinecké železárny 1.6 kg CO_{2eq}/kg steel).[25]

4.4.3.2. Concrete and cement

In 2021, as stated by the Association of Cement Manufacturers of the Czech Republic, cement production in the Czech Republic generated a total of 3.13 million tonnes of CO_2[26], which was approximately 2.6% of the Czech Republic's greenhouse gas emissions. This is comparable to annual emissions of a medium-sized coal-fired power plant. During cement production, emissions are generated mainly from firing of clinker (the main component of Portland cement), both from the chemical reaction of limestone decomposition (an industrial process, about 65% of total GHG emissions) and from the heating of raw materials.[27]

[24] Source: https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2023/; https://www.eurofer.eu/assets/publications/brochures-booklets-and-factsheets/european-steel-in-figures-2023/FINAL_EUROFER_Steel-in-Figures_2023.pdf (p. 15)

[25] Czech Heavy industry decarbonisation, Policy and Financing Roadmap

[26] https://www.svcement.cz/wp-content/uploads/2022/08/SVC_Data_2021.pdf

[27] https://faktaoklimatu.cz/explainery/emise-vyroba-cementu

Main companies in Czech steel industry[28]

Company	Mother company	Key product categories	Production (mt, 2020)	Emissions (kt $CO_{2,eq}$, 2021)	Sell (mld. Kč, 2021)
Třinecké železárny	MORAVIA STEEL, Česko	long rolled products, drawn steel, seamless pipes	2,4	2 533	43,7
Liberty Ostrava	LIBERTY Steel Group, Velká británie	hot rolled strips, sheets, pipes, special profiles	2,3	3 138	27,0

Notes on emission values for both steel mills: Both Třinecké Železárny and Liberty Ostrava have administratively excluded energy from the calculation and emissions from energy production are not included in this table.

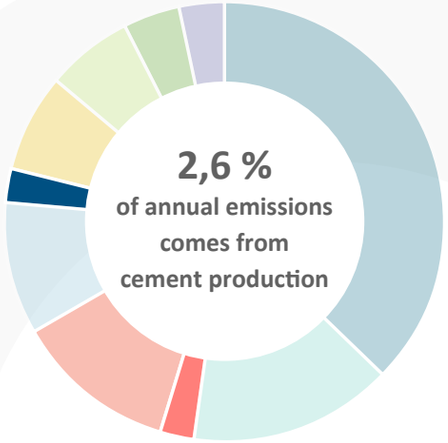
Cement producers in the Czech Republic[28]

Company	Mother company	Cement plants	Emissions (kt CO_{2eq}, 2021)	Sell (mld. Kč, 2021)
Českomoravský cement	Heidelberg Materials	Mokrá, Radotín	1 232	4,2
Cement Hranice	Buzzi Unicem	Hranice	577	2,0
CEMEX Czech Republic	CEMEX	Prachovice	545	4,3*
Lafarge Cement	Holcim	Čížkovice	468	1,7

*In 2018 CEMEX Czech Republic has merged cement and concrete production activities, thus separate data is missing.

[28] Czech Heavy industry decarbonisation, Policy and Financing Roadmap

Emissions from cement production



- 39,5 % energy
- 15,7 % transport
- **2,6 % cement production — chemical reactions**
- Industrial processes (production)
- 10,2 burning in households, institutions and agriculture
- **2,6 % cement production (heating)**
- 7,7 burning in industry
- 6,7 % agriculture
- 4,4 % waste management
- 3,3 % other

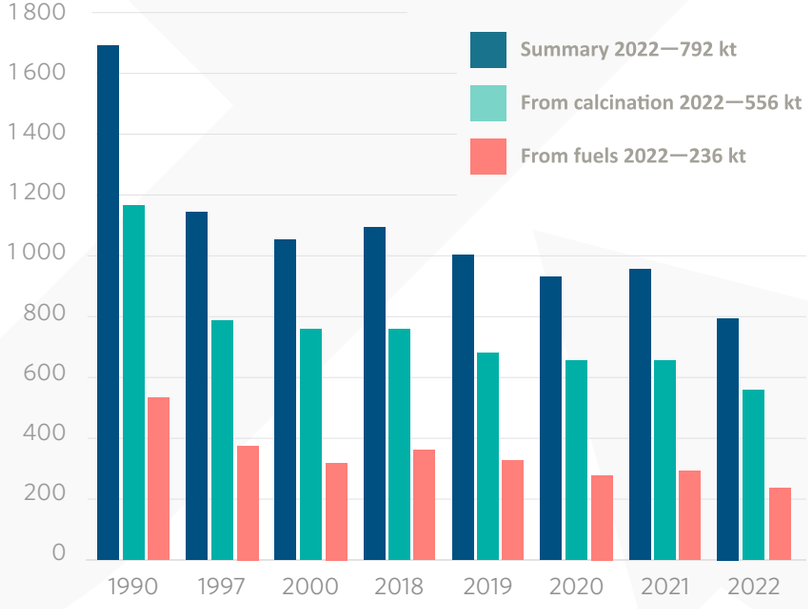
4.4.3.3. Lime/Limestone

According to the annual report of the Association of Lime Producers of the Czech Republic, emissions from Czech lime kilns* reached 792 kt CO_2 in 2022, 70% of these emissions came from calcination and 30% from fuel combustion. In 2022, 30.5% of the lime was supplied to the construction sector.

** members of which are Carmeuse Czech Republic, Hasit Šumavské limenice and plasterworks, LB Cemix, Kotouč Štramberk plant, Krkonošské limenice Kunčice, Vápenka Čertovy schody, Vápenka Vitošov and Vápenka Vitoul*

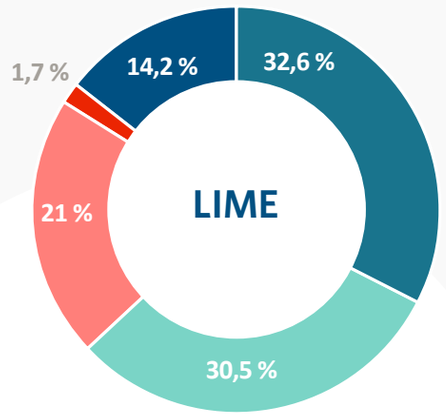
Lime industry green house gas CO_2 emissions[29]

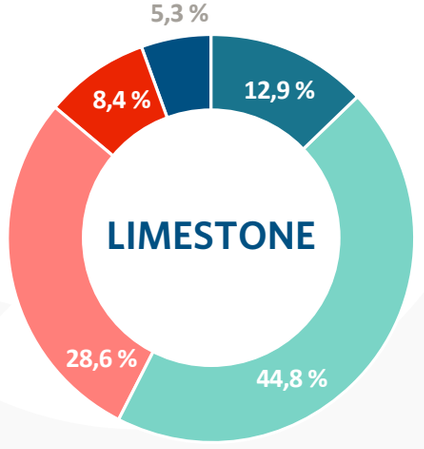
1990, 1997, 2000, 2018—2022



Using of sold lime and limestone

2022





- Industry
- Agriculture
- Building industry
- Exports
- Environment

[29] https://www.svvapno.cz/wp-content/uploads/2023/07/Let-SVV_Data2022.pdf

Fired bricks

Modern robotic lines with high energy efficiency in thermal processes can achieve significant energy and CO_2 savings (up to 40%). Average emissions per tonne of bricks fired can thus reach 195 kg CO_2, according to Heluz's EPD.

Building insulation

Glass wool can be made from up to 80% recycled glass (58% on average). In the case of waste glass, a lower temperature is required for melting, which results in savings in the energy required for melting and, therefore, savings in CO_2 emissions.[1]

Plasterboard

The results of LCA studies on plasterboard show that plasterboard recycling can save 40—45% of CO_2 emissions and reduce energy required for production by 60%.[2, 3] However, in practice, plasterboard is very difficult to recycle due to strict requirements for recovery.

Glass

Reducing energy intensity of production can be achieved by recycling flat glass. The energy intensity of flat glass production is between 9.1 and 10.1 GJ/t of fused glass. An increase of 1 % in the volume of shards in the charge reduces the energy consumption for melting by 0,25 % per tonne of fused glass. This goes hand in hand with the reduction of CO_2 emissions. The emission factor for flat glass is currently about 595 kg CO_2/t of fused glass. Increasing the volume of glass shards in the plant reduces the amount of CO_2 emissions from the raw materials used for glass production and reduces gas consumption.[4]

Plastics

The recovered PVC parts, which primarily come from old window profiles, can be processed into high-quality recycling granulate. Compared to the production of new PVC, up to 88% of CO_2 emissions are saved. In the Czech Republic, for example, REHAU, which uses 40—75% recycled material in its profiles, is involved in take-back and post-processing.[5]

[1] "ISOVER LCA — YouTube", viewed 11 December 2021, https://www.youtube.com/watch?v=aQNHmfBW6hY.

2 M. A. Pedreño-Rojas et al. "Life Cycle Assessment of Natural and Recycled Gypsum Production in the Spanish Context," Journal of Cleaner Production 253 (April 20, 2020): 120056, https://doi.org/10.1016/j.jclepro.2020.120056.

[3] Karin Weimann et al, "Environmental Evaluation of Gypsum Plasterboard Recycling," Minerals 11, no. 2 (February 2021): 101, https://doi.org/10.3390/min11020101.

[4] NETservis s.r.o, "Glass Recycling", Association of the Glass and Ceramic Industry of the Czech Republic, viewed 5 October 2023, https://askpcr.cz/o-skle/recyklace-skla.

[5] https://window.rehau.com/cz-cs/remeslnici-stavebni-firmy/ecopuls

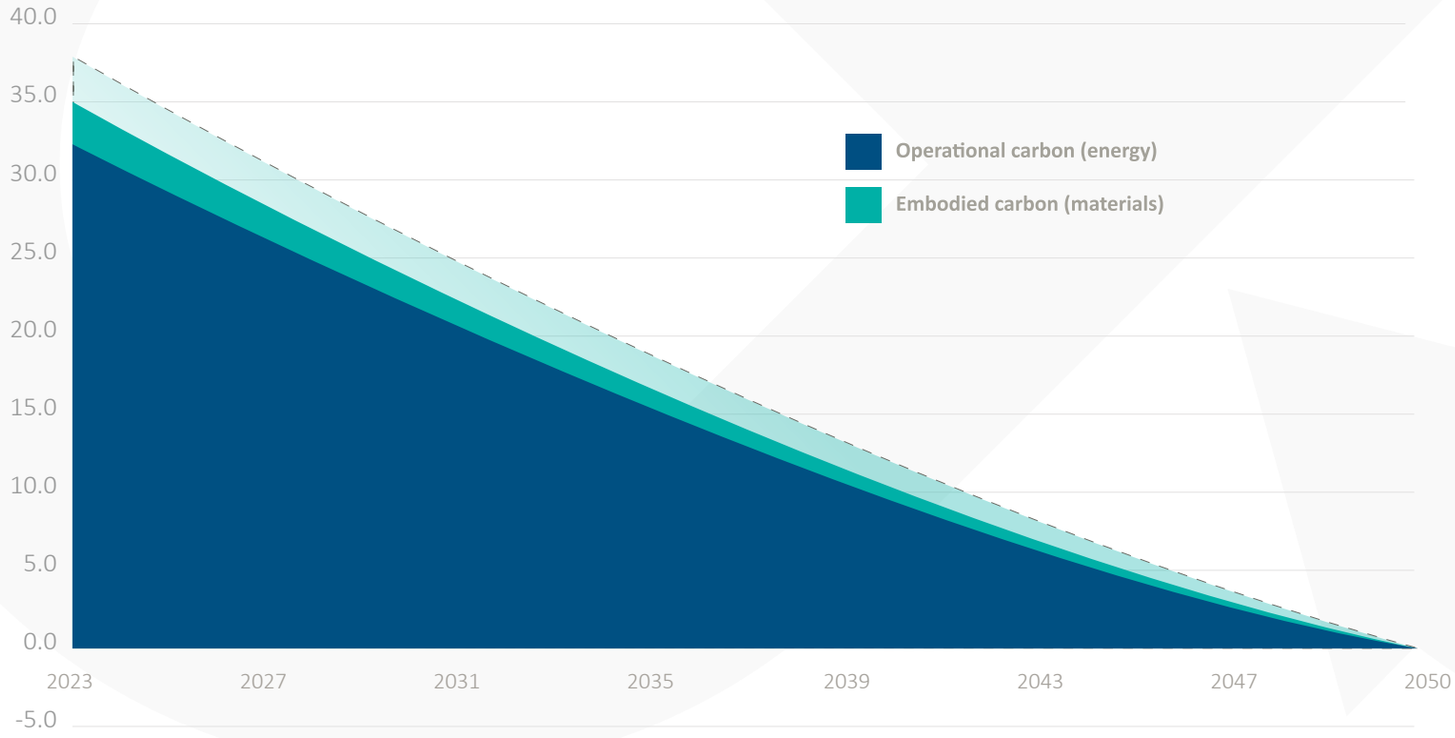
05

/2050 target vision

The aim of decarbonising the national building stock is to achieve a balance of zero greenhouse gas emissions from building operation and construction. This means that a suitable combination of measures is needed to progressively get new and existing buildings into a zero-emission state, but also to ensure a zero-emission lifecycle for building materials, including their extraction, production, transport to site, operation of building technologies, reuse and recycling during or at the end of the buildings' lifetime.

The problem is that for the Czech building stock and building production there is no detailed information and data available that would allow for an accurate quantification of GHG emissions related to buildings. The following chapters are therefore based on approximate calculations and estimates only, and deviations from the actual status may be significant.

Vision of decarbonization trajectory till 2050, estimation in Mt $CO_{2,eq}$



5.1. Reducing operational emissions

Reducing greenhouse gas emissions from building operations was addressed by Chances for Buildings in 2020[1,2]. It modelled the building stock and its possible future development in four scenarios for which it quantified the potential for reducing CO_2 emissions between 2016 and 2050. For each scenario, an estimate was made of the evolution of percentage of resources to cover final energy consumption in buildings and the evolution of electricity generation from photovoltaics installed on buildings.

The calculation looked at savings and replacement of existing energy sources in four basic scenarios, and then modelled the development of photovoltaics based on forecasts from the Renewable Energy Chamber, and looked at the sensitivity of the calculation to changes in the emission factors for electricity, district heat and gas. When including building-mounted PV, the potential for CO_2 emissions reductions ranged from 44% to 87% compared to the 2016 reference year, which would represent a 69% to 93% reduction relative to estimated emissions as of 1990 under different assumptions for building renovation and PV development.

The most progressive of the scenarios modelled came close to the goal of complete decarbonisation, but to achieve truly zero emissions it was proven necessary to significantly change the shares of energy sources on buildings in favour of low and zero emission ones, while significantly reducing the emission factors of electricity, district heat and gas.

[1] A. Lupíšek, T. Trubačík, P. Holub: Update June 2020. Chance for Buildings, 2020.

[2] Lupíšek, A.; Trubačík, T.; Holub, P. Czech Building Stock: Renovation Wave Scenarios and Potential for CO_2 Savings until 2050.
Energies. 2021, 14(9), ISSN 1996-1073. DOI: 10.3390/en14092455

5.2. Embodied emissions

The above calculations do not include embodied emissions, i.e. emissions from the extraction of primary raw materials or recycling of secondary raw materials, the production of construction materials and products, their transport to the site and the actual operation of the site. Neither are these emissions included for materials used for maintenance, renovation of buildings and their disposal after their lifetime. For a rough estimate of the quantification of these emissions, it is possible to divide them by source, i.e. into embodied emissions related to the construction of new buildings and embodied emissions related to building renovations.

5.2.1. Rough estimate of embodied GHG emissions associated with new buildings

Currently, there are no statistical data available on the amount of embodied emissions in buildings in the Czech Republic, so only a very rough estimate is presented here, based on a simple calculation based on the annual increase in floor area of buildings in the Czech Republic and a very approximate determination of specific GHG emissions per floor area according to the available literature.

We consider the annual increment in floor area of buildings in the Czech Republic to be 4.6 million m^2.a. The 2020 embodied energy meta-study[3], which looked at several hundred case studies of different building types in different design standards, states that the tied emissions for conventional new buildings in the Czech Republic are on average around 6.7 kg $CO_{2,eq}/m^2$.a, while for buildings with low operational energy consumption the average is 11.2 kg $CO_{2,eq}/m^2$.a. Both figures are based on a reference period of 50 years. As current legislation requires all new buildings to be energy efficient, we start from a value closer to the upper limit for the baseline and take 10 kg $CO_{2,eq}/m^2$a. Multiplying this by 50 years gives 500 kg $CO_{2,eq}/m^2$, which when converted to the whole building stock is 2.3 Mt $CO_{2,eq}$ for the whole annual increment of the building stock. In the graph above, this value is entered for 2023, and decreases linearly in subsequent years to zero in 2050, when production and other components of embodied emissions of building materials and products should be zero.

5.2.2. Embodied GHG emissions associated with renovations

Another significant amount of greenhouse gas emissions is associated with building renovations, where these are emissions built into passive measures (mainly insulation of structures, replacement of hole fillings) and emissions built into technologies (photovoltaics, battery storage and HVAC systems in general). Background data are not yet available for these emissions, they will need to be supplemented.

On the way to the target state, there are a number of barriers in the current situation in construction, energy and society, which are analyzed in detail in the following chapter and accompanied by a proposal for the necessary measures.

[3] Röck, M. et al. Embodied GHG emissions of buildings — The hidden challenge for effective climate change mitigation, Applied Energy, 2020. Elsevier, 258, p. 114107. doi: 10.1016/J.APENERGY.2019.114107. Supplementary information: https://ars.els-cdn.com/content/image/1-s2.0-S0306261919317945-mmc1.pdf

06

Identifying barriers and how to overcome them

Based on a series of workshops, discussions with selected experts and associations, the most important barriers to decarbonisation of the construction sector have bee identified. The individual barriers have been classified into the following groups according to their nature:

- Technical barriers
- Economic barriers
- Legislative barriers
- Knowledge barriers
- Barriers in education and awareness
- Administrative barriers
- Strategic and organisational barriers

6.1. Technical barriers

6.1.1. Difficulties in reducing emission intensity of traditional material production

Description of the barrier

For many traditional building materials, it is not easy to substitute the energy needed for production with alternatives to fossil fuels. The production of some building materials also includes generating greenhouse gases directly from chemical processes that cannot yet be replaced with processes with no impact on climate change.

An example of the difficulty to substitute fossil fuels are production plants using fossil fuels to fire ceramic products or to melt raw materials. In some cases, it would be technologically possible to electrify the plant at considerable cost, if sufficient electricity sources could be secured. In other cases this would not be possible for technological reasons. The solution may be to switch from gas to biogas or synthetic gases, which are currently scarce or their low-carbon alternatives are extremely expensive.

Prices and potential

Material Economics (2019) for the EU provides the percentage contributions of different strategies for zero-emission pathways for the production of building materials (without CCS technology) such as a combination of circular economy, material and energy efficiency, fossil and waste fuel mix, electrification, hydrogen and biomass.[1] Net zero emission production requires significantly higher investments compared to business as usual (BAU), between 25% and 65% for steel and 22—49% for cement. These are critical sectors on which other areas of construction depend and the process of reducing emissions is very demanding due to the need to maintain quality.

	Steel	Cement
	Contribution to emission reductions (%)	
Circularity	5—27	10—44
Energy efficiency	5—23	1—5
Fossil fuels	9—41	0—51
Decarbonising electricity	36—59	29—71
Biomass for fuel	5—9	0—9
	Investment and increased cost of production (%)	
Investment growth (% compared to BAU)	26—65	22—49
Cost of production (% compared to BAU)	2—20	70—115
Price increase	35—115	10—50

[1] Material Economics, 2019: Industrial Transformation 2050: Pathways to net-zero emissions from EU Heavy Industry. 207 pp. https://materialeconomics.com/publications/industrial-transformation 2050

Steel

Steel is an example of a traditional building material whose low-carbon variant can be achieved by using carbon-free energy sources, generally 4.5—6 MW of electricity per tonne of steel is required. Carbon-free energy must be economically affordable. Other options are increasing the share of secondary processing (the main strategy for steel mills in the Czech Republic until 2030, given that over 95% of crude steel in the Czech Republic is so far produced by primary smelting in blast furnaces with oxygen converters), or using CO_2 capture from production (so-called CCS technology). However, CCS is so far too expensive and unproven on a large scale, and will not be applicable until it is scaled up and cheaper.

- Třinecké železárny plans to reduce its emissions by 35% to 2.4 Mt by 2031/2032 by securing half of its production capacity through secondary electric arc furnaces. The remainder of production will continue to take the form of current primary production with continued investment in energy efficiency and increased use of zero-emission sources.
- Liberty Ostrava plans to invest in hybrid electric arc furnaces and high-voltage lines by 2026/2027, which should help reduce CO_2 emissions by 80% by 2030. It also plans to switch to producing 40% scrap steel and 60% pig iron by 2027, when it expects emissions to fall to 1.57 t CO_2 per tonne of steel. By 2030, the steel plant should produce from either 100% scrap or a combination of 60—70% scrap and 30—40% HBI/DRI (hot briquetted/direct reduced iron).[2, 3, 4]

Barriers to full decarbonisation: for the steel industry to undergo a successful green transformation, steelmakers need a functioning financial system from the European Union, financial mechanisms to ensure competitiveness with other parts of the world with cheaper production, e.g. the EU's Carbon Borders Offsetting Scheme (CBAM).

[2] https://libertysteelgroup.com/cz/news/liberty-zahajuje-historickou-investici-do-transformace-ostravske-huti-ve-vyrobce-zelene-oceli/
[3] LIBERTY Ostrava's transformation to GREENSTEEL and CN30 — Liberty Steel (2022)
[4] https://libertysteelgroup.com/delivering_cn30/liberty-ostravas-plans-to-modernise/

Directly embodied in the chemistry of the production process are the greenhouse gas emissions of lime and cement production, where greenhouse emissions are generated during the firing of the feedstock. Some of these emissions result from the burning of fossil fuels to produce heat, but the bulk of the emissions come from the decomposition of limestone, which releases CO_2, and this phenomenon cannot be prevented.

Cement and concrete

Concrete is the most consumed building material worldwide, with cement being the most emission-intensive component. Despite significant improvements in energy efficiency, direct emissions from cement production are estimated at 2.1—2.5 Gt $CO_{2,eq}$ in 2019, accounting for 14—17% of total direct industrial GHG emissions worldwide. Typically, 35% of cement direct emissions come from process heating, while 65% are process CO_2 emissions from limestone decomposition. Options to reduce these emissions include: increasing the efficiency of kiln firing, using alternative fuels (hydrogen or synthetic biomass fuels), reducing the amount of clinker in cement and partially replacing it, capturing CO_2 emissions (CCS technology). In the case of concrete, also reducing the cement content of each end application. The pathway for reducing greenhouse gas emissions in cement and concrete production was developed by the Cement Manufacturers Association of the Czech Republic.[5, 6]

[5] https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_11.pdf
[6] https://svcement.cz/wp-content/uploads/2022/06/RoadMap-dekarbonizace-SVC-C%CC%8CR-2022-final.pdf

Measures

- Coordinate and determine the status of solutions and needs of building material producers (how far individual production plants have progressed with decarbonisation preparations). (MIT, SPS, SPCR)
- Develop plans for decarbonisation of production (analyse possible measures — cost efficiency; evaluate the possibility of introducing elements of the circular economy) and gradually implement the decarbonisation plan. (Manufacturers)
- Provide methodological support in calls for subsidy for decarbonisation measures. (MIT, MoE)
- Support CCUS through pilot projects. (TAČR)
- Increase support for research aimed at increasing recycled content of construction products. (TAČR)
- Gradually adapt standards to enable the safe use of products with recycled components. (MMR, ČAS)
- Clarify offset schemes (possible by 2030), create a legislative framework for emission offsets. (MoE)

Carbon Capture and Storage (CCS)

CCS is emerging as an important pillar for achieving decarbonisation of the construction sector. Construction companies and their representatives are realising that the problem of embodied carbon in materials cannot realistically be solved in two to three decades. CCS or CCU (Carbon Capture Use) technology is evolving and offers the construction industry an opportunity to combine its efforts to reduce the sector's carbon burden through standard pathways such as reducing energy intensity, using more sustainable materials, circular principles, etc. and CCS technology solutions leading to a steady balance of production and carbon reduction. The technology focuses on capturing and storing carbon dioxide (CCS) and moving it to locations where it can be prevented from entering the atmosphere. Carbon capture and storage is a three-stage process — capture, transport and storage. The technology also offers the possibility of converting CO_2 by so-called methanation with hydrogen into a usable synthetic gas that could replace part of non-renewable fossil fuels such as gas in the future. The CO_2_spicer_Geology project deals with the issue of CCS possibilities in the geological conditions of the Czech Republic. The project analysed potential sites suitable for the placement of storage facilities in an oil and gas field that is nearing end of life. The output of the project will be a model example for potential implementation of other CO_2 storage sites in the Czech Republic and Europe.[7]

[7] https://co2-spicer.geology.cz/sites/default/files/2023-05/Newsletter_02_2023.pdf

Internal price of carbon — Carbon Pricing

An internal carbon price is a value that a company voluntarily sets to internalise the economic cost of its greenhouse gas (GHG) emissions. It can be used as: a decision-making tool that companies use to understand their exposure to external carbon pricing schemes and to guide their business decisions and investments. An internal carbon charge is the market value of each tonne of carbon emissions agreed by all departments of an organisation. The price is set between $5 and $20 per tonne and the funds collected are pooled for investment in internal efficiency improvement projects, green energy and carbon offset programs in an effort to reduce the company's emissions. Either a "Shadow" carbon price or an "Implicit" carbon price is set.[8]

[8] https://carbonpricingdashboard.worldbank.org/what-carbon-pricing

Offset

Offsetting is a way to reduce or offset the entity's own greenhouse gas emissions. The amount of GHG emissions reduced is then represented by so-called offset credits, which are instruments certified by governments or independent organisations. The implementation of offset programmes is taking place at different scales and in many sectors, for example: reforestation, investment in renewable energy sources, innovation in technological equipment to help reduce greenhouse gases and improve natural resource management. The main conditions of a functional offset programme are its **additionality**, **permanence**, and that the programme **is not claimed by another entity**. It is important to establish methodological materials and standardisation globally to make reporting transparent and reliable. The reason for the lack of a global standard is the variability and difficulty in monitoring some projects. Various offset programmes have been running for a long time in the Czech Republic, including crowdfunding tree planting in the form of avenues or other planting or forest protection projects (this is provided by several organisations in cooperation); programmes based on CO_2 sequestration into soil biomass supported by regenerative agricultural practices (e.g. Carboneg project). It is important to say, however, that while offsets are a way of offsetting GHG emissions, they are not recognized for targets confirmed by initiatives such as the Science-Based Targets Initiative (SBTi), nor for CDP (IFRS Sustainability Standards). In the long term, the decarbonisation process cannot be built on offsets.

CLT panels

CLT (Cross Laminated Timber) is cross-laminated timber. The panels are made of three or more layers of cross-glued boards into one block. Ecological and health-friendly adhesives without formaldehyde are used.

CLT is widely used for external and internal walls, ceilings and roofs, it stands out for its high precision of processing. When installed correctly, it has a durability of many years comparable to conventional building materials. The use of CLT makes it possible to significantly speed up construction thanks to prefabrication, the subtle construction saves space, wood helps to ensure a better indoor environment and it is a renewable material.

(Source: Stora Enso)

6.1.2. Insufficient pace of new product introduction and limited capacity to produce alternative materials with a low carbon footprint

Description of the barrier

Building materials with a low carbon footprint, such as wood-based materials, are already available today and can, t a large extent, replace conventional high carbon building materials. Their production capacity is sufficient and their properties have already been fully certified and tested by many years of experience abroad. However, their wider use is hampered by outdated fire standards which do not reflect the current state of knowledge and put wood-based materials (and other natural materials) at a significant disadvantage compared to conventional ones.

In contrast, other low-carbon materials such as unfired clay, hemp and others, risk having insufficient production capacity if demand increases rapidly. Moreover, these materials (except wood-based) are too slow to enter building practice and cannot be used everywhere. The reason is the technical and economic difficulty of verifying their behaviour to ensure quality, long-term reliability and health safety.

Measures

- Monitor the market of building materials and primary raw materials and help in securing them (the State in cooperation with manufacturers, SPS and other sectoral organizations).
- Ensure sufficient quantities of wood as a raw material and its processing for long-term carbon storage in wooden constructions, instead of exporting it and using it for energy purposes, in connection with the prepared Raw Material Policy for Wood (State, MIT, Ministry of Agriculture, Lesy ČR).

- Encourage the use of more wood-based materials by adjusting fire standards and setting requirements for sustainability and low carbon footprint construction of new public buildings, e.g. through public procurement.
- Increase funding to support research, development and certification of new materials and products with a low carbon footprint and the related development of standards needed for new materials (TAČR, State).
- Encourage the use of alternative materials and low-carbon materials by supporting this demand in public procurement, for example by setting a bonus for a percentage of low-carbon material.
- Methodologically support small and medium-sized enterprises in the certification of new products with a low carbon footprint and their marketing, or in the expansion of production capacity in the form of subsidies, soft loans or other forms of investment incentives. (MIT)
- Inform producers about available support programmes. (MIT)
- Extend financial incentives for the use of EPD products to other subsidy schemes. After EPBD IV is issued, highlight the need to use only EPD building materials. (MoE)

Prefabricated wood-based panels

The very process of reconstruction or construction of new buildings often draws on international experience, where a system of wood-based constructions is commonly used to effectively reduce CO_2 emissions. The method of prefabrication, which takes place in production halls, not directly on the construction site, minimizes long-term noise in the surroundings and significantly speeds up the progress of the entire construction, compared to traditional high-emission technologies. The more subtle constructions of prefabricated walls bring less load to the existing load-bearing structures and at the same time allow to obtain a larger usable area within the house.

One of the concrete examples of the use of these prefabricated panels is the reconstruction of the Municipal Office and Kindergarten in Lukov in the Zlín region. The wooden panels were chosen as a replacement for the original boletic panels, which were no longer sufficient in terms of thermal insulation and created a significant environmental burden. In total, approximately 400 m^2 of facade walls were replaced using 35 separate facade panels. The process of installing the panels on the construction site took only 2 days.

A total of 11 tCO2 was stored in the installed wood, which was 11m3, which represents a significant step towards ecological sustainability and reducing CO_2 emissions in the construction industry. (*Source: VEXTA)*

6.1.3. Untapped potential of waste materials

Description of the barrier

The possibility to use waste materials from construction and other industrial sectors to a greater extent would contribute to reducing the emission intensity of the production of building materials, saving raw materials and eliminating the need to process them. In the Czech Republic, construction and demolition waste (C&DW) makes up the majority of the material waste stream. Between 2015 and 2020, this was in the range of 18 to 22 million tonnes of construction and demolition waste per year. Material sources suitable for recycling — i.e. primarily concrete, bricks and their mixtures, as well as asphalt mixtures — represent about 22—28% of the generated MSW. A barrier to a wider processing of these materials is the insufficient quality of single-type sorted material (closely related to the demolition method) and insufficient capacity of recycling technologies. In addition, the difficulty to recover recyclate from a nearby site if the site is owned by someone else, is another barrier, although this would be the easiest option. Assuming responsibility is the issue.

The solution to the barrier could be new policy measures by the Ministry of Environment, such as an updated Waste Management Plan for the Czech Republic for the period 2025—2035.

Measures

- Spread awareness of documents such as the Catalogue of Secondary Raw Materials[9] (MIT, MoE).
- Introduce temporary subsidy support for "controlled demolitions" carried out on the basis of a pre-demolition audit within the transition to a new waste recovery system set out in the Decree on the conditions for the management of construction and demolition waste (MoE).
- Follow demolition procedures that allow for the use of SDOs (Demolition Companies).
- Invest in better recycling lines (Recycling companies).
- Increase the proportion of recycled materials where possible (e.g. bricks can only have a limited percentage of recycled raw materials used) (Material producers).
- Recycle on site, higher use of recycled materials (Developers).

6.1.4. Reserves in material efficiency in production

Description of the barrier

Increased material efficiency in production can be achieved by using a higher proportion of recycled components (steel, aluminium, copper, paper, glass) or by adjusting the composition of the building materials themselves (cement, concrete).

In the Czech Republic, recycling has a significant potential for saving emissions, especially in the steel industry. The use of electric arc furnaces (EOPs) and scrap steel as raw material can achieve a reduction in production energy consumption of 75% and a reduction in greenhouse gas emissions of 75% to 95% compared to existing primary production processes. The main barrier is increased consumption of steel scrap, which will not be sufficient (according to the plans of steel mills for the transition to secondary production in the Czech Republic, their demand for external scrap procurement would increase up to five times by 2031, from today's 0.8 Mt per year to 4.3 Mt). The scrap market is fragmented and the only market driver is price, so it is mainly exported to other EU countries.[10]

In the case of the cement and downstream concrete industry, material efficiency in terms of emission reduction refers not only to recycling (an example of good practice which is given in the following infobox) but also to changing the cement composition (reducing the clinker factor) and consequently reducing its share in concrete in specific end applications. Barriers include unavailability and questionable applicability of low-carbon raw materials (which would be used to replace clinker), availability of SDO fractions of sufficient quality, existing national cement and concrete standards, insufficient experience with durability of concretes with higher recycled content, and construction procedures and willingness of customers, project designers and builders to specify and use concretes containing different types of blended and alternative cements in line with performance and environmental criteria for each particular application.[11]

Measures

- Promote pre-demolition audit, selective demolition, use of recycled SDO (MoE)
- Systematize and clarify the market for secondary raw materials (including guaranteeing material origin) in order to reduce the risks of unavailability of secondary materials (MIT in cooperation with industry organizations).
- Reform the current system of standards in relation to the standard-setting process at the European level, focusing on the performance parameters of alternative solutions and material composition (MIT, CAS).
- Increase support for research and development of secondary production (TAČR).
- Develop advanced sorting and processing technologies (Recycling companies).

[9] http://www.recyklujmestavby.cz/

[10] https://incien.org/wp-content/uploads/2023/11/Prilezitosti-cirkularni-ekonomiky-pro-dekarbonizaci-ceskeho-prumyslu-OCEL.pdf

[11] https://incien.org/wp-content/uploads/2023/11/Prilezitosti-cirkularni-ekonomiky-pro-dekarbonizaci-ceskeho-prumyslu-CEMENT.pdf

- Prioritise the re-use of materials (proportions of materials with a recycled component) and provide investors/clients with evidence-based information on how the existing structure or substructure can be retained while achieving the development potential of the site. They should actively seek out opportunities to reuse structural elements and propose them for dismantling, and promote maximum reuse of existing structures (if structures need to be demolished, promote controlled deconstruction instead of demolition to maximise reuse) (Architects and planners).

6.1.5. Shortage of readily available data on construction materials

Description of the barrier

In order to quantify GHG emissions in the life cycle of buildings on a large scale, it is necessary to have freely available baseline data on building materials and thus be able to compare them based on selected parameters (e.g. GWP). The unavailability of a single LCA database of building products for the Czech market is a barrier. Thus, designers and architects cannot easily check how their design performs in terms of GWP. Generic data (statistical averages of individual types of building materials) are needed in the initial stages of design. In the later stages, on the other hand, product-specific data from the EPDs are needed. Foreign databases are not suitable because the data contained in them are not representative for products supplied to the Czech market (different production processes, different energy mixes, transport distances).

Measures

- Initiate the creation of a national LCA database of construction products. This should integrate generic data to be used in the early stages of building design as well as

GOOD PRACTICE EXAMPLE

THE REBETONG

The Czech Republic produces 7.5 million m^3 of concrete annually and the construction industry is the largest consumer of aggregates. Recycling can contribute significantly to the efficient management of this important natural resource. Rebetong is a concrete with a high recycled content, which can save approximately 1 750 kg of raw aggregate for every m^3 of concrete. In addition, it has reduced carbon footprint by roughly 15% compared to conventional concrete, mainly due to the savings in transport and of exhaust fumes from transport. The recycled aggregate does not have to be taken from the demolition site to the a landfill site and the concrete plant does not have to import aggregate from the quarry to its site.[12]

Skanska started using the new concrete with recycled aggregate Rebetong already in 2019 on the Čertův vršek Residence project in Libeň, Prague. Rebetong covered the consumption of more than 15% of all concrete. For the foundations, partitions and load-bearing structures, 2,000 tonnes of recycled material were used, which would otherwise have ended up in a landfill site. Since then, Rebetong has become a full-fledged part of the construction of houses and apartment buildings, foundation structures and road base layers.

In 2022, the construction started of the fourth project, i.e. the sustainable development of the Modřany Sugar Factory. Here, it is planned to use low-carbon concrete not only for the load-bearing structures of the buildings, but also as a visually pleasing element of the entrances and facades of the apartment buildings. Rebetong will be used here for up to 20% of concrete structures.

[12] SKANSKA: Petr Dušta, Senior Project Manager Skanska Residential

specific data for individual building products. It would also help, for the development of LCA assessment tools, to have the EPD data published in the CENIA database available in a machine-readable format.

- Closely coordinate the development of the LCA database and related procedures (and ensure their compatibility) with the development of uniform and internationally accepted methodologies for life cycle and carbon footprint assessment of building materials and products at EU level. (MoE, Department of Construction and Building Materials at MIT)

6.1.6. Unavailability of official data on emission intensities of sources

Description of the barrier

For strategic planning of decarbonisation of businesses and for designing new buildings as well as planning energy saving measures on existing buildings, it is necessary, in addition to available methodology, to have up-to-date official information on the emission intensity of individual energy sources and guidance on how to calculate emission factors for future years, at least until 2050. This is mainly official data on the current emission intensity of the Czech energy mix and the prediction of its development in future years (i.e. which emission factor to be considered for electricity consumed today, in 10 years, in 2050). Information on gas and its supplementation with hydrogen or substitution with synthetic gas from renewable sources should also be available. In addition, data on emission intensity at the level of energy suppliers, e.g. thermal power plants, should also be provided, in a unified format according to a common methodology and with specified timing for reporting.

Measures

- Set a real electricity emission factor in Decree No. 141/2021 Coll. to match the emission factor given by the MIT[15] (MIT).
- Provide scenarios indicating the values of electricity emission factors that should be taken into account in all studies, assessments and reports, including with regard to future developments. The statistics should be continuously updated on the basis of current developments. The period and timetable for the publication of updates are to be determined. (MIT).
- Gradually amend laws and decrees to reflect these data (to prevent a situation that, unlike current practice, the data specified in decrees are not updated for years), or create a uniform methodology for how these data/updates are reflected into building requirements (MIT/MEW and other departments).
- Require mandatory e-format of data tables (e.g. use of EN ISO 22057) when registering EPDs — most EPD programme operators in the EU already do this. This is then the data source for the national LCA database (MoE/CENIA).

6.1.7. Shortage of data on the building stock

Description of the barrier

For the State to address the decarbonisation of the building sector more systematically, it will need better underlying data on the building stock of the country. This includes in particular more detailed information on the energy performance of buildings and their technical systems, and on the building materials used. A building stock model produced by Chance for Buildings is currently available. However, it is based on 2016 data and is not being updated on an ongoing basis. In addition, there are continuously updated forecasts of new build development with a view to 2050.

Up-to-date and comprehensive building stock data is also key for the assessment of the potential for building renovations, extending the lifetime of buildings instead of new builds, and increasing the utilisation of existing building stock. According to a number of international roadmaps and strategies on embodied carbon in the building sector, the starting principle is to reduce the consumption of primary building materials[16] Significant material consumption can reduce the carbon footprint of a building refurbishment by 50—75% compared to an equivalent new construction, while deferring demolition potentially for decades.[17]

Measures

- Provide statistics and updates, make one of the state organizations responsible for this activity (government).
- Extend the energy label to include some basic information such as material composition. This is anyway needed for the actual calculation of the label (MIT, MEP).
- Expand the set of statistics provided on the building stock (CSU).
- Make data from ENEX databases (MPO) accessible
- Provide information on actual energy consumption in buildings (Building operators).
- Use data on actual consumption from anonymised smart and continuous meters gradually introduced on a mandatory basis (MIT/MMR/CSU).

[15] https://www.mpo.cz/cz/energetika/statistika/elektrina-a-teplo/emisni-faktor-co2-z--vyroby-elektriny-za-leta-2010_2022--273197/

[16] UNEP (2023), WGBC (2023, 2019), UKGBC (2022), PEEB (2021)

[17] https://www.unep.org/resources/report/building-materials-and-climate-constructing-new-future

GOOD PRACTICE EXAMPLE

Circular economy of refrigerants

Approximately 30 tonnes of refrigerants are disposed of annually in the Czech Republic. Heat pump refrigerants (now mostly fluorinated gases) are an integral part of heat pumps, which, according to EU plans including the EPBD or EU REPower, play and will play a very important role in reducing dependence on natural gas, GHG emissions and achieving the Green Deal targets. Used refrigerants, like some other types of waste, can be reused. This is also why, with the support of the European Union, the international online exchange Retradeables has recently been set up, with the aim of ensuring that as little waste F-gases as possible are uselessly disposed of or even end up in the air.

Retradeables[13] is an international platform for trading used refrigerants, accessible to all HVAC companies that are licensed to work with F-gases. It is a transparent and convenient tool to get information and communicate with companies that own used refrigerants and with companies that can process them for further use. Daikin is one of its expert partners. The Czech Republic, together with Slovakia and Hungary, is one of the pilot countries where the scheme has been launched. Users of the platform in the Czech Republic have complete confidence that their trading in used refrigerants is in line with legislation, as the platform was carefully consulted with the Ministry of the Environment before launch.

In addition to the above-mentioned platform, Daikin uses the L∞P programme. When a customer disposes of old equipment and replaces it with, for example, more energy-efficient equipment, they must ensure that the used refrigerant is extracted. Daikin will provide containers for the collection of used refrigerant and their subsequent removal at its own expense. The refrigerant will be reclaimed and then reused in new Daikin products. Daikin believes that this will be a great inspiration for other companies who are not indifferent to environmental protection and also want to save themselves the trouble and money with regard to used refrigerant. Worldwide, L∞P by Daikin already saves the production of 400,000 kg of new F-gases per year. To date, Daikin has sold more than 20,000 VRV heat pumps that operate with certified reclaimed refrigerants.[14]

[13] https://retradeables.com/cs/

[14] Tomáš Habel, Daikin

6.1.8. Insufficient availability and widespread use of tools for environmental assessment of buildings

Description of the barrier

Availability of calculation tools for LCA of buildings is a necessary condition for the successful implementation of GWP calculations in Czech practice. This does not yet exist in the Czech Republic, therefore, LCA is currently calculated mainly by expensive commercial foreign tools, which significantly increases the project costs and lacks representativeness for the Czech Republic, and often also transparency. Another option is to calculate the LCA "manually" e.g. in MS Excel, which is not user-friendly and is time-consuming. Another problem is the inconsistency of LCA methodologies used in calculation tools and the lack of anchoring of LCA methodologies even within a single tool. Inaccuracy is also caused by different LCA data sources used in existing tools, leading to incomparable results. Existing software is unreadable for architects and designers, and the origin and quality of data is unclear.

Measures

- Develop a national calculation tool, either stand-alone or through integration into existing calculation tools for PENB or budgets. A necessary condition is the legislative anchoring of the calculation methodology and consultation with experts regarding LCA of buildings (the tool will either be developed commercially or can be supported by the MIT/MEW/TA of the Czech Republic).

6.1.9. High emission intensity of the Czech energy mix

Description of the barrier

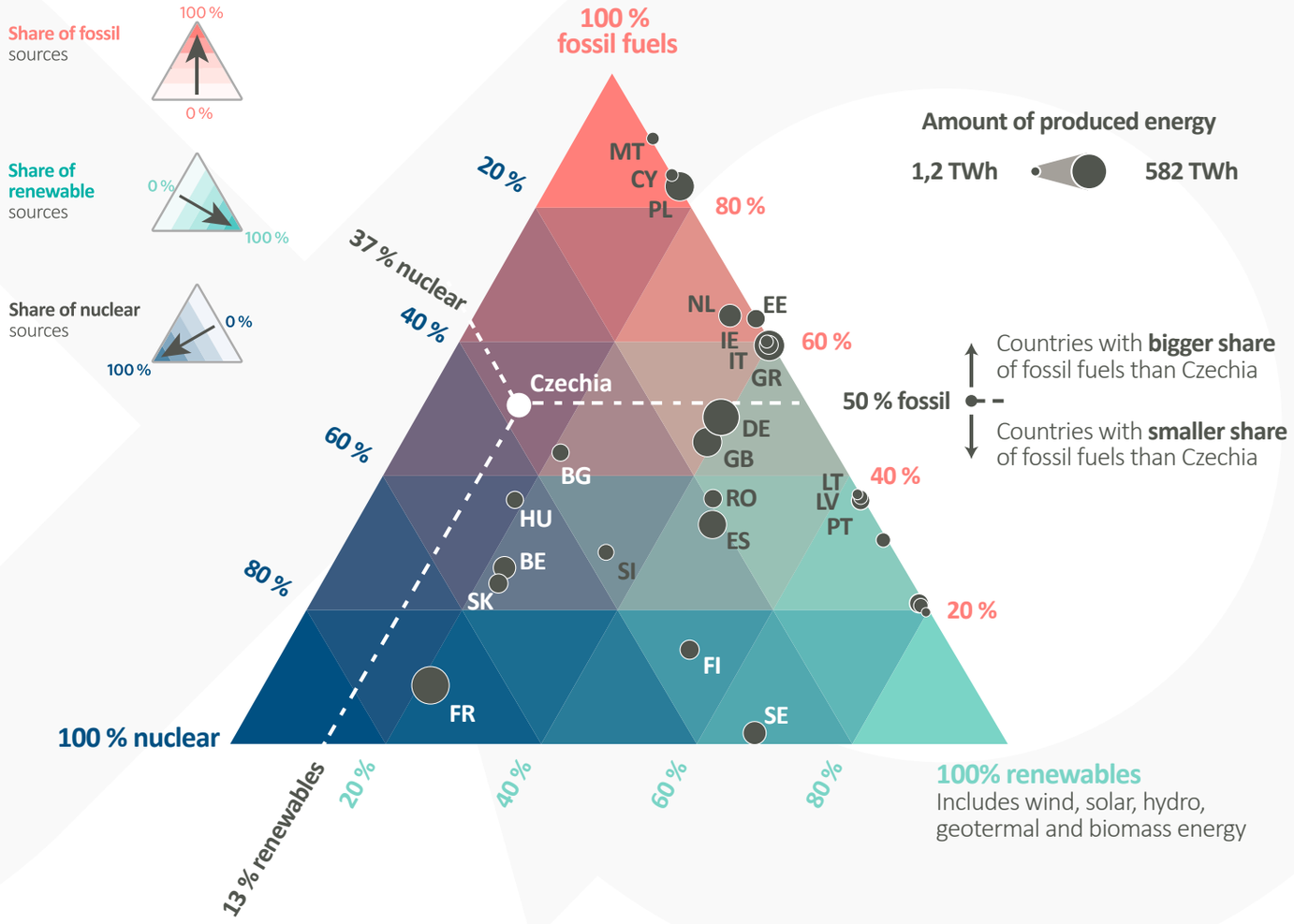
As the analysis of Chances for Buildings[18] shows, electricity, with its significant share of final energy consumption in buildings, is a major contributor to greenhouse gas emissions. Emissions associated with the consumption of electricity in the production of building products are also a significant contributor. The emissions intensity of the Czech energy mix is thus an important boundary condition for the 2050 decarbonisation plan. Poor availability of low emission factor electricity will also harm Czech producers of building products, which will record higher environmental impacts and thus be less internationally competitive. The problem is all the more serious because the path to decarbonisation in industry is through electrification. Businesses located in buildings with higher energy consumption will also bear the emissions burden.

Measures

- Incorporate a plan into the state energy concept for a rapid increase in the capacity of emission-free sources. (MIT)
- Ensure acceleration of permitting processes for the construction of energy infrastructure and their implementation. e. (MMR)

Electricity production by sources in EU and UK

Electricity production from fossil fuels, nuclear sources and renewables in 2021



Source: Infografika Podíl zdrojů na výrobě elektřiny v EU a Británii od autora Fakta o klimatu, licencováno pod CC BY 4.0

[18] Šance pro budovy, Dlouhodobá strategie renovace budov v České republice, aktualizace květen 2020

6.1.10. Operational restrictions

Description of the barrier

A requirement for a comprehensive renovation of buildings may result in an interruption or significant reduction of its operations, which may be unacceptable for some building owners and operators. The problem is most pronounced for buildings with a continuous operation such as hospitals, buildings of transport infrastructure or manufacturing facilities. However, it also affects public, commercial and industrial buildings, some of which are office and residential. A specific case is schools, where completion of restrictive activities during summer holidays should be essential.

Measures

- Phase the work in time and location so that operation can be partially moved within the building (Designers).
- Coordinate the project well and take into account the needs of the operation (Designers, contractors and building operator, project sponsor).
- Speed up the implementation of the work and to move dusty and noisy work outside the building as much as possible — use of prefabrication (Designers, implementation companies).
- Define the needs and motivate the designer and contractor to work efficiently and effectively by mean of technical specifications and evaluation criteria (Contracting Authority).
- Plan and implement accurately, using digitalization (BIM) and production automation (Designers, implementation companies).

6.1.11. High degree of individual approach in the assessment of building reconstruction from the point of view of heritage protection

Description of the barrier

The feasibility of measures to reduce building greenhouse gas emissions often clashes with heritage protection. Heritage protection often covers an entire area, making it impossible to implement energy saving measures in that particular area, and requiring a building-by-building approach. However, there are a number of cases where implementation of building alterations should not be problematic as these will not damage the building heritage character, the visible elements in the exterior and public interior, nor interfere with historically valuable structures that need to be protected. Even in these cases, negotiations with the relevant heritage department are needed and it often happens that different departments in different places have different views on the issue and fail to make a consistent decision. The system is thus unpredictable, making the work of architects and designers more difficult, making the pre-implementation process of approving energy-saving measures for building owners more expensive and more time consuming.

Measures

- Develop general methodologies for the permitting process of construction modifications and placement of technologies (NPÚ).
- On the basis of general methodologies, develop more specific rules for individual sites regarding applicability of individual measures (executive bodies of the state heritage protection authorities).
- On the basis of the methodology, develop a more precise definition of bonuses in subsidy programmes to take into account the impossibility of implementation or increased costs of certain measures (executive bodies of state heritage protection).

Photovoltaic systems in heritage protection

One example is the possibility of mounting photovoltaics on the roofs of renovated and newly designed buildings in conservation areas. In 2022, the National Heritage Institute issued a Methodological Statement on the assessment of plans to install photovoltaic and other solar installations on cultural monuments, in conservation areas and in protection zones of cultural monuments and conservation areas. It will only be possible to install equipment in very specific situations — typically on modern parts of cultural monuments, their grounds or on newly added ancillary buildings. The condition is that the system is hidden from both near and distant views. Depending on the character of the area, a distinction is made between: Conservation Area — mounting of photovoltaics there is undesirable, installation is rather exceptional, Conservation Zone — mounting is possible under certain circumstances and Protection Zone — mounting is possible in cases where there is no reason for refusal.[19]

[19] https://www.npu.cz/portal/o-nas/npu-a-pamatkova-pece/npu-jako-instituce/hlavni-temata-sezony/2022/fotovoltaika/fotovoltaika-v-pp---upraveno-23.pdf

6.2. Economic barriers

6.2.1. Unclear conditions for financing low-carbon construction projects in relation to the EU Taxonomy

Description of the barrier

There is no national methodology in place to complement the technical criteria to meet the EU Taxonomy requirements so that concessional financing from banks or grants can be easily provided to low carbon construction projects. Currently, the procedures of financial institutions are not harmonised, which is very burdensome for applicants for financing, and there is a legal risk that the financing contracts concluded will have to be revised in the future.

The technical criteria of the EU Taxonomy are also very robust, and their application, especially in the part 'Do No Significant Harm' (DNSH), is very costly, which is very demotivating especially for projects of a smaller scale.

The grant programmes apply the technical criteria of the EU Taxonomy, especially the Do No Significant Harm (DNSH) part, very superficially without any real impact on the quality of the supported projects. There is no precise specification of the criteria by the administrators of the grant programmes, the text of the technical criteria is only taken from the text of the Taxonomy, and the compliance check is formal and often lacks substance and original intent.

Measures

- Coordinate and unify the legally binding interpretation of the technical criteria of the EU Taxonomy for the conditions of the Czech Republic (MoF, MoE, MMR), possibly in cooperation with the CBA.
- Proactively participate in the update of the technical criteria of the EU taxonomy, especially in their substantial simplification for smaller projects (MoF, MIT, MoE with the support of professional organizations).
- Coordinate and issue methodological guidance for the application of the EU Taxonomy technical criteria across the two delegated regulations concerning the construction sector and the control of the criteria especially in the part of DNSH in grant programmes (MMR, MIT, MoE).
- Furthermore, to apply another set of technical screening criteria of the EU Taxonomy for the transition to a circular economy under the so-called "environmental" delegated regulation (Annex II, Chapter 3. Construction and real estate activities)[20] in national methodologies with effect from January 2024. These criteria mainly concern measures with an impact on the embodied emissions of buildings (pre-demolition audits, GWP calculation, circular design principles, minimum share of circular raw materials and products made from them, digital building register, e.g. using Environmental Product Declarations (EPD) and at least 90% of construction and demolition waste generated on site is ready for reuse or recycling).[21]

[20] Commission Delegated Regulation (EU) 2023/2486 of 27 June 2023

[21] https://eur-lex.europa.eu/eli/reg_del/2023/2486/oj

Green financing by ČSOB

To be specific and to give an example, in relation to financing investments in housing, there is a new "green" mortgage product with more favourable conditions (amount, maturity, price) for very energy-efficient apartments and houses. We are also going to provide loans under favourable terms for the purchase of solar panels for the roofs of buildings, heat pumps and other similar technologies aimed at reducing greenhouse gas emissions. On the other hand, there will also be some restriction on the financing of commercial real estate in the category of the most energy-intensive buildings. As ČSOB, we are now giving preference to financing buildings with energy labels "A" to "C" and significantly limiting the financing of buildings with labels in the "F" and "G" category, unless the client also submits a plan for their total revitalisation. [22]

[22] https://www.czgbc.org/cs/novinky/csob-a-udrzitelnost-podle-vladislava-nozicky-vykonneho-reditele-utvaru-pro-specializovane-financovani

Developer's view on discounted financing

Green financing (view of the developer CTP Invest, spol. s. r. o.)

The recent trend among banks as financiers is to favour lending into sustainable properties. While banking institutions continue to finance other projects, they now have a clear preference for business partners with an ESG strategy. In the area of real estate assessment, the methodology essentially coincides with the EU Taxonomy as of May 2022. Based on this, the bank then decides whether to support the transaction with a preferential interest rate because it is an ESG beneficial project.

So far, CTP has been providing lenders with data such as PENBs, BREEAM certificates and now also carbon footprints for individual properties on a voluntary basis. Some are also interested in the cost-effectiveness of tenants. In the case of group-wide financing, the company has set ESG targets and can therefore achieve more favourable terms. Banks try to avoid greenwashing and favour borrowers with a proven ESG strategy in the form of "sustainability linked". Today it is quite common that they have experts dedicated to sustainability assessments. For new construction, it is already common for CTP to see that lenders are looking for specific points from BREEAM certification, for example, and the certificate itself is not enough. They are often interested in achieving a number of ENE credits. While this leads to much better transparency, it is an additional administrative burden for the developer that must be taken into account. [23]

[23] CTP Invest, spol. s.r.o.: Gabriela Povýšilová

6.2.2. Non-conceptual long-term financing of renovation of buildings owned by the State and local governments

Description of the barrier

In the public sector, there is a lack of a conceptual, long-term planned allocation of funds for investments, which leads only to the basic rehabilitation of emergency situations or to the implementation of renovations based on currently available subsidy funds, not according to actual need. The public sector still mostly selects designers and implementation suppliers based on the lowest bid price, not in accordance with the requirements for minimizing life cycle costs, and often makes subsequent operation more expensive.

It is not possible for the organizational components of the state to finance projects by a third party with regard to the wording of Act No. 218/2000 Coll., on budget rules. These organizations are then dependent on financial resources from the state budget and implement cost-saving measures only at the moment when these resources have been approved and allocated, not at the time when it is appropriate from a technical and economic point of view. Processes related to the awarding of public contracts, so-called "for function and performance" in accordance with the Public Procurement Act in particular, extend the preparation time.

Contracting authorities do not know or do not have sufficient information on the possibilities of using appropriate financing methods or securing guaranteed savings. For example, project preparation using the Performance Design and Build method, guaranteed energy savings using the EPC method and the combination with grant support.

Measures

- Methodological and project support to municipalities in conceptual long-term planning of investments in new building construction and renovation.
- Educate relevant executive and decision makers in public administration on alternative options for project preparation and financing (e.g. project preparation using the Performance Design and Build method, guaranteed energy savings using the EPC method and combined with subsidy support) and, in the case of smaller municipalities, concentrate activities under joint organised groups or associations.

6.2.3. Financing the decarbonisation of building materials production

Description of the barrier

Based on available public sources and calculations by the International Sustainable Finance Centre (ISFC), it is estimated that investment in decarbonising industry will increase above business-as-usual levels by at least 10% in the period to 2029. A significantly higher increase is estimated in some cases in the years after 2030, when the decarbonisation investment cycle is expected to peak in sectors such as steel and cement.

Cement producers face limited international competition as cement is not widely exported due to transport and weight-to-volume constraints. This should allow companies to remain profitable in the coming years. In contrast, the steel market is highly

globalised and producers are exposed to competition from other regions. The low share of transport in the final price and increased production capacity in China contribute to weak financial results of both Czech steel producers. This market situation is expected to continue for at least the next few years. Financing decarbonisation targets will therefore be a major challenge for them.[24]

Measures

- Provide targeted support and technical assistance to building product manufacturers to decarbonise production and secure inter-ministerial funding. National revenues from the sale of permits under the EU ETS (MIT) can be used. National industry will likely need to be financed from public and private sources, supported by guarantees or risk coverage schemes and instruments.
- Introduce targeted technical assistance in grant calls to successfully obtain funding from the Modernisation and Innovation Fund (e.g. creation of a tested market concept Carbon Heroes Benchmark).
- Provide assistance to the financial sector and investment companies with the implementation of low-carbon projects, especially for those between pilot and full operation.

ENERG ETS programme

MODERNISATION FUND: THE ENERG ETS PROGRAMME — IMPROVING ENERGY EFFICIENCY AND REDUCING GREENHOUSE GAS EMISSIONS IN INDUSTRY IN THE EU ETS

The programme aims to support equipment and measures to improve energy efficiency and/or reduce greenhouse gas emissions in industrial production for installations included in the EU ETS. The areas supported include the reduction of final energy consumption and/or CO_2 emissions in the production process, through:

- upgrading (reconstruction or replacement) of self-consumption energy production equipment, leading to an increase in its efficiency,
- upgrading (reconstruction or replacement) or reconfiguration of production or processing facilities,
- implementation of systems using waste heat,
- implementation of hydrogen applications,
- introduction of innovative energy efficiency management features (e.g. installation of metering and control systems),
- introduction of tools to optimise operations based on monitoring of energy consumption assessments, including support for the implementation of energy management tools.[25]

[25] https://www.sfzp.cz/dotace-a-pujcky/modernizacni-fond/programy

[24] https://www.isfc.org/czech-heavy-industry-decarbonisation

6.2.4. Financing the decarbonisation of heat supply systems

Description of the barrier

District heating systems supply about 40% of the population in the Czech Republic, including industrial and tertiary sector buildings. In 2020, coal and coal-fired fuels were still the most used fuels, accounting for more than half of the total, with natural gas and degasification gas accounting for about 30% and renewables only 10%, with a 3% share in 2010. Thus, the heating sector in the Czech Republic is still very far from emission-free operation and the rate of increase in the share of RES in the last decade is slow and insufficient.[26]

The sources are economically burdened by the EU ETS and air protection legislation, but do not have sufficient financial resources to transform their systems so that the price of heat would remain socially acceptable and competitive with local sources.

The systems are also large in terms of length of distribution lines compared to other EU countries and thus have significant heat losses in heat distribution.

Measures

- Prepare a capacity subsidy programme for the transformation of existing and construction of new heat supply systems focused on the use of low-emission energy sources, transformation of steam systems into hot-water systems allowing pumping and return of waste heat to the system, decentralisation of systems, reduction of heat losses and integration of large-capacity heat storage tanks (MIT, MoE).

[26] Assessment of decarbonisation of district heating in the Czech Republic, MIT, 06/2022

6.2.5. Financing building renovation to reduce the emission burden

Description of the barrier

Technical measures on buildings are intended to reduce their operational emissions, in particular by reducing their energy consumption. This applies to both new and renovated buildings. The investment intensity is highest for construction measures, followed by the installation of modern technologies including renewable energy sources.

Barriers for decisions to make a significant investment vary by owner and property type. For private owners of both residential and non-residential buildings, the main barrier is the high initial investment, for which they often do not have sufficient resources of their own. Commercial loans have high interest rates, and the use of subsidy programmes is associated with complex administration during the application and subsequent sustainability period of the project.

Moreover, in the case of residential buildings, there is a common psychological barrier to committing to long-term loan repayments. In the case of subsidies, there is a barrier in the need to have one's own resources to cover the entire investment, since the subsidy is paid only after the work has been completed and paid for. (An exception is the Repair Grandma's House programme, which allows for partial financing up front, but on the condition of a very thorough, complex and therefore expensive renovation, which even with this benefit may not be available to the general public.)

In the case of collective ownership, such as a unit owners' association, the amount of the investment is very often an obstacle to securing the necessary quorum for approval of the reconstruction.

The problem of both types of residential buildings is also the so-called shallow renovations, i.e. very gradual implementation of individual energy-saving measures, which then have incorrect continuity and the technical savings potential is not achieved.

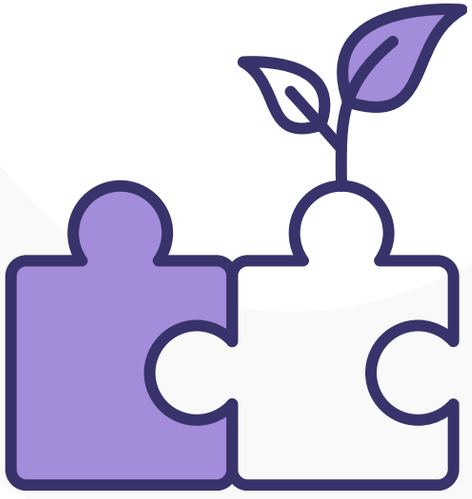
In the commercial sector, the main decision-making argument is the payback period of the investment, which, especially for construction measures, is significantly longer than the horizon of interest of these investors. Grant programmes, as with residential buildings, are often associated with concerns about complex administration over the lifetime of the project.

Since the preparation of public sector construction investment projects is often conditioned by the use of available subsidies due to the reduction of the amount of own financing, projects fulfilling the current criteria of the announced subsidy calls are sometimes given priority at the expense of priority projects.

Measures

- Maintain subsidy support with sufficient allocation of funds, expand the introduction of pre-financing options, provision of soft and guaranteed loans, harmonisation of subsidy programmes between ministries.
- Establish a long-term unified renovation programme for buildings, integrating different types of funding sources.
- Make loans for subsidised projects with a government loan guarantee more favourable.
- For residential buildings, provide a one-stop shop offering assistance to building owners for the entire renovation project journey, ideally at a local bank branch; this should include assistance with pre-project preparation, subsidy and loan processing, advice on project documentation and implementation, and follow-up monitoring (one-stop-shop).
- Implement the EU ETS Directive 2 into legislation.

- Introduce a systematic and long-term motivation and awareness-raising campaign to increase demand for the use of subsidy support for building renovation and for quality properties. Use concrete examples from practice with "breaking down myths".
- For residential apartment buildings, ensure a change in the rules of collective decision-making for the implementation of energy measures within the JVU and BD.
- Systematically promote the reduction of the cost of materials and technologies through long-term support for science and research and support for the development of local producers. This decentralisation will help mitigate the risks of global supply chains. (TAČR)



Emission allowances

The EU Council and Parliament set more ambitious climate targets and agreed to create a new separate emissions trading scheme (ETS 2) for the buildings and road transport and fuels sectors.[27]

The EU ETS 2 will cover all fossil fuels from 2027, i.e. emissions from road transport, heating of buildings and other industry not covered by EU ETS 1. The aim is to reduce emissions in these sectors by 43% by 2030 (compared to 2005). The proceeds will finance the so-called Social Climate Fund, which will ensure that emissions reductions are socially equitable and that the achievement of climate targets does not affect vulnerable groups. It will also aim to support energy efficiency measures and decarbonisation of heating and cooling in buildings.

ETS 2 is being developed to prioritise renewable energy sources, so it significantly affects the issue of energy supplied for production, construction, and the supply of goods, which will affect prices in the supply chain in particular. Permits will be paid by fuel suppliers at the beginning of the supply chain, this will then be reflected in increased prices for end customers[28]

Private transport and residential buildings should only be included in the scheme from 2029, which will require a new Commission proposal, until then they will be included before fuel suppliers.[29]

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[27] https://www.mzp.cz/cz/news_20221218_Fit_for_55_Ceskemu_predsednictvi_se_podarilo_vyjednat_dohodu_k_emisnim_povolenkam_a_pres_50_miliard_pro_nejzranitelnejsi_domacnosti_z_noveho_fondu

[28] https://www.consilium.europa.eu/cs/press/press-releases/2022/12/18/fit-for-55-council-and-parliament-reach-provisional-deal-on-eu-emissions-trading-system-and-the-social-climate-fund

[29] https://www.europarl.europa.eu/news/cs/headlines/society/20170213STO62208/evropsky-system-pro-obchodovani-s-emisemi-ets-a-jeho-reforma

6.3. Legislative barriers

6.3.1. Lack of a binding methodology for reporting and assessing GHG emissions at building level

Description of the barrier

In the optional sustainability certification of buildings and green architecture, a calculation of GHG emissions based on the Life Cycle Assessment (LCA) methodology is used. It is expected that a similar calculation will be mandatory in the future as part of the revision of the EPBD, i.e. it will be part of the PENB. The problem is that the LCA methodology has a wide range of variables and scenarios and that the studies currently carried out are not comparable with each other — there is no single methodology that would be binding for the calculations. It is possible to take as a basis the standard ČSN EN 15978 *Sustainability of buildings — Assessment of the environmental performance of buildings — Calculation method* — however, it is rather difficult to define all boundary conditions in a consistent manner.

Measures

- Decide as soon as possible on a timetable for the implementation of the EPBD revision and establish a working group to set up a binding methodology for reporting life cycle GHG emissions from buildings. The development of the methodology needs to be continuously consulted with industry organisations.
- Start an expert discussion before the final form of the new EPBD is finalised to avoid delays and the subsequent rush to set specific requirements. The outcome of the discussion should be taken into account in particular by the MIT when starting the implementation of the revised EPBD.
- As a basis for a binding methodology, the methodology developed by CTU-UCEEB in the framework of the ECF 2023 project can be used.
- After the introduction of a uniform methodology, database, software and evaluation of a sufficient sample of the building stock, introduce legislative limits on embodied $CO_{2,eq}/m^2$ for new buildings.

6.3.2. Lack of a legislative requirement for product information publication

Description of the barrier

Apart from the lack of a binding methodology (in addition to the already existing and used standard ČSN EN 15978) for quantifying GHG emissions in the life cycle of buildings, there is also insufficient data on GHG emissions associated with the production of building products (so-called embodied emissions).

Measures

- Issue a clear timetable for mandatory documentation and electronic recording of EPDs for construction products, for example through CENIA (despite future obligations under the CPR, it will be possible not to declare EPDs).
- The State should lead by example in its investments and start piloting the introduction of EPD requirements in advance.
- Ensure increased awareness among manufacturers and importers of building materials of the upcoming EPD publication obligation.
- Harmonise EPDs and ensure their comparability according to a single standard.

EPD

The EPD is an Environmental Product Declaration and is the basis for building life cycle assessment. In practice, the EPD is referred to as an Environmental Product Declaration, in line with the EPD logo, and is governed by the ISO 14025 standard. This document contains information on the potential environmental impacts of the production, distribution, use or disposal of a given product. The Czech legislation does not yet require an EPD for products, but it is expected to be required in future years. Some manufacturers already routinely supply EPDs with their products.

More information is available in Book V. LCA and EPD of building products.

6.3.3. Legislative restrictions on recycling in the construction sector

Description of the barrier

Another problem is the insufficiently secured process of transporting materials from the demolition site to the recycling or reuse site.[30] The reuse of construction products and recycling is complicated by the lack of legislation defining waste/non-waste. The current system is set up in such a way that when leaving the demolition/dismantling site, the material is considered as waste. Therefore, for further use or recycling, the material must be treated as waste and can only be handled by a duly authorised body. The use of whole structural elements from existing buildings is not possible due to the absence of a 'recertification' system to determine how to determine their technical parameters.

Measures

- Change legislation governing when material becomes waste/non-waste.
- Introduce a system of recertification or other assessment of building products and materials removed from the building as part of the dismantling process.
- Legislatively support building material producers to facilitate the take-back of leftover materials from construction and their reuse for the production of new materials.

[30] https://zpravy.ckait.cz/vydani/2022-01/recyklace-stavebnich-a-demolicnich-odpadu-ve-svetle-nove-legislativy

CASE STUDY

The Mercury project under demolition

The subject of the case study is the Mercuria building, completed in 1971, which is undergoing selective demolition to recover all materials. It is the first commercial building in the Czech Republic to be dismantled with maximum emphasis on the principles of circular economy.

Selective demolition takes place in several phases — pre-demolition audit, handover and recovery of internal fittings, removal of asbestos from façade units and roof, stripping of floors and installations and sorting into material fractions. It took Skanska 1.5 years just to strip the building and find partners.

On an ongoing basis, materials were to be passed on to end users for recycling or recovery. However, this was a pilot solution for many external suppliers, requiring joint testing of materials and finding process routes. At the same time, funding for the collection and processing of demolition material is the responsibility of the development company, including transport to the processing site.

The limits of the Waste Act, its interpretation and the rigid boundaries it sets were also an obstacle. Some restrictions or demanding requirements led to the suspension of cooperation with some partners. Not all materials can be processed on the territory of the Czech Republic, so the company looked for customers near the border. Here again, the company faced challenges related to cross-border waste transfer, legal considerations and logistics.

Another problem is the lack of a market for the secondary use of some recycled materials; the company more or less finds its own customers in a complicated way. The solution is to learn from this case, adjust legislation, and increase pressure from other developers.[31]

[31] E. Nykodymová — Skanska

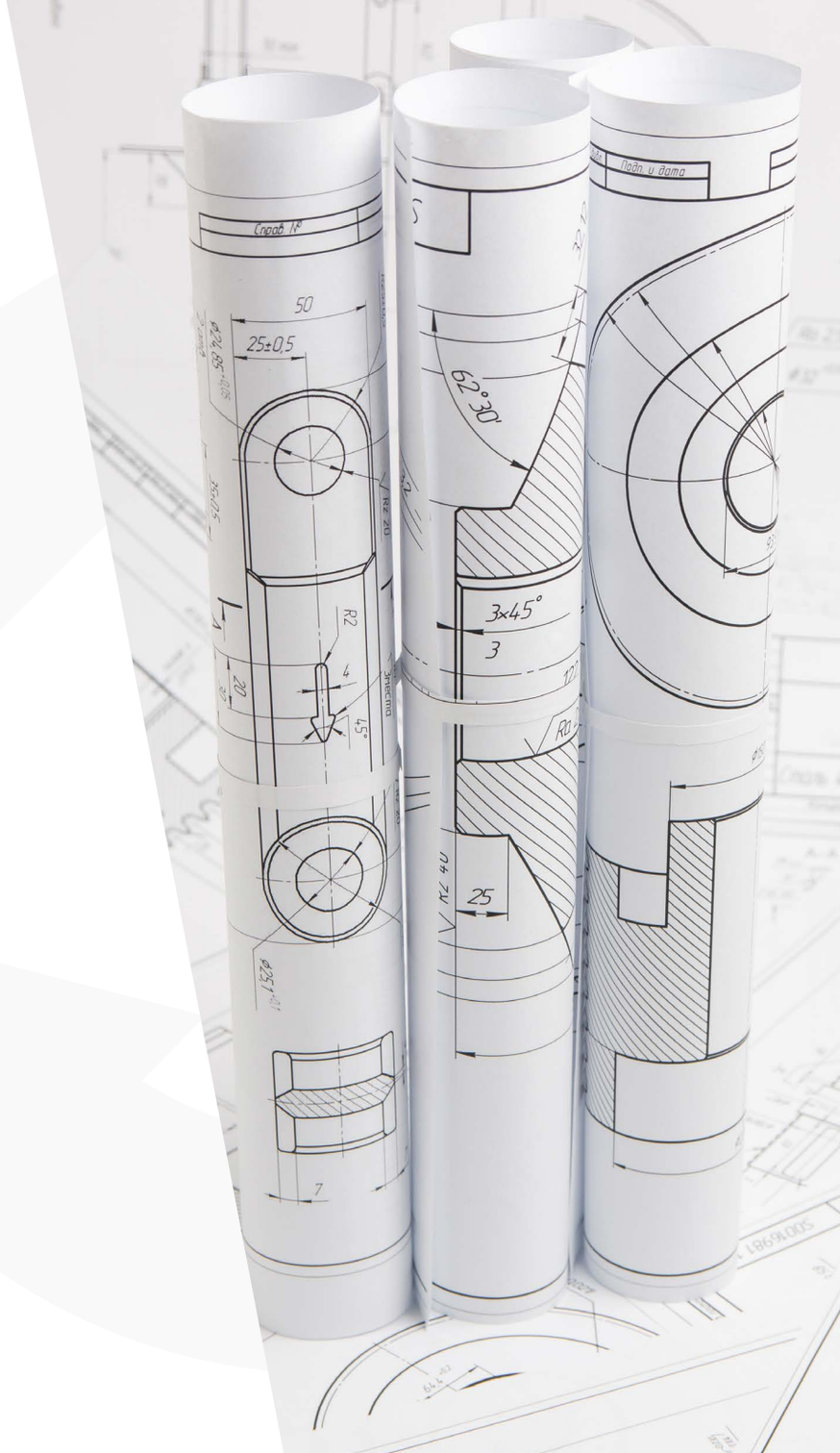
6.3.4. Diluting the intent of EU Directives in their implementation

Description of the problem

Achieving carbon neutrality is not as strongly supported in the Czech Republic as at the EU level, which is also due to the fact that individual agendas are addressed in the Czech Republic with only weak inter-ministerial coordination. The consequence, and another weakness, is that individual measures are often not presented in an overall context, without the connection between individual regulations. One of the reasons for this is that the drafting of individual directives related to climate change and greenhouse gas emissions into the atmosphere is under-staffed in the Czech ministries, given the breadth of the whole agenda. It is then difficult for the staff representing the Czech Republic to proactively participate in the setting of directives and the implementation of key directives and the resulting commitments is often delayed. In the coming years, the implementation of the key directives EPBD IV, EU ETS 2 is being prepared in terms of construction decarbonisation. In addition, ESG directives are being implemented, in particular the SFDR impacting non-financial reporting by financial institutions, the CSRD impacting non-financial reporting by medium and larger companies and the EU Taxonomy Regulation, which has broad technical criteria for distinguishing sustainable from unsustainable projects. The Directives give many obligations, but with varying interpretations of technical details. Thus, many indicators are assessed, but with different metrics and levels of impact for each company and project. The technical criteria in the EU Taxonomy are used in subsidy programmes as mandatory but without consistent interpretation and effective control, i.e. without any real impact. The national administration, in coordination with the EU, must ensure a comparable environment and a uniform interpretation, otherwise the whole purpose of the directives is completely lost. It is also necessary to ensure compliance with other regulatory initiatives, in particular the revision of the Construction Products Regulation (CPR) and the minimum mandatory criteria for green public procurement.

Measures:

- Ensure comprehensive inter-ministerial coordination of transposition and implementation of new legislation.
- Develop methodologies for the interpretation of the SFDR, CSRD and EU Taxonomy technical criteria, in particular Chapter 7 of the 'Climate' Delegated Regulation and Chapter 3 of Annex II of the 'Environment' Delegated Regulation, as they relate to buildings and specifically for the relevant subsidy programmes.
- Increase staff capacity of government departments responsible for the building sector decarbonisation and building operation, low-emission heating and community energy. Thus, intensify cooperation with professional associations and obtain feedback to proposed changes to legislation.
- Increase staff capacity in the areas of sustainable finance according to SFDR, CSRD and EU Taxonomy Regulation.
- Set staffing priority for the implementation of EPBD IV and EU ETS 2.
- Set staffing priority to create a smooth legislative and economic environment for the operation of renewable energy communities.



6.4. Knowledge barriers

6.4.1.Insufficient expertise in building design

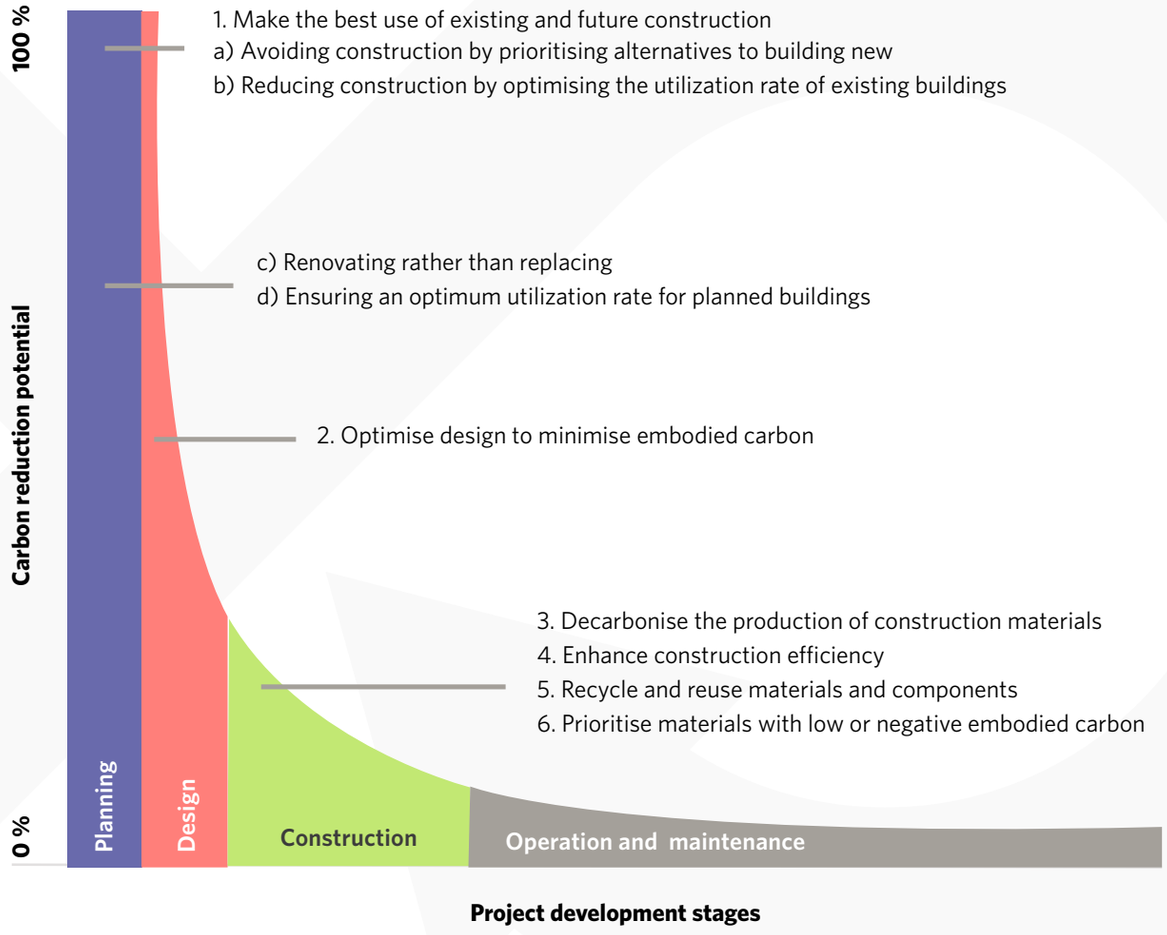
Description of the problem

Architecture and design firms often lack sufficient knowledge of the issues related to reducing GHG emissions from buildings and other design parameters related to sustainable buildings, while it is precisely in the planning and design process where the potential for reducing emissions is the highest (see graphic). In particular, smaller firms outside large cities lack basic experience with strategies of designing buildings with a low carbon footprint. While the issue of energy reduction is already relatively well established (at least to the extent necessary to meet energy performance requirements in building management and the preparation of the Building Energy Performance Certificate), the carbon footprint is not addressed except in isolated cases.

Measures:

- Secondary schools and universities to introduce this issue into all curricula; currently this happens only in specialized fields. The topic of emissions reduction should become an integral part of term project assignments, as well as bachelor and master theses.
- Universities, industry organizations, professional associations and non-profit organizations to introduce a sufficient number of lifelong learning courses, inform about current technical solutions and principles of effective design, and promote cooperation between professions. Promote the topics within their membership base and among students.[33]

Carbon footprint decrease curve with biggest potential during plan and design phases[32]



[33] https://kps.fsv.cvut.cz/index.php?lmut=cz&part=vyuka&sub=druh&type=m-gr&kod=124YPRM

[32] https://incien.org/wp-content/uploads/2023/11/Prilezitosti-cirkularni-ekonomiky-pro-dekarbonizaci-ceskeho-prumyslu-STAVEBNICTVI.pdf, UK Green Construction Board (graphic); Shifting Paradigms (2023). Embodied carbon regulation in the European construction sector — An analysis of the economic impact

- Education should also reflect a longer term perspective, including future alterations, renovations, conversions to other building uses and effective demolition.
- Designers and architects should actively educate themselves in the areas of building design optimisation already at the study stage.

6.4.2. Insufficient expertise on the par of private builders

Description of the barrier

Knowledge barriers for private builders vary by typology and type of owner. Private builders include owners of single-family homes and apartments, as well as owners of non-residential buildings with a variety of uses.

The problem is an insufficient knowledge of the benefits of comprehensive solutions and sustainability elements in new buildings and renovations. Sustainable solutions are often mistakenly perceived as only beneficial for the environment and not for the builder and the building user. At the same time, they are often seen as uneconomic.

The primary contact for private builders when trying to renovate a building or build a new one is the designer or architect. They are often poorly informed in the area of sustainability, energy and carbon reduction. Relevant information on appropriate options and measures is therefore not reaching the end client - the investor — in a timely manner. Comprehensive sustainability of projects is therefore still a topic only for a narrow group of investors who specifically request such projects and look for designers who are able to provide them with the relevant services.

Developers are a specific group of private builders who prepare and implement projects with the aim of reselling them. In the preparation of projects, the future owner, who would have the possibility to directly observe and demand adequate quality, is unknown. In such cases, not only is comprehensive sustainability and operational efficiency often omitted, but the building is implemented with the application of only the minimum necessary legislative measures.

Measures

- The State, in cooperation with industry organisations, professional associations and non-profit organisations, should ensure a comprehensive information and awareness campaign directed at the general public, i.e. all types of private investors in buildings. The aim is to explain the benefits of sustainable/low-emission solutions ideally on the basis of clear parameters and requirements for all market players, which can be translated into clearly interpretable infographics. Dispelling myths about the disadvantages of sustainable solutions must be the main content of the campaign, with examples of good practice. The issue is closely related to the knowledge barriers of designers and architects, who are often the investor's only point of contact during the project preparation.
- Establish a clear, transparent ESG reporting methodology.
- Developers can effectively use the benefits of low emission solutions from the ESG report in their marketing, which can be another form of public education.

Example of a sustainable solutions database

A good tool is, for example, Rethink architecture's constantly improved and updated database of sustainable solutions[34]. It contains a selection of the most important solutions and technologies for environmental, financial and social sustainability, an overview of suppliers, case studies of implemented projects. It also presents recommended practices for implementing sustainable technologies, know-how of BREEAM, LEED and WELL certified experts.

[34] https://www.rethinkarchitecture.cz/databaze

6.4.3. Insufficient expertise on the part of public investors

Description of the barrier

Public investors, especially smaller ones, are not yet fully aware of the impending need to comply with carbon footprint reporting requirements in capital construction projects for new and renovated government-owned buildings. This is a relatively large risk because the larger construction projects that are starting to be planned today will be implemented in 3—10 years, when many of the requirements will be more stringent than today. At the same time, the inability to demonstrate the carbon footprint of a pipeline project can lead to compromised access to financing for long-gestating projects.

Measures

- The MRD in cooperation with the Association of Regions and the Office of Public Investors should ensure the education of public investors (especially investment departments and departments of property and building management).
- Provide methodological support for contracting authorities with specific recommended parameters (tender conditions and evaluation criteria).
- Ensure monitoring of the readiness of construction projects in individual ministries and draw attention to the need to meet environmental requirements for projects.

6.4.4. Insufficient knowledge of decarbonisation issues on the part of material and technology producers and implementation companies

Description of the barrier

Smaller construction companies and building material manufacturers often do not have sufficient professional capacity to monitor the development of legislative requirements and future investor requirements. They will be affected by relatively large changes in the next five years as a result of the requirements for decarbonisation of the construction industry. Building contracting authorities will require quantification of carbon footprint of built-in products, and building contractors will require this information from building material suppliers, even though this information is not yet mandatory. This is likely to change with the amendment of the CPR (Construction Product Regulation), which will make it mandatory to demonstrate the environmental impact of construction products in the form of EPDs.

There is also the CSRD, which requires companies to report on their sustainable business practices, environmental impacts, human rights, social standards and sustainability risks. The CSRD contains detailed requirements regarding what information the report must contain, including sustainability targets and key performance indicators for the company, for example through a decarbonisation strategy. In 2026, all companies meeting at least two of the three requirements will have to report, namely companies with: more than 250 employees, a turnover of at least €40 million and total assets of at least €20 million. As the scope of the report covers the entire supply chain, the monitoring of sustainability parameters will be extended to smaller companies. In order to cover the non-financial reporting agenda, companies need to have dedicated capacity and technical facilities, which can be problematic for a significant number of them.

Measures

- Create an awareness campaign targeting smaller construction companies and smaller producers of construction products to inform them about the obligations related to carbon footprint reporting of construction products and the implementation of EPDs.
- Similarly, with the involvement of the financial sector, create an awareness campaign to inform about the obligations associated with the introduction of CSRD.
- Involve sectoral organisations that can inform their members and show examples of good practice.

6.4.5. Insufficient expertise on the part of building managers, operators and owners

Description of the barrier

Engaging building operators in decarbonisation targets is key to reducing operational emissions in the building sector. Their expertise in emissions reduction will enable targeting effective steps in the decarbonisation strategy of companies covered by mandatory non-financial ESG reporting. Operational emissions include heat and electricity consumption, use of own RES, consumption of refrigerants and fire extinguishers, water consumption, fuel consumption and waste generation. Associated with this is the planning of refurbishments and fit-outs, which are also a source of emissions. Facility managers of smaller companies do not yet have the necessary knowledge, and many management companies do not yet have adequate data collection and reporting systems in place.

When a company is planning energy-saving measures on buildings that involve external financing, it is necessary to have sufficient knowledge of the EU Taxonomy. This defines what needs to be met for an investment to be considered sustainable. In the case of planned acquisitions of new buildings to the existing portfolio, the quality of the building condition in terms of facility management and energy must also be carefully considered.

Measures

- Companies must ensure that they identify the main sources of greenhouse gas emissions in their operations. They must also address the reduction of emissions from the operation of the buildings they use by improving energy efficiency (use of energy audits, implementation of energy management) and maximising the potential of the installed equipment. Include relevant indicators in their decarbonisation strategy.
- Acquisition teams must consider the sustainability status of buildings when making new acquisitions.

6.5. Barriers in education and awareness raising

6.5.1. Insufficient inclusion of the issue in education programmes

Description of the barrier

There is a lack of information on the need to decarbonise the construction sector and the processes that lead to it in some secondary and higher education courses. There is a lack of lifelong learning programmes that would be able to systematically and rapidly train professionals in the construction sector.

Measures

- Ensure the strengthening of sustainability, decarbonisation and energy savings in the curriculum at all levels of education. (MŠMT)
- Plan to strengthen new fields of study to ensure a sufficient workforce with sufficient expertise and technical skills in the areas of sustainability, clean energy, circular economy and digitization of the construction industry at secondary and higher education institutions. To ensure that these fields of study are prestigious and in demand by study applicants. (MŠMT)
- For the labor market, ensure a significant acceleration of the retraining of workers in the fields of clean energy, sustainable construction, circular economy and Construction 4.0. (MPSV)

6.5.2. Communication to the public

Description of the barrier

Many of the barriers originate from ignorance and disinterest in the topic of sustainability and building carbon footprint reduction. There is insufficient communication in the sector about the opportunities and benefits of measures that can help reduce operating costs, dependence on external sources of energy and materials, in some cases improve the building environment and, as a side effect for users, lead to a reduction in the carbon footprint of the building.

Very few actors in the construction value chain are familiar with and use this approach. This is due, among other things, to insufficient awareness among the general public that would lead to creating demand for sustainable solutions. There is a lack of widespread public communication activity towards the public, this is partly replaced by existing subsidy programmes.

Measures

- The State should require marketing experts and qualified professionals to prepare a long-term information and motivation campaign aimed at the entire public. The campaign should target different types of building owners and building typologies in order to better and more specifically convey the necessary information to the target group. The preparation of such a robust campaign must be complemented by sufficient financial resources to provide appropriate media space for different age and social groups of owners. The information campaign must go beyond advertising subsidy programmes and explain the benefits (not only economic) of sustainable measures. The awareness campaign must include social aspects in order to reach the public sufficiently. The campaign previously prepared by the MIT can be used as a basis.
- Awareness must also be directed at the producers of materials and technologies and the supply chain up to implementation so that the manufacturing sector is informed about the potential for optimisation leading to decarbonisation. The potential for companies in the long term can be economic, marketing as well as motivational in terms of finding new workers.

6.6. Administrative barriers

6.6.1. Failure to take emissions performance into account in public procurement

Description of the barrier

The current version of the main public procurement law allows and encourages procurement taking into account aspects other than the amount of investment. These include environmental and social criteria. Procurement with consideration of these criteria is still not the usual standard, but rather an exception to common practice. Contracting authorities lack methodological support and clear guidance on what criteria to choose appropriately for all types and sizes of capital construction projects. A methodology that would include environmental requirements in the form of technical requirements or evaluation criteria is currently being replaced by parameters set by experts individually for each given project, which increases the cost of project preparation and limits the use of this procedure to larger contracts.

Measures

- Prepare a methodology with specific wording of possible technical requirements and evaluation criteria for the tender documentation and subsequent evaluation, basing the methodology e.g. on the principles of Performance Design Build[35].
- Similarly, prepare a simplified methodology with specific wording of possible technical requirements and evaluation criteria for tender documentation and subsequent evaluation for small projects and small contracting authorities with minimal capacity to prepare complex tender documentation. The methodology should include simplified sets of optional criteria that are easy to apply to a given project.
- The methodologies are to include maximum limits (e.g. a specific value per m^2 of floor area) for the carbon footprint of public projects. These limits may be adjusted on an ongoing basis. Furthermore, focus the methodologies on allowing the inclusion of usable secondary raw material available close to the construction site in the tender, e.g. by clearly demonstrating emission savings compared to other options (material from primary raw material, recycled material with longer transport distance).

6.6.2. Non-conceptual preparation of renovation investment projects

Description of the barrier

Insufficient quality and non-conceptual approach to the preparation of investment projects leads to unsystematic solutions, overpriced projects in later stages and problems in securing financing. The problems are usually caused by insufficient time and funding for the preparation phase, insufficient capacity for quality and systematic investment planning and insufficient experience of the staff in charge of project preparation. In some cases, energy efficiency, i.e. the energy performance criterion taken into account in tenders, is not taken into account.

There is a lack of long-term planning for renovation of the building portfolio that would lead to a reduction in energy and emission intensity and thus operating costs. In many cases, building renovations are carried out on the basis of currently available subsidies or, in the case of public buildings, on the basis of political specifications rather than on the basis of actual need.

Measures

- Private and public building owners are to conduct a passporting of the condition of buildings, assess the need for renovation, and create an investment plan, i.e. a list of projects by renovation priority. Investment plans should be long-term.
- Training of relevant executives and decision-makers in public administration, in the case of smaller municipalities to concentrate activities under larger organised units, such as local action groups.

6.6.3. Insufficient renovation of buildings owned by central government

Description of the barrier

According to Article 5 of the EED, the State should renovate annually at least 3% of the floor area of heated and cooled buildings in its ownership and use. Monitoring reports on the implementation of the requirement are regularly updated, but the actual status and quality of the renovations carried out is not clear. The monitoring reports are not sufficiently publicised and the State loses the opportunity to play an exemplary role.

Measures

- Update and refine monitoring reports on the implementation of the commitment to renovate at least 3% of buildings owned and used by the state (MIT).
- Publish the renovation strategy for central government buildings (MIT).
- The government is to allocate investment funds for these renovations.

[35] https://www.p-db.eu/o-pdb

6.7. Strategic and organisational barriers

6.7.1. Lack of a national strategy for the construction sector and its anchoring in legislation

Description of the barrier

The Czech Republic has several strategic documents that set targets and commitments to reduce greenhouse gas production. The main documents are the Climate Protection Policy in the Czech Republic, drafted by the Ministry of the Environment and approved in 2017[36], and the State Energy Concept from 2015[37]. Both documents are currently outdated and are under revision in 2023. As part of the mechanism leading to the fulfilment of climate commitments under Regulation (EU) 2018/1999 of the European Parliament and of the Council, the MIT has drawn up the National Energy and Climate Plan of the Czech Republic[38]. The document, which was approved by the Government on 13 January 2020, takes over and confirms the commitments set out in the Czech Climate Protection Policy. Following the revision of the EU energy and climate policy (the "Fit for 55" package), the national plans of all EU Member States are being updated at the same time. A draft update of the National Energy and Climate Plan of the Czech Republic was submitted to the Government in October 2023. An iterative process with the European Commission will take place until the end of the first half of 2024, with the final version to be submitted by 30 June 2024.[39]

The problem is that the currently available strategies are not specific enough to infer if and when GHG savings requirements for buildings will be set.

Measures

- The Ministry of the Environment will elaborate the Climate Protection Policy in detail and set out what requirements the Czech Republic will set for greenhouse gas emissions from buildings. Buildings, which are one of the main emitters, are to be set out in a separate chapter.
- The MIT will prepare a timetable for the implementation of the EPBD revision and will require the calculation of the life-cycle carbon footprint of buildings in the PENB and initiate a discussion on the required target parameters for buildings and their implementation over time.

6.7.2. Capacities in the ministries

Description of the barrier

Although buildings produce one third of the greenhouse gas emissions in the Czech Republic, the relevant ministries (MIT, MoE, MMR, MoF) do not have sufficient staff to address the problem of decarbonisation of the building sector in a systematic, proactive and coordinated manner.

Measures

- Strengthen the staff capacity of the relevant ministries; without this decarbonisation cannot be implemented in a timely and high-quality manner (MIT, MoE, MMR, MoF).
- Provide ongoing training for staff and support their participation in international events to deepen international cooperation and knowledge and experience (MIT, MoE, MoE, MoF, MoF).
- The government should designate a decarbonisation coordinator and define powers, responsibilities and provide clear and targeted support for inter-ministerial cooperation.

[36] https://www.mzp.cz/cz/politika_ochrany_klimatu_2017

[37] https://www.mpo.cz/dokument158059.html

[38] https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/vnitrostatni-plan-ceske-republiky-v-oblasti-energetiky-a-klimatu--252016/

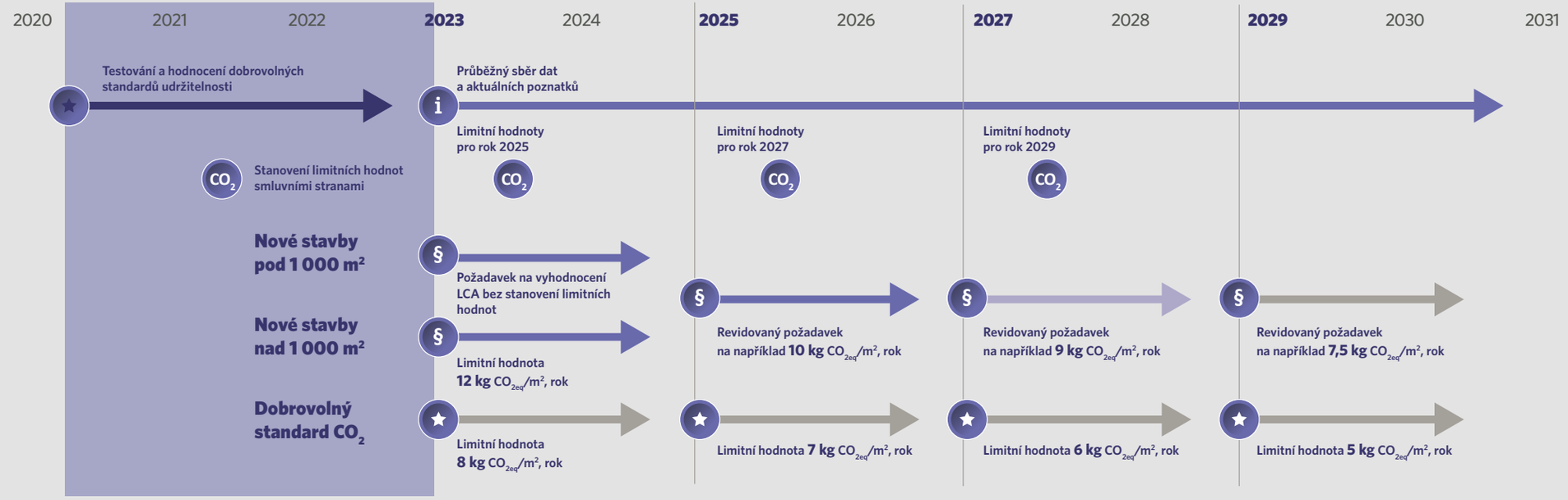
[39] https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/

Sustainable CO_2 limits /m² for buildings

Of the European countries, the Nordic countries are the furthest along in their preparations to introduce legislation regulating operational and embodied greenhouse gas emissions in buildings.

The Finnish government has set a target of achieving climate neutrality as early as 2035. It sees buildings as an important segment that needs to be taken into account to achieve this goal. Finland plans to introduce greenhouse gas emission limits in 2025[40], which will consider the whole life cycle of a building. It will be calculated using a simplified LCA methodology. At the same time, the Finnish government plans to prepare and make freely available a national database of embodied GHG emissions in the coming years.

The introduction of limits in Denmark is one step further on. The National Sustainable Building Strategy[41] contains an action plan leading to the introduction of life cycle greenhouse gas emission limits for buildings as early as 2023. The introduction is preceded by a test period where an assessment is carried out on a voluntary basis. From 2023 onwards, all buildings are obliged to provide evidence of GHG calculations using the LCA methodology and a limit of 12 kg $CO_{2,eq}$/m² and applies to buildings over 1,000 m² floor area. At the end of 2023, the situation will be assessed and a stricter limit will be set, which will apply from 2025 (expected reduction to 10.5 kg $CO_{2,eq}$/m²). In 2025, the limits should apply across the board to all buildings. Further revisions and further tightening of the limit will follow periodically every two years.



[40] Kuittinen and Häkkinen, 2020

[41] Ministry of the Interior and Housing, 2021

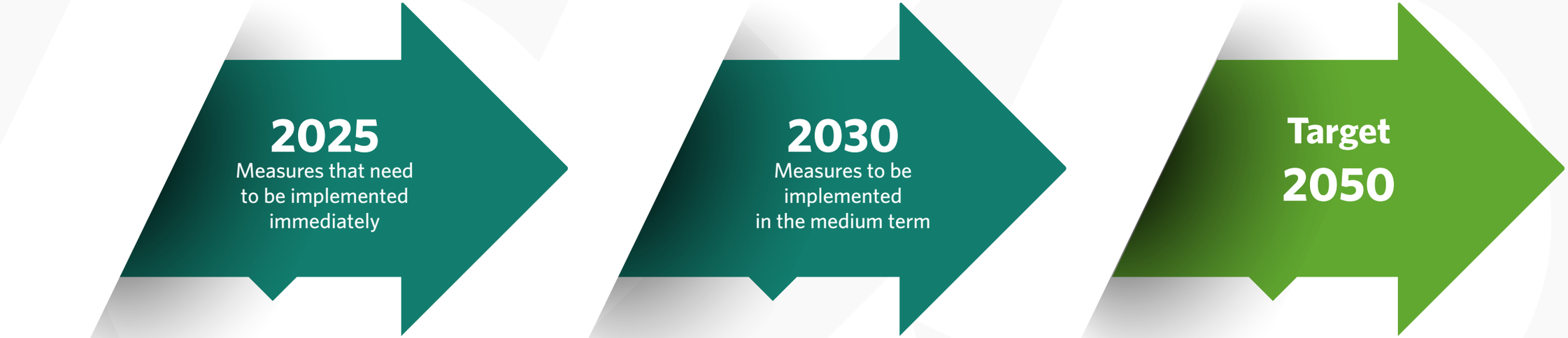
07

Roadmap to net-zero (Proposal of recommended actions and their timeframe)

The path to climate-neutral buildings by 2050 consists of individual measures with critical parts marked. The most important thing is the creation of a strategy for the Czech Republic in the decarbonization of the building environment. Possible measures for individual actors are described in more detail in this chapter.

ZERO CARBON ROADMAP

Proposed action for key stakeholders



ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Government of the Czech Republic

Clearly articulate a coherent national strategy for energy, climate and building transformation. Ensure comprehensive inter-ministerial coordination of the transposition and implementation of new legislation and create capacities for this in designated ministries (6.3.4., 6.7.2.).	The Czech Republic has a clear national strategy and is a strong proactive player in international negotiations on energy and climate legislation.	The Czech Republic is guided by a national strategy for energy, climate and building transformation and has a meaningful legislative system in which the different agendas build on each other. The Czech Republic can strongly promote its national priorities in international negotiations.

2025 → 2030 → 2050

ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Government of the Czech Republic

Ensure that national strategies, agendas and programmes are guided by the Energy Efficiency First principle.	Further strengthen energy security and economic stability by reducing energy intensity.	The Czech Republic is resilient to any lack of available energy.
Align the existing planning instruments (territorial energy concepts, local energy concepts and SECAPs) under one coherent agenda aimed at energy transformation and transition to a sustainable economy and ensure their systematic support in cooperation with the MIT, MoE and MMR.	The strategies at all levels of the territorial units are coordinated, build on each other and support for their continuous updating is ensured.	
Develop a system to collect the necessary data on the national building stock. Identify a national data integrator, which could be the Czech Statistical Office or the MIT. (6.1.7.)	Ensure the creation and regular updating of an open model of the national building stock and underlying data.	The Czech Republic has sufficient background data for strategic management of the construction sector. All underlying data are regularly analysed for the continuous evaluation of the fulfilment of commitments and objectives of the sub-action plans.
Systematically map the state building stock and ensure continuous preparation of quality energy-saving projects. Use the obligation under Article 5 of the EED to annually renovate 3% of the total floor area of heated or cooled buildings owned and used by central government institutions as an opportunity to create exemplary renovations of high architectural quality in a zero-energy standard. Avoid only partial short-term measures. Increase the visibility of regularly updated monitoring reports on the implementation of the renovation commitment.	In line with the 11th Progress Report on the implementation of the national energy efficiency targets in the Czech Republic[1], extend the intervention of the obligation to all public buildings and raise the standard of the final renovation to at least the standard of a near-zero energy building.	The state is acting as an exemplary steward. State-owned buildings operate efficiently and are an example of best practice. All buildings owned and used by central government institutions in the country have a zero carbon footprint across the entire life cycle and provide a healthy and comfortable indoor environment for employees.
Inter-ministerial coordination and creation of one-stop contact points offering targeted support to building owners for the entire renovation project journey: information and methodological support on pre-project preparation, financing options, project preparation, implementation, and monitoring (6.2.4).	For those interested in reducing energy consumption and potential beneficiaries, all conditions are clear and predictable in the medium term, allowing systematic investment planning. In case of confusion, a single point of contact can be contacted to provide useful information and helpful support in applying for support.	

[1] https://www.mpo.cz/assets/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/2023/8/11--zprava-o-pokroku-v-oblasti-plneni-vnitrostatnich-cilu-energeticke-ucinnosti.pdf

2025 → 2030 → 2050

ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Government of the Czech Republic

In line with the building renovation strategy, align the conditions and ensure continuity of subsidy programmes for quality renovations and renewable sources development (5.2.2) with sufficient allocation of funds, expanding the introduction of pre-financing options, providing soft and guaranteed loans and aligning subsidy programmes between ministries.	Establishment of a long-term unified inter-ministerial renovation programme with integration of different types of funding sources.	Legislative conditions and support programmes are set so that all buildings in the Czech Republic have a zero carbon footprint from their operation and new buildings and larger renovations have a zero carbon footprint throughout their life cycle. The areas that the state wants to support have a unified strategy and conditions across ministries.
Increase the staffing capacity of state and local government departments responsible for decarbonising the building sector and building operations, low-emission heating and community energy.	The capacities of the state administration are sufficient to carry out systematic work leading to energy savings and decarbonisation of the Czech economy.	

Ministry of the Environment

The Ministry of the Environment will elaborate the Climate Protection Policy in detail and set out what requirements the Czech Republic will set for greenhouse gas emissions from buildings 6.7.1)	The climate protection policy is developed into a clear action plan, the implementation of which is evaluated and updated annually.	Legislative conditions and support programmes are set so that all buildings in the Czech Republic have a zero carbon footprint from their operation and new buildings and larger renovations have a zero carbon footprint throughout their life cycle.
Strengthen training of Ministry staff on good practice in planning and implementing quality renovations and energy savings (6.2.2, 6.4.3)	Strengthen the transfer of good practice from abroad — introduce a system that will enable the sharing of good practice with similar state institutions abroad, for example in the form of joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.
In cooperation with the MIT and industry organisations, ensure awareness raising among manufacturers and importers of building materials about the forthcoming obligation. (5.3.2) Ensure that the EPD register is machine-readable and the data contained therein comparable.	As part of the revision of European legislation for harmonized construction products with the CE mark (new CPR), additional requirements for declarations of certain environmental properties from the point of view of the entire life cycle will be gradually introduced.	Environmental impact information is widely available and easy to find for all construction products.

2025 → 2030 → 2050

ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Ministry of the Environment

On the basis of a high-quality sociological survey, prepare and implement a targeted information and awareness campaign directed at all relevant target groups to explain the benefits of sustainable solutions, increase demand for high-quality real estate, and promote the possibility of using subsidy support for building renovation. Argumentation of reduced operating costs. Coordination with the MIT and the Ministry of Regional Development according to the scope of subsidy programmes, and ensuring unified communication for the state as a whole (6.4.2, 6.5.2).	With the help of sociologists, systematically monitor shifts in the perception of the implementation of mitigation measures by Czech society.	The CR has an overview of the behaviour and motivations of the target groups and on this basis is able to clearly explain the issues and agendas and to promote behaviour leading to environmental protection.

Ministry of Industry and Trade

Awareness raising among building owners and operators explaining the benefits of energy management and energy audits with an argumentation in operational savings. (6.4.5)	Put more pressure on compliance with the obligations arising from Act 406/2000 Coll. (energy audits, energy management) (5.4.5) This can be secured by the State Energy Inspectorate, which in any case needs to be strengthened in personnel terms.	The Czech Republic is committed to complying with laws leading to a reduction in the energy intensity of the economy.
In cooperation with the MoE and industry organisations, ensure awareness raising among manufacturers and importers of building materials about the forthcoming introduced by recast CPR. (6.3.2)	As part of the revision of European legislation for harmonized construction products with the CE mark (new CPR), additional requirements for declarations of certain environmental properties from the point of view of the entire life cycle will be gradually introduced.	Environmental impact information is widely available and easy to find for all construction products.
Strengthen training of Ministry staff on good practice in planning and implementing quality renovations and energy savings (6.2.2, 6.4.3)	Strengthen the transfer of good practice from abroad — introduce a system that will enable the sharing of good practice with similar state institutions abroad, for example in the form of joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.

2025 → 2030 → 2050

ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Ministry for Regional Development

Provide a methodology with specific wording of possible technical requirements and evaluation criteria for the tender documentation and subsequent evaluation, and ensure mandatory carbon footprint reporting for larger projects in construction procurement (6.6.1)	Ensure that limits are set on the maximum carbon footprint of major projects in construction procurement (6.6.1)	All publicly procured building projects in the Czech Republic have a zero carbon footprint across their entire life cycle.
For individual conservation zones in specific localities, develop binding rules permitting/prohibiting building modifications such as the installation of solar systems and other technical equipment on buildings in specific localities (6.1.11).	A methodology for permitting building modifications and energy renovations for listed buildings has been developed.	The Czech Republic has a good legislative environment in the field of construction in conservation areas, which is clear and predictable for builders.
Provide systematic support to the leaders of JVUs and BDs to improve their knowledge and argumentation skills in promoting energy-saving measures in managed properties. For residential buildings, revise the rules for collective decision-making on the implementation of energy measures within the JVU and BD to unblock the problem of complicated quorum. (6.2.5)	SVJ and BD have a long-term interest in energy-saving measures and enough quality information for their decision-making	
Educate relevant executive and decision makers in public administration on alternative options for project preparation and financing (e.g. project preparation using the Performance Design and Build method, guaranteed energy savings using the EPC method and combination with subsidy support) and, in the case of smaller municipalities, concentrate activities under joint organised groups or associations. (6.2.2)	Alternative methods of project preparation, implementation and financing are a common part of public procurement practice.	

2025 → 2030 → 2050

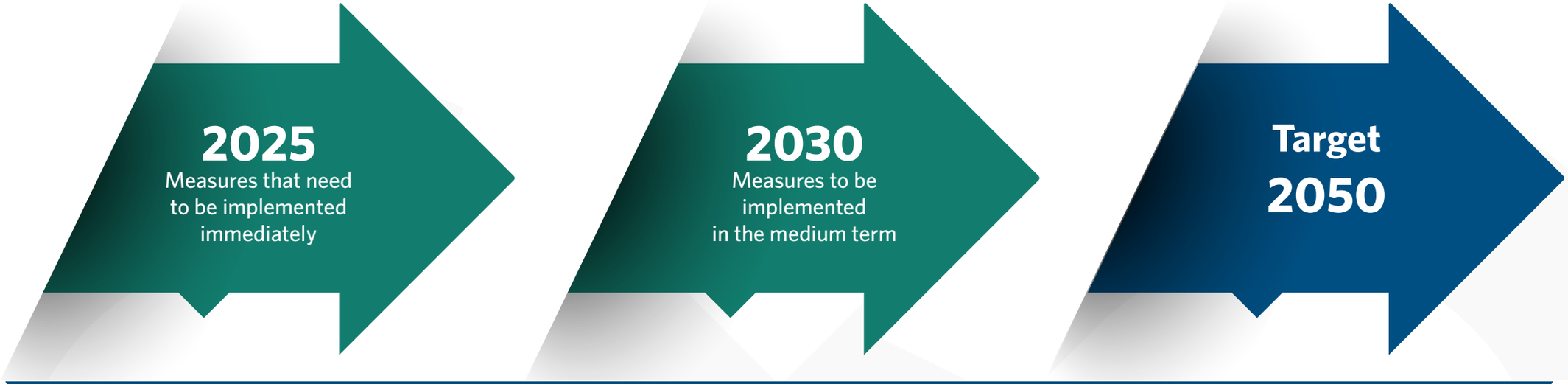
ACCELERATING THE PACE OF QUALITY RENOVATIONS AND ENERGY SAVINGS

Ministry of Finance

In cooperation with the Ministry of the Environment, the Ministry of Regional Development, or the CBA, ensure a uniform internationally harmonised interpretation of the SFDR, CSRD and the EU Taxonomy and DNSH technical criteria for construction projects and negotiate simplified criteria for smaller buildings (6.2.1)	All state programmes are in line with the EU Taxonomy.	The principles and objectives of the EU Green Deal are fully integrated into national agendas and are seen as an opportunity for positive change.
In cooperation with the professional public, ensure legislative amendments to Act No. 218/2000 Coll., on budget rules, so that it is possible to use the financing of projects of organizational units of the state in the form of a supplier loan, repaid from the guaranteed savings generated by the energy services project. (6.2.2)	Where appropriate, routinely use the financing of energy saving projects in the buildings of the state's organizational units in the form of a supplier loan repaid from guaranteed savings.	A good legislative environment is in place for the safe and efficient use of various energy saving financing schemes.
Coordinate the availability of appropriate financial instruments for building renovations of different types of entities, favouring loans for subsidised projects with a state loan guarantee (6.2.4)	The rules for the use of financial instruments are set and financial instruments are commonly used.	

Building users

Companies must ensure that they identify the main sources of greenhouse gas emissions in their operations. They must also address the reduction of emissions from the operation of the buildings they use by improving energy efficiency (use of energy audits, implementation of energy management) and maximising the potential of the installed equipment. Include relevant indicators in their decarbonisation strategy. (6.4.5)	Companies must continuously implement measures according to their decarbonisation strategy and update it on an ongoing basis.	Companies have succeeded in fulfilling their decarbonisation strategies and the Czech Republic will be able to meet its emission reduction commitments.



REDUCING EMBODIED EMISSIONS

2025	2030	Target 2050
Government of the Czech Republic		
Provide building product manufacturers with systematic support targeted at decarbonisation plans and initiating the necessary measures (6.1.1, 6.2.3).	Ensure continued support for the implementation of decarbonisation measures.	The production of building products is climate neutral.
Ministry of the Environment		
Ensure the creation of a national LCA database of building products containing generic data for use in the early stages of building design and specific data for individual building products (6.1.5)	Ensure regular updating of the LCA database.	Designers and architects have effective tools at their disposal to reduce the cost of designing environmentally friendly buildings.
Implement the Circular Czech Republic 2040 Action Plan. In accordance with the Action Plan for Circular Economy 2040, in cooperation with the MIT, adjust the legislative environment for the use of demolition material as secondary raw material and by 2027 evaluate the possibilities and subsequently propose a technical standard setting out the requirements for conducting pre-demolition audits for so-called selective demolition. In cooperation with the Ministry of Regional Development, define the obligation for builders to carry out a pre-demolition audit for certain types and sizes of buildings (6.1.3).	Evaluate the implementation of the Circular Czechia plan and prepare an update for the next period.	Waste-free construction is fully operational.

REDUCING EMBODIED EMISSIONS

Ministry of the Environment

In cooperation with the Ministry of Finance and industry organisations, prepare an awareness-raising campaign aimed at smaller construction companies and smaller producers of construction products to inform them about the obligations associated with the introduction of CSRD. (6.5.4)	Smaller construction firms and smaller building product manufacturers are moving towards their goals reported in sustainability reports to meet the 2050 National Strategy.	Reporting obligations are standard for all, and companies achieve their planned targets.
Promote the use of building products with verified environmental impact assessment (including other indicators in addition to CO_2) through EPDs. Extend subsidies for the use of products with EPDs to other subsidy schemes. (6.1.2)	With the advent of EPBD IV requirements, introduce limits on specific GHG emissions and make it mandatory to require only EPD building materials.	An Environmental Product Declaration (EPD) is prepared for each building material.
Clarify offset schemes (possible until 2030) (6.1.1). Inform about offset schemes possible from 2030 (Union Certification Framework for Carbon Removals) to avoid greenwashing.	Carbon offsets are used according to environmental and quality standards.	
Increased support for research and development of new building products with a low carbon footprint and high recycled content, including their marketing (TA CR Environment for Life programme) (6.1.2)	The Czech Republic systematically supports the development of new technologies that will result in a wider supply and lower prices of environmentally friendly products through long-term support for science and research and support for the development of local producers.	
Support for research, development and possible use of CCUS technologies in the Czech Republic (6.1.1)	Financially support the implementation of pilot CCUS projects.	CCUS technologies are commonly used in the Czech Republic wherever possible.

2025 → 2030 → 2050

REDUCING EMBODIED EMISSIONS

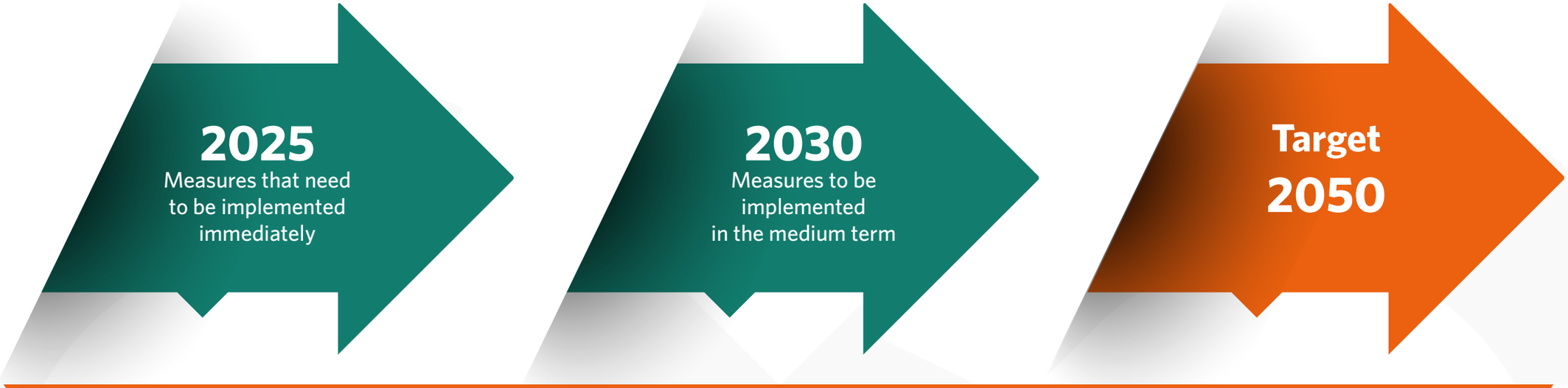
Ministry of Industry and Trade

2025	2030	2050
Establish a uniform methodology for reporting emissions under EPBD IV (6.1.8)	Ensure the development of calculation tools for reporting GHG emissions in line with EPBD IV.	The Czech Republic has a quality legislative environment that is clear and predictable for builders.
Introduce legislative limits on built-in $CO_{2,eq}/m^2$ for new buildings following the introduction of a uniform methodology and database used to evaluate the building stock. (6.1.8)	Introduce legislative limits on embodied $CO_{2,eq}./m^2$ progressively for all buildings to move towards zero emissions in the overall strategy.	All buildings are carbon neutral.
Modifications to standards to allow for the safe use of products with recycled content (CAS) (6.1.1)	Updated and newly developed standards fully allow for the safe use of products with recycled components.	
Map the readiness of building material producers for decarbonisation and inform them about available support programmes (6.1.1, 6.1.2).	Provide long-term supportive financing for decarbonisation of building products production.	Climate-neutral production of building materials is secured.
Provide methodological support to SMEs for the certification of new products, possibly with vouchers or financial instruments to support the processing of EPDs for construction products. (6.1.2)	Require EPDs for all construction products.	Building products normally have their comparable EPDs according to a uniform methodology.
Increase support for research and development of new building products with a low carbon footprint and high recycled content, including their marketing (6.1.2)	The Czech Republic systematically enables the development of new technologies, the expansion of supply and the reduction of the price of environmentally friendly products through long-term support for science and research and support for the development of local producers.	
Ensure that fire standards are adjusted to allow for the efficient construction of multi-storey timber buildings.	The Czech Republic has standards that enable the construction of modern, environmentally friendly and material-efficient buildings that use local renewable resources.	

2025 → 2030 → 2050

REDUCING EMBODIED EMISSIONS

2025	2030	2050
Ministry for Regional Development		
Provide a methodology with specific wording of possible technical requirements and evaluation criteria for tender documentation and subsequent evaluation and pilot the introduction of requirements for the use of low-carbon-footprint products in public procurement (6.6.1, 6.3.2)	Set mandatory limits on greenhouse gas emissions in public procurement. (6.3.2)	All publicly procured building projects in the Czech Republic have a zero carbon footprint across their entire life cycle.
In cooperation with the MIT, define the obligation for builders to prepare a pre-election audit for larger buildings.	Extend the pre-election audit obligation to all types and sizes of buildings.	Waste-free construction is fully operational.
Ministry of Finance		
In cooperation with the Ministry of the Environment, the Ministry of Regional Development, or the CBA, ensure a uniform internationally harmonised interpretation of the EU taxonomy for renovation and energy saving projects and negotiate simplified criteria for smaller construction projects (6.2.1)	Align all government programmes with the EU Taxonomy.	The principles and objectives of the EU Green Deal are fully integrated into national agendas and are seen as an opportunity for positive change.
In cooperation with the Ministry of the Environment and sectoral organisations, prepare an awareness-raising campaign aimed at smaller construction companies and smaller producers of construction products to inform them about the obligations associated with the introduction of CSRD. (6.5.4)	Smaller construction firms and smaller building product manufacturers are moving towards their goals reported in sustainability reports to meet the 2050 National Strategy.	Reporting obligations are standard for all, and companies achieve their planned targets.



DEVELOPMENT OF LOW-EMISSION ENERGY

Ministry of the Environment and Ministry of Industry and Trade

Prepare a capacity subsidy program for the transformation of existing and construction of new heat supply systems. This program should be focused on the use of low-emission energy sources, the transformation of steam systems, the decentralization of systems, the reduction of heat losses and the integration of large-capacity heat storage tanks. (6.2.4) Support for the transformation of the heating industry - transition from fossil fuels to emission-free sources within the Modernization Fund.	Heat supply systems respect the principle of Energy Efficiency First, include energy storage, allow pumping and returning waste heat to the system and are almost emission-free. Decarbonization of buildings using district heating.	
As part of the Modernization fund, set up support for production enterprises in the construction industry with the aim of replacing fossil resources in production processes with renewable energy sources.	Reducing embodied carbon in building products.	
More support for pilot projects in energy-plus neighbourhoods involving local actors. It can also be addressed by supporting municipal energy companies and their joint projects with developers.	Complete large pilot projects, monitor their operation and promote them as examples of good practice.	Building energy-plus neighbourhoods serves as a common solution on the road to more sustainable and energy-efficient cities.

2025 → 2030 → 2050

DEVELOPMENT OF LOW-EMISSION ENERGY

Ministry of Industry and Trade

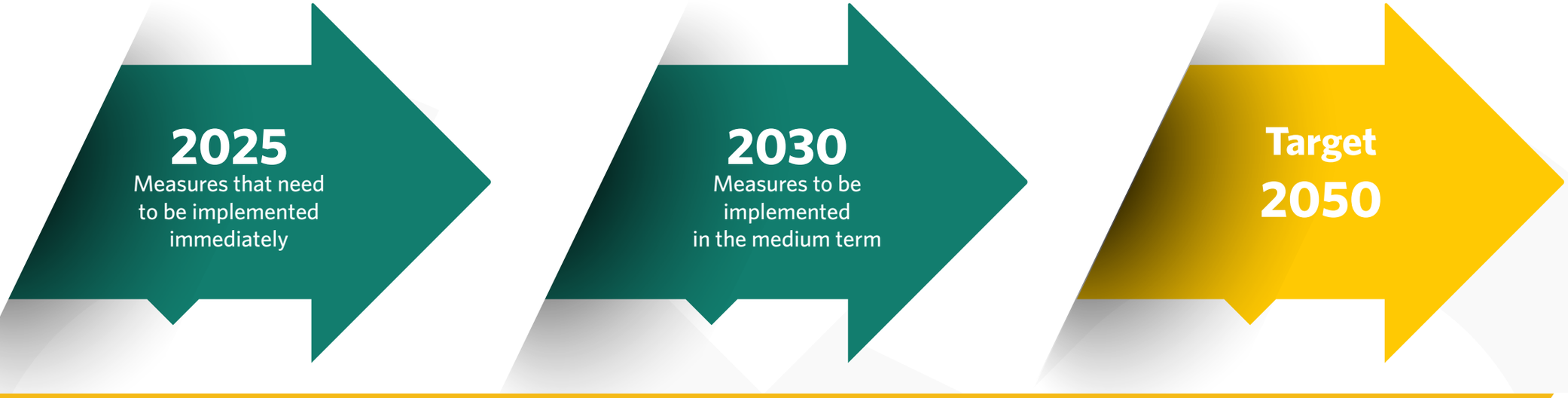
Intensify support for renewable sources development, smart grids research and new ways of storing electricity and heat.	Implement large-scale smart grid pilot projects with large-scale energy storage.	Smart grids are the standard solution.
Consistent transposition of EPBD III in the area of the use of renewable energy sources — take into account the transformation of the energy industry in the calculation of the energy demand of buildings: the development of the use of energy storage devices, the possibility of sharing electricity within energy companies and active customers.	A shift in the evaluation of the energy performance of buildings towards the description of the real operation of the building.	The use of energy digitization in evaluating the operation of buildings.

Ministry for Regional Development

Ensure that strategic goals in the field of energy decarbonisation are reflected in the spatial planning documentation at the level of regions, cities and municipalities, in accordance with national strategies and plans, i.e. development of decarbonized heat energy supply systems, smart grids, renewable energy sources including energy storage devices.	The development needs of both electrical and thermal energy systems are a common part of municipal development planning.
Encourage local actors to be actively involved at the local level. Create the appropriate legislative conditions, prepare funding, and provide training for staff of local authorities and the companies they set up to manage local energy infrastructure, so that they can plan and develop joint projects with the private sector in the long term.	Local actors have sufficient knowledge to manage local energy infrastructure responsibly and to plan and implement joint projects with the private sector.

Ministry of Finance

Respect the requirements of the EU ETS 2 directive in the area of the use of funds for the decarbonisation of the economy across sectors.	EU ETS 2 is fully implemented and the state fully uses available funds in accordance with the requirements of the directive.



CROSS-CUTTING MEASURES

Government of the Czech Republic

To develop a methodological interpretation of the EU Taxonomy and DNSH rules for entering and checking criteria for grant programmes.	All state programmes are in line with the EU Taxonomy.	The principles and objectives of the EU Green Deal are fully integrated into national agendas and are seen as an opportunity for positive change.

Ministry of the Environment

Strengthen training of Ministry staff on good practice in planning and implementing high-quality renovations, energy savings and electricity production from renewable sources. (6.2.2, 6.4.3)	Strengthen the transfer of good practice from abroad - introduce a system that will enable the sharing of good practice with similar state institutions abroad, for example in the form of joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.

Ministry of Industry and Trade

Set up a system for collecting, continuously updating and publishing data on the emission factor of the national energy mix. Ensuring predictability of developments and requirements, thus ensuring and legal certainty during the preparation and implementation of investments. (6.1.6)	Develop a model of the evolution of the emission intensity of the national energy mix up to 2050. Ensure that it is freely available and used across ministries, subsidy programmes and in impact studies in the preparation of new legislation (6.1.6).	The Czech Republic continuously processes and evaluates data on emission factors, shares them publicly in a clear form, and works with them in the development of legislation. Investors have clear guidance on how to proceed, which gives them legal and technical certainty when planning investments.

2025	2030	2050

CROSS-CUTTING MEASURES

Ministry of Industry and Trade

2025	2030	2050
Prepare a timetable for the implementation of the revision of EPBD IV. PENB will start to require the calculation of the carbon footprint of buildings over their entire life cycle. Establish a timetable for the implementation of the requirements for the specific carbon footprint of buildings. (6.7.1) Legislate on calculation methods and ensure the availability of tools for assessing and reporting on the carbon footprint of buildings.	Life-cycle carbon footprint assessments and compliance with defined requirements for zero greenhouse gas emissions buildings are routinely carried out for all building types.	
Anonymised access to data from the MIT ENEX database and linking to the cadastral register RÚIAN (6.1.7)	Continuously collect and evaluate data on energy and emission performance of buildings for the purpose of mapping and modelling the building stock in the Czech Republic.	
Prepare the MIT ENEX database for the collection of EPBD IV data, including new data on the emission performance of buildings (6.1.7)	Start reporting on the emission performance of buildings according to EPBD IV using the MIT ENEX database.	The data recording system is fully functional, the collected data is valid and is further evaluated for statistical purposes and monitoring of the decarbonisation process of buildings.
Enable the use of anonymised data on energy consumption of consumption points, or occupancy of properties, at least in aggregate at the level of blocks or neighbourhoods.	The anonymised data serves as a sound basis for assessing the achievement of the 2050 construction targets.	
Enable the use of actual consumption data from anonymised smart and continuous meters gradually being made mandatory.	The anonymised data serves as a sound basis for assessing the achievement of the 2050 construction targets.	
Incorporate into the National Energy Concept a plan to ensure a rapid increase in the capacity of emission-free sources.	The capacity of low- and zero-emission sources is being increased according to the plan in the energy concept.	The Czech Republic has a sufficient amount of low-emission, emission-free energy sources.
Strengthen training of Ministry staff on good practice in planning and implementing high-quality renovations and energy savings (6.2.2, 6.4.3)	Strengthen the transfer of good practice from abroad - introduce a system that will enable the sharing of good practice with similar state institutions abroad, for example in the form of joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.

CROSS-CUTTING MEASURES

Ministry for Regional Development

Ensure acceleration of energy infrastructure construction permitting processes and their implementation.	Building permit processes are sufficiently fast and do not constitute an obstacle to the development of construction.	
Ensure consistent control of the existence of documentation of the actual construction design for buildings owned by central government institutions, local governments and their subordinate organizations. Check the same for projects subsidised by public budgets.	The documentation of the actual construction is part of each completed project and its long-term archiving is ensured. The documentation shall include a pre-collapse audit or similar document with information on the possibilities of dismantling the building and the use/recycling of materials in accordance with the principles of the circular economy.	
Strengthen training of Ministry staff on good practice in planning and implementing quality renovations and energy savings (6.2.2, 6.4.3)	Strengthen the transfer of good practice from abroad - introduce a system that will enable the sharing of good practice with similar state institutions abroad, for example in the form of joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.

Regions

Provide systematic methodological and project support to lower territorial units, especially smaller municipalities, in conceptual long-term planning and implementation of investments in quality new building construction and renovation and renewable sources development. (6.2.2)	Continuous improvement and streamlining of support to municipalities based on feedback and developments in legislation, financing and technical innovation to achieve a zero carbon footprint for owned buildings.	A zero carbon footprint is achieved in new building construction, renovation and building operation.

CROSS-CUTTING MEASURES

Regions

Educate relevant executive and decision makers in public administration on alternative options for project preparation and financing (e.g. project preparation using the Performance Design and Build method, guaranteed energy savings using the EPC method and combination with subsidy support) and, in the case of smaller municipalities, concentrate activities under joint organised groups or associations. Strengthen training of region staff on good practice in planning and implementing quality renovation and energy saving projects (6.2.2, 6.4.3)	Strengthen the transfer of good practice at national level and from abroad - introduce a system that allows sharing of good practice between institutions, for example through joint conferences, workshops or exchange internships.	The level of professional competence of civil servants is at the top international level. International good practice is shared and we are not afraid to adopt solutions that work abroad for our needs.

Developers, investors, building owners and real estate companies

Prepare decarbonisation strategies for their companies and for their owned building portfolio and start implementing them.	Implement and regularly update decarbonisation strategies	The operations of companies in the construction sector are being decarbonised.
Include appropriate effective measures to reduce the carbon footprint (built and operational) of new building and renovation projects and ensure they comply with the EU Taxonomy.	Minimise the carbon footprint of new building construction, renovation and building operations.	Zero carbon footprint is achieved in the construction of new buildings, renovations and building operations.

Provide regular staff training and establish internal systems to raise awareness of carbon footprint reduction opportunities in upcoming projects.

Acquisition teams must consider the sustainability status of buildings in new acquisitions. (6.4.5.)

2025	2030	2050

CROSS-CUTTING MEASURES

Financial institutions

Increase the number of funded projects meeting the requirements of the EU taxonomy methodology leading to a reduced carbon footprint. In cooperation with the state, favour loans for subsidised projects with a state loan guarantee.	Increase the number of funded projects meeting the requirements of the EU taxonomy methodology leading to a reduced carbon footprint.	Fund only projects with a zero carbon footprint.

Architects, designers and specialist consultants

Designers and architects need to actively educate themselves in the areas of optimising building design at the study stage, incorporating appropriate effective measures to reduce the carbon footprint (both built and operational) of new building and renovation projects and ensuring they comply with the EU Taxonomy.	It is common practice to apply appropriate effective carbon footprint reduction measures (both built and operational) to all new build and refurbishment projects and ensure they comply with the EU Taxonomy.	Designers and architects have strong competencies so that new building projects and renovations are designed to have a zero carbon footprint.

Provide regular staff training and implement internal systems to raise awareness of carbon footprint reduction opportunities in upcoming projects.

Provide education and awareness to the professional community on reducing the carbon footprint of buildings.

Manufacturers and suppliers of materials and technologies

Develop plans to decarbonise production (analyse possible measures - cost efficiency; evaluate the possibility of introducing elements of the circular economy) and gradually implement the decarbonisation plan. Increase the share of recycled materials where possible (e.g. bricks have a limited share of recycled materials).	Successfully implement the decarbonisation measures planned for 2030, update the 2050 strategy and continue implementing other measures.	Achieving a zero carbon footprint in the manufacture of building products where technologically feasible.

CROSS-CUTTING MEASURES

Manufacturers and suppliers of materials and technologies

Provide regular staff training and introduce internal systems to raise awareness of opportunities to reduce the carbon footprint of the company's operations.

Share the principles of good practice with the professional community.

Construction, demolition and recycling companies

Prepare decarbonisation strategies for their companies.	Implement and regularly update decarbonisation strategies.	Achieved a zero carbon footprint in the construction of new buildings and renovations as well as in the operation of the company itself.
Include appropriate effective measures to reduce embodied carbon in new buildings and renovations. Take into account opportunities to reuse existing building materials.	Ensure quality separation of secondary raw materials to ensure maximum recovery. Minimise the carbon footprint of demolition and recycling activities.	

Comply with demolition procedures according to pre-demolition audits, recycle construction demolition waste well. To create high-quality secondary raw materials with declared properties for their use in buildings and construction prod

Provide regular staff training and implement internal systems to raise awareness of carbon footprint reduction opportunities in upcoming projects.

Share the principles of good practice with the professional community.

2025 → 2030 → 2050

CROSS-CUTTING MEASURES

Professional and trade organisations

In cooperation with the relevant ministries, raise awareness among manufacturers and importers of building materials of the forthcoming obligation to publish EPDs. (6.3.2)	The relevant professional and industry organisations guarantee the quality of their member companies' products in the area of sustainability.	Professional organisations support quality improvement and continuous education of their members, including in the area of sustainability and carbon footprint reduction.
Provide regular training to employees in relevant sectors of the construction industry on how to reduce their carbon footprint.		
To share the principles of good practice of its members with the public.		
In cooperation with the Ministry of Finance and the Ministry of the Environment, an awareness-raising campaign aimed at smaller construction companies and smaller producers of construction products to inform them about the obligations associated with the introduction of CSRD. (6.5.4)	Smaller construction firms and smaller building product manufacturers are moving towards their goals reported in sustainability reports to meet the 2050 National Strategy.	Reporting obligations are standard for all, and companies achieve their planned targets.

Ministry of Education, Youth and Sports, Ministry of Labour and Social Affairs, Educational Institutions

Ensure that sustainability, decarbonisation and energy savings are reinforced in the curriculum at all levels of education.	Sustainability and decarbonisation topics are integrated as standard in secondary and higher education curricula and in the lifelong learning system.	
Plan for the strengthening of new fields of study to ensure a workforce with sufficient expertise and technical skills in the areas of sustainability, clean energy, circular economy and digital construction in secondary and higher education. Ensure that these fields of study are prestigious and sought after by applicants;	Increase the number of graduates (high school and university) with sufficient professional knowledge and technical skills in the areas of sustainability, clean energy and digital construction.	Školství průběžně zajišťuje dostatek pracovních sil s odbornými znalostmi a technickými dovednosti v oblastech udržitelnosti, čisté energetiky, oběhového hospodářství a digitalizace stavebnictví na středních a vysokých školách.
For the labour market, it will ensure a significant acceleration of the retraining of workers in the fields of clean energy, sustainable construction, the circular economy and Construction 4.0.	The education sector continuously ensures a sufficient workforce with expertise and technical skills in sustainability, clean energy, circular economy and digital construction in secondary and higher education.	

08

Glossary of abbreviations and terms

- **Baseline:** A concept that is basically untranslated into the Czech language. Baseline is a static reference of the starting position, baseline state, baseline or commonly used Anglicism "Baseline" is a static reference of the baseline state against which progress towards the goal is compared. Baselines allow changes or improvements to be tracked over time and across projects. If we do not establish a good "baseline" in terms of the carbon footprint of any project or product, all our efforts are doomed to failure, often at great cost and to the detriment of the professional erudition of the entire Carbon Management team.
- **Embodied Carbon** comes from the energy consumed to extract, refine, process, transport and manufacture a material or product (including buildings). It is often measured from cradle to gate (factory), cradle to site (use) or cradle to grave (end of life). The embodied carbon footprint is therefore the amount of carbon (CO_2 or CO_{2eq} emissions) that is required to produce a material.
- **Environmental Product Declaration (EPD):** Environmental product statements are documents that state the environmental impact of products on the environment. They are based on LCA models and are verified by a third party.
- **Life Cycle Assessment (LCA):** LCA is a systematic methodology for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to a building, infrastructure, product or material over its life cycle (ISO 14040: 2006).
- **Life Cycle Cost (LCC) assessment:** the Life Cycle Cost (LCC) is the total cost incurred over the lifetime of a product.

Abbreviations used in the document:

Organisation	
MIT	Ministry of Industry and Trade
MOE	Ministry of the Environment
MMR	Ministry for Regional Development
MF	Ministry of Finance
CSO	Czech Statistical Office
IHRA	Office for State Representation in Property Matters
TAČR	Technology Agency of the Czech Republic
TIME	Czech Agency for Standardization
CBA	Czech Banking Association
KACR	I couldn't find anywhere in the document
SPS	Association of Construction Entrepreneurs
SPCR	Confederation of Industry and Transport of the Czech Republic
BPIE	Buildings Performance Institute Europe
ÚOHS	Office for Protection of Competition

Other abbreviations	
LCA	Life cycle assessment
GHG	Greenhouse gas
GWP	Global warming potential
CCUS	Carbon capture and utilisation and storage technologies
CCS	Carbon capture and storage technology
CCU	Carbon capture and utilisation technologies
ENEX	Database of energy audits, assessments and certificates of energy performance of buildings
DNSH	The principle of non-material damage
CRAB	Central register of administrative buildings
PENB	Energy performance certificate for buildings
EPC	Energy Performance Contracting — a method of renovation in the form of guaranteed savings
DB (PDB)	Design and Build (Performance Design and Build) — preparing projects for function and performance
RÚIAN	Register of Territorial Identification, Addresses and Real Estate
SECAP	Sustainable Energy and Climate Action Plan
CIA	Lifelong learning

09

Case studies

CTPark Prague North — industrial building D8.7Bs with green building elements

CASE STUDY

Investor: CTP Invest, s. r. o.

BREEAM certification supplier and consultant: CEVRE Consultants, s.r.o.

CTP has long been one of the leaders in the construction and management of highly sustainable industrial and office parks, and its innovative approach to construction helps to dispel myths that are often mentioned in connection with developers. The company is following the path of "making sustainability a standard from above-standard". A current example is CTPark Prague North, which aspires to be the most sustainable industrial park in the Czech Republic, and hall D8.7B is one of the most sustainable industrial buildings in the world. In addition, the park will also offer a modern high-tech shopping zone, including offices and community facilities for leisure activities, and will support cycling infrastructure. Nature trails are also being built in the vicinity of the building to raise awareness of sustainability, relaxation zones with artistic elements and sports grounds. The principles of the circular economy are applied in the construction of the entire park. The park will place great emphasis on greenery and there will also be facilities for animals.

- Use of materials with a lower carbon footprint documented in a valid EPD (Environmental Product Declaration) and demonstrated in LCA
- Application of energy-saving measures with regard to maintaining thermal comfort and with regard to expected climate changes, including the use of a flat roof for the installation of a photovoltaic power plant (up to 3.2 MWp)
- Application of environmentally friendly measures that have a positive impact on local ecosystems and areas that are degraded by intensive agriculture

ctp

cevre CONSULTANTS

Description

The hall currently under construction is designed to achieve carbon neutrality. Design, implementation and commissioning are carried out in accordance with the EU taxonomy. Preference is given to materials with a lower carbon footprint documented in a valid EPD and proven in an LCA. One of the structural elements that made a significant contribution to this is, for example, the trapezoidal sheets made of "green" XCarb steel, which cover the entire roof area of the larger 32,000 m^2. As a result, 835 tonnes of CO_{2e} will be saved. Gravel replaces recycled concrete. CTP also strives to reduce the production of construction waste, which is 9.0 kg/m^2 of the gross floor area of the building, including excavated soil. The emphasis on sustainability is not only on the construction process, but also on the subsequent operation of the building. Savings in electricity consumption will occur thanks to the incorporation of energy-saving measures with regard to maintaining thermal comfort and with regard to predicted climate change. The entire area will be used for the installation of a photovoltaic power plant (up to 3.2 MWp). Innovative solutions such as zone lighting, sensors for efficient heating and cooling, temperature control and freecooling air circulation ensure lower energy consumption. An integral part of the system are retention tanks for working with rainwater, waterless urinals and the aquastop system. As part of the BREEAM certification, issues of interior comfort are also addressed. The hall will receive full marks in the field of acoustics. From start to finish, biological supervision takes place here, which contributes to the protection of the local fauna and flora. An integral part of the park is greenery with a varied planting of local plant and tree species and facilities for local animals. In the future, in addition to lizard pits, beetle pits, birdhouses and ponds, we will also find an equestrian area open to the public, where the concept of the entire park envisages riding routes for horses and their riders.

Conceptual study of energy system in an existing building in Prague

CASE STUDY

Investor: Daikin Airconditioning Central Europe — Czech Republic spol. s r.o.

Study author: ČVUT UCEEB

As part of this conceptual study, 3 variants of the energy concept of heating and cooling of the existing administrative building with a curtain wall in Prague were developed as a basis for investment decision-making with regard to CO_2 emission savings.

Subsequently, an evaluation of primary energy from non-renewable sources and an economic evaluation were added. The existing building has a glazed curtain wall, which is still of solid quality. The following variants were defined and calculated for them:

VAR 1 — Replacement of the current heating and cooling method with a VRV system (refrigerant, variable flow). The design of the DAIKIN device was carried out as 1 VRV system per 1 floor of a high-rise building. The distribution of heat or cold is designed by means of indoor cassette units with a number of 22 pcs/floor. The device is of the so-called VRV 5 generation, enabling heat recovery or cold recuperation. It is a three-pipe heat recovery system that allows simultaneous cooling and heating by transferring heat from areas that require cooling to areas that need heating.

VAR 2 — Replacement of the current heating and cooling method by means of air-to-water heat pumps (water circuit). By installing a new energy source, the district heating system is completely disconnected from the district heating system. Heat pumps will provide a complete supply of thermal energy for heating, hot water preparation and the supply of the necessary cooling.

VAR 3 — NReplacement of the existing cooling method with the same technology, but with higher efficiency.

In the VAR1 and VAR2 variants, the possibility of heat recovery or energy transfer has also been taken into account. The basic method was the calculation of the hourly balance applied to cooling. Due to the absence of detailed data for heating, a monthly balance was also used. A more detailed model yields more relevant results in relation to heat recovery and heat load.

The building is now connected to the district heating supply system (DH), where the heat supplier is Pražská teplárenská a.s. The contractually stipulated output of DH is 1.5 MW. The source of heat is the Mělník power plant burning brown coal. District heating is used for heating and hot water preparation in the building. The heating system includes a backup electric boiler with a heat output of 420 kW.

The main central source of cooling is two compressor cooling units with a water-cooled condenser, a circuit with two cooling towers located next to the building. The total cooling capacity of the system is 1774 kW with an electrical input of 376 kW.

Following the purpose of the study, the production of CO_2 emissions and the consumption of primary energy from non-renewable sources were evaluated. The CO_2 emission factors were taken from the Decree No. 141/2021 Coll. on Energy Assessments and Primary Energy Factors from Non-Renewable Sources from Decree No. 264/2020 Coll. on the energy performance of buildings, see Table 7. Emission factors do not take into account the refrigerant charge in individual equipment, as the operation of the building, i.e. the operational consumption of individual energy carriers, is evaluated as part of energy savings.

DAIKIN

ČVUT UCEEB

CO_2 emission and primary energy factors usede

Energy carrier	Emission factor (tCO_2/MWh)	Primary energy factor (-)
Electricity	0,86	2,6
District heating (Mělník heat plant, brown coal)	0,352	0,9

With regard to the overall evaluation, it was found that all variants lead to overall energy savings as well as emission and primary energy savings.

- The greatest savings are shown by VAR1 with the installation of a VRV system (air-to-air heat pump) and the use of heat recovery, where the savings in CO_2 and primary energy emissions reach 54 and 52%, respectively.
- It is a three-pipe heat recovery system that allows simultaneous cooling and heating by transferring heat from areas that require cooling to areas that need heating.
- This is followed by VAR2 with the installation of a heat pump, including a pumped heat pump, where there are savings of 44 and 37%, respectively. The smallest savings were calculated for VAR3 with a simple replacement of the device with the same technology, where the emission and primary energy savings are 9 and 10 %, respectively.

On the basis of the calculation, it was also concluded that all variants will save operating costs compared to the current situation, taking into account the same specific prices for energy. VAR1 will save CZK 4,590 thousand per year, i.e. by about 53%. VAR2 will save CZK 3,558 thousand per year, i.e. by about 41%. VAR3 will save CZK 784 thousand per year, i.e. by about 9%.

CO_2 emission and primary energy factors used

Parameter	Energy carrier	Present state	VAR1 VRV	VAR2 heat pump	VAR3 change
CO_2 emissions (tCO_2/year)	Heat	1 087	242	0	1 087
	Electricity	634	549	972	485
	Total	**1 722**	**790**	**972**	**1 572**
	Savings (%)		**54**	**44**	**9**
Non-renewable primary energy (MWh/year)	Heat	2 780	618	0	2 780
	Electricity	1 918	1 659	2 940	1 466
	Total	**4 698**	**2 277**	**2 940**	**4 245**
	Savings (%)		**52**	**37**	**10**

CPIPG ESG strategy and objectives

CASE STUDY

Our ESG strategy and objectives are constantly evolving. As we are a property owner, our objective is set out in section E — Environmental Sustainability. Currently, our target is to reduce the GHG intensity of our property portfolio by 32.4% by 2030 compared to 2019. We have also committed to switching to renewable electricity by 2024, which we would primarily like to generate within our own properties and, in the event of insufficient capacity, to use sourcing guarantees from the countries in which we operate.

Hand in hand with our commitment to reduce our greenhouse gas intensity, we have developed an action plan to achieve this goal, so that our commitment is both ambitious and realistic. The action plan consists of five steps, which first and foremost lead to a reduction in energy intensity:

- Operation optimization — energy management
- Cooperation with tenants
- Investment (CAPEX) in green technologies
- Electricity from renewable sources
- Development — new buildings designed in accordance with the net zero energy standard

All of these five steps are important to us, and all will contribute to reducing the greenhouse gas intensity of our property portfolio and thereby to achieving our stated environmental commitment. The greenest energy is that which does not have to be produced/consumed at all. For buildings, whether new or existing, this means reducing consumption to a minimum and then covering this minimum from renewable sources, optimally on-site. Of course, this is easier to achieve in new buildings where passive design features such as orientation to the cardinal points, quality construction without thermal bridges or heat recovery can be used. For existing buildings, it is mainly about investing in new technologies to improve energy performance, which we evaluate on the basis of Life Cycle Cost Analysis.

Monitoring of the environmental target from 2019—2022 has shown that the managed portfolio is still more than 15% above the target.

We have been implementing all of these steps across all of our segments for several years now, and we are still below the trajectory of our stated GHG intensity reduction.

Our environmental target is set in line with the Paris Agreement, meeting the “well below 2 degrees” scenario commitment. As of July 2022, we are one of the first companies in the region to have this target scientifically verified and approved by the independent Science Based Target Initiative (SBTi).

Steps to fulfil CPIPG goals

CPI Property Group

The new Česká spořitelna headquarters building in Smíchov — reducing the built-in carbon footprint through the eyes of the investor

CASE STUDY

Investor: Česká spořitelna a.s.

Reducing the embodied carbon footprint is important in the construction industry, as embodied emissions come to the fore with high operational energy efficiency in buildings. An analytical approach helps to focus attention on where the greatest effect can be achieved. Appropriate material choices can reduce greenhouse gas emissions.

Purpose: The design of the new headquarters of Česká spořitelna, with a planned area of approximately 70,000 m^2, is part of the second stage of the construction of the largest comprehensive district in the modern history of Prague. The winning building design by Pavel Hnilička Architects and Austrian studio Baumschlager Eberle emerged from a competition of 138 designs from around the world. The project is expected to be completed in 2027/28.

Sustainability and climate ambition: the project aims for high quality in the area of comprehensive sustainability, and is being prepared in the context of BREEAM and WELL sustainability certifications. The EU taxonomy is uniquely taken into account, not only with regard to the ambition to make a significant contribution to reducing negative environmental impacts, but also to avoid significantly damaging other areas through the settlement of requirements.

In its ambitious brief, the investor aims to minimise the embodied carbon footprint of the building materials by 10—25%. The variance is due to the inconsistent comparative basis in the market. Achievement of the limit values and below will be evidenced by the general contractor of the building with an Environmental Product Declaration (EPD). These declarations will form the basis for the final carbon footprint calculation and reduction.

In terms of energy and climate performance, the embodied carbon footprint of modern and sustainable buildings is increasingly being addressed in addition to the energy performance of the project, which is also addressed in the energy performance certificate. Measuring and reducing it is important for reducing overall greenhouse gases and sustainable development in the building sectors. The Savings Bank, as a responsible investor that emphasises sustainability principles, is moving in this direction.

Quality management in this area includes the procedural, preparatory and analytical part, and the subsequent implementation with monitoring in accordance with the planned objectives. CS plans to transfer the lessons learned to the business model of its real estate business.

Phase of the plan to minimise the embodied carbon footprint

In the first phase, the project focused on a thorough analysis of the building materials used in the construction. Based on the Revit model, the volumes of each material were determined by a calculation that took into account the CO_2 footprint for the entire life cycle of the material from production, transport, and installation, to maintenance and final disposal. Based on this analysis, we focused on the three materials with the greatest environmental impact. These were concrete, steel and insulation. These three materials are responsible for almost 90% of the embodied CO_2 emissions of the building.

- Building concrete is the source of 40% of the embodied CO_2. Reduction is achievable by using blended cements in the concrete mix, where part of the cement fraction is replaced by fly ash or blast furnace slag. An alternative may be to reduce the proportion of clinker. Example of proposed limit values:

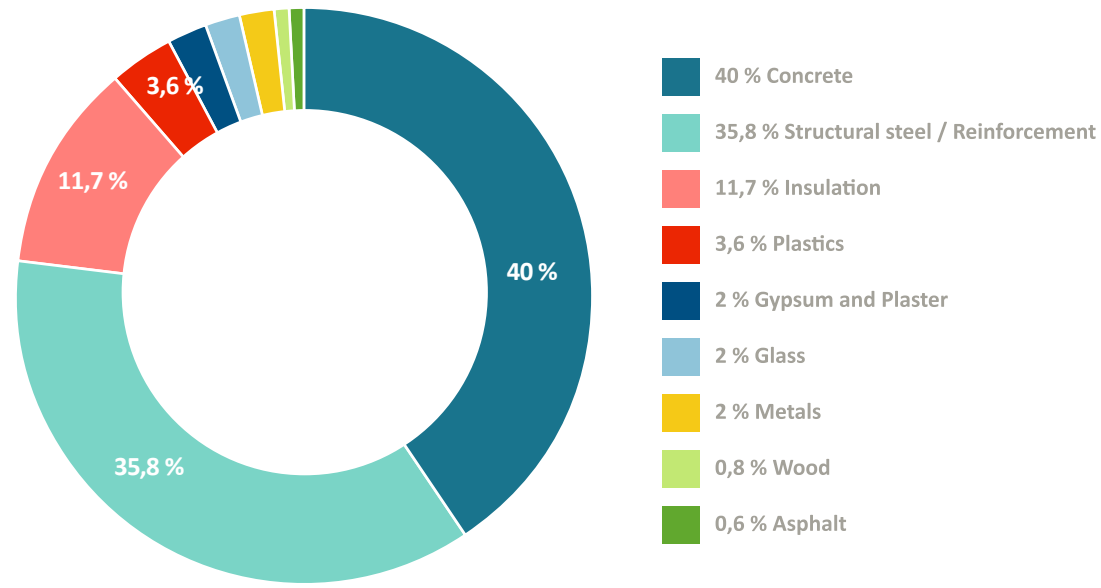
Strength class of concrete	20/25 (20/25 MPa)	25/30 (25/30 MPa)	28/35 (28/35 MPa)	32/40 (32/40 MPa)	35/45 (35/45 MPa)	40/50 (40/50 MPa)
kg $CO_{2,eq}/m^3$	208,9	221,5	234,8	259,3	274,8	293,5

Embodied emissions requirements for concrete — maximum values in kg$CO_{2,eq}$ per m^3

- Steel is a material with a high embodied CO_2 content (35.8%) and is ranked 2nd in the project. This footprint can be substantially reduced by the appropriate use of recycling. For all steel materials used on site, we propose a maximum proportion of recycled content.
- Other materials that affect the carbon footprint are building insulation with a share of 11.7%. For insulation, alternatives with significantly lower carbon footprints can be found by making appropriate choices while maintaining physical properties.

In collaboration with our consultants, we have limited the maximum amount of embodied CO_2 in the requirements for the general contractor and further defined specific materials that meet the requirements to reduce the carbon footprint. The use of appropriate materials, recycling, does not always mean increased construction costs for the builder.

Distribution of the bound carbon footprint on the materials used in the Česká spořitelna office building project



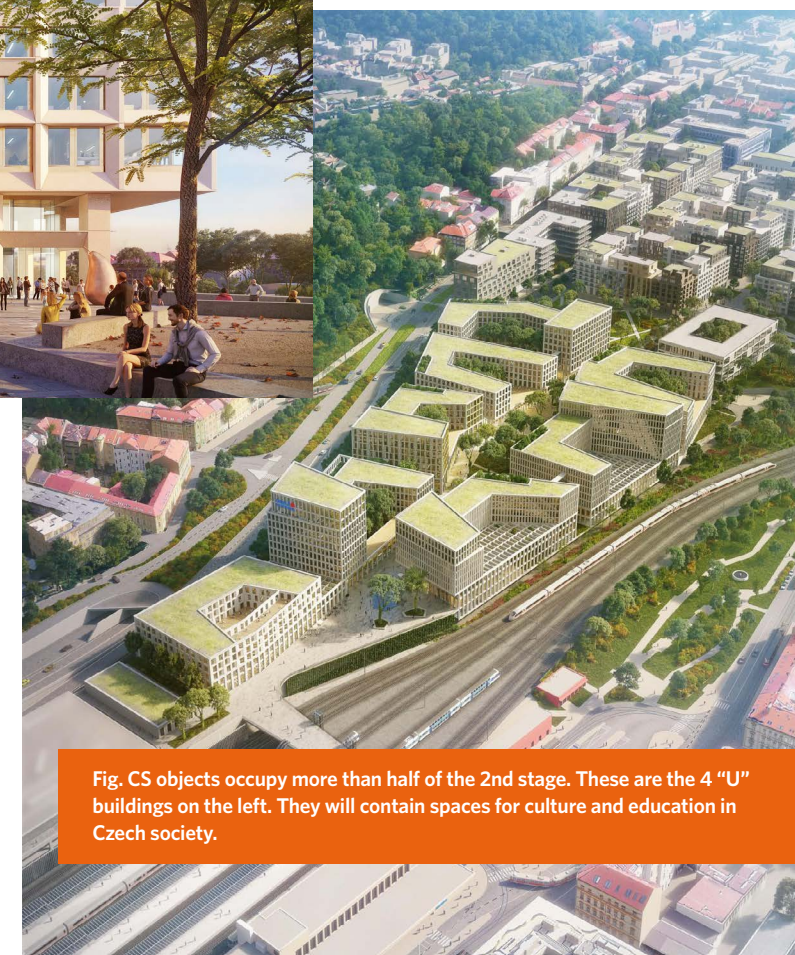


Fig. CS objects occupy more than half of the 2nd stage. These are the 4 "U" buildings on the left. They will contain spaces for culture and education in Czech society.

Energy Savings with Guarantee (EPC) in Prague Congress Centre and Karlovy Vary Hospital

CASE STUDY

Supplier of measures: ENESA Member of ČEZ ESCO

The Prague Congress Centre, a building in the metropolis designed for congresses and cultural events, is gradually changing inside and out. The costs of electricity, gas and water used to cost nearly CZK 74 million annually, but today the image of a wasteful colossus no longer applies. In 2016—2017, the Prague Congress Centre (KCP) underwent a major rebuild of its energy system while fully operational.

ENESA from the ČEZ ESCO Group implemented one of the largest domestic guaranteed energy savings projects (EPC) in the KCP building, which at an initial investment of CZK 136 million was a major success. This will save at least CZK 24 million annually in energy costs. The investment required the modernization of the central boiler room with 4 new efficient boilers and a new cogeneration unit for electricity and heat production. The air-conditioning system, controlled by CO_2 sensors, has also undergone a thorough renovation, which allows optimisation of the amount of energy used to heat or cool the air in the halls. Further savings are made by new LED lighting with infinitely variable intensity control and an individual temperature control (IRC) system in each room. The energy operation is supervised by a central control room with new visualisation of the technological processes.

In 2023, a photovoltaic power plant with an installed capacity of 936 kWp was placed on the roof of the KCP. The emission-free power source with 2080 solar panels will cover 10% of the Congress Centre's annual electricity consumption and will save the KCP an additional CZK 5.5 million a year in energy costs.

ESCO

The energy-saving project in **Karlovy Vary Hospital** started with the modernization of hospital building technologies for CZK 66 million. The project included reconstruction of the gas boiler room and hot water preparation, installation of a cogeneration unit, new air conditioning, kitchen modernization, lighting replacement and water-saving measures.

Another important change was the fitting of heating elements in selected rooms with automatically controlled valves. As a result, the temperature can now be adjusted according to usage. A key element of the whole system is consistent energy management.

Guaranteed savings in electricity, heat and water costs amount to CZK 8 million per year. This is a decrease of 32%.

The project also has environmental benefits: the annual water saving is 4436 m^3 and the equivalent CO_2 emissions are 1833 tonnes.

Efficient heating and cooling of residential buildings at Maloměřické nábřeží

CASE STUDY

Technology supplier: GT Energy

A multifunctional building with a shop and five apartment buildings were built as part of the brownfield revitalization. Thanks to the use of ground/water heat pumps with large-scale heating and cooling systems, these buildings have one of the lowest energy consumptions for heating and cooling in the Czech Republic.

HEAT PUMPS

The buildings are heated by IVT GEO G heat pumps with individual boiler outputs of 48 to 128 kW. The total output of the heat pumps exceeds 400 kW. The energy is obtained from boreholes 120 m deep. The heat pumps also provide hot water.

PASSIVE COOLING

The buildings use a passive cooling system, where the cold from the boreholes is fed into pipes in the ceilings and cools the rooms pleasantly, without noise or draughts. The heat removed from the building during summer cooling is directly used in hot water production and is also partly stored in the boreholes. The boreholes are thus at a higher temperature even in the heating season, so that the heat pumps work with less electricity during heating.

HEATING AND COOLING SYSTEM

The buildings are heated by underfloor heating. Cooling is provided by a large ceiling cooling system. In the first stages of construction, the ceiling cooling system was used only in the commercial areas of the buildings. In the later stages of construction, after positive experiences with installation and operation, the ceiling system is already used in all areas.

The cooling system consists of ICE ENERGY gypsum plasterboard cooling panels with an embodied 8 mm PE-RT pipe with an oxygen barrier.

Business premises — PENNY Skuteč

CASE STUDY

Investor: PENNY Market s.r.o.

Supplier of the construction system Stora Enso Wood Products Ždírec s.r.o.

- The first all-wooden discount store in the Czech Republic
- 264 t of CO_2 stored in a wooden structure made of CLT
- 3 minutes — the time it takes for the wood used for the building to grow in the forests where it comes from
- Lower heating and lighting requirements, thanks to the use of exposed timber construction
- Potentially easy dismantling and recycling of the wooden structure

The PENNY store in Skuteč in the Chrudim region is the first all-wooden discount store in the Czech Republic and one of the most environmentally friendly stores in the country. It was completed in December 2022 and took only 4 months to build. State-of-the-art technologies were used in its design and construction, contributing to significant energy savings and carbon neutrality of the entire building.

These technologies include:

- All-timber structure using laminated solid timber panels (CLT), glued structural beams (BSH) and Thermowood timber facade cladding
- ESyCool Green cooling technology
- Photovoltaic power plant
- LED lighting
- Charging stations for electric vehicles (to be installed in 2024)
- Electronic price tags

399 m^3 of timber from sustainably managed forests was used for the structure; this means that for every tree felled, one to three new ones were planted. At the same time, the use of timber not only enabled a significant reduction in the carbon footprint of the structure, but also a 30% reduction in construction time and, due to the lower weight of timber compared to conventional building materials, a reduction in truck traffic to the site.

The use of glued solid wood technology not only reduces the construction time by a third, but also reduces the requirements for the construction itself. Buildings made from precision-engineered solid timber or prefabricated elements push the boundaries of the conventional use of wood as a building material. They make it possible to build strong, stable, yet lightweight structures and achieve greater building lengths and heights without complicated alignment, specialised work or expensive equipment. The environmental aspect of this construction solution also plays an important role. 500 kilograms of CO_2 are produced for every cubic metre of reinforced concrete. In the case of solid wood, this is a renewable resource that absorbs and stores carbon dioxide from the environment as it grows. It is by recycling and reusing such building elements that the carbon storage time is prolonged, as it is not released back into the environment. This again contributes to reducing the ecological burden on the planet.

The unique shop in Skuteč is also equipped with the ESyCool Green cooling technology from Viessmann Refrigeration Solutions, unique in the Czech Republic and Europe. This unique modular solution for cooling and heating the shop is designed in a comprehensive way and the energy savings for cooling and heating alone are up to 25% compared to the last CO_2-based systems used. At the same time, environmentally friendly natural refrigerant is used, of which there is up to 95% less in the entire system than has been needed in conventional expansion systems. There is thus no risk of Freon leakage and professional servicing is much less demanding. The entire system takes care of the complete refrigeration technology of the shop, i.e. the refrigeration and freezer boxes, as well as the heating and air conditioning of the entire shop area.

Mercury Building — selective demolition

CASE STUDY

Investor: Temster, s.r.o. (Skanska Property Czech Republic s.r.o.)

The subject of the case study is the Mercuria building, completed in 1971, which is undergoing selective demolition in order to maximise the use of all materials.
Selective demolition is carried out in several phases — pre-demolition audit, handover and recovery of internal fittings, removal of asbestos from façade units, stripping of floors and installations and sorting into material fractions, removal of asbestos from roofs and removal of asbestos within the asphalt roof, and phased dismantling of the building.
On an ongoing basis, all materials are passed on to end users for recycling or recovery. The aim is to use as much of the extracted commodities or products made from them as possible in the new building.

- 52 year-old building, inadequate spatial arrangement and lack of facilities for building technical equipment, high operational inefficiency
- The first commercial building in the Czech Republic to be dismantled with maximum emphasis on the principles of the circular economy
- Pre-demolition audit developed — the aim is to find out what volumes can be handled during demolition and to communicate directly with materials partners
- Partnerships with external suppliers, pilot solutions for many materials — finding ways to reuse or recycle commodities both logistically and process-wise
- Legislative research — interpretation of the Waste Act, solutions for transboundary waste transfer, standard limits for individual building components and their health safety
- Laboratory testing of materials — presence of flame retardants and other components
- Cooperation with students — REBORN DESIGN — design of products that can be made from recycled plasterboard
- The logistics of selective demolition in an urbanised environment

The Merkuria building, completed in 1971 for a foreign trade organisation, is a building with an inadequate spatial layout and a complete lack of facilities for the building's technical equipment, especially the air handling system. This makes the building highly inefficient from an operational and economic point of view. During the demolition we decided to dismantle the building based on the principles of circular economy. This involved, for example, carrying out a pre-demolition audit to ascertain at least the approximate volumes of materials and to define a disposal plan. This also allowed us to approach specific companies that can process the material and produce something from it. For many of them, however, these were pilot projects where we tested the material together, looking for process routes, and the commercial side of things. At the same time, we have encountered the limits of the Waste Act, its interpretation and the rigid boundaries it sets. Some limitations or demanding requirements led to the suspension of cooperation with some partners. Not all materials can be processed on the territory of the Czech Republic, so we also looked near the border. Here again we faced challenges related to cross-border waste transfer, legal aspects and logistics. Given the lack of a market for secondary use of some recycled materials, we approached talented students and engaged them in a materials challenge as part of the REBORN DESIGN competition, which yielded designs almost ready for commercial use. Last but not least, the project tests the constraints posed by selective demolition in an urbanised environment, where the demolished building is separated from the residential buildings by a street approximately 16 metres wide.

SKANSKA

The role of building societies in the decarbonisation of the Czech Republic

CASE STUDY

Česká spořitelna Building Savings Bank

Planning and financing sustainable energy renovations

Brief basic description: In June 2023, representatives of the Association of Czech Building Societies signed a memorandum of cooperation with the Ministry of Finance and the Ministry of the Environment. The building societies are thus becoming the main partner of the state in the energy transformation of Czech households. The aim of the cooperation is to increase the availability of financing for energy-saving measures for Czech citizens and to simplify access to funds from support and subsidy programmes. This will significantly contribute to reducing the production of pollutants and greenhouse gas emissions and help meet the state's sustainability goals.

Example of financing a complete energy-saving renovation with the Buřinka Loan for the Future and with a subsidy from the New Green Savings Programme.

Every year, building societies provide around CZK 50 billion in loans for energy savings for households and improving their housing. Thanks to the possibility of setting the loan maturity up to 20 years, loans granted by building societies are also favourable to the monthly household budget.

Description:

According to a survey by Stavební spořitelna České spořitelna (Buřinka), the main barrier preventing people from reconstruction is the lack of finance among owners of family houses. 77% of Czechs finance reconstruction from their own savings. It would help a third of those who are hesitant to embark on reconstruction if they knew how much the reconstruction will cost and what is the most cost-effective to reconstruct. A quarter would welcome more information about possible support in the form of state subsidies.

The new role of building societies is a solution to these problems.

In order to enable as many households as possible to renovate their homes, reduce energy bills and pollutant and greenhouse gas emissions, the whole renovation process needs to be made as accessible and simple as possible. It is essential to simplify access to advice and concessional financing. More than 1 400 branches of building societies across the country will help with this.

At Stavební spořitelna Česká spořitelna, we offer households an assessment of the current condition of the property and recommend appropriate measures. We will provide an overview of suitable subsidies, including the range of subsidy amounts. We will explain the conditions for obtaining subsidies and provide a list of contacts for certified experts. In the next step, we will suggest a suitable method of financing a sustainable renovation, and finally we will assist in the application for a subsidy.

STAVEBNÍ České spořitelny

A — Very efficient — 4,3 MWh

Example of sustainable renovation

Property

Client owns 140 m² area property (e.g. family house)

G — Very inefficient — 40,8 MWh

Energy costs

Costs before	Costs after	Savings
263 609 Kč per year	27 088 Kč	-236 521 Kč
21 970 Kč per year	2 257 Kč	-19 710 Kč

Costs of loan financing

BEFORE	SUBSIDY	AFTER
Loan amount 2 090 020 Kč	-553 860 Kč	Loan with subsidy 1 488 269 Kč
Monthy payment 14 817 Kč	-3 975 Kč	Monthy payment 10 842 Kč

Insulation - walls, windows, roof

COSTS	SUBSIDY
1 501 843 Kč	284 188 Kč

Heat pump

275 500 Kč — 106 667 Kč

Photovoltaics

312 677 Kč — 163 005 Kč

TOTAL COSTS (ENERGY + LOAN)

SUBSIDY INCLUDED

Costs before	Costs after	Savings
263 609 Kč per year	157 192 Kč per year	-106 417 Kč
21 970 Kč per month	13 099 Kč per month	-8 868 Kč

Recycling of Rigips plasterboards

CASE STUDY

Company: Saint-Gobain Construction Products CZ a.s.

Saint-Gobain Construction Products CZ a.s. is a major manufacturer of Rigips gypsum plasterboards with a strong position thanks to its innovative and sustainable products and services. The company is committed to minimizing the environmental impact of its products and systems.

Construction technology

Dry construction is generally more sustainable than construction with conventional bricks or aerated concrete. The production and transport of drywall material produces far fewer emissions and almost no water is required for assembly.

Plate production

The production of drywall is a relatively simple and energy-intensive process. In the production of drywall, high temperatures are not used, such as when burning bricks. The basic raw material for the production of boards is gypsum, which is obtained from thermal power plants instead of mining, where it is produced as a by-product. Rigips use 100% recycled paper and up to 10% recycled gypsum.

Recycling during production and from construction waste

The company is constantly increasing the proportion of recycled material in the production of its products. Drywall can be recycled well due to the fact that the gypsum solidification process is reversible. After sorting and grinding on the recycling line, the waste from the production of individual types of boards is reprocessed and re-enters production as the initial raw material.

This means that even drywall from construction can be recycled. In Western countries, the take-back of this building material is a common matter, and even in our country, people are gradually becoming aware of it. Through controlled sorting on the construction site and subsequent recycling, we are able to return unnecessary residues back to the production process, thus reducing the amount deposited in landfills. This protects the natural resources of gypsum and can actively contribute to environmental protection.

Since 2018, Saint-Gobain Construction Products CZ a.s. has been offering the Rigips gypsum plasterboard recycling service. Since then, hundreds of tonnes of drywall cuttings from construction have been recycled.

Building Certification Credits

A benefit for developers striving for LEED or BREEAM environmental certifications is the opportunity to obtain, in addition to credits, e.g. for the use of material with recycled content, also credits for meeting waste management conditions.

Here, the emphasis is on minimizing the amount of construction waste and its subsequent recycling.

Rigips can contribute to earning these credits by optimally designing the boards, supplying customized board dimensions and recycling them themselves.

This makes it possible to meet the requirements of LEED certification when obtaining the MRc5 credit (Construction and demolition waste management), or the BREEAM certification of the Wst 01 credit (Construction waste management).

SAINT-GOBAIN

The Rigips Horní Počaply production plant is a notified facility recycling gypsum plasterboard and, as the final processor, issues a waste recycling certificate.

Zero Carbon Roadmap

Pathway to Climate-Neutral Buildings in the Czech Republic