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EU BUILDINGS CLIMATE TRACKER 2nd EDITION

A CALL FOR FASTER AND BOLDER ACTION

BPIE

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BPIE (Buildings Performance Institute Europe) is a leading independent think tank on energy performance of buildings. Our vision is a climate-neutral built environment, aligned with the ambition of the Paris Agreement, and in support of a fair and sustainable society. We provide data-driven and actionable policy analysis, advice, and implementation support to decision-makers in Europe and globally. www.bpie.eu

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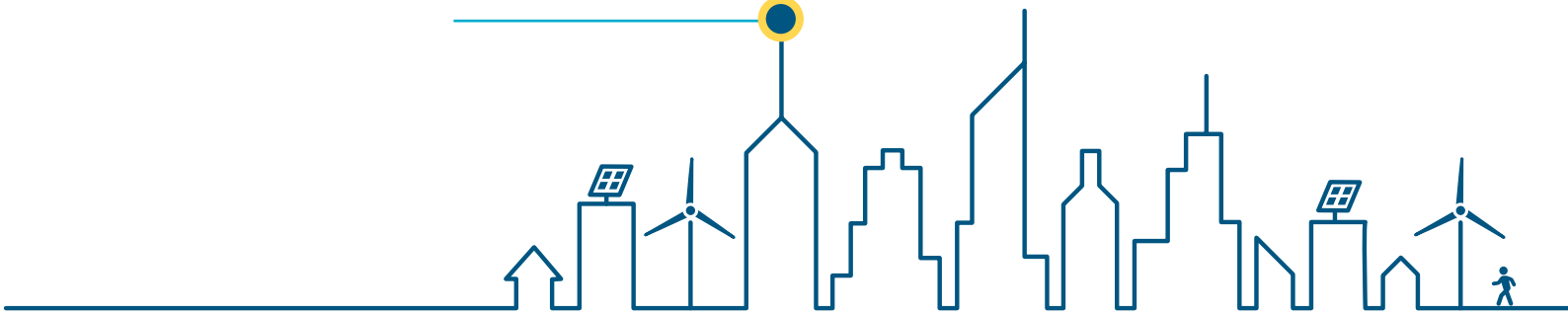

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EXECUTIVE SUMMARY

The EU Buildings Climate Tracker (EU BCT) monitors the progress of the building stock in the European Union towards the goal of achieving climate neutrality by 2050, in the form of an index. This second edition analyses the progress of the EU building stock towards climate neutrality from 2015 until 2020.

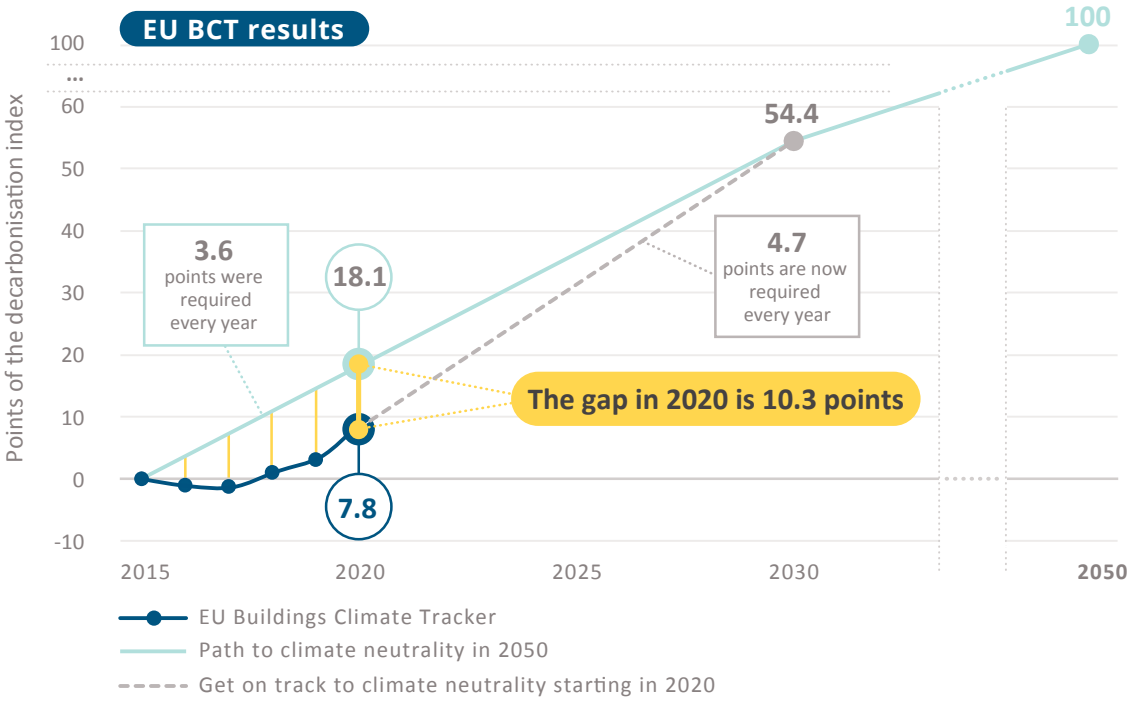
The tracker finds that the EU building stock remains off track to achieve climate neutrality by 2050. Compared to the previous results, the decarbonisation gap is slightly reducing, but not to the degree necessary to bring the sector on track towards climate neutrality. The tracker's value for 2020 should be at 18.1 points but is only at 7.8, resulting in a gap of over 10 decarbonisation points. This significant gap means that the effects of policies and support programmes to decarbonise EU buildings must urgently increase in the coming years.

Figure 1[1] shows the difference between the observed results and the necessary progress. The gap between the actual progress made until 2020 (dark blue line) and the reference path (grey dotted line) is significant. The actions taken after 2015 have not been effective enough to decarbonise the EU building stock as much as required. Since 2015, the start of the index, around 3.6 points of decarbonisation progress would have been required every year. From 2019 to 2020 the gap has decreased only by 1.1 points, not enough to stay on the path of climate neutrality. Based on the current situation, **4.7 points of progress in the decarbonisation of the building stock are required every year to get on track by 2030**. The longer we delay, the harder it will be to get on track. Now is time to bring the EU building stock on track towards climate neutrality.

The EU Buildings Climate Tracker finds that the EU building stock remains off track to achieve climate neutrality by 2050. The decarbonisation gap is not reducing to the degree necessary to bring the sector on track towards climate neutrality.

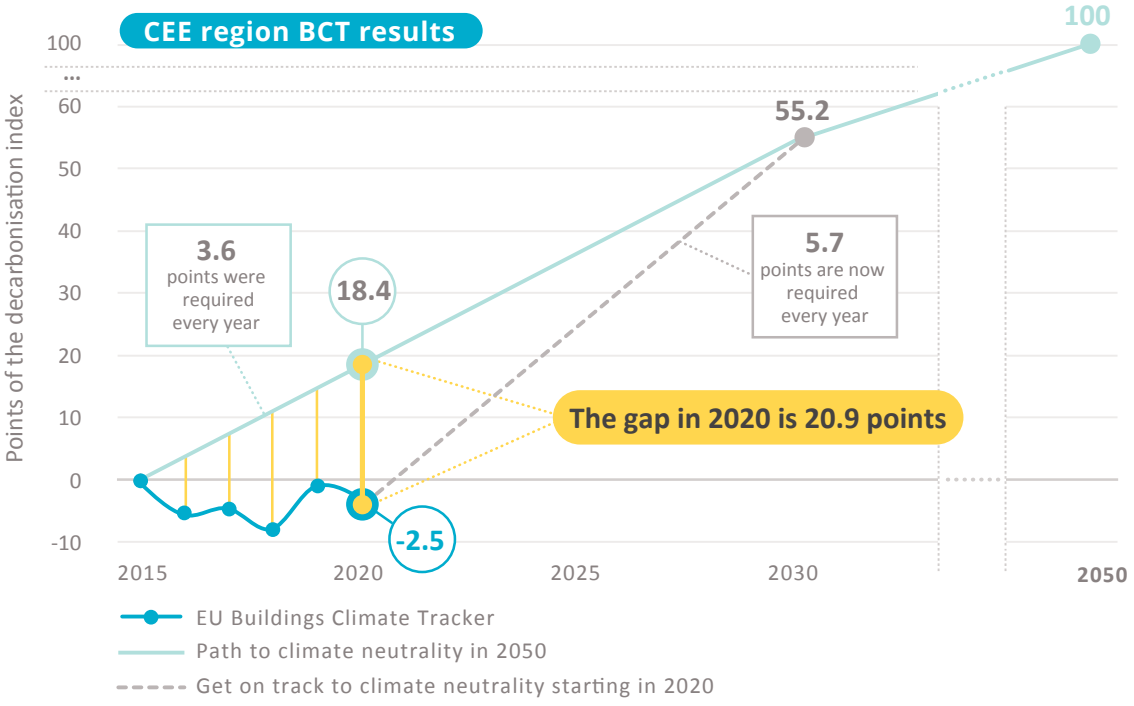
[1] Due to a technical correction the historical index values are different from those published in the first edition. Please refer to Annex IV for more details.

Figure 1: EU BCT results for the EU in 2015-2020 and the required development to be on track by 2030.



This edition also includes a separate analysis of the Central and Eastern European (CEE) region (Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia). The analysis for the CEE countries shows a more worrying trend: by 2020 the progress to decarbonise the building stock is 21 points off the required decarbonisation path, the largest gap since the beginning of the tracker period in 2015, as presented in Figure 2. This requires a significant increase of efforts to implement effective policies in the near future. Based on the current situation, **5.7 points of progress in decarbonisation are required every year in the CEE region to get on track by 2030.**

Figure 2: EU BCT results in the CEE region 2015-2020 and the required development to be on track by 2030.



HOW IS THE EU BUILDINGS CLIMATE TRACKER GENERATED?

The tracker corresponds to an index composed of a set of five indicators monitoring CO_2 emissions, final energy consumption, renewable energy share, investments in renovation, and domestic energy expenditures.

When looking at the progress between 2015 and 2020, the results for most of the indicators show a gap between the current status and the values required to be on track towards climate neutrality. These gaps highlight the need to strengthen efforts to improve the EU building stock to achieve the goals established for each indicator.

- **In 2020, CO_2 emissions from energy use in buildings reached 422 Mt CO_2, more than 18% higher than the required goal value. The reduction of CO_2 emissions from the EU building stock is clearly off track.** Energy efficiency measures and renewable energy supply should be accelerated to reduce the CO_2 emissions resulting from the operation of the EU building stock.
- Considering both households and the service sector, **final energy consumption has seen no significant progress,** with only a 1% reduction between 2015 and 2020. This calls for clear and effective schemes to support and promote deep renovation, especially in the worst-performing buildings, to reduce the CO_2 emissions from energy use.
- Considering only the residential sector, it is observed that the **final energy consumption in households by 2020 has not reduced compared to the starting value in 2015, but instead is 1.2% higher.** By 2020, this indicator is 7.6% higher than the target value for that year. It is important to notice that the final energy consumption in households in 2020 could have been even higher due to people spending more time at home and other consumption patterns linked to the COVID-19 pandemic restrictions. This expected trend might have been balanced by energy savings due to an exceptionally mild winter (the value of heating degree days in 2020 was the lowest registered in recent decades[2]).
- **The share of renewable energies for heating and cooling was around 30% lower than required, which calls for a clearer roadmap to decarbonise the heating and cooling sector.** Decarbonisation of heating and cooling needs to be linked to energy efficiency measures to reduce the heating and cooling needs of the EU building stock.
- **Accumulated investments in renovation in 2020 were 40% lower than required.** Greater investment and better-targeted investment schemes are needed, along with better access to existing funding opportunities.
- Energy expenditures per household were close to achieving the targeted values in 2020, but the subsequent increase in energy prices may negatively impact this indicator. The consequences of not reducing household energy expenditures can be significant, especially in regions with high energy poverty levels like **the CEE region, where household energy expenditure was already 6.3% higher than the required value in 2020.**

[2] According to the Eurostat database, which has records for heating degree days since 1979.

In 2020, four out of the five main indicators were off track: [3,4]

	Indicator		CURRENT STATUS 2020
1	**CO_2 emissions**	**OFF TRACK**	**a.** Emissions from energy use in households reached 301 Mt CO_2, which was **20.7% higher than the required value.** **b.** Emissions from energy use in service sector buildings reached 121 Mt CO_2, **13.2% higher than the required value.**
2	**Final energy consumption**	**OFF TRACK**	**a.** Final energy consumption in households was 2,886 TWh, **7.6% higher than the target.** **b.** Final energy consumption in service sector buildings was 1,410 TWh, meeting the target (1,462 TWh).
3	**Renewable energy share**	**OFF TRACK**	**a.** The share of energy from renewable sources for heating and cooling reached only 23%, **11.4 percentage points lower than the target.** **b.** The share of energy from renewable sources in gross electricity consumption reached 37.4%, **1.6 percentage points below the target.**
4	**Investments in renovation**	**OFF TRACK**	Accumulated to €1,771 billion,[5] **41.2% lower than the target.**
5	**Domestic energy expenditure**	**ALMOST ON TRACK**	**Reached €1,406 per household.[6]**

The need to improve and strengthen strategies supporting the decarbonisation of the building stock in the EU demands immediate action. This means seizing opportunities such as the ongoing recast of the Energy Performance of Buildings Directive (EPBD) to get on track towards a climate-neutral building stock. As the main legislative instrument to advance the decarbonisation of buildings at EU level, the EPBD must set ambitious goals, trigger action and establish monitoring mechanisms to guide Member States' efforts to deliver a climate-neutral building stock by 2050.

EPBD provisions[7] regarding **zero-emissions buildings (ZEBs), a whole-life carbon approach** for the EU building stock, **minimum energy performance standards (MEPS)**, the **review of EPCs** and a **financial support framework for building renovation and decarbonisation** are crucial to tackle the lack of progress. Effective, immediate, and robust EPBD provisions and additional strategies can enable the reduction of final energy consumption in buildings, reduction of CO_2 emissions from non-renewable energy supply (especially for heating and cooling), reduction of energy poverty, and increase of investments in renovation, as summarised below. All these improvements will contribute to bridging the gap between the path the EU is currently following and the required path to achieve climate neutrality by 2050.

[3] The detailed analysis for each indicator and the results for the CEE region can be found in the full report.
[4] Two potential indicators covering the energy performance certificates (EPCs) and the use of primary solid biofuels for space heating were also investigated. The analysis for EPC ratings exposes two main challenges: a) the EPC schemes across Member States are not harmonised and their comparison is very limited; b) there is a lack of aggregated EPC data at the national and EU levels, and the data available is often not consistent. The analysis of primary solid biofuel use shows many households depend on this energy source to fulfil their space heating requirements (biomass represents almost 90% of the renewable energy for space heating in households).
[5] Adjusted to 2015 euro values.
[6] Adjusted to 2010 euro values.
[7] An overview is available in BPIE's report on Assessment of co-legislators positions and recommendations

WHAT IS EXPECTED FROM THE EPBD TO GET ON TRACK WITH CLIMATE NEUTRALITY?

		BENEFITS TOWARDS DECARBONISATION
ZEB DEFINITION	• The use of **fossil fuel heating systems** in new buildings **should not be allowed** • The ZEB definition must have **well-defined low thresholds** for energy needs • **New buildings should be constructed as ZEBs** as soon as possible	**Final energy consumption and CO_2 emissions reduction**
WHOLE-LIFE CARBON APPROACH	• Clear principles on **how to measure, disclose and limit whole-life carbon** of buildings should be defined • An implementation plan should be developed, including a clear **timeline and incentives** for data collection and generation	**CO_2 emissions reduction**
MEPS	• MEPS should be designed **to address the worst-performing buildings first**, establishing clear targets, milestones and timelines • MEPS should be accompanied by an **effective compliance support and enforcement system** to monitor and track their deployment and impacts	**Final energy consumption, energy expenditures, and CO_2 emissions reduction**
EPCs	• **EPC thresholds and definitions should be aligned with ZEBs and MEPS** • **Quality principles are required** for EPCs as a tool to support decision-making (buy/sell, renovation trigger/advise, etc.) • High **EPC rollout** and **better national databases** should be pursued	**Final energy consumption, energy expenditures, and CO_2 emissions reduction**
FINANCIAL FRAMEWORK	• Strategies to **improve access to existing funding programmes** should be developed • Funding programmes should be **designed and targeted to achieve the greatest energy savings and social benefits**	**Investments in renovation increase, final energy consumption reduction**
RENEWABLE ENERGY SYSTEMS	• **Ambitious targets and clear roadmaps** to decarbonise building heating and cooling systems should be integrated in national building renovation plans	**CO_2 emissions reduction**
RENOVATION	• **Deep renovation should be a guiding principle** reflected in the design of all policy measures and financing programmes • **Technical information to support initiatives should accelerate**, e.g. one-stop-shops and strategies to engage inhabitants • Better schemes should be implemented to **monitor the number and type of renovation activities being carried out**	**Investments in renovation increase, final energy consumption reduction**

ABBREVIATIONS

BCT	Buildings Climate Tracker
CEE	Central and Eastern Europe
EU	European Union
EEA	European Environment Agency
EPC	Energy performance certificate
EPBD	Energy Performance of Buildings Directive
FIEC	European Construction Industry Federation
MEPS	Minimum energy performance standards
RED	Renewable Energy Directive

INTRODUCTION

In the European Union, different efforts have been promoted to decarbonise the building stock to meet the goals of the Paris Agreement and other international and regional commitments towards 2050. These include initiatives such as the Renovation Wave and directives on the energy performance of buildings and energy efficiency. Monitoring the progress and impacts of these efforts is essential to evaluate the level of ambition and effectiveness of the different policies and programmes. This can help identify effective strategies that can be replicated, and areas that require adjustment or improvement.

The EU Buildings Climate Tracker (EU BCT) was developed to track the progress of decarbonisation of the EU building stock. It is an index composed of a set of five indicators monitoring (i) CO_2 emissions, (ii) final energy consumption, (iii) renewable energy share, (iv) investments in renovation, and (v) domestic energy expenditures. The EU BCT serves as a benchmark and assessment tool for the status of decarbonisation in the EU building stock and progress towards climate neutrality by 2050. The EU BCT is not a tool for modelling the future or forecasting: rather, it documents the progress achieved since 2015 (when the Paris Agreement was adopted) towards a scenario for climate neutrality in 2050.[8]

THE EU BUILDINGS CLIMATE TRACKER ANSWERS THE FOLLOWING QUESTIONS:

- **How has decarbonisation of the building stock in the EU evolved since 2015?**
- **Is the building stock improving enough to achieve climate neutrality by 2050?**
- **What degree of improvement is needed between the most recent observations and 2050 in order to achieve climate neutrality?**

[8] MIX scenario from the impact assessment accompanying the Communication *'Stepping up Europe's 2030 climate ambition'*

The first edition of the EU BCT was published in 2022. It presented and assessed the status of the EU building stock between 2015 and 2019. In this second edition (2023), newly available data allows us to evaluate progress towards climate neutrality between 2015 and 2020. We also provide an overview of progress in 2020 and 2021, aiming to offer a more comprehensive understanding of the indicators' performance during this period. Specific circumstances, including the COVID-19 pandemic and changes in the methodology for estimating the proportion of renewable energies, influenced the analysis. This outlook is presented for all the indicators included in the EU BCT except domestic energy expenditures, for which the data was not yet available.

This edition of the EU BCT also includes a separate analysis of the Central and Eastern European (CEE) region (Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia), which was presented at the Central & Eastern European Energy Efficiency Forum (C4E) in May 2023. The same set of indicators and timespan analysed for the EU level were used to study the progress in the CEE region.

Finally, we present two potential future indicators: (i) energy performance certificate (EPC) ratings and (ii) share of primary solid biofuels[9] in renewables for space heating. The possibility of including the progress in EPC ratings was discussed in the first edition of the EU BCT. In this new edition, we include a dedicated section with new data for this potential indicator and discuss the trends. A similar section is presented for primary solid biofuels for space heating, focusing on households.

The report is organised as follows:

- **METHODOLOGY** presents the EU BCT methodology, including the definition of the indicators and their goals.
- **TRACKER RESULTS** includes the results of the composite index for the EU and CEE regions between 2015 and 2020.
- **RESULTS FOR ALL SINGLE INDICATORS** includes a breakdown for each indicator, with a brief outlook of the developments in 2020-2021.
- **POTENTIAL FUTURE INDICATORS** is a dedicated section on EPC ratings and the share of primary solid biofuels in renewables for space heating.
- **MAIN FINDINGS AND RECOMMENDATIONS** summarises the conclusions, key remarks and observations, including an overview of all results for the EU and CEE region.

[9] According to the Eurostat definition, primary solid biofuels comprise: fuelwood, wood residues and by-products, black liquor, bagasse, animal waste, other vegetal materials and residuals, and renewable fraction of industrial waste.

METHODOLOGY

HOW WAS THE EU BUILDINGS CLIMATE TRACKER DEVELOPED?

In 2020, BPIE developed a global tracker for climate change action for the buildings and construction sector for the Global Status Report of the Global Alliance for Buildings and Construction.[10] Based on this work, BPIE developed in 2021-2022 the first edition of the EU BCT. The tracker gathers the performance of five indicators in a composite index to monitor and assess the decarbonisation progress in the EU building stock towards climate neutrality by 2050.

SELECTION OF INDICATORS

The EU BCT is based on the five indicators presented in Table 1. More than 60 European and global data sources that monitor the buildings sector[11] were reviewed in choosing the indicators. To select the most relevant, the potential data sources were screened against the following criteria: EU coverage, reliability, consistency, continuity, timeline and quality. We used the same set of indicators for the analysis of the CEE region.

[10] Global Alliance for Buildings and Construction (2020) 2020 Global Status Report for Buildings and Construction: Towards a zero-emissions, efficient and resilient buildings and construction sector

[11] Including the European Environment Agency (EEA), International Energy Agency (IEA), Eurostat, ODYSSEE and Tabula

Table 1: Summary of indicators included in the EU BCT

	Indicator	Description	Source
1	**CO_2 emissions from energy use in buildings by households and services**	CO_2 emissions from the direct use[12] of fossil fuel energy in buildings and indirectly from the production of electricity and heat used in buildings. Composed of two sub-indicators: 1(a) CO_2 emissions from energy use in buildings from households, and 1(b) CO_2 emissions from energy use in service sector buildings, including institutional buildings.	European Environment Agency (EEA)[13]
2	**Final energy consumption in households and services**	Energy consumption of end-uses in households and service sector buildings, excluding consumption by the energy sector itself and losses occurring during transformation and distribution of energy. Composed of two sub-indicators: 2(a) final energy consumption in households, and 2(b) final energy consumption in service sector buildings.[14]	Eurostat
3	**Renewable energy share**	Composed of two sub-indicators: 3(a) share of energy from renewable sources for heating and cooling, and 3(b) share of energy from renewable sources in gross electricity consumption. Weights are assigned to aggregate the sub-indicators as follows: 75% for 3(a) and 25% for 3(b).	Eurostat
	A **Share of energy from renewable sources for heating and cooling**	Share of renewable energy used for heating and cooling,[15] including derived heat from solar thermal, geothermal energy, ambient heat captured by heat pumps, solid, liquid and gaseous biofuels, and the renewable part of waste.	Eurostat
	B **Share of energy from renewable sources in gross electricity consumption**	Share of electricity produced from renewable energy sources including wind power, solar power, hydropower, tidal power, geothermal energy, biofuels and the renewable part of waste.	Eurostat
4	**Cumulated investment in renovation in real terms**	Cumulated investments in renovation of the building stock excluding inflation, i.e., expressed in real terms. Includes the investments that Member States have reported for renovation activities.	European Construction Industry Federation (FIEC)
5	**Annual domestic expenditure per household in real terms**	Annual expenditure per household on energy (electricity, heating and gas) for end uses, such as space and water heating, space cooling, electrical appliances, cooking and lighting.	ODYSSEE

[12] Sectors are reported according to the common reporting format (CRF) classification used for reporting GHG inventories according to IPCC 2006 guidelines. https://www.eea.europa.eu/themes/climate/eu-greenhouse-gas-inventory/read-me-eea-ghg-data-viewer

[13] In the first edition of EU BCT, we used ODYSSEE data (data based on EEA reports) as a source for this indicator. In this second edition, we used the data directly from EEA since ODYSSEE data was not yet available.

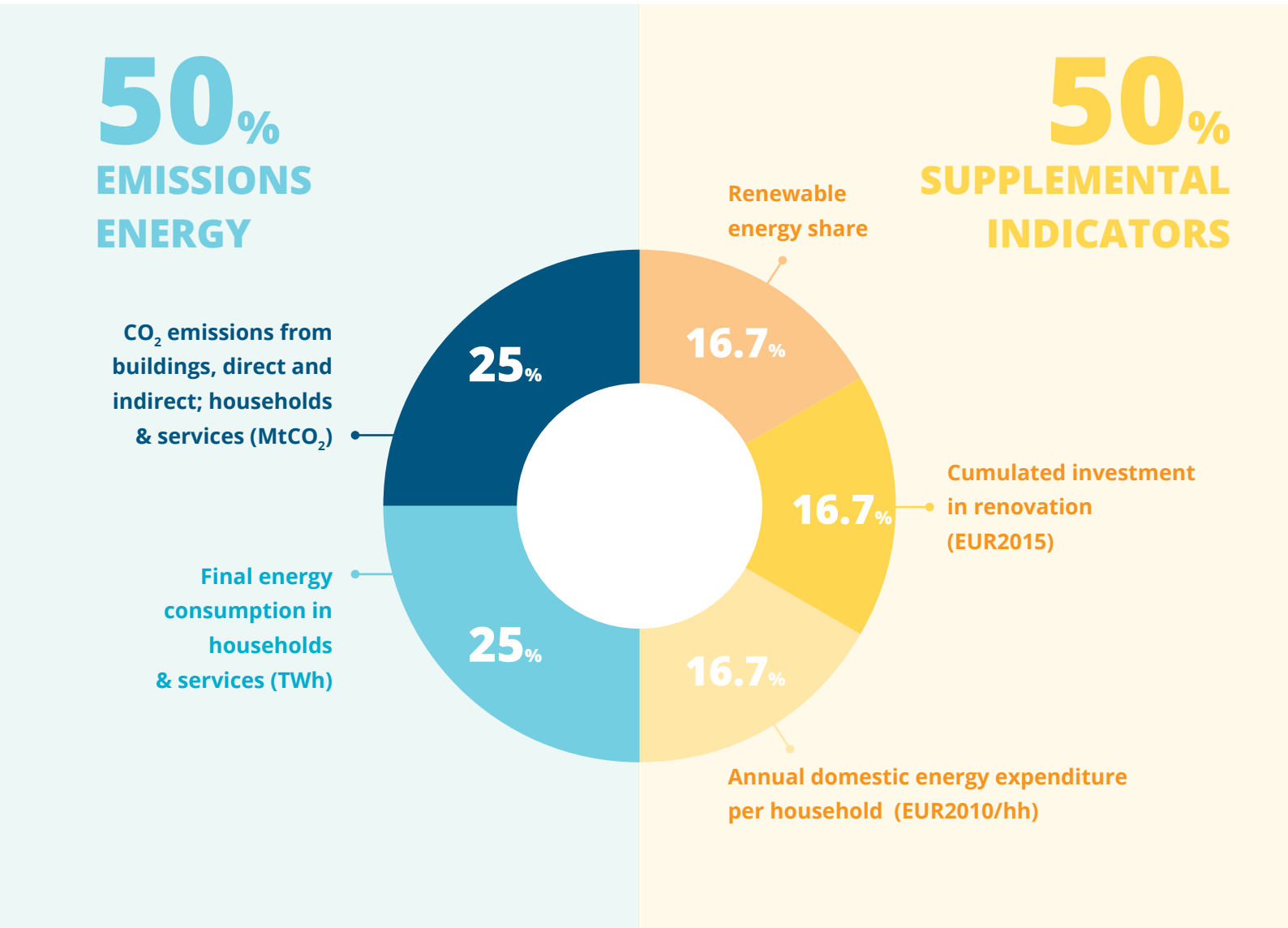
[14] The data available in Eurostat includes outdoor lighting for this sector.

[15] The data available on Eurostat includes process heat as well.

WEIGHTING OF INDICATORS

To create the composite index of the EU BCT, weights were assigned to the indicators according to their significance in reaching the path to climate neutrality. CO_2 emissions and final energy consumption are the main indicators to monitor the decarbonisation and energy performance in buildings. Each was assigned 25% weight to represent together half of the composite index, as presented in Figure 3. However, these two indicators may be influenced by other factors than implementation of policy measures, such as economic activity and climate fluctuations. Including supplemental indicators gives a more robust picture of the complex multidimensional issue of decarbonising the building stock in the EU, as the combination of indicators sheds light on the progress from different perspectives. A one-sixth (~16.7%) weighting was therefore assigned to each of the remining three indicators (renewable energy share, cumulated investment in renovation, and annual domestic energy expenditure per household). The same weight distribution was used for the analysis of the CEE region.

Figure 3: Indicators and their weighted contribution to the EU BCT



TRANSLATING CLIMATE NEUTRALITY BY 2050 INTO A GOAL FOR EACH INDICATOR

To compare the observed development of the different indicators in relation to the objective of reaching climate neutrality by 2050, goal values have been determined for each indicator. The goal values presented in Table 2 are based on the MIX scenario used in different impact assessments,[16,17] undertaken by the European Commission in the framework of the EU Green Deal. While the MIX scenario is conservative regarding its level of ambition, especially in view of the Paris Agreement 1.5°C goal and alignment with climate neutrality by 2050, it has been selected as a benchmark since it guides the setting of energy and climate objectives at EU level, as well as the adoption and implementation of policy measures. Newer scenarios, such as the RePowerEU scenario, were also considered to define the goal values in this edition of the EU BCT. However, the published information on these scenarios does not provide the necessary data.

The EU BCT therefore assesses progress by comparing observed values with commonly agreed and legally adopted goals at EU level, i.e., goals adopted within the timespan analysed for this version of the EU BCT (2015 to 2020). New goals and targets may be adopted in the EU in upcoming years due to more recent developments such as the adoption of the Fit for 55 package and the recast of the Energy Performance of Buildings Directive. As new goals and targets are adopted, the path to climate neutrality and goals for the indicators will be reviewed accordingly.

The EU BCT assesses progress by comparing observed values with commonly agreed and legally adopted goals at EU level... As new goals and targets are adopted, the path to climate neutrality and goals for the indicators will be reviewed accordingly.

[16] Impact Assessment accompanying Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

[17] Impact assessment accompanying the Communication *'Stepping up Europe's 2030 climate ambition'*

Table 2: Indicator goal values for the EU BCT

	Indicator	Goal value 2050	Methodology determining goal values
1	**CO_2 emissions from energy use in buildings by households and services**	0 $MtCO_2$	The MIX scenario achieves net zero greenhouse gas (GHG) emissions in 2050. We assume that CO_2 emissions follow this trajectory,[18] so the goal for 2050 is set as 0 $MtCO_2$.
2	**Final energy consumption in households and services**	3,315 TWh	The MIX scenario aims at 55% GHG reduction by 2030[19] and translates this goal into a final energy consumption reduction of 17% by 2030 and 27% by 2050 (households), and 8% by 2030 and 18% by 2050 (services). The goal value is the sum of the remaining buildings energy consumption in 2050 for households and services.
3	**Renewable energy share**		
	A Share of energy from renewable sources for heating and cooling	100%	The MIX scenario translates net zero emissions in 2050 into 100% renewables in 2050 and 62.5% renewables in 2030
	B Share of energy from renewable sources in gross electricity consumption	85%	Gross electricity production in the MIX scenario will be CO_2 neutral in 2050 but the assumptions in the scenario contain 15% nuclear[20] power. For 2030 the MIX scenario assumes 57% renewables and 19% nuclear power.
4	**Cumulated investment in renovation in real terms**	20,778 billion in 2015 Euros[21]	The goal for investments in renovation activities is derived from observed data and the absolute envisaged increase in renovation investment defined in the MIX scenario.[22] In the scenario, average annual energy-related investments in renovation in the residential sector are €190 billion between 2021 and 2030 and about €174.4 billion between 2031 and 2050. These values are for the entire EU. Not all Member States report their investments in renovation and the dataset available includes only 16 countries, so the goal is adjusted to account for this. The goal is derived by comparing the values suggested for 2021-2030 and 2031-2050 with the value in the baseline scenario for 2011-2020, €83.7 billion.[23] Annual investments are expected to be 2.27 times greater than this during 2021-2030 and 2.08 times greater during 2031-2050. The final goal is defined as the sum of the currently observed[24] and scenario-based future investments during the period from 2015 to 2050.
5	**Annual domestic expenditure per household in real terms**	1,120 in 2010 Euros	We used the MIX scenario for energy-related expenditures in households for 2030.[25] To set the goal value for 2050, we assumed that the inflation-adjusted expenditure follows the reduction rates of the final energy consumption from 2030 to 2050, i.e., 12% less by 2050 compared to 2030.

[18] This assumption is supported by the fact that non-CO_2 emissions represent only around 6% of household GHG emissions (according to EEA data for 2015). In the MIX scenario, non-CO_2 emissions are expected to reduce significantly (85%).

[19] Impact Assessment accompanying Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

[20] While the MIX scenario could be called into question regarding the nuclear share, it has been selected as a benchmark as it guides the setting of energy and climate objectives at EU level.

[21] The goal value was adjusted in this edition of the EU BCT because new countries (Bulgaria, Estonia and Ireland) were included in the data set. The analysis excludes Croatia, Cyprus, Greece, Hungary, Latvia, Lithuania, Luxemburg, Poland, Romania and Slovakia.

[22] Renovation investments from the MIX scenario are defined as "average renovation costs by climate type and renovation deepness, as used in the PRIMES buildings module. Investment costs are the energy related expenditures needed to implement the indicated level of renovation of a building, excluding usual renovation expenditures needed for other purposes (structure, finishing materials, decoration etc.)." See EU Reference Scenario 2020 which is the baseline for the MIX scenario and its modelling approach.

[23] Impact assessment accompanying the Communication 'Stepping up Europe's 2030 climate ambition'.

[24] When analysing the results for this indicator, it is important to notice that while the goal is based on energy-related renovation, the data set available does not explicitly differentiate between types of renovation – some countries also include the renovation of other urban infrastructure in their reports.

[25] Available in the full version of *Stepping up Europe's 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people.*

The goal values for the CEE region were defined following a similar approach. To reduce the number of assumptions due to the lack of clear national targets for most of the indicators, the goals for the CEE region were defined following a methodology as close as possible to the one followed for the EU level. However, certain adjustments were required to translate the EU goals to goals applicable to the CEE region. Table 3 summarises the methodology followed to define these goals.

Table 3: Indicators goal values for the CEE region

	Indicator	Goal value 2050	Methodology determining goal values
1	**CO_2 emissions from energy use in buildings by households and services**	0 $MtCO_2$	As at EU level, we assume that CO_2 emissions for building conditioning and use are reduced to zero by 2050.
2	**Final energy consumption in households and services**	618 TWh	The same methodology is followed, with the target based on energy consumption in 2050 for households and services in the CEE region only.
3	**Renewable energy share**		
	A Share of energy from renewable sources for heating and cooling	100%	As at EU level, we assume 100% renewables in 2050 and 62.5% renewables in 2030 in CEE.
	B Share of energy from renewable sources in gross electricity consumption	85%	As at EU level, we assume gross electricity production in 2050 is CO_2 neutral but contains 15% nuclear power.[26] For 2030, the MIX scenario assumes 57% renewables and 19% nuclear power.
4	**Cumulated investment in renovation in real terms**	148 billion in 2015 Euros	As above, the final goal is the sum of the currently observed investments for the CEE region and scenario-based future investments during 2015-2050. Note that this value is based on investments in only 4 out of 11 countries in the CEE region (Bulgaria, Czechia, Estonia and Slovenia). Once data from more countries is available, this value will be adjusted accordingly.
5	**Annual domestic expenditure per household in real terms**	763 in 2010 Euros	The same methodology is followed, adjusted for households and energy consumption in the CEE region only.

[26] This assumption seems feasible since the share of nuclear power in the EU and CEE region are similar, around 26% in the EU and 20% in the CEE region. According to the data available on Eurostat.

UPDATES TO INDICATORS

In general, the same data sources that were used during the first edition (2022) of the EU BCT were used for this edition. Most of these sources have released new reports, including data for additional years and updating previous values. A short summary including these updates and additional information is presented for each indicator. For most of the indicators, data is available until 2021; nevertheless, the calculations for the composite index of the EU BCT presented in the "Tracker results" section below **only consider the period between 2015 and 2020** to ensure the consistency across all indicators.

To provide an overview of all the data available, we present an outlook including the data for 2021 where available in the "Results for all single indicators" section. When analysing the results for 2020 and 2021, it is important to consider that restrictions related to the COVID-19 pandemic may have had a significant impact on several indicators. Other external factors such as changes in the methodology to estimate the share of renewable energies may also have an influence.

1

CO_2 emissions from energy use in buildings from households and in the service sector

The first edition of the EU BCT used the ODYSSEE database, which relied on data from the EEA. In this second edition, the data was obtained directly from the EEA database, which provides data until 2021.

2

Final energy consumption in households and services

Data on final energy consumption in households and services comes from the Eurostat database, as in the previous edition. The latest Eurostat report[27] includes data up to 2021.

3

Renewable energy share

a. Share of energy from renewable sources for heating and cooling

Data on the share of energy from renewable sources for heating and cooling was collected from the SHARES tool of Eurostat, as in the previous edition. The latest SHARES report, published in December 2022, includes information up to 2021. The SHARES tool followed the calculation provisions from Directive 2009/28/EC (RED I) for results until 2020; for 2021, results are based on Directive (EU) 2018/2001 (RED II) provisions. One of the main modifications concerns strengthened sustainability criteria for biofuels, which may affect reporting on renewables from certain Member States.

b. Share of energy from renewable sources in gross electricity consumption

As above, data on renewable electricity was collected from the SHARES tool of Eurostat. The latest SHARES report includes data up to 2021. As in the previous indicator, when analysing the data, it is important to consider the differences between Directive 2009/28/EC (RED I) for the results until 2020 and Directive (EU) 2018/2001 (RED II) for the results in 2021.

[27] https://ec.europa.eu/eurostat/databrowser/view/ten00124/default/table?lang=en

4 Cumulated investments in renovation in real terms

Data on investments in renovation come from the dataset provided by FIEC, which represents construction enterprises of all sizes in 27 European countries. Last year, the indicator included 14 countries: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Italy, Netherlands, Poland, Portugal, Slovenia, Spain and Sweden. In 2023, information for three new countries (Bulgaria, Estonia and Ireland) was included, while Poland was excluded due to lack of data, and the goal was adjusted accordingly. Considering the new countries included in FIEC dataset, the new goal value for 2050 is €20,778 billion in 2015 Euros. As a result, the path to climate neutrality for this indicator is more ambitious in this second edition. For the CEE region, data is only available for four countries: Bulgaria, Czechia, Estonia and Slovenia.

5 Annual domestic energy expenditure per household

Data on energy expenditure per household comes from the ODYSSEE database. The most recent data reported by ODYSSEE includes data until 2020 and updates on the values from previous years. The goal for this indicator was adjusted according to the new data available. Data for France was only available until 2019. To ensure the consistency with the data for the other countries, the value for this indicator in France was estimated by extrapolation based on the values in 2018 and 2019.

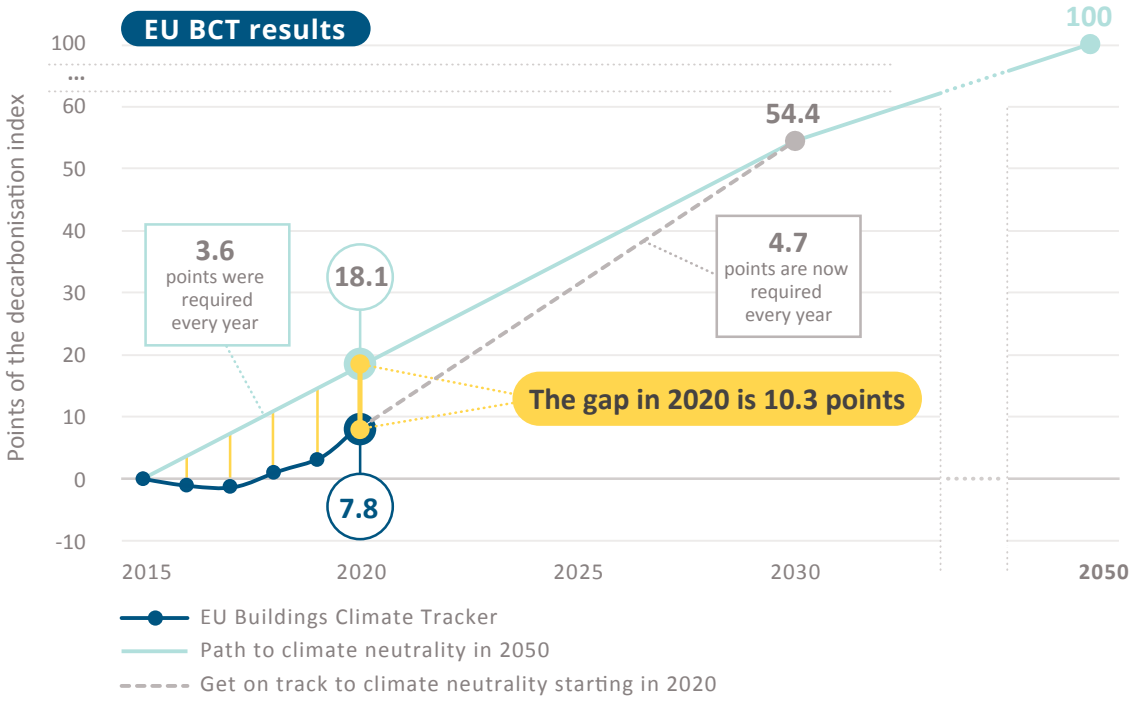
TRACKER RESULTS

COMPOSITE INDEX OF THE EU BCT

The EU BCT combines the indicators described above to give a single index number representing the overall progress of the EU building stock towards the climate neutrality goal. Figure 4[28] shows the difference between the observed results and the necessary progress between 2015 and 2020.

The gap between the actual progress made until 2020 (dark blue line) and the reference path (light blue line) is significant. The results of the tracker show that progress dropped below the 2015 starting point during 2016 and 2017. After 2017, overall progress increased beyond the starting level, but remained off track compared to the reference path. In 2020, the distance-to-goal – i.e., the gap between the tracker and the reference path – was reduced by 1.1. points compared to the value in 2019, nevertheless, it is still significant, at more than 10 points. The distance-to-goal has doubled since 2016. It is evident that the decarbonisation of the EU building stock is far from being on track.

Figure 4: EU BCT results for the whole EU 2015-2020 and the required development to be on track by 2030



[28] Due to a technical correction the historical index values are different than published in the first edition. Please refer to Annex IV for more details.

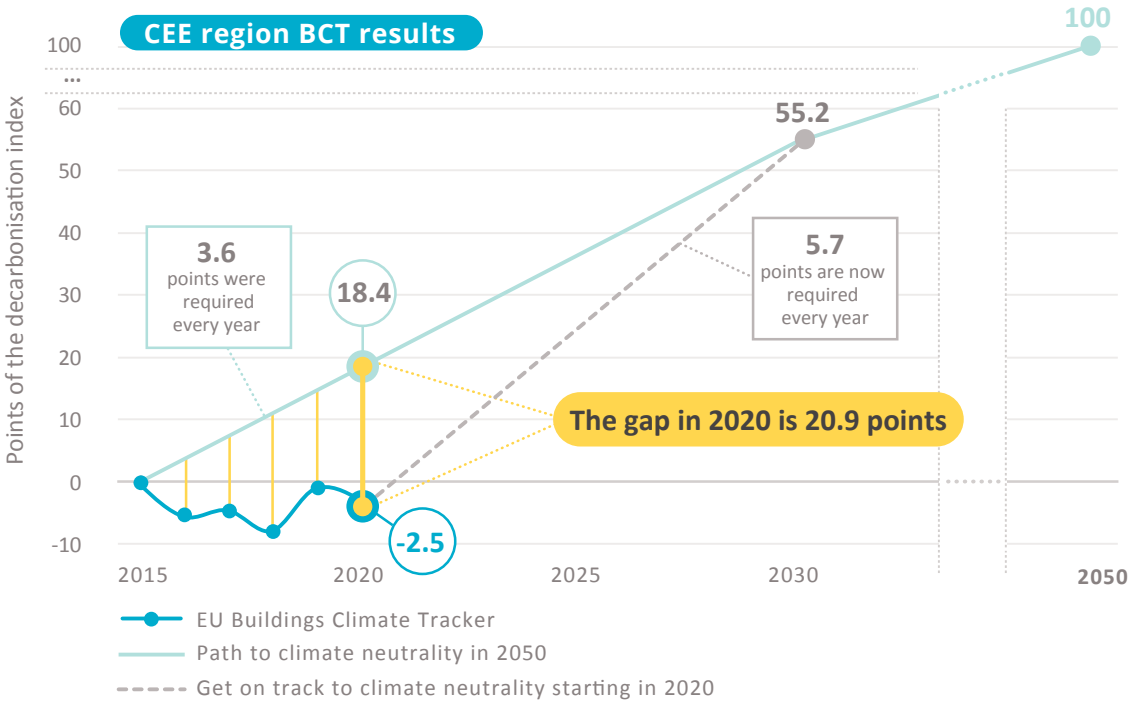
The actions taken since 2015 have not been effective enough to decarbonise the EU building stock as much as required. At the start of the index in 2015, around 3.6 points of decarbonisation progress would have been required every year. From 2019 to 2020 the gap between action taken and where we should be decreased by just 1.1 points, not enough to stay on the path of climate neutrality. Based on the current situation, **4.7 points of progress are now required every year to get on track by 2030.**

If this gap remains or increases, it will be increasingly difficult to adjust the trend to be on track with the reference path. More effective policies covering the different aspects mapped by the indicators included in the EU BCT need to be applied to accelerate the progress to close the gap. This will require a balance between rapid actions and more structural measures to ensure high levels of energy savings and CO_2 emissions cuts are delivered and maintained consistently.

Results for the CEE region[29] are shown in Figure 5. Far from being on track, the region has gone backwards, with index in 2020 remaining below the 2015 starting point. Although the gap between the tracker and the reference path reduced from 19 points in 2018 to 16 points in 2019, in 2020 the gap widened again, reaching 21 points.

Better implementation of legislative requirements and more ambitious and inclusive strategies (especially in view of the high share of people experiencing energy poverty[30]) are required in the CEE region to decarbonise the building stock. This will require significant efforts in the near future. Based on the current situation, **5.7 points of progress is required every year in the CEE region to get on track by 2030.**

Figure 5: EU BCT results in the CEE region 2015-2020 and the required development to be on track by 2030



[29] Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia
[30] https://www.odyssee-mure.eu/publications/policy-brief/european-energy-poverty.html

RESULTS FOR ALL SINGLE INDICATORS

This section presents the results for each indicator individually, both in their original form and as a normalised value against a common scale. Where applicable, indicators are presented in terms of the sub-indicators that compose them. The results are presented for both the EU and CEE. As in the composite index, results are presented for 2015-2020. Where data for 2021 is available, an outlook including this year is given. Since 2020 and 2021 were both affected by special circumstances, interpreting the development in 2021 alone may be challenging, so the outlook (when available) is based on the data for both 2020 and 2021.

HOW TO READ THE INDICATOR RESULTS

For each indicator, we present:

(i) results for the EU for 2015-2020,

(ii) results for the CEE region for 2015-2020, and

(iii) an outlook for 2020-2021 at EU and CEE levels.

These results are depicted on a graph containing the absolute values of the indicators and normalised values translated to a common scale. To better visualise changes over time, for the graphs presenting the absolute values the y-axis is modified to show only a portion of the range.

For the normalised values, all indicators are shown on a common scale which shows the path to climate neutrality, from 0% (levels in 2015) to 100% (final goal in 2050). More details can be found in the annex of the report of the first edition of the EU BCT.

1 CO_2 EMISSIONS FROM ENERGY USE IN BUILDINGS BY HOUSEHOLDS AND SERVICES

A. CO_2 EMISSIONS FROM ENERGY USE IN BUILDINGS FROM HOUSEHOLDS

EU 2015-2020:

- As shown in Figure 6(A), CO_2 emissions from households exhibited a consistent decline (ranging from 1% to 3%) between 2016 and 2019. This trend changed in 2020, with a reduction of only 0.4% compared to the emissions value in 2019.
- In 2020, this indicator reached 301 $MtCO_2$, which was **20.7% higher than the target value** for that year. Despite expectations of a more significant change resulting from lockdown measures and increased time spent at home during the COVID-19 pandemic, the final energy consumption in households remained relatively stable in 2020 (see indicator 2. Final energy consumption in households and services). This stability may be attributed to lower heating requirements as suggested by the heating degrees days during that period.[31]
- As shown in Figure 6(B), the gap between the reported emissions and the path to climate neutrality grew wider than in previous years. The widening gap can be observed in both the absolute values on the left and the transformed values on the right, evident when comparing the dark blue observations with the light blue path towards climate neutrality.

CEE 2015-2020:

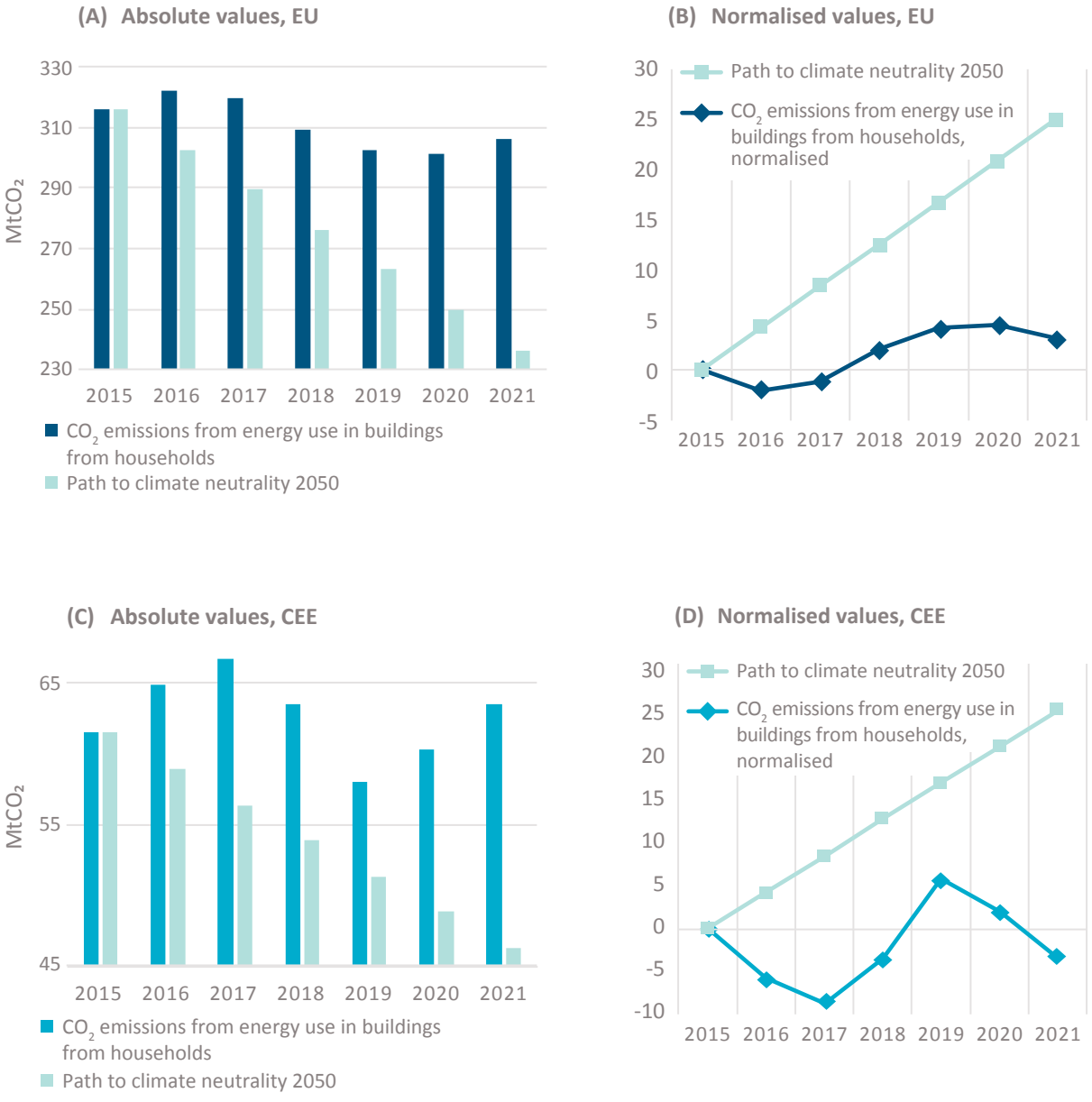
- As shown in Figure 6(C), CO_2 emissions from households decreased between 2017 and 2019.
- In 2020, this indicator reached 60 $MtCO_2$, **23.5% higher than the target value**. This resulted in the indicator returning to levels close to those observed in 2015.
- As shown in Figure 6(D), the trend as of 2020 is worrying as the gap between observed emissions and targeted values increases again. As improvements in the building stock (e.g. renovation) have not been lost, this emissions rebound may be related to a temporary increased energy need. Further analysis would help understand its origin and future development.

Outlook 2020-2021:

In the EU, in 2021, the previous downward trend in CO_2 emissions from households was interrupted, and instead, there was an increase of 1.5%. The emissions reached 306 $MtCO_2$, which was **29.2% higher than the target value**. Similarly, **in the CEE region**, there was a 5.4% increase in household CO_2 emissions, resulting in emissions of 63.5 $MtCO_2$. This value was **37.3% higher than the target value** for 2021. Both cases demonstrate a wider gap between the actual emissions and the desired path to climate neutrality, as shown in Figure 6(B) and (D), respectively. This trend could be attributed to the increase of final energy consumption, which can be linked to impacts of the COVID-19 pandemic and other external elements (see indicator 2. Final energy consumption in households and services).

[31] According to the Eurostat database, the heating degree days value in 2020 was the lowest registered since 1979 (the first year for which data is available).

Figure 6: CO_2 emissions from energy use in buildings from households



B. CO_2 EMISSIONS FROM ENERGY USE IN SERVICE SECTOR BUILDINGS

EU 2015-2020:

- As shown in Figure 7(A), CO_2 emissions from energy use in service sector buildings decreased constantly between 2017 and 2020, but are still far from the path to climate neutrality.
- In 2020, this indicator reached 121 $MtCO_2$, **13.2% higher than the target value for that year.**
- As shown in Figure 7(B), the gap between actual emissions and the path to climate neutrality has widened since 2018.

CEE 2015-2020:

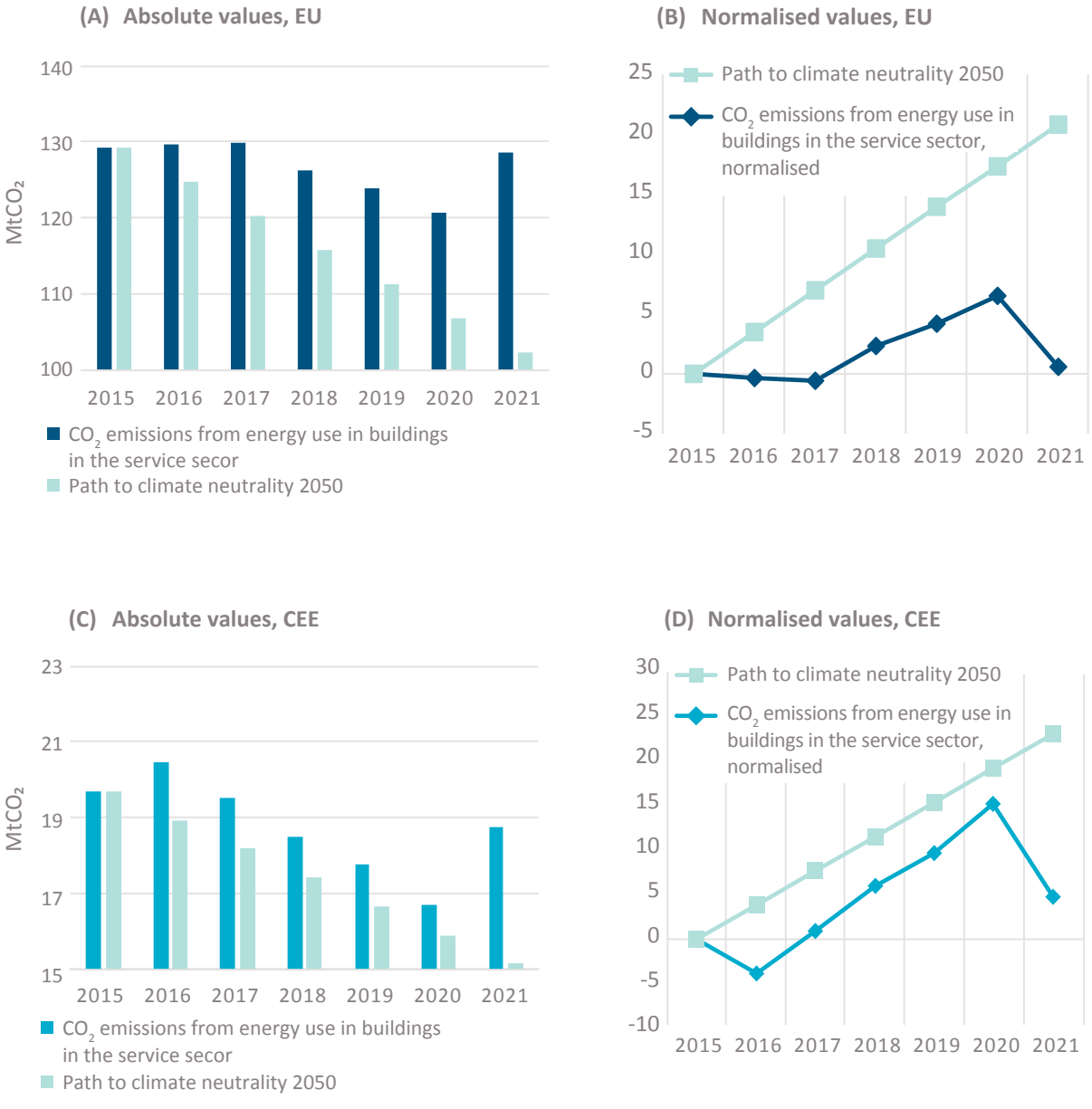
- As shown in Figure 7(C), CO_2 emissions from service sector buildings reduced constantly between 2016 and 2020, close to the goal values.
- In 2020, this indicator reached 16.7 $MtCO_2$, **only 5% higher than the target value**.
- As shown in Figure 7(D), the gap between the reported emissions and the path to climate neutrality was closing from 2016 until 2020.

Outlook 2020-2021:

In the EU, in 2021 the downward trend in CO_2 emissions from service sector buildings was interrupted. Instead, emissions increased by 6.4%, reaching 128.5 $MtCO_2$, which is **25.7% higher than the target value**. Similarly, **in the CEE region,** these emissions increased by 12.5% in 2021, reaching 18.8 $MtCO_2$, **24% above the target value**.

For both the EU and CEE region, the rebound in emissions is significant. This change in the trends can be related to multiple external factors, notably the reactivation of the service sector after the lifting of some COVID-19 restrictions in 2021. In both cases, the gap between the reported emissions and the path to climate neutrality is wider than in previous years, as shown in Figure 7(B) and (D), respectively.

Figure 7: CO_2 emissions from energy use in buildings in the service sector



2 FINAL ENERGY CONSUMPTION IN HOUSEHOLDS AND SERVICES

A. FINAL ENERGY CONSUMPTION IN HOUSEHOLDS

EU 2015-2020:

- As shown in Figure 8(A), since 2016, the final energy consumption in households has been higher than in 2015. It decreased between 2018 and 2019 but stabilised in 2020.
- In 2020, it was 2,886 TWh, **7.6% higher than the target value**.
- The COVID-19 pandemic restrictions may have influenced this indicator. People spent more time at home, home office practices increased and other consumption patterns changed, which might have been expected to lead to increased energy consumption rather than stabilisation. The likely explanation is that increased consumption due to people spending more time at home was balanced by reduced heating needs due to a mild winter; the level of heating degree days in 2020 was the lowest registered in more than 40 years.[32]
- As shown in Figure 8(B), the gap between the reported energy demand and the path to climate neutrality is widening. The small improvements seen since 2018 did not even bring final energy consumption back to the 2015 starting levels.

CEE 2015-2020:

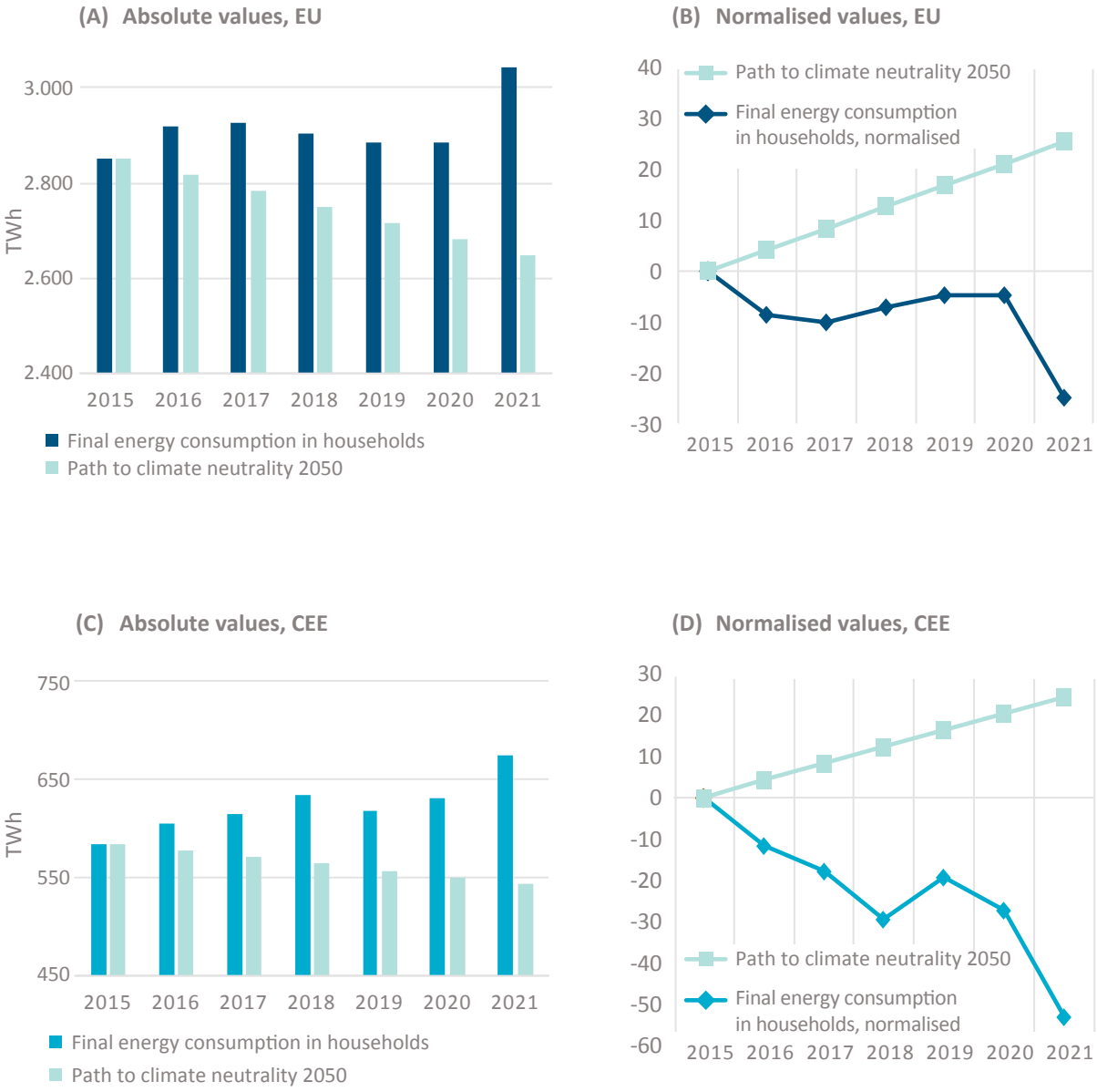
- As shown in Figure 8(C), the final energy consumption in households has been higher than the level in 2015 every year since.
- In 2020, it reached 631 TWh, **14.6% higher than the target value**.
- As shown in Figure 8(D), the gap between the reported final energy consumption and the path to climate neutrality is increasing significantly.

Outlook 2020-2021:

In the EU, the final energy consumption in households **increased by 5.5% in 2021**, reaching 3,044 TWh. This trend could be related to the increase of home-office practices and the fact that 2021 had the highest level of heating degree days (i.e. the coldest winter) since 2014, meaning households needed more heating. A similar development can be observed for the **CEE region**, where this indicator **increased by 6.9% in 2021**. In both cases, the gap between the observed values and the path to climate neutrality increased considerably in 2021 as shown in Figure 8(B) and (D), respectively.

[32] According to the Eurostat database, which has records for heating degree days since 1979.

Figure 8: Final energy consumption in households



B. FINAL ENERGY CONSUMPTION IN BUILDINGS IN THE SERVICE SECTOR

EU 2015-2020:

- As shown in Figure 9(A), final energy consumption in the service sector decreased between 2017 and 2020.
- In 2020, this indicator reached 1,410 TWh, even lower than the path to climate neutrality (1,462 TWh). However, this reduction in energy consumption can be attributed to reduced activity in the service sector due to the COVID-19 pandemic restrictions during this period.
- As shown in Figure 9(B), the gap between the reported values and the path to climate neutrality was closing until 2019, and in 2020 this indicator even went beyond the path to climate neutrality, though this result is likely to be an outlier.

CEE 2015-2020:

- As shown in Figure 9(C), the final energy consumption in the service sector decreased between 2016 and 2019, though remained higher than 2015 levels.
- In 2020, this indicator fell sharply to 225 TWh, even lower than the target value for the suggested linear path to climate neutrality (228 TWh).
- As in the EU as a whole, this reduction coincides with reduced activity in the sector due to COVID-19 pandemic restrictions.
- As shown in Figure 9(D), the gap between the reported service sector energy consumption and the path to climate neutrality was significant until 2019. Although results in 2020 surpassed the target value, it is premature to suggest that this indicator is on track towards climate neutrality.

Outlook 2020-2021:

In the EU, following a decrease in 2020, this indicator **increased 6.7% in 2021**, reaching 1,504 TWh and returning to levels similar to 2019. This upturn could be attributed to the partial reactivation of this sector following the lifting of certain COVID-19 pandemic-related restrictions. **In the CEE region, this indicator increased by 9.1% in 2021**, going back closer to 2016 and considerably increasing the gap between the observed values and the path to climate neutrality, as shown in Figure 9(D).

Figure 9: Final energy consumption in buildings in the service sector

3 RENEWABLE ENERGY SHARE

A. SHARE OF ENERGY FROM RENEWABLE SOURCES FOR HEATING AND COOLING

EU 2015-2020:

- As shown in Figure 10(A), the share of energy from renewable sources for heating and cooling has increased since 2016, but too slowly. It remains far from the path to climate neutrality.
- In 2020, this indicator reached only 23%, **11.4 percentage points lower than the target value for that year.**
- As shown in Figure 10(A) and (B), the gap between the observed values and the path to climate neutrality is widening.

CEE 2015-2020:

- As shown in Figure 10(C), this indicator has improved since 2017, but is still far from the target value.
- In 2020, this indicator reached 25.5%, **9.8 percentage points lower than the target value for that year.**
- As shown in Figure 10(D), the growing trend, previously better than the EU average, has flattened, and the gap between the observed values and the path to climate neutrality is increasing.

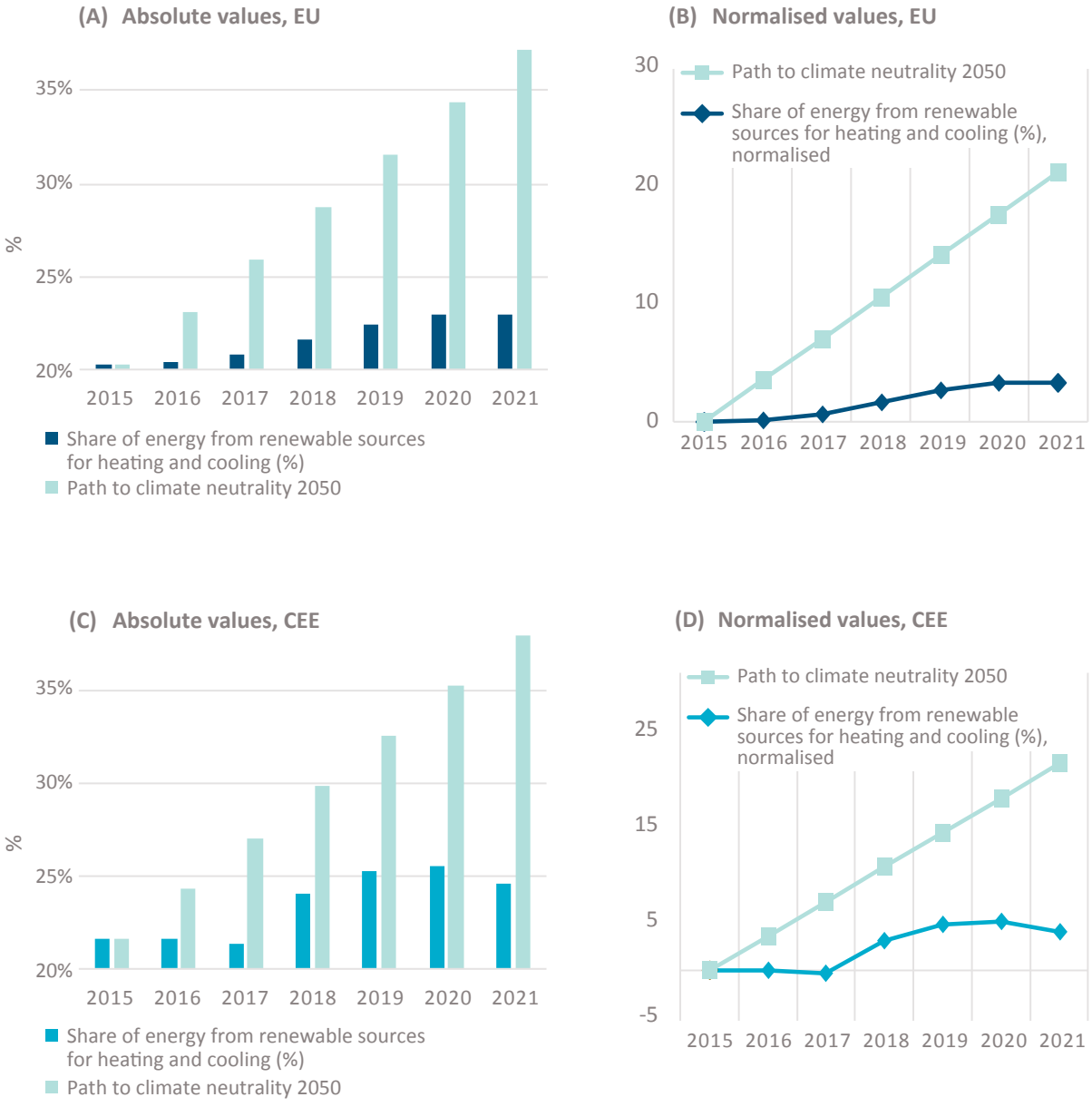
Outlook 2020-2021:[33]

In the EU, in 2021, this indicator was stable compared to 2020. This slight change compared to the slight growing trend in previous years may be linked to a cold winter in 2021[34] with higher heating needs. In absolute terms, around 5.7% more energy was generated from renewables for heating and cooling in 2021. However, the energy from all sources increased by a similar proportion (6.1%), making the final share of renewables in 2021 similar to the share in 2020. All in all, this indicator has been plateauing since 2019, after a very slow take off. **In the CEE region, in 2021, the share of renewables in heating and cooling reduced from 25.5% to 24.7%.** In absolute terms, around 3.1% more energy was generated from renewables but energy from all sources increased by 6.6%. In both cases, we can see a widening gap between the observed values and the path to climate neutrality, as shown in Figure 10(B) and (D).

[33] When looking at the results for 2021, please note that the Eurostat SHARES tool followed Directive 2009/28/EC (RED I) until 2020 and Directive (EU) 2018/2001 (RED II) for 2021. One of the main modifications concerns strengthened sustainability criteria for biofuels that can be reported as part of the renewables share.

[34] According to the Eurostat database, which has records for heating degree days since 1979.

Figure 10: Share of energy from renewable sources for heating and cooling



B. SHARE OF ENERGY FROM RENEWABLE SOURCES IN GROSS ELECTRICITY CONSUMPTION

EU 2015-2020:

- As shown in Figure 11(A), the share of energy from renewable sources in gross electricity consumption has been increasing since 2015.
- In 2020, this indicator reached 37.4%, **only 1.6 percentage points below the target value.**
- As shown in Figure 11(B), the gap between the observed values and path to climate neutrality was closing between 2018-2020.

CEE 2015-2020:

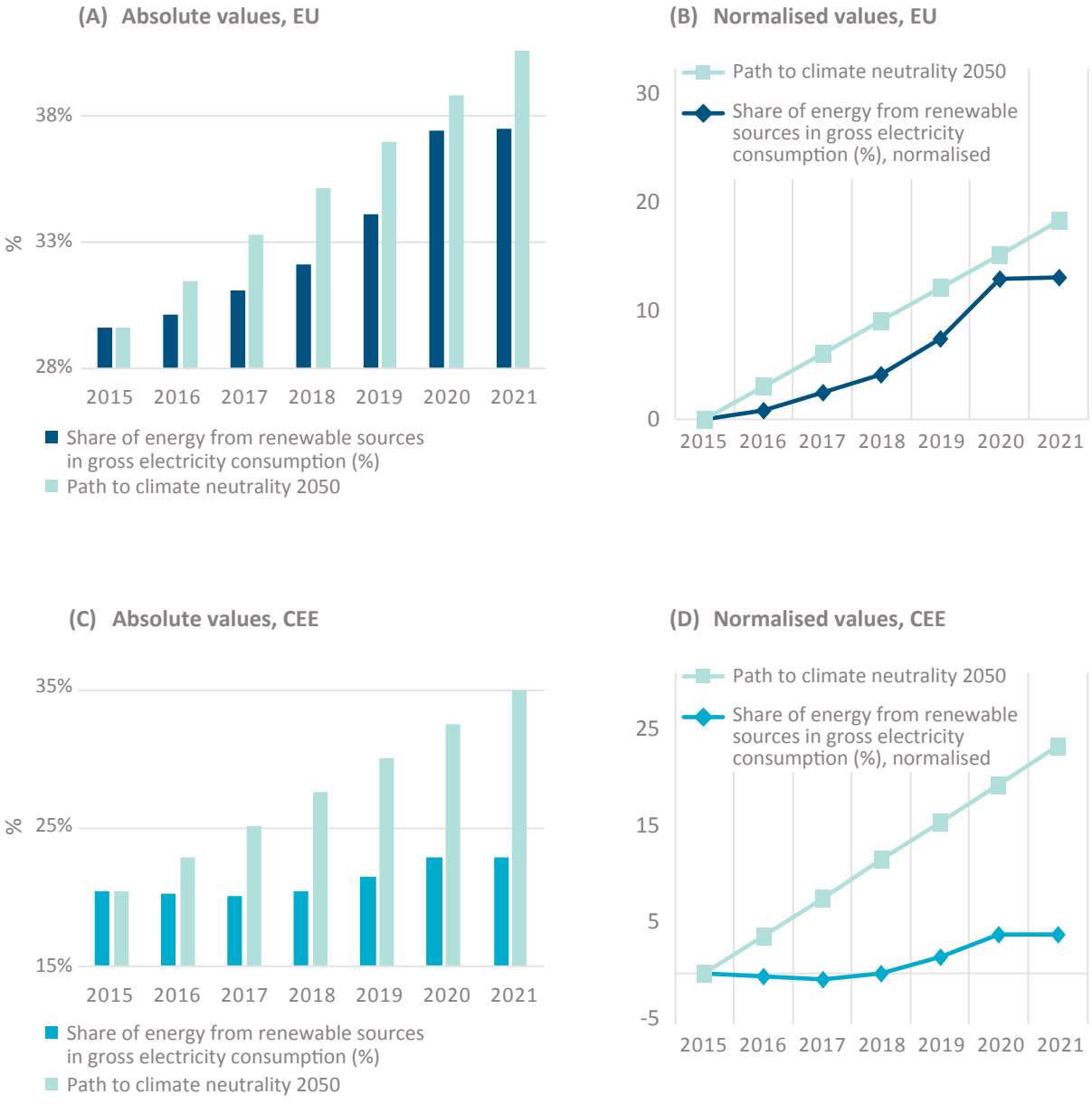
- As shown in Figure 11(C), the share of energy from renewable sources in gross electricity consumption has been increasing since 2017. However, it is still far from the path to climate neutrality.
- In 2020, this indicator reached 22.8%, **10.2 percentage points below the target value**.
- As shown in Figure 11(D), even though some progress has happened since 2017, the gap between the observed values and the path to climate neutrality remains significant.

Outlook 2020-2021:[35]

In the EU, in 2021, this indicator **remained relatively stable with a slight increase from 37.4% in 2020 to 37.5%**. This stability contrasts with the consistent growth observed in previous years, as illustrated in Figure 11(B). Although there was an absolute increase of around 4.6% in the amount of electricity generated from renewables in 2021, overall electricity generation from all sources increased by a similar proportion (4.3%), leaving the final share of renewables comparable to the previous year. **In the CEE region** (see Figure 11(D)), a similar development can be observed: the share of renewable sources in gross electricity consumption **remained stable between 2020 and 2021 at around 22.8%**.

[35] When looking at the results for 2021, note that the Eurostat SHARES tool followed Directive 2009/28/EC (RED I) until 2020 and Directive (EU) 2018/2001 (RED II) for 2021. One of the main modifications concerns strengthened sustainability criteria for biofuels that can be reported as part of the renewables share.

Figure 11: Share of energy from renewable sources in gross electricity consumption



4 CUMULATED INVESTMENT IN RENOVATION

EU[36] 2015-2020:

- As shown in Figure 12(A), the cumulated investment in renovation in real terms has increased since 2015 but is still far from the path to climate neutrality.
- In 2020, this indicator only accumulated to 1,771 billion EUR2015, **41.2% lower than the target value**.
- As shown in Figure 12(B), the gap between the observed values and the path to climate neutrality is widening steadily.

CEE[37] 2015-2020:

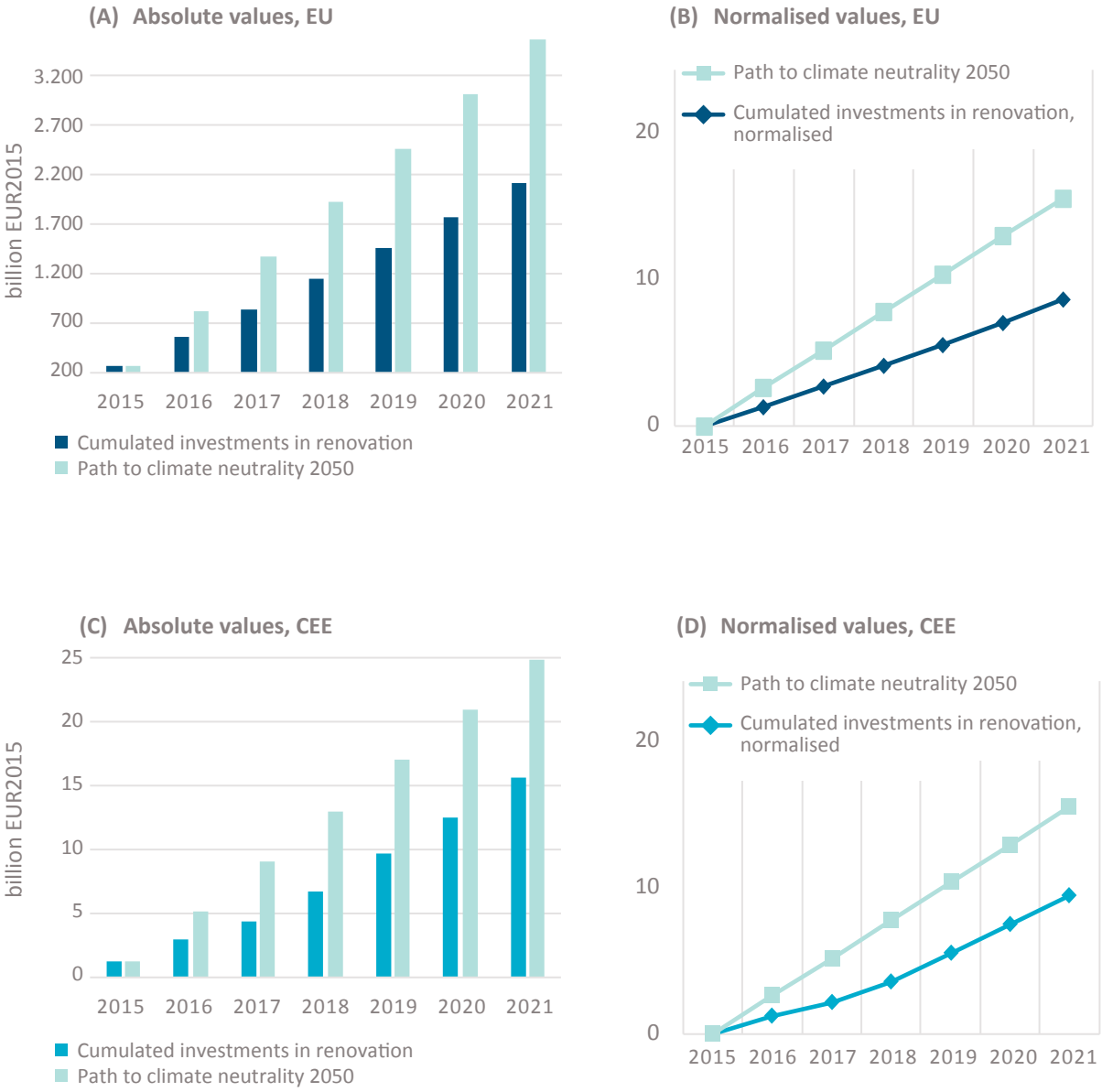
- As shown in Figure 12(C) the cumulated investment in renovation in real terms has increased since 2015; however, it is still far from the target value.
- By 2020, this indicator reached only 13 billion EUR2015, **39.7% lower than the target value**.
- As shown in Figure 12(D), the gap between the observed values and the path to climate neutrality is widening steadily.

Outlook 2020-2021:

In the EU, in 2021, investments in renovation increased by 7.8%, but the accumulated value (2,111 billion EUR2015) is still **40.7% lower than the target value** (3,557 billion EUR2015). **In the CEE region**, in 2021, investments in renovation increased by 3%, but the accumulated value (16 billion EUR2015) **is still 37.1% lower than the target value** (24.9 billion EUR2015).

[36] Includes Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Slovenia, Spain, Sweden.
[37] Includes Bulgaria, Czechia, Estonia and Slovenia.

Figure 12: Cumulated investment in renovation



5 ANNUAL DOMESTIC ENERGY EXPENDITURE PER HOUSEHOLD IN REAL TERMS

EU 2015-2020 period:

- As shown in Figure 13(A), the annual domestic energy expenditure per household reduced until 2017 by around 1% per year. However, in 2018 and 2019 it increased, going higher than the path to climate neutrality.
- In 2020, this indicator reached 1,406 EUR2010, **almost equal to the target value for that year** (1,407 EUR2010).
- Since people spent more time at home and home-office practices increased due to the COVID-19 pandemic restrictions, an increase in annual domestic energy expenditure could have been expected in 2020 instead of a reduction. As in the case of final energy consumption, the slight reduction (2.6%) could be linked to savings in heating energy costs due to a mild winter (the number of heating degree days in 2020 was the lowest registered in the last four decades).[38]
- As shown in Figure 13(B), after performing better than the path to climate neutrality until 2017, in 2018 and 2019 this indicator fell off-track, before returning close to the target value in 2020.

CEE 2015-2020 period:

- As shown in Figure 13(C) the annual domestic energy expenditure per household has been higher than the target values since 2015, except in 2017.
- In 2020, this indicator reached 1,018 EUR2010, **6.3% higher than the target value for that year.**
- This indicator has fluctuated[39] since 2015 (see Figure 13(D)), mostly performing worse than the path to climate neutrality.

[38] According to the Eurostat database, which has records for heating degree days since 1979.
[39] Since the aggregation of this indicator is based on the floor area of the building stock in each country, the fluctuations may be related to fluctuations identified in countries with large building stocks such as Poland and Romania.

Figure 13: Annual domestic energy expenditure per household

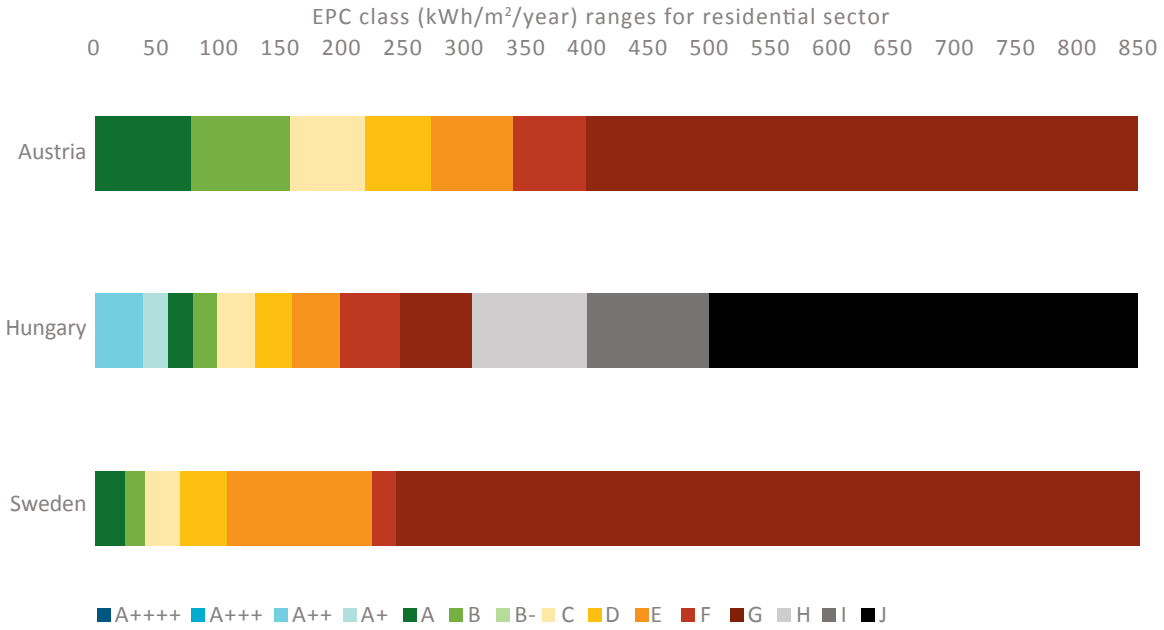
POTENTIAL FUTURE INDICATORS

This section presents a brief introduction to two potential additional indicators: (i) EPC ratings and (ii) the share of primary solid biofuels in renewables for space heating. Including EPC ratings within the EU BCT could help monitor the transformation of the EU building stock in terms of energy performance, but there are multiple challenges related to data availability and definitions of EPC classes, among others. Considering the use of biomass for space heating can help to understand better the energy matrix that supplies the EU building stock, and is important given the dependence on biofuels in some countries and the potential environmental and health impacts.

EPC RATINGS

Energy performance certificates (EPCs) contain information on the energy performance of individual buildings and are one of the main sources of bottom-up information on the performance of the building stock. Improvements in EPC ratings could therefore provide a useful indicator in the tracker. However, there are two caveats. Firstly, depending on the Member State, EPC classes refer to very different energy performance thresholds for residential buildings, so the data collected from Member States cannot be easily compared, as shown in Figure 14 with the data from three countries. The EPBD recast proposal also includes a provision requiring Member States to rescale EPC classes in a more harmonised way, although no estimation is yet available of what this will mean in terms of the distribution of EPC classes in individual Member States and on average across the EU. If this provision is adopted, and as data becomes available in the future, an EPC indicator would reflect this development.

Figure 14: EPC class ranges (kWh/m²/year) for residential buildings in different Member States



Secondly, there is currently no database at EU level that provides up-to-date data on EPC ratings in all Member States. The analysis therefore must rely on getting data from national EPC databases, most of which are not publicly available. The EPBD recast proposal includes a provision (Article 19) that would require Member States to open access to their national EPC databases. The volume of available EPC data is expected to increase in the future if this provision is adopted and implemented by Member States.

Until data availability and quality improves, EPC ratings cannot be included as an indicator in the tracker. BPIE conducted an extensive data collection exercise in 2022 and in 2023, when 11 and 19 Member States respectively provided their EPC data (residential and service sector) (see Table 4). Although the 19 Member States represent 83% of the total useful floor area of building stock in the EU, the total floor area with EPCs was not provided. Most of the Member States report the number of certified buildings; only a few report the floor area certified.

Table 4: EPC data composition

		Member States data available		
Countries	**Code**	**2014 (ZEBRA)#**	**2022**	**2023**
Austria	AT			
Belgium - Brussels	BE_BRU			
Belgium - Flanders	BE_FLA			
Belgium - Wallonia	BE_WAL			X
Bulgaria*	BG		X	X
Croatia*	HR			X
Cyprus	CY			
Czechia*	CZ			
Denmark	DK	X	X	X
Estonia*	EE			X
Finland	FI		X	X
France	FR	X	X	X
Germany	DE		X	X
Greece	EL		X	X
Hungary*	HU			X
Ireland	IE		X	X
Italy	IT	X	X	X
Latvia*	LV			X
Lithuania*	LT	X		X
Luxembourg	LU			
Malta	MT			
Netherlands	NL			
Poland*	PL			
Portugal	PT	X	X	X
Romania*	RO			
Slovakia*	SK	X	X	X
Slovenia*	SI			X
Spain	ES		X	X
Sweden	SE			X

*Central and East European (CEE) countries; #data collected from the ZEBRA project; X: countries with available data

NOTE: Data collected in 2022 and 2023 considered the residential and non-residential EPCs where the data was available.

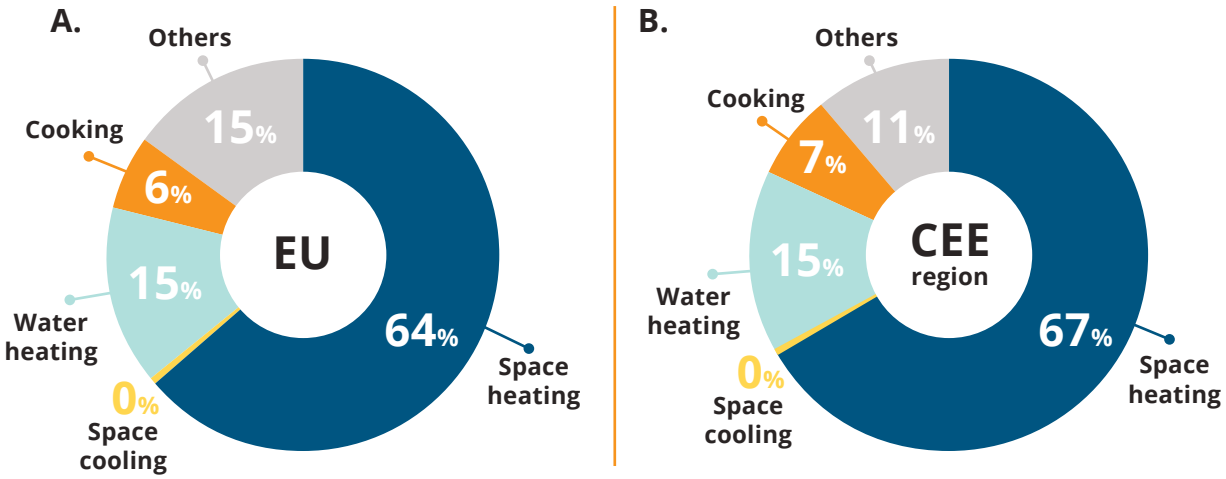
Tracking the evolution of EPCs is nevertheless extremely important to monitor the progress in Member States towards decarbonisation of the building stock and inform decision-making.[40] We intend to monitor this indicator in parallel with the other indicators that are a part of the EU BCT, but will continue to exclude it from the calculation of the index due to the challenges highlighted above. In our future work, depending on changes brought to the EPC framework by the EPBD recast, we hope to develop a methodology to make the data comparable and report progress every year as a part of the index.

PRIMARY SOLID BIOFUELS SHARE IN RENEWABLES FOR SPACE HEATING

According to the European Commission,[41] biomass for energy (bioenergy) continues to be the main source of renewable energy in the EU, with a share of almost 60%. The heating and cooling sector is the largest end-user, accounting for about 75% of all biomass for energy used in the EU. Even though biomass is often considered a key source of the EU's energy supply,[41] it can have negative impacts, including on forest ecosystems, biodiversity, and indoor environmental quality and air quality. These impacts may conflict with its definition as a clean source of energy for the decarbonisation of the residential sector. In this context, the EU has made efforts such as including new sustainability criteria in the recast of the Renewable Energy Directive 2018/2001 (RED II) to promote a gradual shift away from conventional biomass to more sustainable biomass fuels.

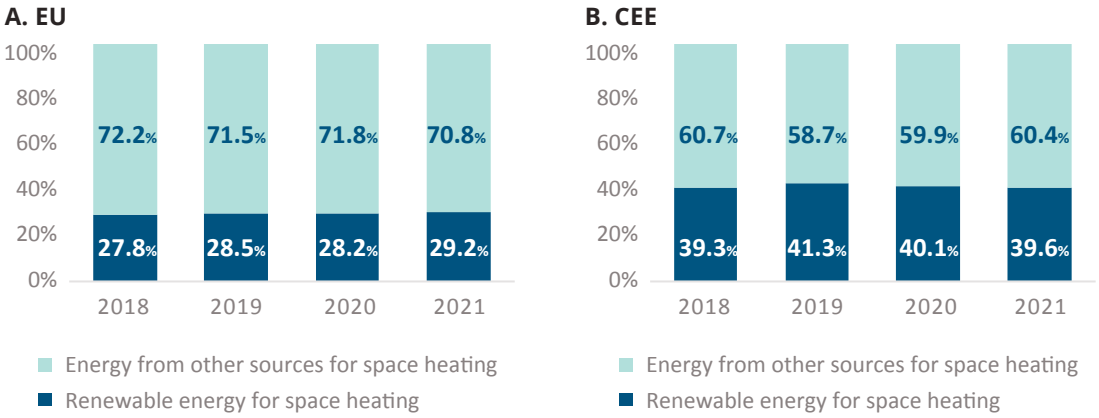
Based on the available data from Eurostat, we propose a *'Primary solid biofuels*[42] *share in renewables for space heating'* indicator to monitor the development of biomass for energy in households to track its share at EU level and corresponding impact on decarbonisation. Figure 15 (A) and (B) show household energy consumption broken down by energy use for the EU and CEE region respectively. Space heating represents more than 60% of the total energy consumption in both cases. If we focus on this component, renewable energy sources represent around 28% of energy for space heating in households in the EU and 40% in the CEE region (Figure 16 (A) and (B), respectively).

Figure 15: Breakdown of total energy consumption in households



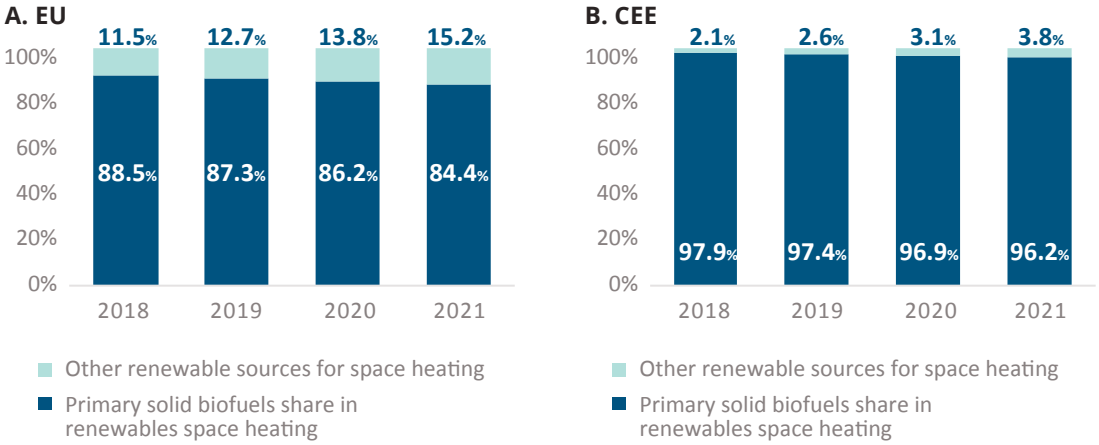
[40] Next-generation energy performance certificates: End-user needs and expectations - ScienceDirect
[41] According to the European Commission report https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomass_en
[42] According to the Eurostat definition, primary solid biofuels comprise: fuelwood, wood residues and by-products, black liquor, bagasse, animal waste, other vegetal materials and residuals, and renewable fraction of industrial waste.

Figure 16: Breakdown of energy source for space heating in households



The preliminary results presented in Figure 17 (A) and (B) show that primary solid biofuels represent around 86% of the renewable energy used for space heating in households in the EU, reaching 97% in the CEE region. It is clear that almost all renewable energy for space heating is derived from biomass, highlighting the importance of understanding what type of biomass is used and whether it is sustainable. To determine this, thorough monitoring and analysis of the use of primary solid biofuels for domestic heating is needed.

Figure 17: Primary solid biofuels share in renewable energy for space heating



Some efforts have been made through the Renewable Energy Directive recasts to strengthen the sustainability of biomass energy. These include the introduction of sustainability criteria in RED II, and the cascade principle to prioritise other uses of wood before burning for energy, sustainable harvesting criteria and reduced support for electricity-only installations considered in RED III. However, the share of primary solid biofuels in renewables for space heating in households has shown little change in the EU (~4% reduction between 2018 and 2021) or the CEE region (~2% reduction between 2018 and 2021). The important role of biomass for energy[43] requires a strategy to guarantee that the development of this technology supports the energy transition while ensuring the sustainable use of natural resources.

[43] According to the European Commission report https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomass_en

MAIN FINDINGS AND RECOMMENDATIONS

THE RESULTS FOR THE COMPOSITE INDEX OF THE EU BCT AND THE SET OF INDICATORS INCLUDED IN IT ANSWERED THE INITIAL QUESTIONS:

- **How is the decarbonisation of the building stock in the EU evolving since 2015?**
- **Is the building stock improving enough to achieve climate neutrality in 2050?**
- **What degree of improvement is needed between the most recent observations and 2050 in order to achieve climate neutrality?**

Overall, the progress since 2015 in the decarbonisation of the building stock in the EU and CEE region has not been enough. By 2020, the gap between the observed values and the path to climate neutrality is considerable, at 10 points in the EU, and 21 points in the CEE region. Most of the indicators which are used to calculate the EU BCT show that the EU and the CEE region are not on track to climate neutrality. Table 5 summarises the results for each indicator and progress in relation to the path to climate neutrality in 2050 for the EU as a whole, and Table 6 for the CEE region.

Table 5: Summary of the current status (until 2020) of the EU BCT indicators for the EU

	INDICATOR	OBSERVATION	COLOUR CODE
1	CO_2 emissions from energy use in buildings for households and services	**OFF** track	
	• Households	**OFF** track	
	• Services	**OFF** track	
2	Final energy consumption for households and services	**OFF** track	
	• Households	**FAR OFF** track	
	• Services	**ON** track	
3	Renewable energy share	**OFF** track	
	• Share of energy from renewable sources for heating and cooling	**FAR OFF** track	
	• Share of energy from renewable sources in gross electricity consumption	**ALMOST ON** track	
4	Cumulated investment in renovation in real terms	**OFF** track	
5	Annual domestic energy expenditure per household in real terms	**ALMOST ON** track	

Table 6: Summary of the current status (until 2020) of the EU BCT indicators for the CEE region

	INDICATOR	OBSERVATION	COLOUR CODE
1	CO_2 emissions from energy use in buildings for households and services	**OFF** track	
	• Households	**FAR OFF** track	
	• Services	**ALMOST ON** track	
2	Final energy consumption for households and services	**FAR OFF** track	
	• Households	**FAR OFF** track	
	• Services	**ON** track	
3	Renewable energy share	**OFF** track	
	• Share of energy from renewable sources for heating and cooling	**OFF** track	
	• Share of energy from renewable sources in gross electricity consumption	**OFF** track	
4	Cumulated investment in renovation in real terms	**OFF** track	
5	Annual domestic energy expenditure per household in real terms	**ON** track	

Key recommendations

NEW EFFORTS, SUCH AS THE MEASURES IN THE LATEST EPBD RECAST, ARE URGENTLY NEEDED GET THE BUILDINGS SECTOR ON TRACK TOWARDS CLIMATE NEUTRALITY AND MEET THE GOALS OF THE PARIS AGREEMENT.
OUR KEY FINDINGS AND RECOMMENDATIONS ARE SUMMARISED BELOW:

The final energy consumption indicator is far off track for achieving climate neutrality in the EU and CEE region. External events, such as the COVID-19 pandemic and the alternately mild and cold winters of 2020 and 2021, affected the final energy consumption considerably, especially in households. This shows the susceptibility of the building stock's energy performance to external factors, calling for urgent improvements to enable buildings to fulfil users' variable (often increasing) needs more efficiently, while adapting to diverse circumstances.

Recommendation

The EU and Member States should prioritise deep renovation to mitigate the increased energy consumption resulting from the intense use of buildings (e.g. home working, reactivation of service sector activities). Member States should also promote the implementation of adaptation measures across the existing and new building stock to reduce the influence of weather and natural events on buildings operations.

The use of renewable energy for heating and cooling is far from meeting the targets to achieve climate neutrality in the EU and CEE region. This trend can also be observed in the results for CO_2 emissions from energy use in households and the service sector, which show a wide gap between the target values and the actual CO_2 emissions from buildings.

Recommendation

There is an urgent need to decarbonise building heating systems. In doing this, it is also important to consider that primary solid biofuels make up most of the renewable energy for space heating (around 86% in the EU and 97% in the CEE region). The EU and Member States should define clear and effective sustainability criteria for bioenergy if it continues to play a major role in the heating sector.

The amount of renewable energy in gross electricity consumption has been increasing in the EU, close to meeting the target values. However, the simultaneous increase in electricity demand means their final market share has been increasing more slowly. In the CEE region, the share of renewable energy in the electricity network is far from achieving the target values.

Recommendation

The EU and Member States should ensure that the increase in renewable energy generation is complemented by energy-efficiency measures to reduce energy consumption and avoid the use of fossil fuels. Member States should define more clear and ambitious goals to accelerate the transformation of the electricity grid in the CEE region.

Both the EU and the CEE region are far from achieving the targets for investments in renovation. The low investments are reflected in the low renovation rates across the Member States, even after the development of initiatives such as the Renovation Wave.

Recommendation

Financial support schemes for renovation of buildings should receive more funding and higher subsidies should be spent on deep renovation. Member States should accelerate the effective implementation of technical and information support initiatives such as one-stop-shops and strategies to engage inhabitants in short-term actions to decrease their energy consumption.

The lack of data on investments in renovation, including disaggregated data on energy and non-energy related renovation activities, represents a significant challenge to monitor the progress of renovation efforts. It was not possible to include around 40% of EU countries and 60% of CEE countries due to this lack of data.

Recommendation

Member States should monitor the number and type of renovation activities being carried out and monitor the final destination (end-beneficiaries) of public investments and financial support. National statistics on the renovation activities taking place are essential to evaluate the renovation rates and targets and assess the effectiveness of subsidies, national schemes and technological developments.

In the EU, the energy expenditure per household is close to achieving the target value towards climate neutrality. The gap in the CEE region is widening. In both cases, it is important to consider the social aspects around this indicator. Not reducing energy expenditure for households can have significant impacts, especially in regions with high energy poverty levels.

Recommendation

While governments may need to provide some direct support to households due to rising heating costs, the main priority should be to reduce energy expenditure by improving the energy performance of buildings. Energy-poor households should receive support to increase the energy performance of their buildings through targeted renovation programmes. Member states should define robust and effective minimum energy performance standards to reduce the energy expenditure of households living in the worst-performing buildings, while reducing energy consumption and improving indoor conditions.

The analysis of EPC ratings exposed significant challenges in monitoring EPC schemes across Member States. A main barrier is the lack of structured and harmonised data at the national level.

Recommendation

Despite differences in energy classes due to aspects such as national regulations and climate, Member States should pursue the creation of functional EPC databases. Having well-established national databases can be the starting point to feed information into a more general database at the EU level to enable monitoring of the performance of the building stock. EPCs remain an important information tool for citizens and other stakeholders to support decision-making (e.g. on buying and selling, renovation triggers/recommendations, etc.) and policy-making (e.g. defining MEPS). Member States should design strategies to make EPCs more reliable and to boost their rollout to quickly cover a larger portion of the building stock.

Many households depend on biomass to fulfil their space heating requirements. Previous projects have pointed out significant gaps between the supply and demand sides in the official statistics reported by Member States.[44] These discrepancies often leave a high amount of solid biomass use (as high as 50% in some cases) unexplained.

Recommendation

Member States should ensure that strong monitoring and verification approaches are established to reduce damage to forests and other ecosystems, and to guarantee that all the impacts produced by the use of primary solid biofuels are quantified and considered.

[44] BIO SCREEN project report available at https://rekk.hu/downloads/projects/Country_report_Hungary_ENG_FINAL.pdf

What do these results mean for the EPBD negotiations?

The EU Buildings Climate Tracker confirms that the EU is facing a considerable gap in its progress towards climate neutrality. To achieve its 2050 goals, the EU must rapidly accelerate the rate of building decarbonisation.

As the main legislative instrument to advance the decarbonisation of buildings at EU level, the Energy Performance of Buildings Directive must set ambitious goals, trigger action and establish monitoring mechanisms to guide Member States' efforts to deliver a climate-neutral building stock by 2050.

EPBD PROVISIONS REGARDING ZERO-EMISSIONS BUILDINGS, A WHOLE-LIFE CARBON APPROACH FOR THE EU BUILDING STOCK, MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS), THE REVIEW OF EPCS AND A FINANCIAL SUPPORT FRAMEWORK FOR BUILDING RENOVATION AND DECARBONISATION ARE CRUCIAL TO TACKLE THE LACK OF PROGRESS IN THE DECARBONISATION OF THE EU BUILDING STOCK.

EU co-legislators are in the last phases of debating and deciding on these EPBD provisions, which will soon need to be transposed and implemented at national level.[45] The stakes are high: the design and ambition of these provisions will outline the transformation of the building stock in the next decade and go a long way to determining whether the EU is on track to meet or miss its 2050 objectives.

[45] An overview is available in BPIE's report on Assessment of co-legislators positions and recommendations

WHAT IS EXPECTED FROM THE EPBD TO GET ON TRACK WITH CLIMATE NEUTRALITY?

		BENEFITS TOWARDS DECARBONISATION
ZEB DEFINITION	• The use of **fossil fuel heating systems** in new buildings **should not be allowed** • The ZEB definition must have **well-defined low thresholds** for energy needs • **New buildings should be constructed as ZEBs** as soon as possible	**Final energy consumption and CO_2 emissions reduction**
WHOLE-LIFE CARBON APPROACH	• Clear principles on **how to measure, disclose and limit whole-life carbon** of buildings should be defined • An implementation plan should be developed, including a clear **timeline and incentives** for data collection and generation	**CO_2 emissions reduction**
MEPS	• MEPS should be designed **to address the worst-performing buildings first**, establishing clear targets, milestones and timelines • MEPS should be accompanied by an **effective compliance support and enforcement system** to monitor and track their deployment and impacts	**Final energy consumption, energy expenditures, and CO_2 emissions reduction**
EPCs	• **EPC thresholds and definitions should be aligned with ZEBs and MEPS** • **Quality principles are required** for EPCs as a tool to support decision-making (buy/sell, renovation trigger/advise, etc.) • High **EPC rollout** and **better national databases** should be pursued	**Final energy consumption, energy expenditures, and CO_2 emissions reduction**
FINANCIAL FRAMEWORK	• Strategies to **improve access to existing funding programmes** should be developed • Funding programmes should be **designed and targeted to achieve the greatest energy savings and social benefits**	**Investments in renovation increase, final energy consumption reduction**
RENEWABLE ENERGY SYSTEMS	• **Ambitious targets and clear roadmaps** to decarbonise building heating and cooling systems should be integrated in national building renovation plans	**CO_2 emissions reduction**
RENOVATION	• **Deep renovation should be a guiding principle** reflected in the design of all policy measures and financing programmes • **Technical information to support initiatives should accelerate**, e.g. one-stop-shops and strategies to engage inhabitants • Better schemes should be implemented to **monitor the number and type of renovation activities being carried out**	**Investments in renovation increase, final energy consumption reduction**

ANNEXES

ANNEX I - OVERVIEW OF THE RESULTS FOR THE EU

Figure 18 to Figure 25 show the detailed results for all the indicators for the EU in the form of normalised values.

Figure 18: CO_2 emissions for energy use in buildings from households, EU

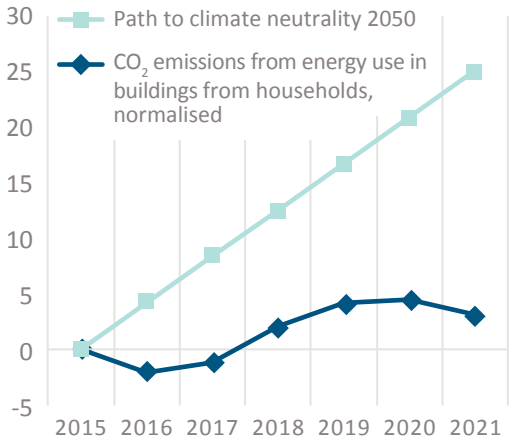


Figure 19: CO_2 emissions from energy use in buildings in the service sector, EU

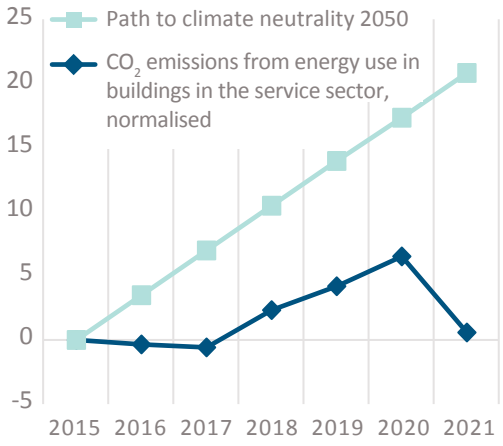


Figure 20: Final energy consumption in households, EU

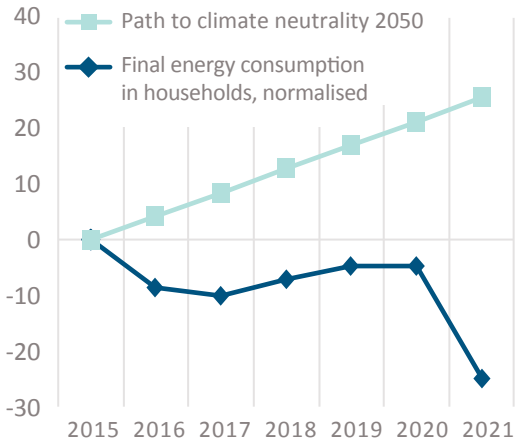


Figure 21: Final energy consumption in the service sector, EU

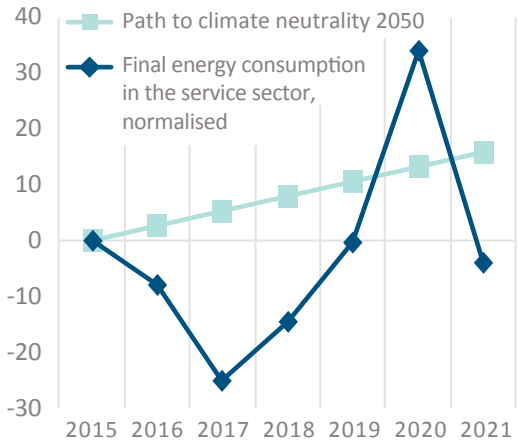


Figure 22: Share of energy from renewable sources for heating and cooling, EU

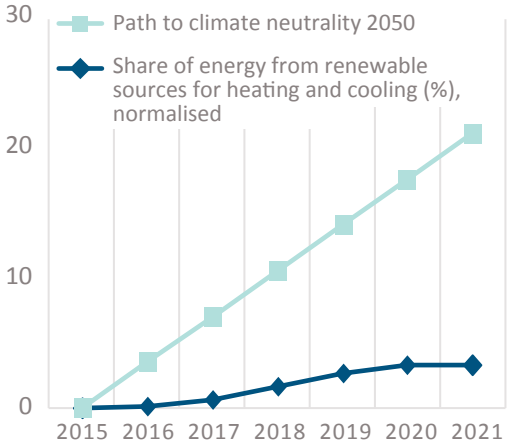


Figure 23: Share of energy from renewable sources in gross electricity consumption, EU

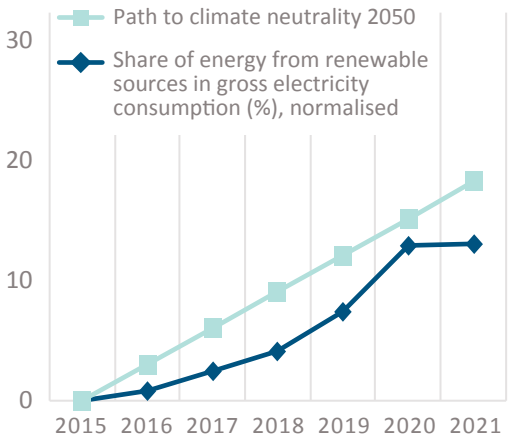


Figure 24: Cumulated investments in renovation, EU

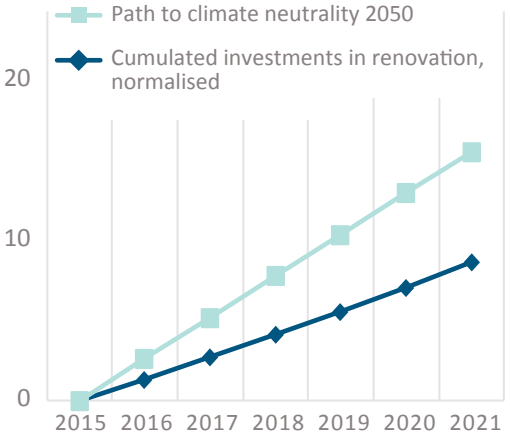
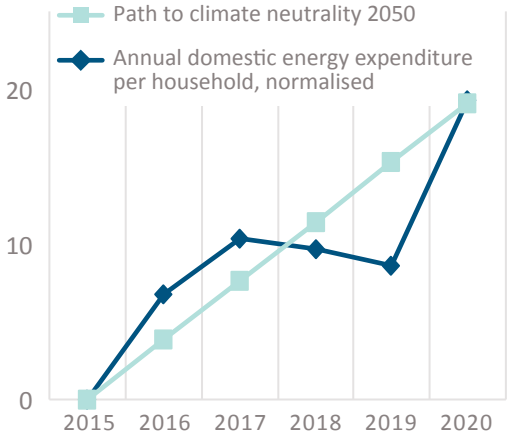


Figure 25: Annual domestic energy expenditure per household, EU



ANNEX II - OVERVIEW OF THE RESULTS FOR THE CEE REGION

Figure 26 to Figure 33 show the detailed results for all the indicators for the CEE region, in the form of normalised values.

Figure 26: CO_2 emissions for energy use in buildings from households, CEE region

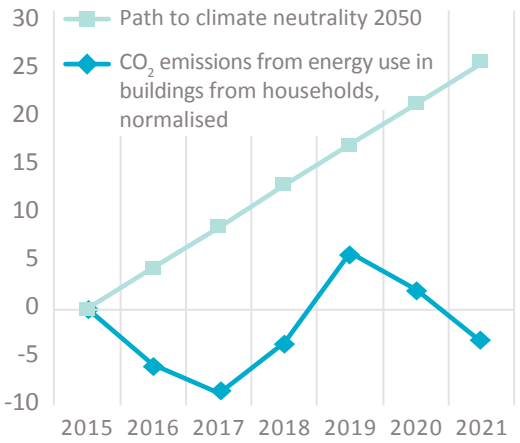


Figure 27: CO_2 emissions from energy use in buildings in the service sector, CEE region

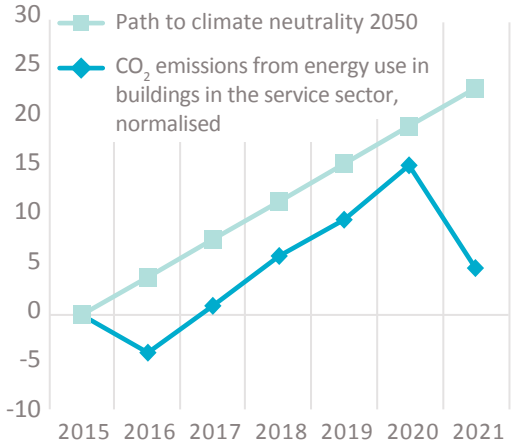


Figure 28: Final energy consumption in households, CEE region

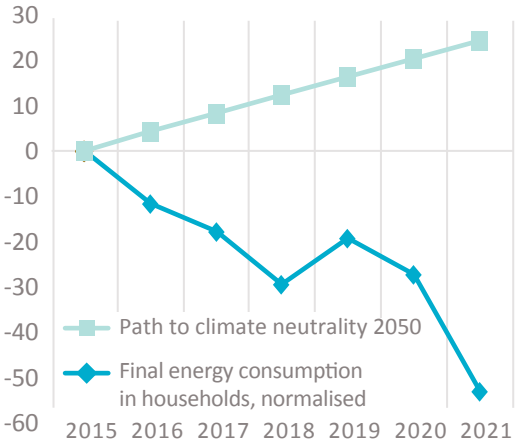


Figure 29: Final energy consumption in the service sector, CEE region

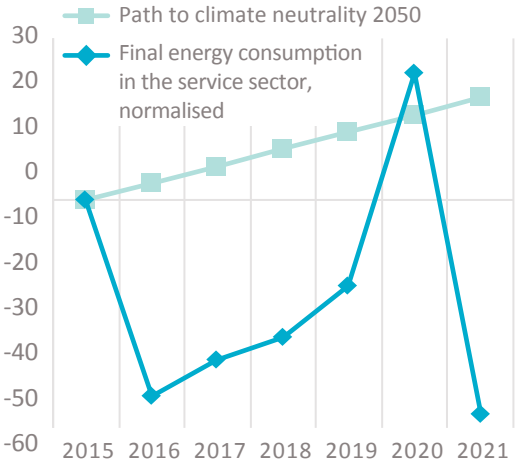


Figure 30: Share of energy from renewable sources for heating and cooling, CEE region

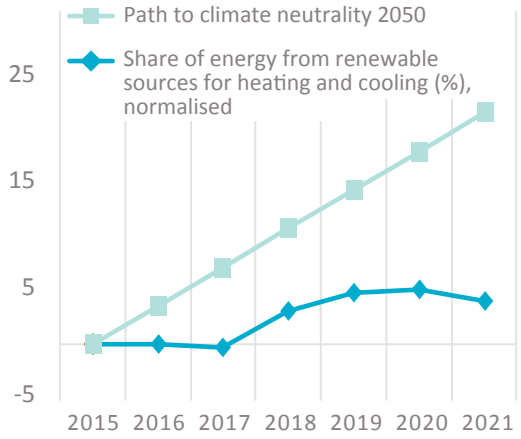


Figure 31: Share of energy from renewable sources in gross electricity consumption, CEE region

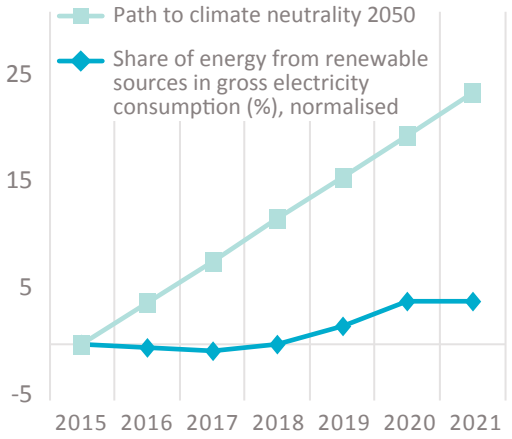


Figure 32: Cumulated investments in renovation, CEE region

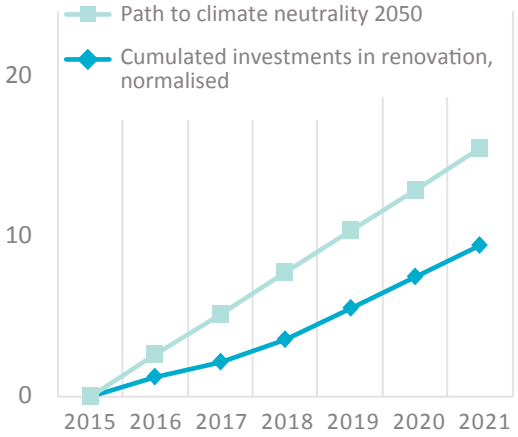
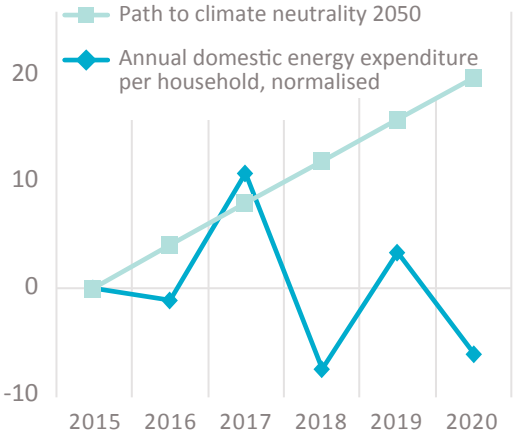


Figure 33: Annual domestic energy expenditure per household, CEE region



ANNEX III - METHODOLOGY - FREQUENTLY ASKED QUESTIONS

How were the normalised values for the indicators obtained?

All the indicators were transformed to a common scale where the path to climate neutrality is defined as the path from 0% (the status of that indicator in 2015) to 100% (final goal value that the indicator should reach by 2050). This allows all the indicators to be translated to an equivalent scale to facilitate the interpretation and analysis of the results. More details can be found in the annex of the report of the first edition of the EU BCT.

How is the composite index of the EU BCT calculated?

The composite index of the EU BCT aggregates the performance of the set of five indicators through a weighted sum. Each indicator was assigned a weight according to its role towards the decarbonisation of the EU building stock. More details can be found in the "Weighting of indicators" section in the methodology of this report.

For how long has the EU BCT monitored the decarbonisation of the EU building stock?

The first edition of the EU BCT was released in 2022. In that first edition, the analysis focused on the period 2015-2019. This report, published in 2023, is the second edition, and monitors the decarbonisation of the EU building stock for the period 2015-2020. The second edition also includes an overview of the year 2021 for those indicators for which data was available.

How are the goals for 2050 for each of the indicators defined?

To compare the observed development of the different indicators in relation to the objective of reaching climate neutrality by 2050, goal values have been determined for each indicator. The goal values are based mainly on the MIX scenario used in different impact assessments[46,47] undertaken by the European Commission in the framework of the EU Green Deal. For most of the indicators, the definition of the goal for 2050 relies on an intermediate goal for 2030 defined by the MIX scenario. More information about the goals definition can be found in the section "Translating climate neutrality by 2050 into a goal for each indicator" in the methodology of this report.

Why is the set of indicators slightly different in this second edition?

When the EU BCT was released in 2022, it considered six indicators, including the improvement of EPC ratings. This indicator is important to monitor energy performance of new and existing buildings, which is a key aspect of the transition towards a climate-neutral EU building stock. However, various barriers meant we were unable to accurately estimate progress in 2022, so we removed this indicator from the tracker composition to improve transparency. This change is intended to be temporary, and EPC ratings will be included in the set of indicators as soon as methodologically possible. Challenges include the lack of data across most Member States, discrepancies in the definition of the categories/classes in the EPC schemes, and changes in regulations and guidelines. A comprehensive section on EPC ratings is still included in this edition, and we will continue to monitor the status of this potential indicator.

[46] Impact Assessment accompanying Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

[47] Impact assessment accompanying the Communication *'Stepping up Europe's 2030 climate ambition'*

ANNEX IV - TECHNICAL CORRECTION TO THE TRACKER

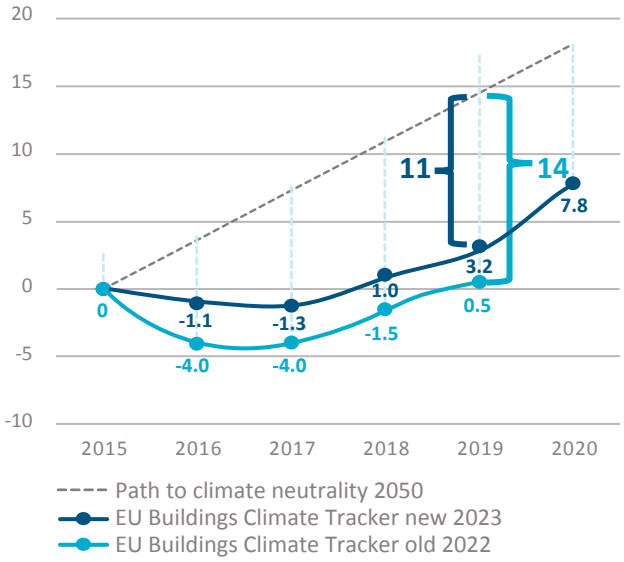
The correction in the data involved revising the values for the EU Buildings Climate Tracker from the editions in year 2022 to 2023. The correction in the data primarily involved revising the target values for the "renewable energy share" indicator. It was discovered that the previous target value lacked the appropriate weighting, which resulted in an overestimation of the targets and an underestimation of the achieved values.

To rectify this issue, a technical correction was applied, incorporating the missing weighting factors. The correction involved assigning weights to different components contributing to the renewable energy share indicator. Specifically, a weight of 3/4 was allocated to the renewable share in heating and cooling, while a weight of 1/4 was assigned to the renewable share in gross electricity production.

By incorporating these weighting factors, the corrected data provides a more accurate representation of the achieved values in relation to the weighted targets. The weighting accounts for the varying importance and contribution of different components within the overall renewable energy share indicator.

As a result of the correction, it was observed that the curve for the current edition (2023) exhibited a higher value than the curve for the previous edition (2022). This change indicates improved performance in reaching the target values after considering the appropriate weighting. Furthermore, the correction impacted the assessment of previous years. According to the new, corrected calculation, it was determined that the index had already reached a value of approximately 3.2 points in 2019. In contrast, without the correct weighting, the index would have reached only 0.5 points in 2019. Consequently, the correction resulted in a decrease in the distance to the target value for 2019, reducing it from around 14 points to 11 points. The following graph illustrates this technical correction.

Figure 34: Comparison of EU BCT composite index first and second edition



The corrected decarbonisation gap in this second edition of the EU BCT (2023), is 11 points in 2019.

Decarbonisation gap indicated in last year's report, i.e. the first edition of the EU BCT in 2022, was 14 points for 2019.

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