Plan 4 Climate

CAN CLIMATE ACTION NETWORK Europe

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Europe's climate dividend:

Economic benefits, jobs, health and lower energy costs

Energy saving measures could provide over €826 billion in yearly monetised co-benefits by 2030

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Executive summary

Since the 1980s, Europe has warmed at roughly twice the global average, and the economic toll is mounting to match. According to the European Environment Agency, weather and climate extremes have cost the EU an estimated €822 billion in losses between 1980 and 2024, with a quarter of that total between 2021 and 2024, each ranking among the five costliest on record. The same events have caused more than 441,000 deaths over the same period. [1]

Our landmark 2024 Paris Pact Payoff report concluded that for the EU as a whole, the benefits of ramping up climate action (by implementing a 1.5°C-aligned pathway) significantly outweigh the costs, and direct co-benefits amount to at least €1 trillion by 2030. What has changed since the first report was published is not just the underlying economics, but also the politics around them. The EU adopted a binding 90% emissions reduction target for 2040 which became law in March 2026, but only after sustained industry pushback and open opposition from several member states, and the debate has shifted from whether to act to whether Europe can afford to. Renewed fossil fuel price volatility tied to the US-Israel war on Iran has also highlighted again what was already stated and shown by the Russian aggression on Ukraine: continued dependence on imported fossil fuels is itself a cost and a vulnerability, not a safe default.

This report updates our evidence base against that backdrop, showing that the direct co-benefits of climate action, on jobs, health, and household energy costs, remain large and growing, restating the positive impact decarbonization has on many layers of society.

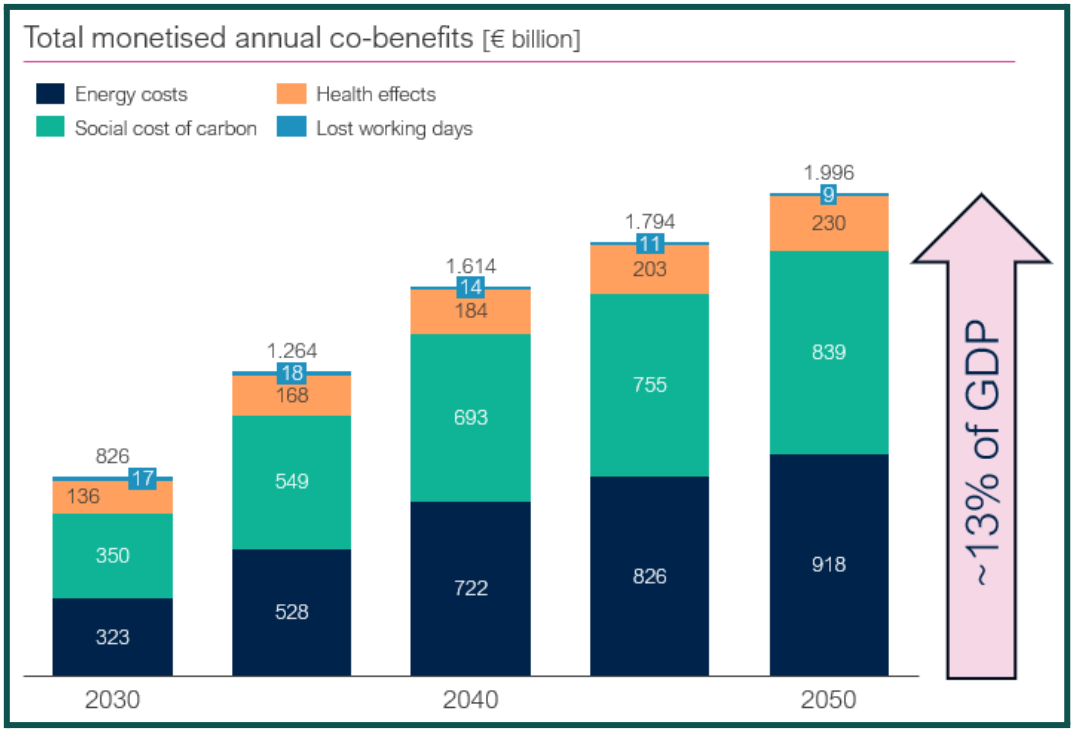
Energy saving measures could provide over €826 billion in yearly monetised co-benefits by 2030 and nearly 2 trillion by 2050 (13% of EU27 2021 GDP)

Energy saving measures across the EU27 generate benefits beyond lower energy bills, including avoided global climate damage[2], improved public health, and fewer working days lost to illness. As shown in Figure 1, these combined co-benefits are projected to more than double, from €826 billion a year in 2030 to nearly €2 trillion a year by 2050, equivalent to about 13% of EU27 2021 GDP. Cumulated, the considered energy savings and renewables deployment account for almost €32 trillion in monetized co-benefits over the period 2030-2050.

[1] European Environment Agency, "Extreme weather and uneven climate adaptation challenge Europe's resilience," June 2026.

[2] The social cost of carbon in this report estimates the global damage caused by each additional tonne of CO2 emitted, using cost rates from the German Environment Agency (UBA, Methodenkonvention 3.2). These rates cover impacts on agriculture, buildings energy use, sea-level rise, and human health, on the global level

Figure 1. Total monetised annual co-benefits in billion euros, per type of benefit



Import dependency

While this report quantifies energy cost savings as a direct co-benefit of decarbonisation measures, it's worth stating the scale of the exposure those savings help address. Eurostat data[3] show the EU's energy import dependency rate stood at 58% in 2023, meaning nearly 60% of the bloc's energy needs were met through net imports, with individual member states ranging from under 5% to over 90%. Oil and petroleum products alone accounted for 67% of the EU's energy imports in 2024, and overall fossil fuels for 95%. Reducing this dependency matters beyond cost: heavy reliance on fossil fuels leaves European consumers exposed to geopolitical pressure, price shocks, and supply disruptions largely outside the EU's control, risks that recent Gulf tensions and the post-2022 scramble to replace Russian gas have both made concrete rather than hypothetical.

Energy saving investments could support over 8.5 million jobs in 2030, mainly from the renovation wave

Investments in energy saving measures translate directly into employment, from construction and renovation to the installation of new heating and mobility technologies. These investments could support

[3] Eurostat, "Shedding light on energy in Europe – 2025 edition," 11 March 2025, https://ec.europa.eu/eurostat/web/interactive-publications/energy-2025

over 8.5 million new full-time-equivalent jobs in 2030, of which 6.5 million come from construction and renovation alone, and continue to provide between 3.5 and 5.8 million jobs a year through 2050.



Reducing air pollution and insulating homes could prevent almost 34 000 deaths annually by 2030.

Better-insulated homes and lower exposure to air pollution translate directly into public health gains: additional climate action could prevent almost 34,000 deaths a year by 2030 (from these channels alone; other climate-related mortality, notably from heatwaves, is not included), alongside 8,000 fewer hospital admissions. Reduced excess cold-weather mortality is the largest of these benefits, with over 21,000 premature deaths avoided annually by 2030, rising to up to 50,000 by 2050. To note: this sum does not include deaths as a consequence of extreme weather events and climate change itself, but avoided deaths as a consequence of the energy transition - which comes on top of the tragic loss of human lives due to extreme weather events.

These figures are, moreover, a conservative reading. The assessment covers only the energy savings and renewables deployment of the Paris Agreement Compatible (PAC) 2.0 pathway compared to a baseline, business-as-usual scenario, which together account for close to 64% of the EU's 2024 emissions.

The remaining reductions, along with the benefits that cannot be expressed in monetary terms or modelled in this study, are absent from the totals above. The benefits of climate action, already enormous in these numbers, are likely even larger.

Agriculture and land use are the clearest case in point. They lie outside the scope of this study (see the attached methodological chapter), yet carry substantial gains for health, biodiversity, water quality and rural livelihoods. Section 4 addresses them qualitatively and shows that their contribution could add considerably to what is quantified here.

It is worth pointing out that the losses that climate change causes in Europe are not quantified in this current report. **The benefits presented here therefore come on top of limiting dangerous climate change.**

1. Context: Can Europe afford not to act?

In 2026, Europe was shown the full price of its dependence on fossil fuels. Since the war in the Middle East began, imported fossil fuels have cost the EU an additional €90 billion, "without a single molecule of energy added", while a summer of extreme heat brought more than 35,000 additional deaths[4]. Every year of delay adds to both costs. The question is no longer whether Europe can afford ambitious climate action, but how much longer it can afford to go without it.

Against this backdrop, the EU has set a binding target to cut net greenhouse gas emissions by 90% by 2040. The governance rules, the plans and budgets - that will decide whether this target is met - are now being negotiated. At the same time, the case for climate action is more openly contested than when our previous 'Paris Pact Payoff' report on the co-benefits of the energy transition was published in January 2024.

This section sets out that political context, the arguments made against faster action, and what this report adds to the debate.



[4] European Commission, "2026 State of the Union Address by President von der Leyen," SPEECH/26/1868, 16 September 2026, https://ec.europa.eu/commission/presscorner/api/files/document/print/ov/speech_26_1868/SPEECH_26_1868_OV.pdf.

The 2040 target is now law, but the rules to deliver it are still being written

The amended European Climate Law, which entered into force in March 2026, sets a binding target to cut net greenhouse gas emissions by 90% by 2040, compared with 1990 levels[5]. The target came with significant concessions. From 2036, international carbon credits can cover up to five percentage points of the target, so domestic cuts could be as low as 85%. The start of the new emissions trading system for buildings and road transport (ETS2) was delayed by one year to 2028, and the law will now be reviewed every two years[6]. Czechia, Hungary, Poland and Slovakia voted against the final text, and Belgium abstained[7].

The final target sits at the bottom of the 90-95% range recommended by the European Scientific Advisory Board on Climate Change, and international credits could take domestic cuts

[5] Regulation (EU) 2026/667 of the European Parliament and of the Council of 11 March 2026 amending Regulation (EU) 2021/1119 as regards the setting of a Union intermediate climate target for 2040, https://eur-lex.europa.eu/eli/reg/2026/667/oj/eng.

[6] Council of the EU, "2040 climate target: Council gives final green light," press release, 5 March 2026, https://www.consilium.europa.eu/en/press/press-releases/2026/03/05/2040-climate-target-council-gives-final-green-light/.

[7] Council of the EU, voting result on the adoption of the legislative act amending the European Climate Law, ST 7034/1/26 REV 1, March 2026, https://data.consilium.europa.eu/doc/document/ST-7034-2026-REV-1/en/pdf.

below it[8]. It also falls short of what CAN Europe has called for - based on science - domestic net zero emissions by 2040 at the latest, based on at least 92% gross emission reductions[9]. When Member States agreed their position in November 2025, CAN Europe warned that the deal was "far weaker than the 90 per cent headline suggests"[10].

The pathway modelled in this report - the so-called Paris Agreement Compatible (PAC) 2.0 scenario - goes further than the adopted target. The PAC 2.0 scenario reaches climate neutrality in the EU27 by 2040, with gross emission reductions of 92% compared to 1990. It does so through demand reduction and a fully renewable energy system rather than through offsetting (see Section 5). The co-benefits in this report are therefore not an assessment of the 2040 target as adopted. **They show what the EU and its Member States stand to gain by delivering emission cuts at home, and by going further.**

Most of the rules that will deliver the target are now being drafted. By the end of 2026, the Commission is due to propose a revision of the EU's energy and climate governance rules for the post-2030 period, which will also cover the phase-out of fossil fuel subsidies. A revision of national climate targets and a new framework for climate resilience are on the same timetable[11]. New post-2030 frameworks for energy efficiency and renewable energy are also due by the end of the year[12]. The Commission's proposal to review the EU Emissions Trading System (ETS), published in July 2026, is already before the European Parliament and the Council[13].

In parallel, EU leaders aim to agree the next long-term EU budget, the 2028-2034 Multiannual Financial Framework (MFF), by the end of 2026[14]. Under the Commission's proposal, cohesion and agricultural funding, and from 2028 the Social Climate Plans, would be merged into a single National and Regional Partnership Plan for each Member State[15].

The governance revision matters most for this report. The Commission sees it as the first step towards the post-2030 energy and climate framework, and wants to turn National Energy

[8] European Scientific Advisory Board on Climate Change, "Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050," June 2023.

[9] CAN Europe, "Letter: CAN Europe letter calling for an ambitious EU 2040 climate target," July 2025, https://caneurope.org/publications/letter-eu-2040-climate-target/.

[10] Sven Harmeling, Head of Climate, CAN Europe, in CAN Europe, "2040 Climate Target Agreed: a deal, but not a breakthrough," 5 November 2025, https://caneurope.org/2040-climate-target-agreed-a-deal-but-not-a-breakthrough/.

[11] European Commission, "Commission work programme 2026," COM(2025) 870 final, Annex I, 21 October 2025, https://commission.europa.eu/document/download/d3be0082-c462-434e-8357-51d06a95525c_en?filename=COM_2025_870_1_annexe_EN.pdf.

[12] European Commission, "Post-2030 energy efficiency framework – public consultation" and "Post-2030 renewable energy framework – public consultation," 20 March 2026, https://energy.ec.europa.eu/news/post-2030-energy-efficiency-framework-public-consultation-2026-03-20_en.

[13] European Commission, proposal for the review of the EU Emissions Trading System, COM(2026) 616 final, 17 July 2026, https://climate.ec.europa.eu/document/download/c0b4ca8e-0e12-4b4e-9976-98c0b4224410_en.

[14] Council of the EU, "Timeline – The EU's long-term budget 2028–2034," https://www.consilium.europa.eu/en/policies/the-eu-s-long-term-budget-2028-2034/timeline-eu-long-term-budget-2028-2034/.

[15] European Commission, proposal for a regulation establishing the European Fund for economic, social and territorial cohesion, agriculture and rural, fisheries and maritime, prosperity and security, COM(2025) 565 final, recital 58, July 2025, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025PC0565.

and Climate Plans (NECPs) into real investment plans[16]. NECPs are already meant to assess the economic, social, health and employment impacts of the policies they contain[17]. In practice, these assessments remain weak. CAN Europe's review of 16 final NECPs found that most do not estimate the investments needed to deliver them, and that 14 of them list fossil fuel subsidies incompletely or not at all. Even if fully implemented, the plans would leave the EU one percentage point short of its 2030 target of a 55% net emissions cut[18].

CAN Europe is calling for the revision to keep binding EU targets for renewables and energy efficiency, to keep annual progress reporting, and to strengthen enforcement, including access to justice before national courts[19]. The method used in this report, which calculates co-benefits consistently across countries, can help Member States carry out these assessments properly and use their NECPs to guide investment under the next EU budget.

[16] European Commission, "Review of the Governance Regulation of the Energy Union and Climate Action – public consultation launched," 18 December 2025, https://energy.ec.europa.eu/news/review-governance-regulation-energy-union-and-climate-action-public-consultation-launched-2025-12-18_en.

[17] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, Annex I, Part 1, Section B, point 5.2, https://eur-lex.europa.eu/eli/reg/2018/1999/oj/eng.

[18] CAN Europe, "NECPs' ambitious implementation must close the gaps: EU climate goals at risk," June 2025, https://caneurope.org/content/uploads/2025/06/NGO-NECP-ASSESSMENT-JUNE-2025.pdf.

[19] CAN Europe, "Why the revision of the EU Governance Regulation matters," 17 April 2026, https://caneurope.org/news/governance-regulation-revision/; and "CAN Europe's priorities on the revision of the Governance Regulation," 2 September 2026, https://caneurope.org/publications/can-europes-priorities-on-the-revision-of-the-governance-regulation/.

The debate has shifted to whether Europe can afford to act, while it is already paying for not acting

Since the Paris Pact Payoff report was published, the debate has shifted from whether Europe should act on climate to whether it can afford to. A vocal group of governments and industry associations now argues that Europe must slow down. This rests on a misdiagnosis: Europe's high energy prices, a real drag on its competitiveness, are a fossil fuel problem.

The Draghi report on European competitiveness found that EU companies pay electricity prices two to three times higher than in the United States, and gas prices four to five times higher. It concluded that decarbonisation will be an opportunity for Europe if its climate targets are matched by a coherent plan, but could run contrary to competitiveness and growth without one[20]. The risk it identified was the lack of a plan, not too much ambition. Yet the political response has often been to remove planning rather than strengthen it. The first Omnibus simplification package, adopted in February 2026, limited sustainability reporting to companies with more than 1,000 employees and €450 million in turnover. It also removed the requirement for the largest companies to adopt and implement a climate transition plan[21].

[20] M. Draghi, "The future of European competitiveness – Part A: A competitiveness strategy for Europe," September 2024, https://commission.europa.eu/topics/competitiveness/draghi-report_en.

[21] Directive (EU) 2026/470, published in the Official Journal on 26 February 2026, https://eur-lex.europa.eu/eli/dir/2026/470/oj/eng; see also Linklaters, "EU Omnibus I Directive published in the Official Journal of the EU," 26 February 2026.

Carbon pricing, the clearest application of the polluter-pays principle in EU climate policy, has borne the brunt of this pressure. Ahead of the March 2026 European Council, Poland and nine other Member States, including Italy, argued in a joint letter that the phase-out of free emission allowances for industry was too steep. Italy's minister for enterprise went further and called for the ETS to be suspended[22]. EU leaders did not follow them. Instead, they asked the Commission for a review that would reduce carbon price volatility while preserving the essential role of the ETS[23].

The Commission's proposal, published in July 2026, still gives ground on several fronts. It slows the pace at which the emissions cap falls after 2030 and keeps free allowances for industry beyond 2030, subject to decarbonisation plans. It also delays their phase-out in sectors covered by the Carbon Border Adjustment Mechanism (CBAM) to 2038, and opens the door to international credits from 2036[24].

Concessions of this kind do not make decarbonisation cheaper. They move its cost elsewhere. As CAN Europe put it, "every extra tonne of CO_2 allowed under the ETS makes Europe's climate challenge harder and more expensive". The extra emissions add costs for citizens and companies, and force deeper cuts in buildings, agriculture and transport if the 2040 target is to be met[25]. They also shift costs onto public budgets. Since 2005, the ETS has helped cut emissions in the sectors it covers by 50%, and has raised more than €270 billion for innovation, industrial decarbonisation and the modernisation of Europe's energy system[26]. Despite pushback from parts of the European industry, Nordic business federations have warned that, without a strong carbon price, national budgets would increasingly have to finance the transition[27]; and in March 2026, more than 100 companies, including EDF, Heidelberg Materials, Holcim, Tata Steel, Vattenfall and Volvo Group, wrote to EU leaders arguing that the real drivers of Europe's competitiveness problems are fossil-fuel-driven energy prices, global industrial overcapacity and a fragmented single market, not climate policy[28].

Unfortunately, the same logic of retreat is being applied to public finance. NATO allies have committed to spend 5% of GDP on defence and

[22] EU Observer, "Major emissions trading fight looms at EU summit," 18 March 2026, https://euobserver.com/207480/major-emissions-trading-fight-looms-at-eu-summit/.

[23] European Council, Conclusions, EUCO 1/26, 19 March 2026, paragraphs 38 and 41(c), https://www.consilium.europa.eu/media/lwhk3itd/en-20260319-european-council-conclusions.pdf.

[24] The proposed linear reduction factor is 3.7% for 2031–2035 and 1.7% for 2036–2040, compared with 4.4% from 2028 under the current rules. International Carbon Action Partnership, "EU Commission publishes EU ETS review proposal," 17 July 2026, https://icapcarbonaction.com/en/news/eu-commission-publishes-eu-ets-review-proposal.

[25] CAN Europe, "Commission's EU ETS proposal rewards delay instead of decarbonisation," 17 July 2026 (quote by Chiara Martinelli, Director), https://caneurope.org/news/ets-revision-proposal/.

[26] European Commission, "Commission boosts Europe's competitiveness, decarbonisation and independence with Electrification Action Plan and ETS review," 17 July 2026, https://malta.representation.ec.europa.eu/news/commission-boosts-europes-competitiveness-decarbonisation-and-independence-electrification-action-2026-07-17_en.

[27] Carbon Market Watch, "Despite the political noise, support for the EU ETS is overwhelming," 24 March 2026, https://carbonmarketwatch.org/2026/03/24/despite-the-political-noise-support-for-the-eu-ets-is-overwhelming/.

[28] Carbon Market Watch, "Despite the political noise, support for the EU ETS is overwhelming," 24 March 2026.

security by 2035[29]. In the EU, 18 Member States have activated an escape clause in the fiscal rules that lets them exceed their fiscal paths by up to 1.5% of GDP a year until 2028 to increase defence spending[30]. Fiscal room has been found for defence, while the climate investment gap keeps growing.

The Commission has proposed a long-term EU budget of close to €2 trillion for 2028-2034, with a 35% target for climate and environmental spending[31]. According to CAN Europe's analysis, however, the resulting €700 billion for green investments is lower than under the current budget once inflation is taken into account. The Just Transition Fund would also be merged into the new national plans, without funds clearly reserved for regions in transition. CAN Europe is calling for €1 trillion, half of the budget, to close the climate and biodiversity investment gaps[32].

According to I4CE[33], climate investment in the EU reached €534 billion in 2025, against needs of €878 billion a year until 2030. The gap grew by €45 billion in a single year, to €344 billion. Investment in building renovation, the largest driver of the co-benefits in this report, fell by 5%.

Europe is not short of money for energy. Rather, it is spending it on the wrong energy. In 2025, the EU spent around €340 billion on fossil fuel imports, almost as much as its entire climate investment gap[34]. EU governments also spent €97 billion on fossil fuel subsidies in 2024, well above the 2015-2019 average of €60 billion, and made no new commitments to phase them out that year[35]. The affordability debate has the ledger the wrong way round. The rest of this report sets out the other side of it: what the transition pays back.

A second fossil fuel price shock in four years has put a price on dependence

On 28 February 2026, US and Israeli air strikes on Iran triggered what the International Energy Agency (IEA) called "the largest supply disruption in the history of the global oil market". Oil flows through the Strait of Hormuz, normally around 20 million barrels a day, fell to a trickle, and IEA members agreed to make 400 million barrels of emergency stocks available[36]. Brent crude came close to $120 a barrel in March. Prices eased in early summer, but rose again in July as strikes resumed and the Strait was effectively closed

[29] NATO, "Defence expenditures and NATO's 5% commitment," https://www.nato.int/en/what-we-do/introduction-to-nato/defence-expenditures-and-natos-5-commitment.

[30] Council of the EU, "National escape clause for defence expenditure," status as of 12 June 2026, https://www.consilium.europa.eu/en/policies/national-escape-clause-for-defence-expenditure-nec/.

[31] ECCO, "EU budget proposal 2028–2034: funding for the energy transition and climate," July 2025, https://eccoclimate.org/eu-budget-proposal-2028-2034-funding-for-the-energy-transition-and-climate/.

[32] CAN Europe, "EU's next long-term budget: Commission's proposal leaves gaps in climate and nature," 16 July 2025, https://caneurope.org/news/mff-proposal-2028-2034/.

[33] I4CE, "The State of Europe's Climate Investment – 2026 edition," June 2026, https://www.i4ce.org/en/publication/state-europe-climate-investment-2026/.

[34] European Commission, "AccelerateEU – Energy Union: Affordable and Secure Energy through Accelerated Action," COM(2026) 370 final, 22 April 2026, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52026DC0370.

[35] European Commission, "Energy subsidies report highlights further reduction in 2024," 17 September 2026, https://energy.ec.europa.eu/news/energy-subsidies-report-highlights-further-reduction-2024-2026-09-17_en.

[36] International Energy Agency, "Oil Market Report – March 2026," 12 March 2026, https://www.iea.org/reports/oil-market-report-march-2026.

once more. At the end of September, Brent was trading above $107 a barrel[37].

For Europe, the bill arrived quickly. By April 2026, the EU had already spent an additional €24 billion on fossil fuel imports because of the conflict[38]. By mid-September, the President of the Commission put the additional cost at €90 billion[39]. This is the second such shock in four years, while Russia's war against Ukraine continues to weigh on Europe's energy markets.

The last crisis showed how costly this dependence can be. Between September 2021 and mid-2023, EU governments set aside €540 billion to shield consumers from high energy prices[40]. Euro area inflation peaked at 10.6% in October 2022, which an ECB Executive Board member has described as "fossilflation"[41]. The early response to the 2026 shock risks repeating the same mistakes. By mid-June 2026, more than half of the €11.8 billion in support tracked by Bruegel across Europe was untargeted, and 86% of it increased incentives to consume fossil fuels[42]. CAN Europe has called for support that protects the most vulnerable now, while tackling the fossil fuel dependence that causes these shocks, so that this crisis becomes Europe's last[43].

EU leaders have recognised the structural answer. In March 2026, they concluded that the energy transition "remains the most effective strategy for achieving Europe's strategic autonomy, strengthening resilience, structurally lowering energy prices"[44]. In July 2026, the Commission put forward an indicative target to raise the share of electricity in the EU's energy use from 23% to 46% by 2040. It estimates that this could cut the EU's fossil fuel import bill by €260 billion a year[45]. The Commission's impact assessment for the 2040 target estimated that lower fossil fuel imports would save about €2.8 trillion between 2031 and 2050[46].

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[37] International Energy Agency, "Oil Market Report – August 2026," 12 August 2026, https://www.iea.org/reports/oil-market-report-august-2026; Al Jazeera, "Oil prices surge as US strikes Iran, reversing fall to pre-war levels," 8 July 2026; Al Jazeera, "Oil prices surge after Trump rejects Iran's plan to reopen Strait of Hormuz," 28 September 2026, https://www.aljazeera.com/economy/2026/9/28/oil-prices-surge-after-trump-rejects-irans-plan-to-reopen-strait-of-hormuz.

[38] European Commission, "AccelerateEU – Energy Union: Affordable and Secure Energy through Accelerated Action," COM(2026) 370 final, 22 April 2026.

[39] European Commission, "2026 State of the Union Address by President von der Leyen," SPEECH/26/1868, 16 September 2026.

[40] Bruegel, "National fiscal policy responses to the energy crisis," dataset, last updated 26 June 2023, https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.

[41] F. Elderson, "Europe's fossil fuel dependence poses risks to price stability," The ECB Blog, 7 April 2026, https://www.ecb.europa.eu/press/blog/date/2026/html/ecb.blog20260407~dfa96b8bfc.en.html.

[42] Bruegel, "2026 European energy crisis fiscal response tracker," dataset, updated 16 June 2026, https://www.bruegel.org/dataset/2026-european-energy-crisis-fiscal-response-tracker.

[43] CAN Europe, "European Council: EU leaders must pair crisis response with accelerating the energy transition," 19 March 2026, https://caneurope.org/news/european-council-eu-leaders-must-pair-crisis-response-with-accelerating-the-energy-transition/; and "Letter: Protect People Now and Build Lasting Energy Security," 25 September 2026, https://caneurope.org/publications/letter-protect-people-now-and-build-lasting-energy-security/.

[44] European Council, Conclusions, EUCO 1/26, 19 March 2026, paragraphs 38 and 41(c).

[45] European Commission, "Commission boosts Europe's competitiveness, decarbonisation and independence with Electrification Action Plan and ETS review," 17 July 2026.

[46] European Commission, "Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society," COM(2024) 63 final, 6 February 2024, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52024DC0063.

Countries that moved early show how this works. In Spain, rapid growth in wind and solar cut the share of hours in which gas sets the electricity price from 75% in 2019 to 15% in 2026[47]. According to the Banco de España[48], wholesale electricity prices in the first half of 2024 were more than 40% lower than if wind and solar output had stayed at 2019 levels. Energy savings, the focus of this report, are the other half of the answer: energy that is not used does not need to be imported, and is not exposed to the next price shock.

The scope: the costs of climate change in Europe are already large, and they are not quantified in this report

Climate change is increasingly seen as a systemic risk to Europe's economy and public finances, not only as an environmental problem. The European Environment Agency (EEA) has identified 36 major climate risks to Europe, affecting energy and food security, ecosystems, infrastructure, water, financial stability and health.

More than half of them need more action now, and eight are particularly urgent. The EEA also warns that Member States' public finances face substantial climate risks, even in the near term[49].

The economic losses are already large. Weather- and climate-related extremes cost the EU an estimated €822 billion between 1980 and 2024, a quarter of it between 2021 and 2024 alone, and less than 20% of these losses were privately insured[50]. Average annual losses in 2020-2023 were 2.5 times as high as in the previous decade[51].

The summer of 2026 made these trends tangible. On top of the heat-related deaths, 660,000 hectares burnt and some 12 million tonnes of crops were lost[52]. According to early estimates by Triodos Bank[53], the heat alone could cost the EU around 1% of GDP in 2026, or about €180 billion, mostly through lost labour productivity. Looking further ahead, the Commission has estimated that climate impacts could lower EU GDP by about 7% by the end of the century[54].

[47] Bruegel, "How Europe should respond to the Iran gas shock (and how it shouldn't)," 1 April 2026, https://www.bruegel.org/analysis/how-europe-should-respond-iran-gas-shock-and-how-it-shouldnt.

[48] J. Quintana, "The impact of renewable energies on wholesale electricity prices," Banco de España, Economic Bulletin 2024/Q3, 4 September 2024, https://www.bde.es/wbe/en/publicaciones/analisis-economico-investigacion/boletin-economico/2024t3-articulo-09-el-impacto-de-las-energias-renovables-sobre-el-precio-mayorista-de-la-electricidad.html

[49] European Environment Agency, "European Climate Risk Assessment," EEA Report 01/2024, March 2024, https://www.eea.europa.eu/publications/european-climate-risk-assessment.

[50] European Environment Agency, "Economic losses from weather- and climate-related extremes in Europe," indicator, https://www.eea.europa.eu/en/analysis/indicators/economic-losses-from-climate-related.

[51] European Environment Agency, "Europe's environment 2025 – Main findings," 29 September 2025, https://www.eea.europa.eu/en/europes-environment-2025/toolkit/europes-environment-2025-preview-and-main-findings/@@download/file.

[52] European Commission, "2026 State of the Union Address by President von der Leyen," SPEECH/26/1868, 16 September 2026.

[53] Triodos Bank, "Europe's extreme heat could wipe out EU growth in 2026," press release, 8 August 2026, https://www.triodos.com/en/press-releases/2026/europes-extreme-heat-could-wipe-out-eu-growth-in-2026.

[54] European Commission, "Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society," COM(2024) 63 final, 6 February 2024.

Even these estimates are incomplete. Most leave out damage to ecosystems and biodiversity and the risk of tipping points, and estimates have tended to rise as the evidence improves[55].

None of these avoided losses in Europe are counted in this report[56]. Most of the co-benefits presented here are **direct gains of the transition itself: lower energy bills, jobs, economic output and better health.**

The report does include one indicator of climate damage: **the social cost of carbon, which puts a value on the global damage caused by each tonne of CO_2 emitted**. It does not measure the losses that climate change causes to the EU economy. Avoided heat-related deaths are not included either, even though building renovation can also protect people from extreme heat.

Worth to note, that our 2024 Paris Pact Payoff report also estimated avoided losses and it found that a 1.5°C-compatible pathway would avoid cumulative losses of more than €22 trillion compared with inaction, and more than €4 trillion compared with current policies[57] to 2100. As stated, the losses that climate change causes in Europe are not quantified in this current report (and will be updated in a separate, upcoming paper). **The benefits presented here therefore come on top of limiting dangerous climate change.**

Well-designed decarbonisation can respond to several crises at once

If decarbonisation were only a cost paid to avoid future damage, the arguments against it would be harder to answer. But the evidence shows that, if designed well, it can address several of Europe's current crises at once. It reduces exposure to imported fossil fuels and volatile prices. It improves public health: air pollution remains the largest environmental health risk in Europe, and exposure to fine particulate matter above WHO guideline levels was linked to 182,000 deaths in the EU in 2023[58]. It tackles energy poverty at its roots: 9.2% of the EU population, around 41 million people, could not keep their homes adequately warm in 2024, rising to 19% in Bulgaria and Greece[59]. It creates jobs, for example in building renovation, that are local by nature and cannot be moved abroad. And by lowering the energy costs at the heart of the competitiveness debate, it can strengthen Europe's industrial base rather than weaken it.

Europeans appear to see this more clearly than the political debate suggests. In 2025, 85% considered climate change a serious problem, 81%

[55] CAN Europe, "Paris Pact Payoff: Speeding up the green transition for socio-economic co-benefits," January 2024, https://old.caneurope.org/content/uploads/2024/01/CAN-Europe-co-benefits-of-climate-action_REPORT.pdf.

[56] The social cost of carbon in this report estimates the global damage caused by each additional tonne of CO2 emitted, using cost rates from the German Environment Agency (UBA, Methodenkonvention 3.2). These rates cover impacts on agriculture, buildings energy use, sea-level rise, and human health, on the global level

[57] CAN Europe, "Paris Pact Payoff: Speeding up the green transition for socio-economic co-benefits," January 2024.

[58] European Environment Agency, "Harm to human health from air pollution in Europe: burden of disease status, 2025," December 2025, https://www.eea.europa.eu/en/analysis/publications/harm-to-human-health-from-air-pollution-burden-of-disease-status-2025/mortality-exposure-pm25.

[59] Eurostat, "9.2% of EU population struggled to keep their home warm," 2 February 2026, https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20260202-2.

supported the EU goal of climate neutrality by 2050, and 75% agreed that reducing fossil fuel imports would increase energy security and benefit the EU economically[60]. As the EEA puts it, Europe's competitiveness depends not only on the price, quality and sustainability of its products, but also on the resilience of European society[61].

Aggregate gains do not automatically translate into fair outcomes

Climate action generates aggregate gains, but those gains are not automatically shared fairly. The same transition that lowers energy costs and creates jobs can leave specific groups worse off if it is not designed with them in mind. These include households that cannot afford the upfront cost of a renovation or a heat pump, workers in carbon-intensive industries and regions, and communities already facing high energy poverty. As the Paris Pact Payoff stressed, policy design plays a key role in ensuring that the benefits of climate action are fairly distributed, and not reserved for the wealthiest[62]. It is the responsibility of policymakers to put those policies in place. This requires just transition plans at national, sectoral and company level, developed with the full participation of workers and their trade unions.

The EU's existing instruments reflect this. The Just Transition Fund has €19.7 billion for 2021-2027, and is expected to mobilise a further €7.3 billion in national co-financing. It is part of a wider Just Transition Mechanism that aims to mobilise around €55 billion for the most affected regions[63]. The Social Climate Fund, discussed in Section 3.1, is designed to protect vulnerable households, transport users and micro-enterprises from the cost of ETS2.

Both instruments face an uncertain future. The Commission's budget proposal does not keep the Just Transition Fund as a separate fund, and would merge the Social Climate Plans into the new National and Regional Partnership Plans from 2028[64]. CAN Europe has criticised the lack of funding reserved for regions in transition[65]. A report for the LIFE Plan4Climate project records fears that vulnerable areas will once again have to compete with wealthier regions for resources[66]. National planning is also weak. CAN Europe's assessment of final NECPs found that most do not properly integrate just transition requirements,

[60] European Commission, Special Eurobarometer 565 on climate change, press release IP/25/1376, 30 June 2025, https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_25_1376/IP_25_1376_EN.pdf.

[61] European Environment Agency, "Europe's environment 2025 – Main findings," 29 September 2025.

[62] CAN Europe, "Paris Pact Payoff: Speeding up the green transition for socio-economic co-benefits," January 2024.

[63] European Commission, "The Just Transition Mechanism," https://commission.europa.eu/topics/regional-and-urban-policy/just-transition-mechanism_en.

[64] European Commission, proposal for a regulation establishing the European Fund for economic, social and territorial cohesion, agriculture and rural, fisheries and maritime, prosperity and security, COM(2025) 565 final, recital 58, July 2025.

[65] CAN Europe, "EU's next long-term budget: Commission's proposal leaves gaps in climate and nature," 16 July 2025.

[66] M. Guénard (Germanwatch) and G. Sahin (ICLEI Europe), "Supporting a Just Transition to Climate Neutrality Through the National and Regional Partnership Plans (NRPP): Lessons from the practice and recommendations for the 2028–2034 MFF," LIFE Plan4Climate, March 2026, https://plan4climate.caneurope.org/nrpp-report-funding-climate/.

and that most set no national targets for reducing energy poverty[67].

To note: the MICAT and the Pathways Explorer models used in this report produce results at EU and national level, not by income group or region. Therefore - this report has limitations and does not model how co-benefits are distributed.. The closest indicator, the number of people lifted out of energy poverty, is reported in several national factsheets. Where this report discusses just transition, it does so qualitatively and relies on external, sourced evidence rather than on the co-benefit figures.

This report updates and extends the evidence base of the Paris Pact Payoff

Our 2024 Paris Pact Payoff report concluded that, for the EU as a whole, the benefits of a 1.5°C-aligned pathway outweigh its costs by a factor of 1.4 to 4. It also found that the direct co-benefits of such a pathway amount to at least €1 trillion by 2030[68]. The report was clear that these figures underestimated the total, as it modelled the co-benefits of energy savings but not those of clean energy investment and infrastructure.

This report builds on that work in three ways.

- ➔ First, it uses a new method. Co-benefits are calculated with the open-source Multiple Impacts Calculation Tool (MICAT).
- ➔ Second, it compares the PAC 2.0 scenario, coordinated by CAN Europe with the European Environmental Bureau, the Renewables Grid Initiative and REN21, with a historical-trends baseline, for the EU27 and for individual Member States[69].
- ➔ Third, it covers more indicators. Alongside energy cost savings, jobs and GDP, it quantifies avoided premature deaths, hospital admissions, disability-adjusted life years and lost working days, as well as the global climate damage avoided by lower CO_2 emissions. It also presents national factsheets prepared with CAN Europe members. The results are available through the Climate Action Benefits Explorer (CABEX).

Multiple Impacts Calculation Tool (MICAT)

Co-benefits are calculated with the open-source Multiple Impacts Calculation Tool (MICAT), developed under the EU's Horizon 2020 programme by a consortium led by Fraunhofer ISI[70]. MICAT is linked to Climact's Pathways Explorer, so that each decarbonisation lever corresponds to a MICAT action. This creates a single, transparent and replicable calculation pipeline, which can be updated as scenarios and evidence change.

[67] CAN Europe, "NECPs' ambitious implementation must close the gaps: EU climate goals at risk," June 2025.

[68] CAN Europe, "Paris Pact Payoff: Speeding up the green transition for socio-economic co-benefits," January 2024.

[69] CAN Europe, Renewables Grid Initiative, REN21 and EEB, "Paris Agreement Compatible Energy Transition Scenarios (PAC 2.0) – Technical Summary," 2024, https://www.pac-scenarios.eu/fileadmin/user_upload/PAC/PAC_documents/202408_PAC20_Technical_Summary.pdf.

[70] Fraunhofer ISI, "MICAT – Multiple Impacts Calculation Tool," project running from October 2020 to September 2023, https://www.isi.fraunhofer.de/en/competence-center/energiepolitik-energiemaerkte/projekte/micat.html.

Because the tools, scenario and scope differ, the figures in this report cannot be compared directly with those of the Paris Pact Payoff. **Like those of its predecessor, they are conservative. They cover only the transition levers that could be mapped onto a MICAT action, which account for close to 64% of the EU's 2024 emissions.** They exclude agriculture and land use, which Section 4 addresses qualitatively, as well as benefits that cannot be monetised or that are not covered by the MICAT tool. Finally, as mentioned above - the costs of climate change damages are not calculated at EU-level. There is only an indicator of the global damages avoided by EU emission cuts. These benefits that are not included come on top of the benefits listed in this report. What follows is a floor, not a ceiling.

2. Methodological summary

The figures in this report were generated using the **MICAT tool**. This open-source model calculates climate action co-benefits in different areas such as health, employment or GDP, based on minimal inputs of energy savings or renewable energy deployment.

These inputs are generated by linking it to another model: the **Pathways Explorer**. The Pathways Explorer is used to develop decarbonisation scenarios and provides quantified energy consumption pathways across sectors, by letting the user specify the amount of ambition for a set of measures, or "levers", across different subsectors. These levers represent a wide range of actions: behavioural changes, energy efficiency improvements, technological shifts, fuel switches, and the deployment of renewable capacity.

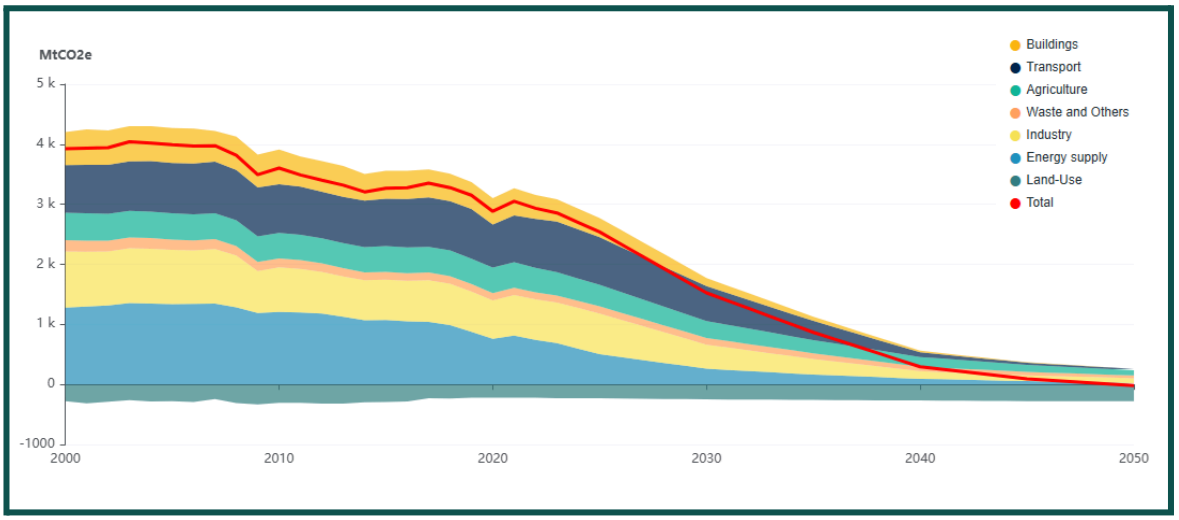
The actions available in the Pathways explorer map well onto the type of actions the MICAT recognises. This natural correspondence is the foundation of the linking approach used in this project: **levers in the Pathways Explorer are associated with a matching action in the MICAT tool**, allowing co-benefit indicators to be derived directly from scenario outputs of the Pathways Explorer.

To deliver energy savings or additional renewable deployment as required by the MICAT tool, **two scenarios** are compared in the Pathways Explorer.

The first is an ambitious decarbonization scenario, built on the PAC 2.0 national scenario work. The figure below shows the modelled scenario's emission pathway in the Pathways Explorer.

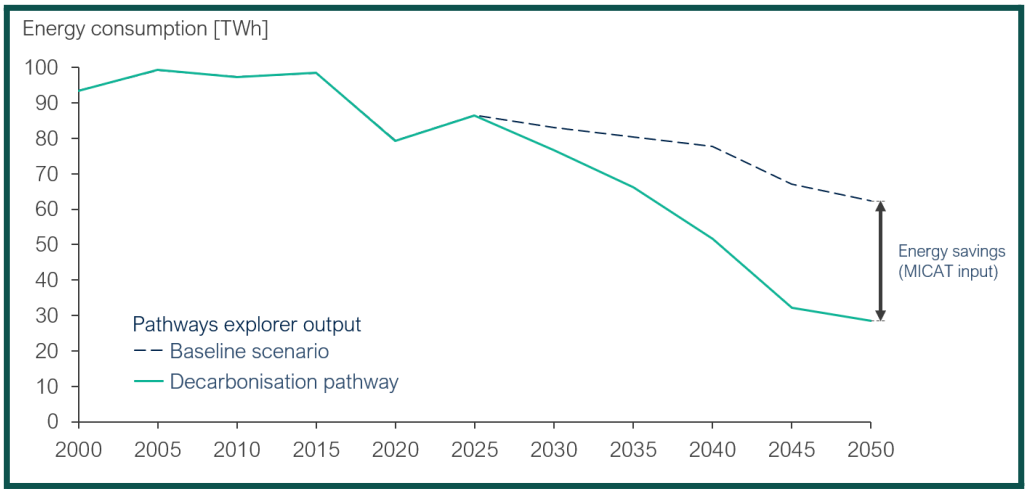


Figure 2: The modelled PAC 2.0 scenario emission pathway in the Pathways Explorer



The second is a baseline scenario, which is defined as a "historical trends" scenario, in which each lever in the Pathways explorer is set so that future energy consumption follows historical trends, which amounts to a business-as-usual projection. The energy consumption between the two scenarios is then compared to calculate the energy savings of the ambitious pathway, as illustrated in Figure 3.

Figure 3: Energy savings are computed by comparing the energy consumption of two Pathways explorer scenarios



To obtain more accurate results, users of the MICAT tool can specify several parameters beyond the overall energy savings. For example, one can specify the distribution of affected fuels, i.e. which fuels are actually saved for a specific measure. The Pathways explorer outputs detailed

energy consumption metrics across sectors and energy carriers, which are used to specify this distribution of affected fuels. In general, as much results from Pathways explorer as possible were used to refine the inputs of the MICAT tool. A full methodology on how the two models were linked can be found in Section 5.

2.1 Key indicator outputs

This report analyses the following co-benefits that are calculated by the MICAT tool in more detail:

- **Health indicators**: MICAT estimates avoided premature deaths and hospital admissions from lower air pollution, fewer cold-related deaths from better-insulated homes, avoided disability-adjusted life years from improved indoor climate, and fewer working days lost to illness. Each impact is monetised with standard economic values. More in the MICAT health indicators documentation[71].
- **Energy cost reductions:** MICAT calculates the reduction in end-users' energy spending from the final energy savings of each measure, using sector-specific energy prices[72].
- **Social cost of carbon:** Every tonne of CO_2 emitted adds to global warming for decades and causes damage around the world: to crops and forests, buildings, ecosystems and human health. The social cost of carbon puts a monetary value on that damage. It is the total future damage caused by one additional tonne of CO_2, expressed as a single value in the year the tonne is emitted. Multiplying it by the CO_2 emissions the modelled measures avoid gives the value of the future climate damage those emission cuts prevent. Because this damage occurs worldwide, the indicator measures a benefit of EU climate action for the world as a whole. It does not measure the losses that climate change causes within the EU, which this report does not estimate. MICAT values the CO2 emissions avoided by energy savings using a damage cost from the German Federal Environment Agency (UBA)[73]. That cost is €335/tCO2 in 2030, and €435 in 2050. Only CO2 is covered, and the value reflects global climate damage from emitting an additional tonne of CO2, valued at Western European income levels. Note that the MICAT uses an old version of CO2 damage values, with newer values being slightly higher[74]. The reported values are therefore likely an underestimation.
- **Economic indicators**: MICAT estimates the investment needed for each energy-saving measure. Figures on job creation and added value (GDP) are derived from that investment.[75]

[71] MICAT, "Social indicators," MICAT documentation, Fraunhofer ISI,

[72] Berger, F., "Environmental Impacts: Energy (cost) savings," MICAT Project, Fraunhofer ISI,

[73] Matthey, A., Bünger, B. and Eser, N., "Methodological Convention 3.2 for the Assessment of Environmental Costs – Value Factors," German Environment Agency, October 2024,

[74] Eser, N., Matthey, A. and Bünger, B., "Handbook on Environmental Value Factors – Methodological Convention 4.0 for the Assessment of Environmental Impacts," German Environment Agency, February 2026,

[75] Vrontisi, Z., Fragkiadakis, K. and Morfis, S., "Economic Impacts: Employment Effects," MICAT roject/E3-Modelling & Vrontisi, Z., Fragkiadakis, K. and Morfis, S., "Economic Impacts on GDP," MICAT Project/E3-Modelling.

3. Assessment of the co-benefits of energy efficiency measures at the EU level

Based on the modelling (find details in Section 5 and the PAC 2.0 synthesis report) energy saving measures in the PAC 2.0 pathway deliver co-benefits on a scale comparable to the EU's largest budget lines. **Monetised, they amount to over €826 billion a year by 2030 and nearly €2 trillion a year by 2050.** Behind that total sit:

- → 8.5 million jobs supported in 2030;
- → Annual added value from investments amounting to 1.7% of 2021 GDP on average over the period 2030-2050.
- → Up to €713 per capita in avoided end-use energy costs annually by 2030;
- → Almost 34 000 premature deaths avoided every year by 2030 and 3.3 million fewer sick days.
- → €350 billion a year by 2030 in avoided future climate damage globally

Transport and residential buildings account for the largest share, and construction and renovation activity alone drives up to 70% of the monetised benefits in 2030. Even against the investment they require, these measures come out ahead: their monetised co-benefits exceed estimated cumulative investments by €21 trillion in 2050.

What are co-benefits?

Within the relevant literature, the benefits of ambitious climate action are classified in two broad categories: first, the avoided losses triggered by limiting the increase of the global temperature to 1.5°C compared to the negative impacts of less ambitious scenarios; second the "co-benefits"which are defined as the ancillary benefits of mitigation measures and investments.

For example, whereas the primary objective of reducing internal combustion engine vehicles is the reduction of greenhouse gas emissions from transport (and the associated avoided climate damages), the co-benefits would include a reduction of air pollution and the corresponding improvement of health outcomes.

For a holistic assessment of the benefits of ambitious climate action, both dimensions (avoided climate impacts and co-benefits) need to be taken into account.

This report, while including one indicator on avoided global climate damage, focuses on quantifying co-benefits, updating key figures from the Paris Pact Payoff report (whilst a second report will estimate avoided losses based on revised damage functions).

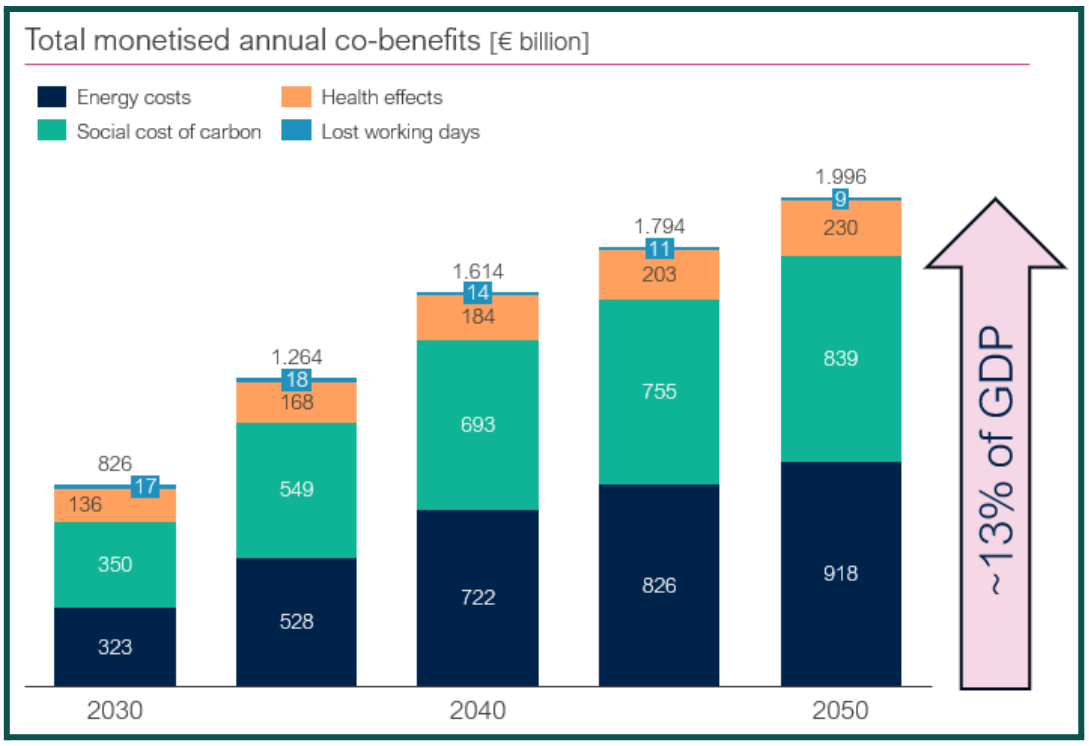
These figures are, moreover, a conservative reading. The assessment covers only the transition levers that could be mapped onto a MICAT action. Together, these modelled levers cover energy savings that represent close to 64% of today's gross emissions in 2050, and already 60% in 2040. The remaining reductions, along with the benefits that cannot be expressed in monetary terms or are not computed by the MICAT tool, are absent from the totals above. The benefits of climate action, already enormous in these numbers, are likely even larger

Agriculture and land use are the clearest case in point. They lie outside the scope of the MICAT tool, yet carry substantial gains for health, biodiversity, water quality and rural livelihoods. Section 4 addresses them qualitatively and shows that their contribution could add considerably to what is quantified here.

Energy saving measures could provide over €826 billion in yearly monetised co-benefits by 2030 and nearly 2 trillion by 2050 (13% of EU27 GDP)

Energy saving measures across the EU27 generate benefits beyond lower energy bills, including avoided global climate damage, improved public health, and fewer working days lost to illness. As shown in Figure 4, these combined co-benefits are projected to more than double, from €826 billion a year in 2030 to nearly €2 trillion a year by 2050, equivalent to about 13% of EU27 2021 GDP by 2050.

Figure 4. Total monetised annual co-benefits in billion euros, per type of benefit



Import dependency

While this report quantifies energy cost savings as a direct co-benefit of decarbonisation measures, it's worth stating the scale of the exposure those savings help address.

Eurostat data[76] show the EU's energy import dependency rate stood at 58% in 2023, meaning nearly 60% of the bloc's energy needs were met through net imports, with individual member states ranging from under 5% to over 90%. Oil and petroleum products alone accounted for 67% of the EU's energy imports in 2024, and overall fossil fuels for 95%.

Reducing this dependency matters beyond cost: heavy reliance on fossil fuels leaves European consumers exposed to geopolitical pressure, price shocks, and supply disruptions largely outside the EU's control, risks that recent Gulf tensions and the post-2022 scramble to replace Russian gas have both made concrete rather than hypothetical.



3.1 Key economic indicators

Investments in energy savings could support over 8.5 million jobs in 2030, mainly from the renovation wave

Indicator: *additional full-time-equivalent jobs generated by investment in energy efficiency measures. Employment effects scale with the volume of investment, using coefficients derived by e3m[77].*

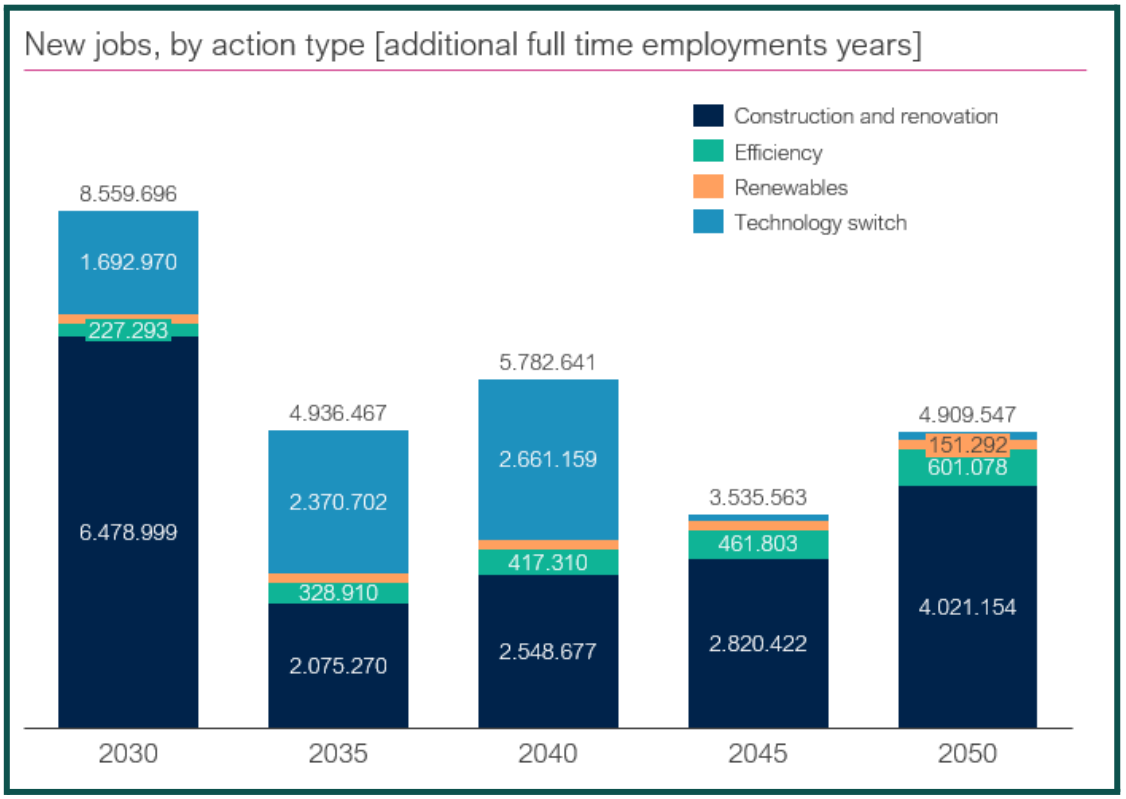
Investments in energy saving measures translate directly into employment, from construction and renovation work to the installation of new heating and mobility technologies. As shown in Figure 5, these investments support over 8.5 million additional full-time-equivalent new jobs in 2030, of which 6.5 million come from construction and renovation alone.

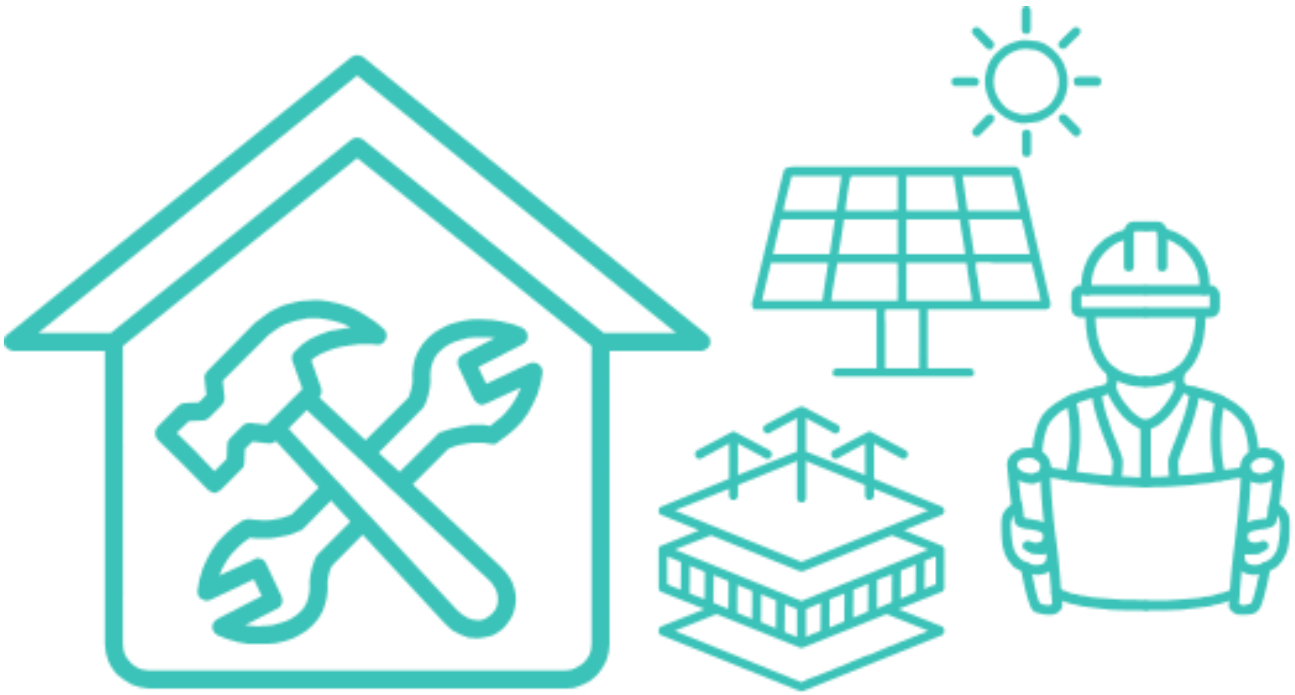
Because the CAN scenario models an ambitious renovation push before 2030 followed by a second wave of investment as the car fleet electrifies between 2030 and 2040, job creation eases to around 4.9 million in 2035 before climbing back to 5.8 million in 2040. After 2040, as both waves of investment complete, the amount of jobs supported settles in the 3.5 to 4.9 million range through 2050, still a lasting contribution to EU employment.

[76] Eurostat, "Shedding light on energy in Europe – 2025 edition," 11 March 2025, https://ec.europa.eu/eurostat/web/interactive-publications/energy-2025

[77] MICAT, "Employment effects," MICAT documentation, Fraunhofer ISI, https://doc.micatool.eu/economic_indicators/employment_effects.html

Figure 5. New jobs supported yearly by energy saving measures, by action type, in additional full-time-equivalent employment years.





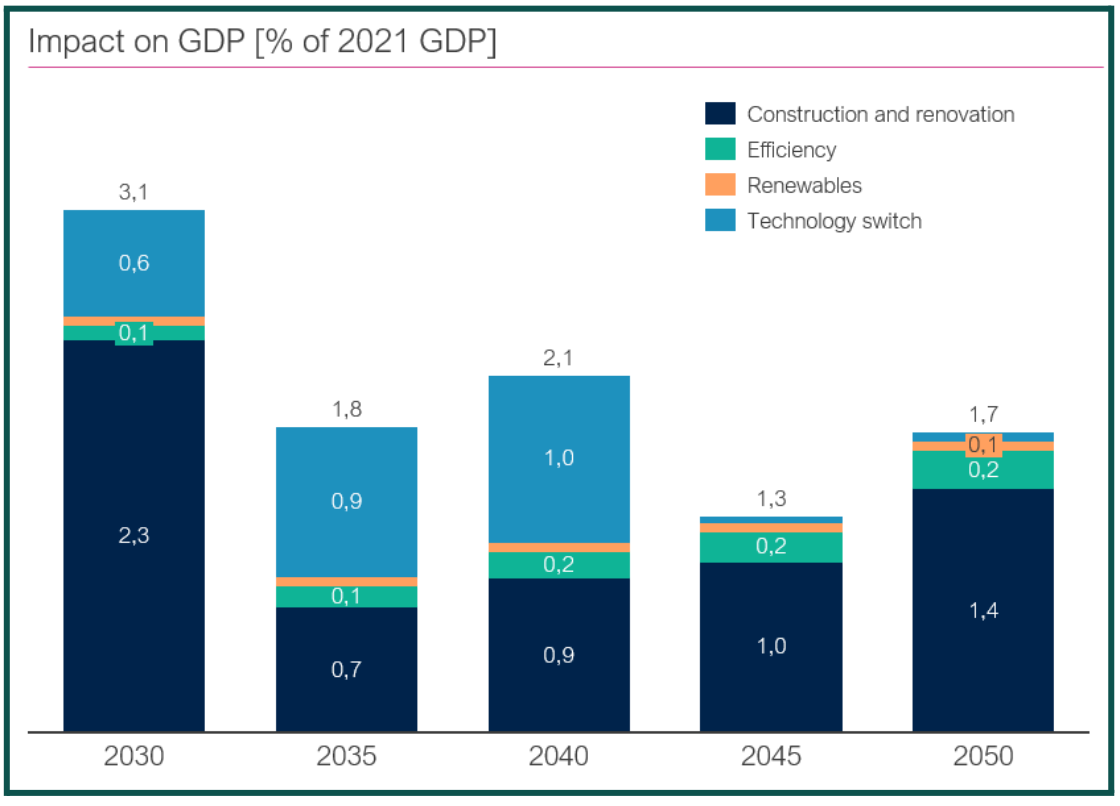
Investments in energy savings could increase GDP by 3% in 2030, mainly through renovation again

Indicator: *change in GDP driven by investment in energy efficiency measures. Like employment effects, this indicator scales with the volume of investment, using coefficients derived by e3m.*

The same investments also lift economic output. Figure 6 shows that energy saving measures provide added value equivalent to up to 3.1% to EU27 2021 GDP in 2030, again driven mainly by construction and renovation activity.

As with employment, this impact follows the same two-wave pattern: it eases to 1.8% in 2035, climbs back to 2.1% in 2040 as the car fleet electrifies, then settles in the 1.3% to 1.7% range through 2050.

Figure 6. Impact on GDP of energy saving measures, by action type, as a percentage of 2021 GDP

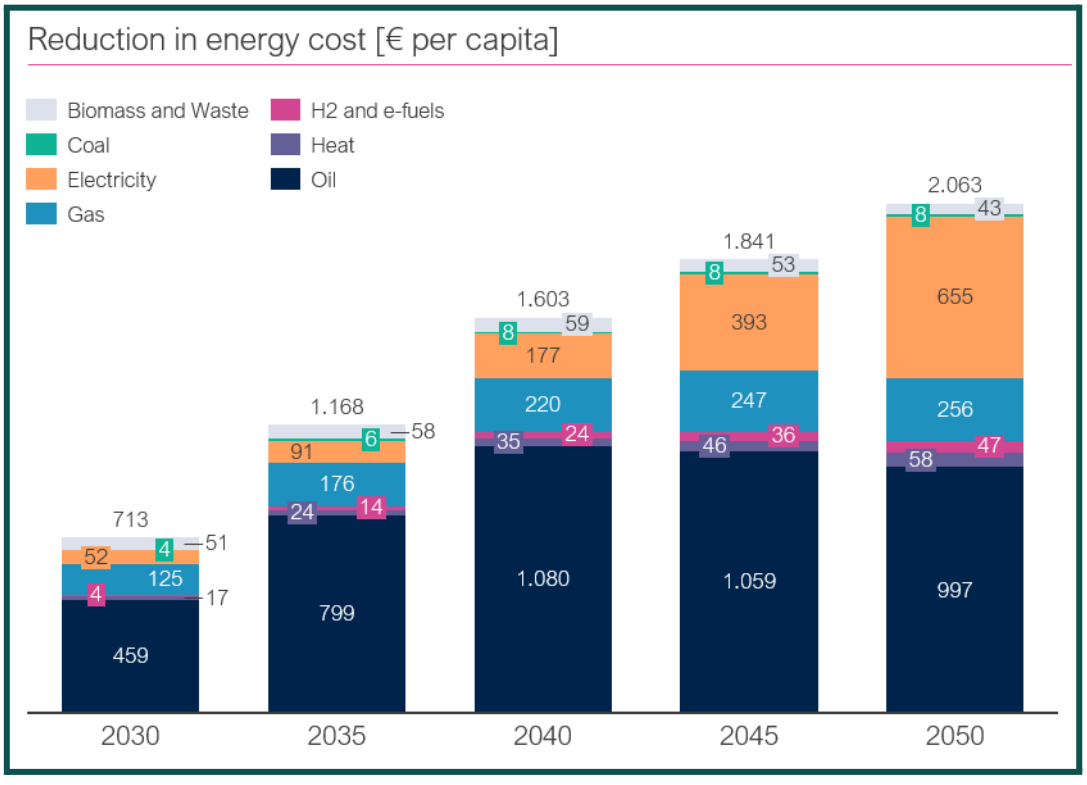


Up to €713 per capita in avoided end-use energy costs by 2030, with oil and electricity reductions the largest contributors

Indicator: *reduction in energy expenditure from final energy savings, valued using sector-specific energy prices from the Enerdata database - which the MICAT tool uses.*

Energy saving measures also cut what people and businesses spend on energy directly. As seen in Figure 7, avoided end-use energy costs reach €713 per capita in 2030 and continue to grow to over €2,000 per capita every year by 2050. Reduced oil consumption delivers the largest share of these savings throughout the period, with road transport accounting for more than 90% of it as most of the fleet electrifies between 2030 and 2040. Electricity savings grow fastest of all: by 2050, residential electricity savings alone reach €471 per capita, close to a quarter of all avoided energy costs.

Figure 7. Reduction in end-use energy cost per capita, by energy carrier



Can the Social Climate Fund absorb the distributional cost of the transition?

The Social Climate Fund (SCF) is the EU's dedicated answer to the distributional question raised above: it recycles ETS2 revenue, worth up to €65 billion in EU financing between 2026 and 2032 (€86.7 billion including mandatory national co-financing)[78], specifically to shield vulnerable households, transport users, and micro-enterprises from the cost of extending carbon pricing to buildings and road transport.

Whether that sum is adequate is contested, and the evidence points in different directions depending on where you look:

- At EU level, ETS2 is projected to raise average household energy and mobility costs by around 1-2% once fully phased in (varying percentage depending on geographical location and household type - disproportionately affecting vulnerable groups the most), while roughly 41-42 million Europeans were already unable to adequately heat their homes before ETS2 takes effect[79].
- At national level, the adequacy picture varies. Italy's submitted Social Climate Plan allocates €1.55 billion a year, against an estimated €0.6-1.3 billion a year in additional ETS2 costs for its most vulnerable households, a comfortable margin, on paper[80]. Other Member States' plans are less generously funded relative to their exposed populations, and cross-country comparisons of plan size against modelled ETS2 impact are not yet systematically published.
- Independent assessments (Bruegel[81], the Institut Delors[82]) flag two structural risks that are independent of the fund's size: the SCF's disbursement will only start delivering to households once national plans are approved and implemented, and the EU's own Just Transition Fund, the SCF's closest precedent, has a documented history of slow absorption. A well-funded plan that arrives after ETS2 costs are already felt does not protect the households it was designed for.

This report does not attempt to model SCF adequacy country by country, that would require comparing each Member State's approved Social Climate Plan allocation against our own ETS2 cost estimates from Section 3.1, which is a natural next step for this workstream but outside its current scope. What can be stated with the evidence available: the SCF is sized to plausibly cover the aggregate EU-level cost it was designed for, but adequacy at national level depends on plan design and disbursement speed, not on the headline €65 billion figure alone.

[78] European Environment Agency, "EU new Emissions Trading System (ETS2) and Social Climate Fund: Mechanisms, challenges and conditions for a fair decarbonisation in road transport," March 2026, https://www.eea.europa.eu/en/analysis/publications/emissions-reduction-from-transport-in-europe-how-the-ets2-will-help-this-sector-meet-its-climate-targets

[79] Maria Markaki, Theocharis Marinos, Yannis Sarafidis, Elena Georgopoulou and Sevastianos Mirasgedis, "The impact of the EU-ETS2 on prices and welfare in the European Union," Energy Policy, Vol. 215, August 2026, Article 115350, https://doi.org/10.1016/j.enpol.2026.115350

[80] ECCO, "Towards a sustainable transition: the Social Climate Plan," October 2025, https://eccoclimate.org/towards-a-sustainable-transition-the-social-climate-plan/

[81] Bruegel, "Making the best of the new EU Social Climate Fund," policy brief, https://www.bruegel.org/policy-brief/making-best-new-eu-social-climate-fund

[82] Institut Delors, Eisl, A. and Nguyen, T., "How to make the ETS2 socially acceptable," policy paper, November 2025, https://institutdelors.eu/content/uploads/2025/11/PP314_How_to_make_the_ETS2_socially_acceptable_Eisl_Nguyen_EN_2.pdf

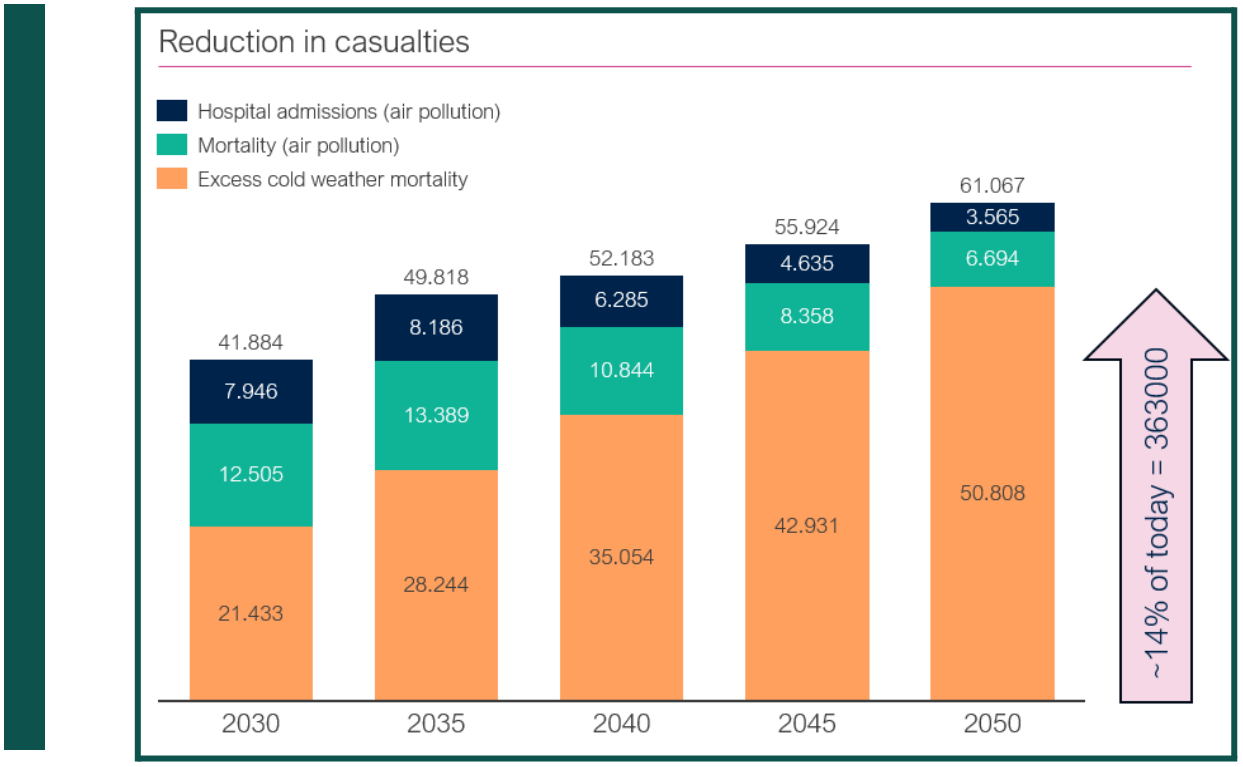
3.2 Key social indicators

Additional climate action could lead to almost 34 000 fewer deaths annually by 2030, as well as 8 thousand fewer hospital admissions

Indicator: *combines two MICAT indicators: reduced excess cold-weather mortality from better-insulated homes (more prevalent among energy-poor households) and reduced mortality and hospital admissions from lower air pollution (based on IIASA data using the EU Reference Scenario 2020). Both are monetised using the WHO's value of statistical life.*

Better-insulated homes and lower exposure to air pollution translate directly into public health gains. As shown in Figure 8, additional climate action could prevent almost 34,000 deaths a year by 2030, alongside 8,000 fewer hospital admissions. Reduced excess cold-weather mortality is the largest of these health co-benefits: over 21,000 premature deaths could be avoided annually by 2030, rising to up to 50,000 by 2050, a 14% decrease from today's roughly 363,000 cases a year. Health benefits from lower air pollution, by contrast, are largest in the near term and diminish over time as air pollution already falls under the baseline scenario, while avoided cold-weather deaths keep growing as energy efficiency measures continue to expand through 2050.

Figure 8. Reduction in premature deaths and hospital admissions from energy saving measures

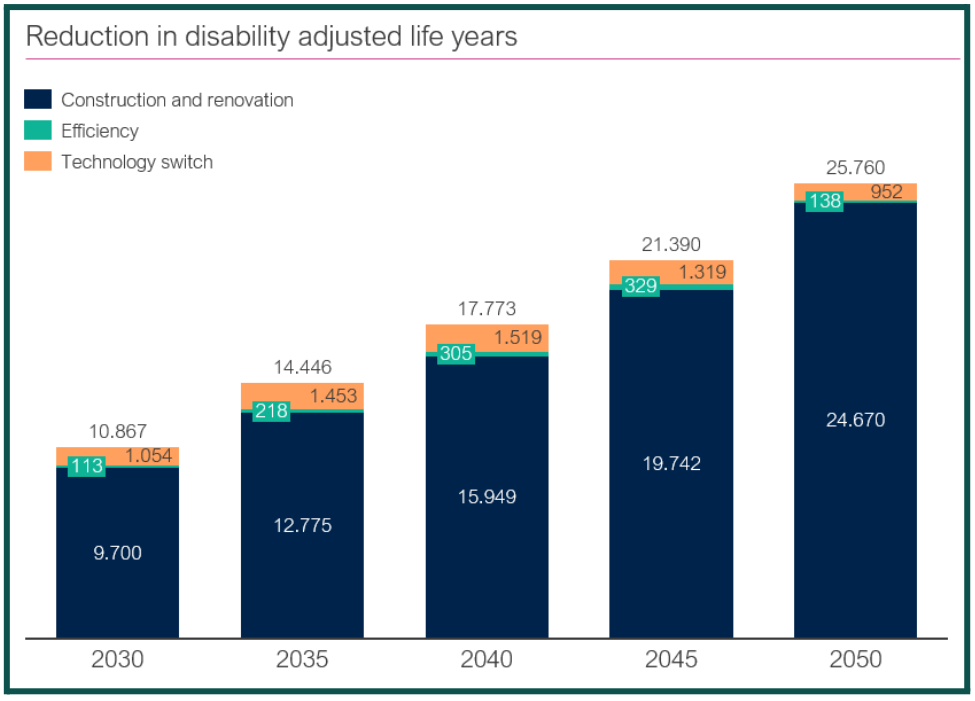


Better indoor climate from renovations could save up to 25,000 disability-adjusted life years by 2050

Indicator: *Disability-Adjusted Life Years (DALYs) avoided through fewer asthma cases linked to renovating damp and mouldy homes, based on national rates of building dampness and a coefficient of DALYs lost per affected dwelling.*

Beyond avoided deaths, improved indoor climate also reduces the burden of illness for people who continue to live with it, mainly by cutting asthma cases linked to damp and mouldy homes. As shown in Figure 9, building renovation could save up to 25,000 disability-adjusted life years a year by 2050, up from close to 11,000 in 2030, with construction and renovation work accounting for the vast majority of the gain.

Figure 9. Reduction in disability-adjusted life years (DALYs) from energy saving measures

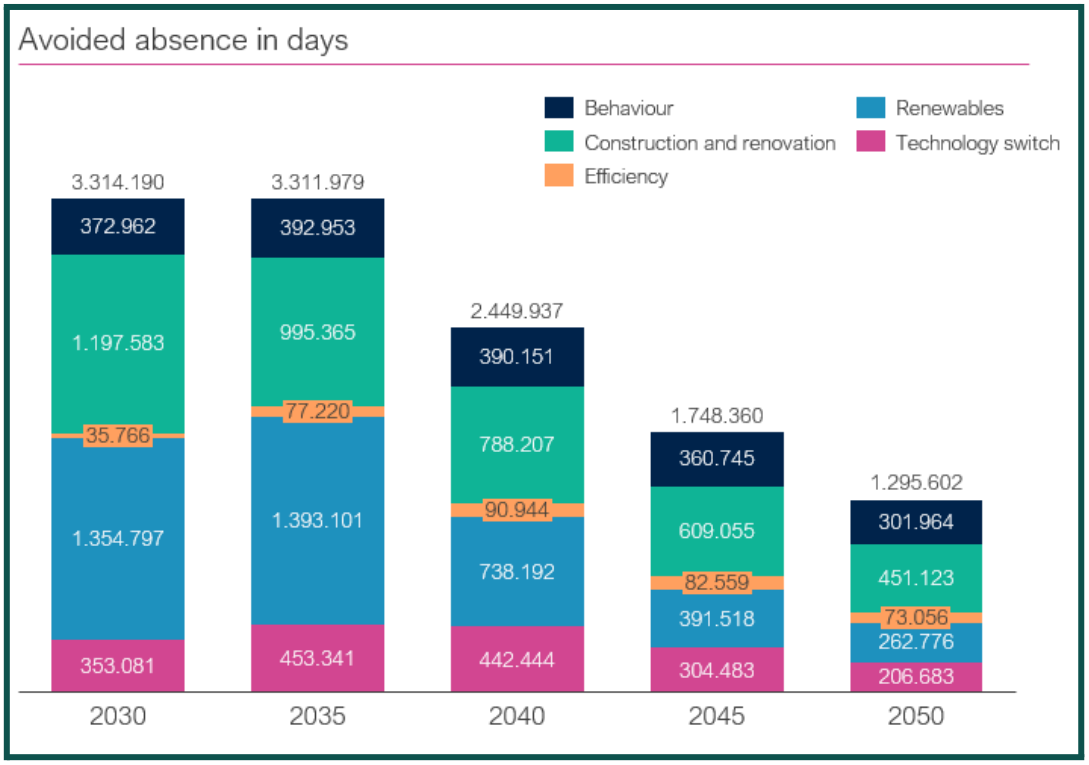


Health benefits from reduced air pollution could avoid 3.3 million sick days by 2030

Indicator: *working days no longer lost to illness from air pollution, based on IIASA data using the EU Reference Scenario 2020 and monetised using the WHO's value of a working day.*

Cleaner air from energy saving measures also keeps people healthier day to day. As shown in Figure 10, reduced air pollution could avoid 3.3 million sick days a year by 2030, days that would otherwise be lost to illness. These benefits are largest in the near term: as air pollution already falls under the baseline scenario, the number of avoided sick days declines over time, though still around 1.3 million working days a year could be avoided by 2050 compared to that baseline.

Figure 10. Avoided sick days from reduced air pollution due to energy saving measures



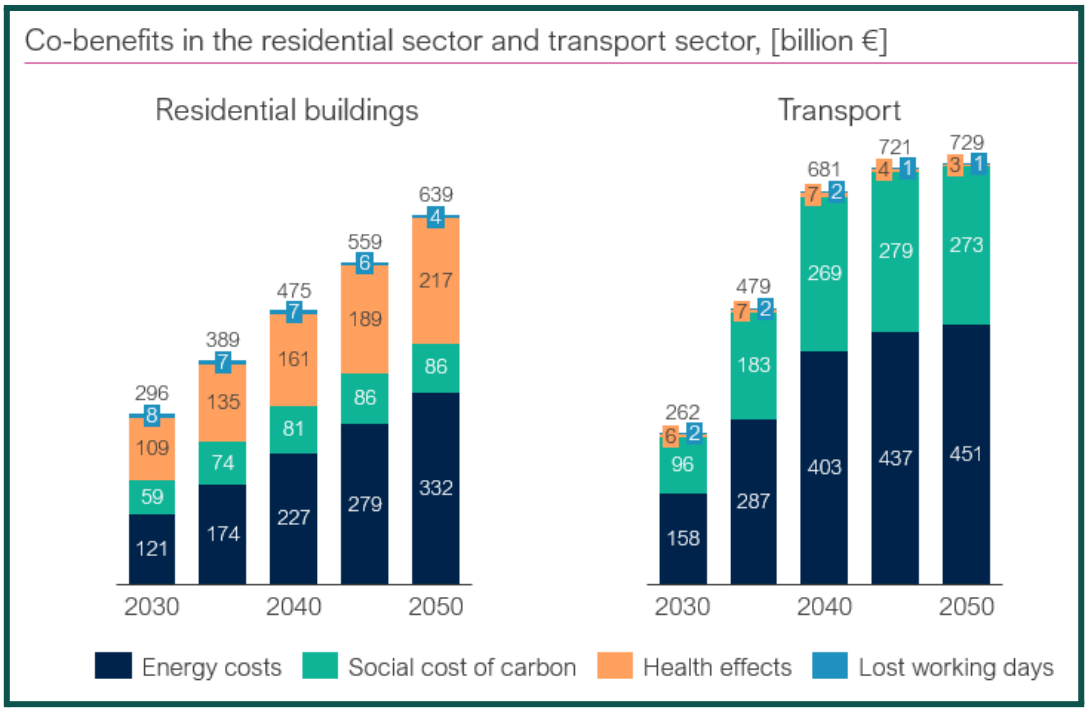
3.3 Sectoral analysis

Transport and residential sectors are the primary sources of co-benefits, delivering up to €557 billion by 2030

The transport and residential building sectors generate the majority of co-benefits, representing €557 billion (67% of total monetised co-benefits) annually in 2030 and €1,368 billion (69% of total monetised co-benefits) in 2050. However, as shown in Figure 11, the specific types of co-benefits differ. Across both sectors, direct energy savings represent most of the monetised co-benefits. Beyond these savings, the transport sector offers the highest emission reduction potential, avoiding at least €273 billion in global climate damages yearly by 2050. In the buildings sector, improved indoor climate conditions deliver substantial health benefits, reaching up to €217 billion by 2050, equivalent to roughly €480 per EU citizen.



Figure 11. Co-benefits in the residential sector and transport sector (billion €)



Direct energy savings could generate up to €279 billion by 2030, accounting for half of the monetised co-benefits

Indicator: *Energy savings in transport and buildings leads to direct energy cost reductions using sector-specific energy prices from the Enerdata database.*

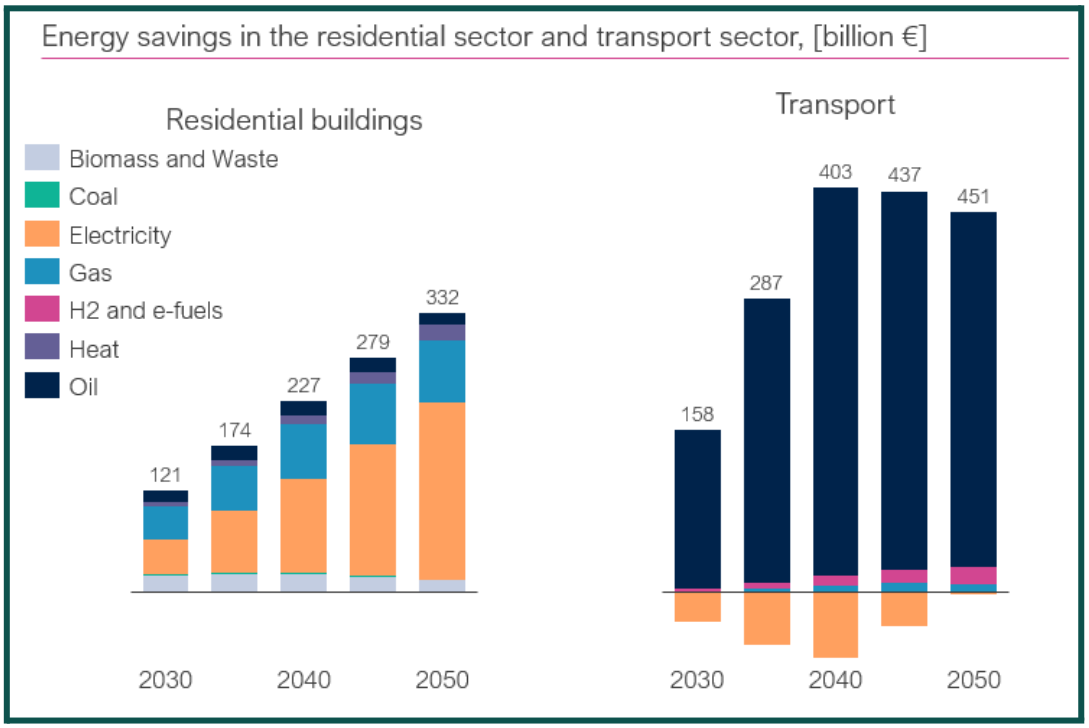
Across the building and transport sectors, direct energy savings constitute 50% of their combined co-benefits, as shown in Figure 12.

In buildings, these savings are dominated by reduced electricity and gas consumption, driven by both construction and renovation, and by long-term behavioural changes. Financial gains in this area could reach €121 billion in 2030 and up to €331 billion in 2050, or roughly what 224 million European households spend on energy each year. In the transport sector, savings are dominated by reductions in oil consumption.

This decline is partly due to fleet electrification between 2030 and 2040, resulting in a consumption shift from oil to electricity.

Energy savings in transport are projected to reach €158 billion in 2030 and scale up to €452 billion annually by 2050, equivalent to the annual transport spending of over 200 million EU citizens.

Figure 12. Energy savings in the residential sector and transport sector (billion €)



3.4 Key drivers

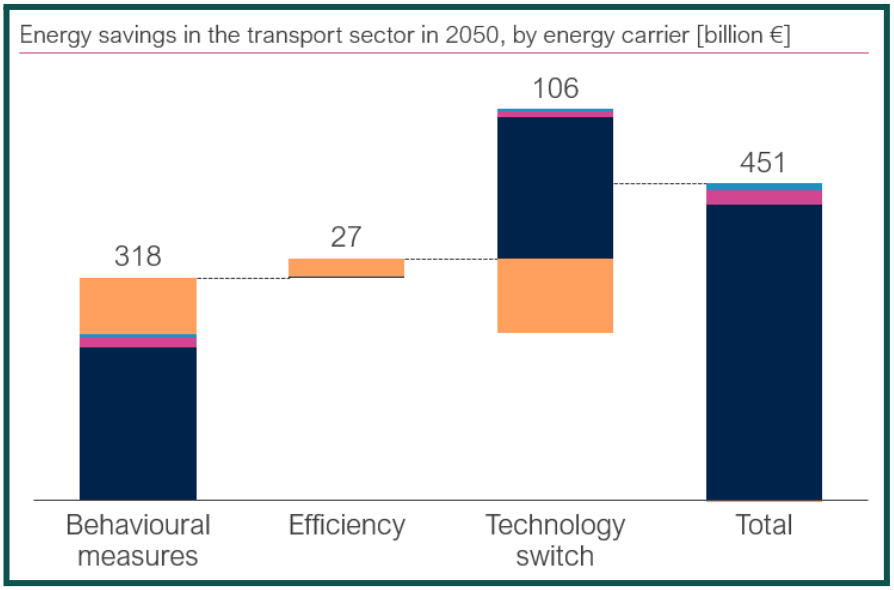
Long-term behavioural changes in transport could generate up to €317 billion in energy savings by 2050

Indicator: *Energy savings in transport leads to direct energy cost reductions using sector-specific energy prices from the Enerdata database.*

Fleet electrification between 2030 and 2040 drives a significant drop in oil consumption but simultaneously increases electricity demand within the sector. However, as shown in Figure 13, behavioural measures (such as the expansion of public transport and reduced individual car usage) combined with efficiency gains lead to a reduction in electricity demand that prevents a large increase in electricity costs.

These behavioural changes account for 70% of savings by 2050, representing €317 billion. €421 billion of the €452 billion in energy costs saved by 2050 are savings on oil costs, equivalent to around 5 billion full tanks of fuel, based on 2025 average diesel prices.

Figure 13. Energy savings in the transport sector in 2050, by energy carrier (billion €)



Road safety and urban space co-benefits of transport decarbonisation

Ambitious transport decarbonisation policies generate measurable co-benefits extending beyond emission reductions, particularly regarding road safety and urban space optimisation. According to the International Transport Forum[83], a high-ambition policy scenario, combining road pricing, green procurement, and broad fleet electrification, yields tangible safety improvements for European municipalities relative to a Current Ambition scenario reflecting existing policy commitments. Under this trajectory, pedestrian conflict exposure with passenger vehicles across Europe is projected to fall by nearly 30% by 2050 compared to the Current Ambition scenario. This decline is largely driven by structural interventions such as separated cycling infrastructure and lower urban speed limits.

Several further findings from the same study and related literature are modelled at a global rather than EU-specific scale. Worldwide, assessments demonstrate that the monetised public health benefits of increased active mobility outweigh residual crash risks by a factor of up to 18 to 1 (OECD/ITF, 2013, as cited in ITF, 2023[84]), while overall road occupancy is projected to fall by 2% to 10% by 2050 under the same High Ambition scenario, relative to Current Ambition. While these global magnitudes cannot be directly extrapolated to the EU, given Europe's more advanced existing policy baseline, they illustrate that the underlying mechanisms, a favourable balance between active mobility's health benefits and risks, and more efficient use of urban space through modal shift, operate at a substantial scale wherever they are applied. In the European context specifically, these mechanisms would allow municipalities to reallocate street space towards green infrastructure, public amenities, and enhanced urban liveability.

[83] ITF (2023), *ITF Transport Outlook 2023*, OECD Publishing, Paris, https://doi.org/10.1787/b6cc9ad5-en.

[84] International Transport Forum (2023). ITF Transport Outlook 2023, citing OECD/ITF (2013). OECD Publishing, Paris. https://doi.org/10.1787/b6cc9ad5-en.

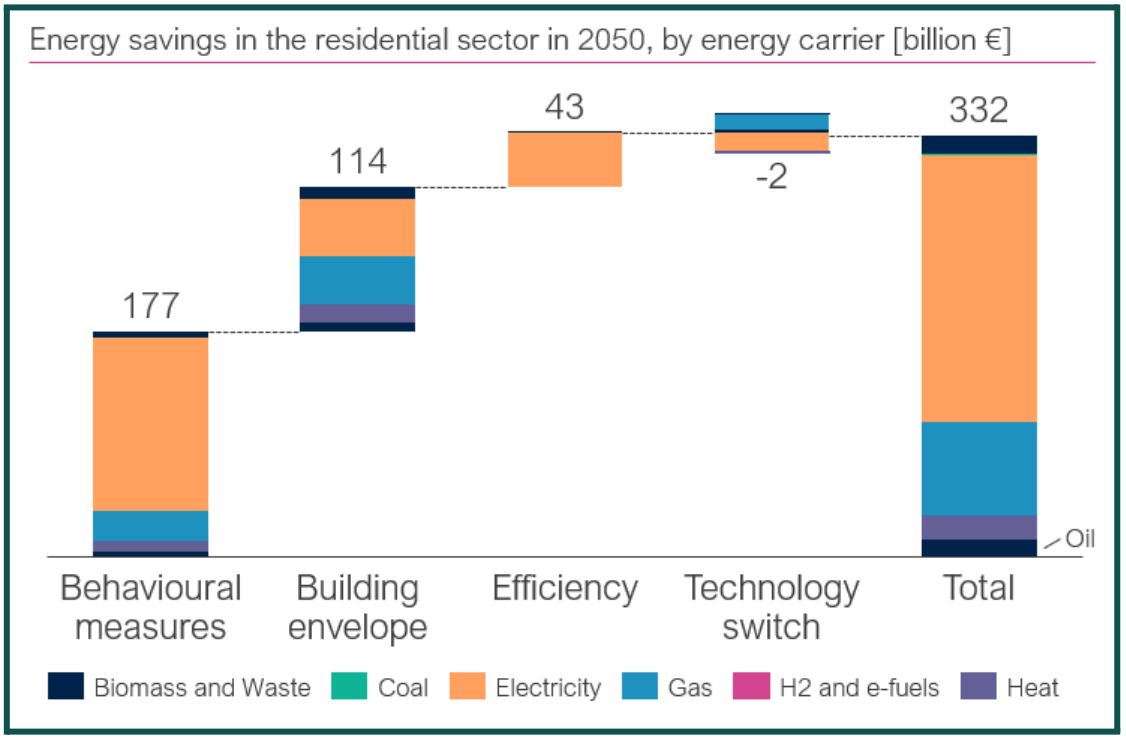
In the residential sector, behavioural measures could account for 53% of energy savings in 2050

Indicator: *Energy savings in transport and buildings leads to direct energy cost reductions using sector-specific energy prices from the Enerdata database.*

In the residential sector, behavioural changes such as thermostat adjustments or optimising living space per person deliver the highest energy savings. By 2050, as seen in Figure 14, these actions are projected to reach €177 billion (roughly half of what the EU spent on energy imports in 2025), accounting for 53% of the sector's total energy cost reductions.

Ultimately, the majority of these savings come from reduced electricity costs.

Figure 14. Energy savings in the residential sector in 2050, by energy carrier (billion €)

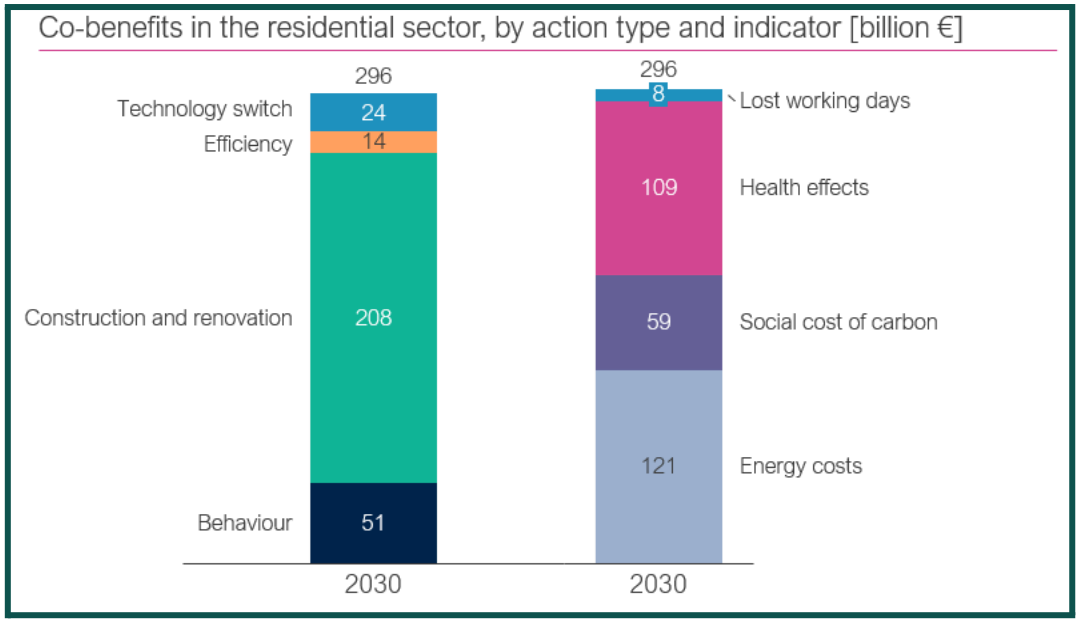


Construction and renovation represent up to 70% of total monetised co-benefits by 2030

Renovation delivers substantial health benefits through indoor climate improvements. Consequently, while it is not the primary driver of energy savings, it could generate up to 70% of monetised co-benefits, as shown in Figure 15.

The CAN scenario models an ambitious renovation pathway by 2030, making construction and renovation the dominant action type at €208 billion.

Figure 15. Co-benefits in the residential sector, by action type and indicator (billion €)



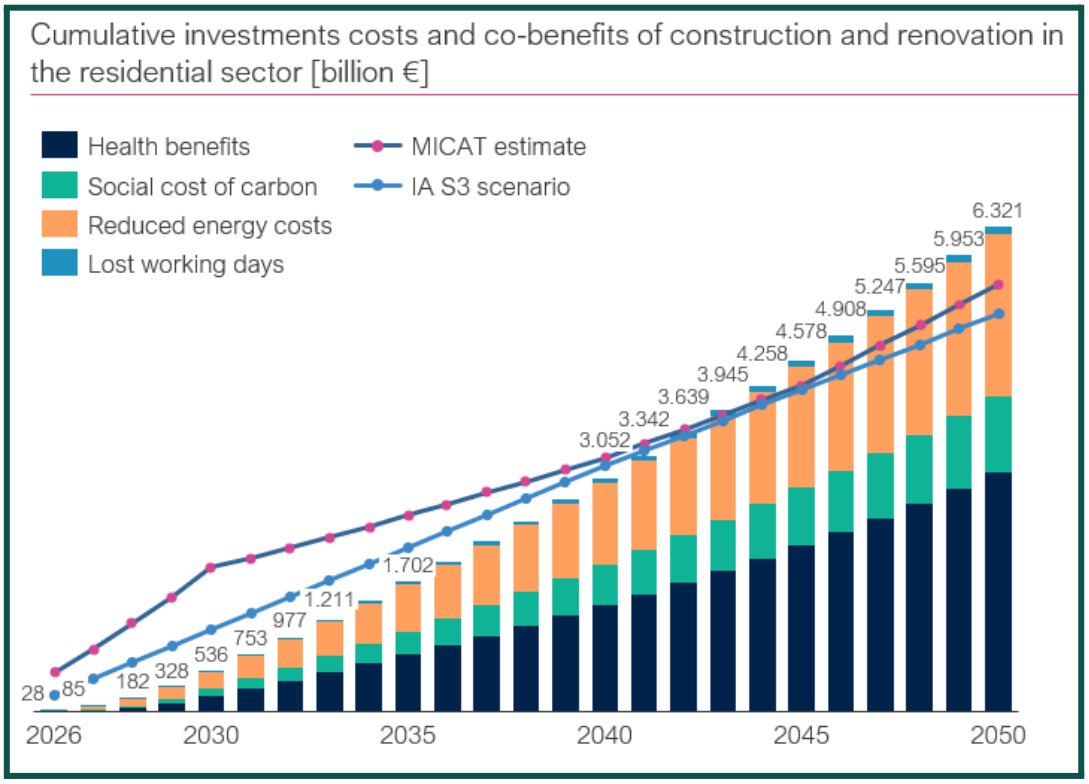
While construction and renovation require significant investments, their overall monetized co-benefits outweigh the costs by €751-1133 billion in 2050.

Energy efficiency measures through construction and renovation in the residential sector requires significant investments. The MICAT tool estimates an average of €222 billion per year. The recent 2040 climate target impact assessment by the European Commission estimates, for the more ambitious S3 scenario, an average of €214 billion per year in the period 2031-2040, and €198 billion in 2041-2050[85].

However, the resulting energy savings from these investments create huge co-benefits, mainly through lower energy bills and better health, while also stimulating the economy and creating jobs. As shown in Figure 16, in the long term the total amount of monetized co-benefits outweigh the investment by an estimated €751-€1133 billion by 2050.

[85] European Commission, "Impact Assessment Report accompanying 'Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society'." SWD(2024) 63 final, 6 February 2024, Table 33, converted to €2021

Figure 16. Cumulative investments costs and co-benefits of construction and renovation in the residential sector (billion €)



Material use and housing co-benefits of building renovation

Renovation and better use of the existing housing stock generate other co-benefits related to resource consumption and housing supply. According to a 2026 green paper by BPIE et al., prioritising renovation, reuse, and reactivation of existing buildings over new construction across the EU could avoid between 5.8 and 13 gigatonnes of material use compared to a pathway that meets housing demand primarily through new construction. Since resource extraction accounts for the large majority of construction-related biodiversity damage, this reduction in material demand also eases pressure on ecosystems and lowers exposure to volatile global supply chains for construction materials.

This shift addresses the EU's housing shortage directly. The same analysis estimates that between 50 and 107 million additional dwellings could be unlocked from the existing stock without new construction, potentially housing between 115 and 246 million people in areas where housing supply is most constrained. Against an estimated EU housing need of around 22 million homes over the next decade, this represents two to five times the required capacity.

Delivering housing this way can furthermore be more cost-effective than building new. Evidence from completed conversion projects across the EU shows that homes can be delivered at a cost comparable to, or in some cases up to 20% cheaper than, equivalent new construction.

4. Assessment of the co-benefits of other measures at the EU level

Co-benefits of changes from AFOLU sector

Expanding upon the results of our internal model, this chapter provides a complementary perspective by presenting the unmodelled co-benefits of the AFOLU sector (Agriculture, Forestry, and Other Land Use). The key climate levers for this sector rely on behavioural changes, the optimisation of Land Use, Land Use Change and Forestry (LULUCF), and the transformation of agricultural production methods.

Co-benefits of behavioural changes in the AFOLU sector

Behavioural changes in the models are primarily driven by a shift towards a less meat-intensive diet and less wasteful consumption.

From a production system perspective, the shift in demand will lead to a significant reduction in agricultural land requirements: this creates the opportunity to implement the land-use interventions discussed below.

Furthermore, this transition towards more plant-based agriculture drastically reduces soybean import requirements, as modeled in the IDDRI's TYFA scenario[86], thereby decreasing vulnerability to global market volatility.

Beyond agriculture, these behavioural changes yield massive and measurable benefits at the consumer level: according to European Commission estimates[87], less wasteful and more plant-based food consumption could save up to €400 per household annually. The most significant impacts are on health: dietary shifts directly reduce non-communicable disease incidence. At the global scale, a study by Springmann et al.[88] estimates that a full shift to low-carbon, plant-rich diets could lead to up to 12% fewer premature deaths from chronic diseases by 2030. For regions like Europe, where current diets heavily rely on animal-sourced foods, shifting towards these dietary guidelines represents a major opportunity to realize a significant portion of these health co-benefits.

[86] Poux, X. and Aubert, P.-M. (2018), An agroecological Europe in 2050: multifunctional agriculture for healthy eating. Findings from the Ten Years For Agroecology (TYFA) modelling exercise, IDDRI-AScA, Study No. 09/18, Paris, France, 74 p.

[87] European Commission (2023). *Frequently Asked Questions: Reducing Food Waste in the EU*. QANDA/23/3566.

[88] Springmann, M., Wiebe, K., Mason-D'Croz, D., Sulser, T. B., Rayner, M., & Scarborough, P. (2018). "Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail." *The Lancet Planetary Health*, 2(10), e451–e461. https://doi.org/10.1016/S2542-5196(18)30206-7

Co-benefits of actions in the Land Use, Land Use Change and Forestry (LULUCF) sector

In the pursuit of the EU's climate targets, action within the LULUCF sector involves both reducing direct emissions caused by soil degradation and enhancing natural carbon sequestration within biomass and organic matter pools. This sector encompasses a variety of land-based interventions, ranging from the restoration of vulnerable ecosystems to the increase of tree biomass, in both agricultural and forestry environments.

In the face of climate pressures, the rewetting of wetlands and the integration of agroforestry networks significantly increase the ecosystem resilience to extreme conditions. Major river floods are better absorbed by these natural retention areas, preventing between €15.4 and €39.4 billion per year in property and infrastructure damage across Europe and the UK[89]. Expanding vegetation cover and root systems also preserves soil integrity. While primarily serving as biological carbon sinks, these networks act as the main natural safeguard against severe erosion, directly addressing a systemic crisis that currently costs European agriculture €1.25 billion in lost productivity annually[90]).

[89] Feyen, L., Ciscar, J. C., Gosling, S., Ibarreta, D., Soria, A., et al. (2020). *Climate change impacts and adaptation in Europe*. JRC PESETA IV final report. Publications Office of the European Union. JRC119178. https://doi.org/10.2760/171121

[90] Panagos, P., Standardi, G., Borrelli, P., Lugato, E., Montanarella, L., & Bosello, F. (2018). Cost of agricultural productivity loss due to soil erosion in the European Union: From direct cost evaluation approaches to the use of macroeconomic models. *Land Use Policy, 72*, 259-267. https://onlinelibrary.wiley.com/doi/full/10.1002/ldr.2879

Conclusion

Our report brings compelling evidence that the direct co-benefits of climate action, on jobs, health, and household energy costs, remain large and growing, restating the positive impact decarbonization has on many layers of society.

The assessment covers the energy savings and renewables deployment of the PAC 2.0 pathway compared to a baseline, business-as-usual scenario, which together account for close to 64% of the EU's 2024 gross emissions. The remaining reductions, along with the benefits that cannot be expressed in monetary terms or modelled in this study, are absent from the totals above. The benefits of climate action, already enormous in these numbers, are likely even larger. Our figures are clearly the floor, not the ceiling - in other words a conservative reading of benefits.

After the sectoral analysis at the EU level, the following chapter examines the potential monetised benefits in 12 European countries - Belgium, Bulgaria, Croatia, Czechia, Estonia, France, Hungary, Italy, Poland, Portugal, Slovenia and Spain.

Based on expert opinion we summarise the most important factors of national context as well as key messages based on the data. We look more granularly on the national level - how the faster transition to renewable energy, electrification and lower energy demand could reduce exposure to volatile fossil-fuel prices, lower energy bills, improve energy security, create jobs and strengthen public health.



Plan4Climate

Belgium

National context

Belgium's budget deficit is among the highest in the eurozone, which is used by government and industry as an argument against ambitious climate policies. However, the economic effect of climate is ignored completely (€10 billion in economic losses due to the 2026 heatwaves alone), despite it's enormous impact on the same economic growth that is at the heart of the government's discourse.

The government wants to lower energy prices to keep the industry local but is putting existing plans for offshore wind on the back burner, choosing to nationalize old nuclear power plants instead. Electrification is also hampered by insufficient grid capacity, storage, and flexibility.

Belgium is very vulnerable to heat and droughts.
The European heat wave of June 2026 was the deadliest in Belgium, with over 2000 heat-related deaths.

Key messages

By 2030, the monetised co-benefits of decarbonisation and energy savings would reach € 8,7B for Belgium annually, or 1.72% of GDP. This is 21% of the projected 2030 budget deficit.

Energy savings could avoid over €3 bn worth of grid and generation capacity expansion, corresponding to 0.6% of GDP.

By 2030, Belgium could avoid 383 premature deaths annually by reducing air pollution and improving indoor climates.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	575	1945
Avoided future global climate damage (€ per capita)	442	1317
Total monetised benefits (bn €)	14	46,6
Benefits as % of 2021 GDP	2,8	9,2
Direct employment (person-years)	121k	104k
Avoided mortality (deaths/year)	383	1182
Avoid lost working days	22k	30k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Bulgaria



National context

Climate action brings numerous co-benefits, while climate inaction comes with climate losses, energy insecurity and volatile energy prices.

Bulgaria is decreasing its coal dependence (coal and RES accounted for 25.3% of the electricity mix in 2024, whereas in 2019 coal accounted for 42%), while the coal exit is still not clear. A RES based electricity system is on its way but needs additional support and predictability.

Bulgaria still faces high energy poverty but implementing energy saving measures for households pose a huge untapped potential.

Key messages

Ambitious climate action will deliver €10.8 bn in total co-benefits for Bulgaria in 2030, which is 15.1% of the 2021 GDP, rising to €15.3 bn (21,4% of GDP) by 2050.

€555 energy costs per person annually will be saved by 2030 and €1624 by 2050, while 46 thousand lost working days will be avoided by 2030.

Climate measures can save at least 377 lives a year by 2030.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	555	1624
Avoided future global climate damage (€ per capita)	1036	1060
Total monetised benefits (bn €)	10,8	15,3
Benefits as % of 2021 GDP	15,1	21,4
Direct employment (person-years)	68k	31k
Avoided mortality (deaths/year)	377	317
Avoid lost working days	46k	9k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Croatia

National context

Croatia's revised NECP targets a 42.5% renewable energy share and a 42% cut in greenhouse gas emissions by 2030 (versus 1990).

Transport remains the country's largest emitting sector (around 40% of national GHG emissions), driven almost entirely by road transport and an aging vehicle fleet averaging over 12 years old.

Building renovation, central to unlocking the co-benefits above, including relief from energy poverty, still lags badly at just 0.7% per year, well short of the roughly 3% rate needed to meet national targets.

Key messages

Climate action is a major economic multiplier for Croatia. The pathway delivers €6.21 billion in total monetised co-benefits by 2030 (10.6% of 2021 GDP), rising to €13.70 billion by 2050 (23.5% of GDP), driven by energy savings, avoided health costs, and avoided global climate damages.

It's a substantial jobs, cost-of-living, and energy poverty relief engine. The pathway supports roughly 74,400 direct jobs (person-years) in 2030, growing to over 121,000 by 2050, cuts household energy costs by €562 per person in 2030 (€1,529 by 2050), and lifts up to 14,900 people out of energy poverty by 2030, rising to nearly 76,000 people by 2050.

The health payoff accelerates over time. Avoided premature deaths from cleaner air and warmer homes more than triple, from about 188 per year in 2030 to nearly 650 per year by 2050, alongside over 21,600 working days saved from illness in 2030 alone.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	562	1529
Avoided future global climate damage (€ per capita)	928	1976
Total monetised benefits (bn €)	6,2	13,7
Benefits as % of 2021 GDP	10,6	23,5
Direct employment (person-years)	74k	121k
Avoided mortality (deaths/year)	188	650
Avoid lost working days	22k	6k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Czech Republic

National context

The Czech energy mix is still overreliant on coal and gas plants, which contributes to overall high prices of electricity.

High electricity prices, together with higher inflation rates, have driven many people on the brink of energy poverty. The economy is heavily industrialised, with more than ¼ of all workers having their jobs in the manufacturing industry.

Despite some progress in recent years, the share of renewables remains one of the lowest in the EU, resulting in unnecessary costs for both the industry and the households.

Key messages

Each euro invested in the transition reaps more than €3,3 in benefits by 2050, with the investment becoming profitable already from 2033 onwards. In 2030 alone, the co-benefits such as reduced energy costs, improved health and avoided lost working days are estimated to be over €23 billion (over ¼ of the annual state budget)

In 2035, each person could save more than 180 EUR (ca 4500 CZK) due to reduced fossil gas and coal consumption.

In 2040, the average industrial GDP will get added value exceeding €224 million, while avoiding almost €1,3 million in lost working days.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	952	2735
Avoided future global climate damage (€ per capita)	910	2264
Total monetised benefits (bn €)	23,1	58,8
Benefits as % of 2021 GDP	9,4	23,9
Direct employment (person-years)	399k	108k
Avoided mortality (deaths/year)	848	1741
Avoid lost working days	75k	38k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Estonia

National context

Estonian population is the least supportive Member State of EU climate neutrality by 2050 target.

Strong pushback from industry and politicians to already timid national climate policy.

Overall feeling that Estonia is greener and has already done more to reduce emissions than other countries.

Estonia will have parliamentary elections in March 2026 and current predictions show the win of right leaning parties which oppose climate action.

Key messages

The cumulative monetised benefits of implementing more ambitious climate policies exceed the total required investments already by 2033. By 2050 every euro invested produces at least 2.2 euros in cumulative benefits.

Phasing out fossil fuels faster and adding more renewable energy would save each Estonian 336 euros a year by 2030 and 1317 euros a year by 2050.

The transition also brings social benefits: by 2030, energy-saving measures could support 36 000 direct employment person-years that is comparable to the current number of unemployed Estonians. By 2050, this will increase to 41 000 jobs.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	336	1317
Avoided future global climate damage (€ per capita)	1449	4006
Total monetised benefits (bn €)	2,6	7,3
Benefits as % of 2021 GDP	8,1	23,3
Direct employment (person-years)	36k	41k
Avoided mortality (deaths/year)	40	131
Avoid lost working days	1,3k	0,2k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

France

National context

The energy crisis is weighing most heavily on vulnerable households (those with no economic and geographical means to reduce their fossil fuel dependency and access low carbon solutions).

More than 12 million people are currently facing difficulties in covering their energy bills and 80% of the population relies on their cars as their only or main means of transportation.

Inefficient housing stock and limited past progress on large-scale building renovations: in 2024, 13.9% of households were labeled as particularly badly insulated.

Key messages

The energy transition is an escape route for households trapped in oil and gas dependency. Once the government makes low carbon transport and energy efficient options accessible to all households, French citizens would quickly save up 500 euros per year per person in 2030 and 1500 euros per year in 2050 on energy and fuel expenses.

The energy transition is a worthwhile investment in prosperity. It could create nearly 300 000 jobs as soon as 2030, and renovation efforts would increase the asset value of buildings.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	496	1500
Avoided future global climate damage (€ per capita)	618	664
Total monetised benefits (bn €)	91,9	165,6
Benefits as % of 2021 GDP	3,7	6,6
Direct employment (person-years)	301k	311k
Avoided mortality (deaths/year)	3406	2860
Avoid lost working days	793k	71k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Hungary



National context

The Hungarian government inherited economic challenges and reindustrialisation: now under reconsideration energy independency from import, energy saving and wind utilization seem to gain priority.

Key messages

Yearly energy cost reduced (per capita) by 2030 per year can reach the equivalent amount of half of the energy bill of an average household. By 2050, annual savings can reach 3 months of energy bills.

Hungary can save huge amounts of money: by 2030, 2 bn euros (over 15% of what new government recently brings home from EU funds); by 2050 9.9 bn euros (6.41% of GDP yearly). Overall, energy saving measures can provide at least 21 bn euros in monetized co-benefits.

Strong positive effects on health already tangible; avoided lost working days benefit directly. By 2030 it can rise to 210 avoided mortalities yearly, and 639 by 2050.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	138	897
Avoided future global climate damage (€ per capita)	197	1393
Total monetised benefits (bn €)	3,8	21,8
Benefits as % of 2021 GDP	2,5	14,1
Direct employment (person-years)	85k	84k
Avoided mortality (deaths/year)	210	639
Avoid lost working days	23k	13k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Italy

National context

Italy keeps on investing in fossil gas even though it has the highest energy prices in the EU from this dependency.

Italy is among the countries with the highest energy bills in the EU

Italy doesn't have ambitious and clear public investments plans on the Energy Transition towards 2030 and 2040.

Energy savings measures can bring close to €228 billion worth of co-benefits yearly by 2050, or about 12,4% of GDP.

Key messages

Energy savings with an ambitious 2040 phase out from fossil fuels would benefit each Italian of 533euros/y in energy cost reduction by 2030 and 1895euros/y by 2050.

With an average additional investment of 48 billion every year from 2026 to 2050 in energy savings measures to achieve a 2040 net-zero emissions scenario, there is a total cumulative co-benefit of 1473.42 billion in 2040, meaning an average co benefit of 144 billion every year up until 2050; a revenue almost triple compared to the investment done.

In Italy, energy savings with an ambitious 2040 net-zero emissions scenario could support up to 506 thousand additional jobs on average every year up until 2050.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	533	1895
Avoided future global climate damage (€ per capita)	660	1848
Total monetised benefits (bn €)	84,2	227,8
Benefits as % of 2021 GDP	4,6	12,4
Direct employment (person-years)	676k	490k
Avoided mortality (deaths/year)	3510	4701
Avoid lost working days	532k	279k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Poland

National context

Poland is still highly dependent on coal (50%) and other fossil fuels: oil (98% - imported) and gas (80% - imported). State owned companies manage most revenues from fossil fuels.

Coal is extracted and produced in Poland, though with high cost. Many people might lose their secure jobs, when the extraction industry will be closed.

Poland becomes land with not enough people to work (very low birth rates in an ageing society).

Air pollution has greatly improved in the last 10 years.

Key messages

Delaying the energy transition means permanently higher energy costs. By 2050, Poland's energy costs could be €1,379 lower per person, while the Polish NECP alone is projected to reduce electricity prices by 13%.

Cleaner energy saves lives and improves productivity. In 2030 alone, over 1480 premature deaths and 331000 lost working days could be avoided through lower air pollution and better indoor climates.

Energy transition is an investment in prosperity. It could support at least half a million jobs a year between 2030 and 2050, and generate added value equivalent to 2.5-4.8% of Poland's 2021 GDP yearly.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	428	1379
Avoided future global climate damage (€ per capita)	634	1917
Total monetised benefits (bn €)	43,8	121,4
Benefits as % of 2021 GDP	7,5	20,8
Direct employment (person-years)	564k	1053k
Avoided mortality (deaths/year)	1481	3943
Avoid lost working days	331k	301k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Portugal

National context

For Portugal, the strongest advocacy angle is affordability and the wider economic value of climate action.

Energy-saving measures can reduce household and economy-wide energy costs, while also generating jobs, improving health and delivering sizeable monetised co-benefits.

Key messages

Climate action pays back: Portugal could generate €8.5 bn/year in monetised co-benefits by 2030, rising to €28.6 bn/year by 2050 — equivalent to 3.9% of 2021 GDP in 2030 and 13,2% by 2050.

Affordability is the key national message: reduced energy costs could reach €280 per capita in 2030 and €1,069 per capita by 2050, making climate action directly relevant to households and energy-poverty concerns.

The transition also brings social benefits: by 2030, energy-saving measures could support 151k direct employment person-years, avoid 678 deaths per year, and prevent 66k lost working days.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	280	1069
Avoided future global climate damage (€ per capita)	279	1282
Total monetised benefits (bn €)	8,5	28,6
Benefits as % of 2021 GDP	3,9	13,2
Direct employment (person-years)	151k	62k
Avoided mortality (deaths/year)	678	1031
Avoid lost working days	66k	49k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Slovenia



National context

Slovenia's energy system still strongly relies on coal and nuclear with slow RES deployment.

Energy poverty remains a structural problem stemming from inefficient housing and limited progress on building renovation.

Slovenia urgently needs positive climate stories to counter the growing political support for militarisation and pushback against green policies.

Key messages

Climate action can deliver €1.5 bn in benefits for Slovenia specifically in 2030 (3% of 2021 GDP), rising to €5.1 bn (10% of GDP) in 2050.

An ambitious climate pathway could support around 45,000 jobs in 2030 and deliver €619 in energy cost savings per person in the same year, rising to over €2,200 by 2050.

Climate measures avoid 66 deaths/year in 2030, more than doubling to 135/year in 2050, driven by reduced air pollution and better home insulation

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	619	2223
Avoided future global climate damage (€ per capita)	375	1640
Total monetised benefits (bn €)	2,4	8,6
Benefits as % of 2021 GDP	4,5	16,5
Direct employment (person-years)	45k	44k
Avoided mortality (deaths/year)	66	135
Avoid lost working days	9k	3k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

Spain



National context

The expansion of renewable energy has reduced the role of natural gas in setting electricity prices to just 15 %, lowering Spain's exposure to energy price volatility during crises.

Key barriers to further decarbonisation include the need to scale up storage and battery capacity, as well as to expand the electricity grid, to integrate a greater share of renewable energy and increase the resilience of the power system.

The decarbonisation of the Spanish economy will require action beyond the electricity sector, namely in the transport, industry, buildings and agriculture sectors.
Concerning energy savings, Spain is lagging behind in building renovation. The percentage of the population unable to keep their house adequately warm, or living with a leaking roof, damp walls or rotten frames, is above the EU average.

Key messages

By 2030, the co-benefits of decarbonisation and energy savings would reach 3,7% of GDP, creating 611k new jobs annually.

By 2030, Spain could avoid more than 2800 deaths annually by reducing air pollution and improving indoor conditions, including temperature, ventilation and humidity.

By 2030, more than 3,000,000 people in Spain could be lifted out of energy poverty.

Indicator table

	2030	2050
Reduced energy costs (€ per capita)	395	1272
Avoided future global climate damage (€ per capita)	258	2003
Total monetised benefits (bn €)	45,3	203,7
Benefits as % of 2021 GDP	3,7	16,5
Direct employment (person-years)	611k	275k
Avoided mortality (deaths/year)	2823	6407
Avoid lost working days	170k	148k

The total monetised benefits in the indicator table (bn eur) contain both national level and global level benefits for each country. As such, relative values per capita or as a share of GDP are given as an order of magnitude. On top of this, in some cases specific national benefits are calculated and indicated in the key messages.

5. Annex: Detailed methodology

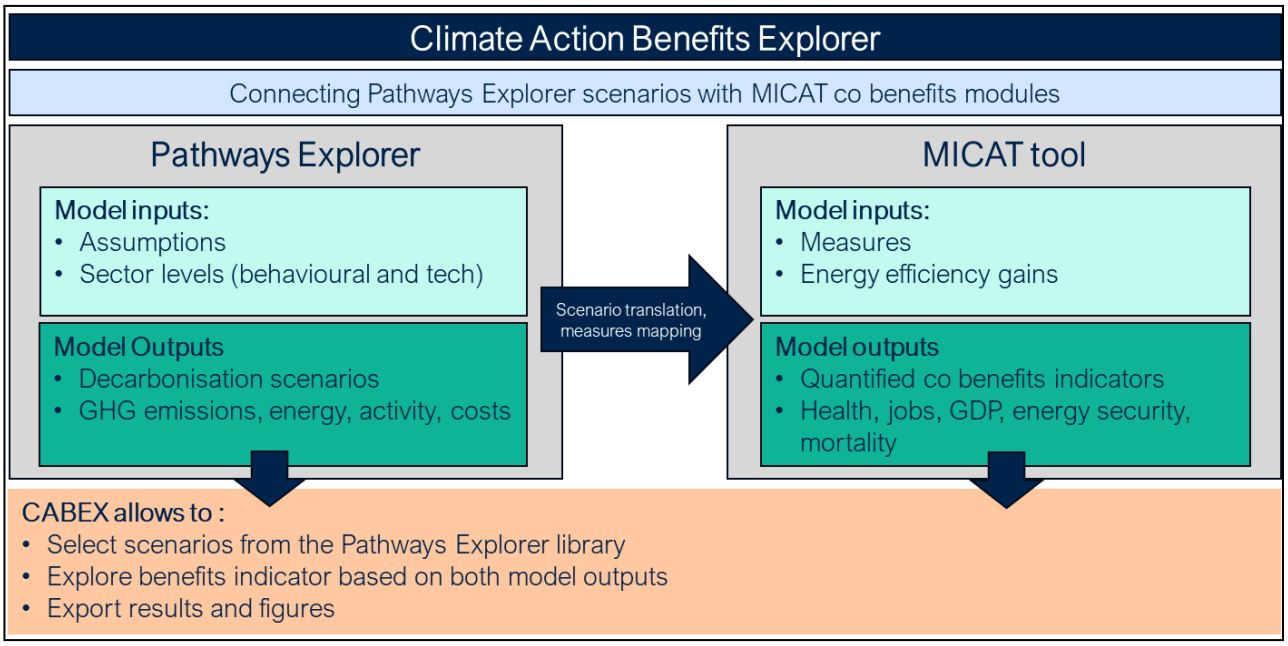
5.1 Introduction

The indicators used in this report were generated by linking two complementary models: the **Pathways Explorer** and the **MICAT tool**. The Pathways Explorer is used to develop decarbonisation scenarios and provides quantified energy consumption pathways across sectors. The MICAT tool uses these pathways as inputs and delivers co-benefit indicators of climate action, covering impacts on health, employment, GDP impact associated with investment in energy efficiency and renewable energy, and energy security. In collaboration with CAN Europe, ambitious decarbonisation scenarios have been designed in the Pathways Explorer, building on the PAC 2.0 national scenario work.

This methodological section documents how the outputs of these Pathways Explorer scenarios are mapped to the inputs required by the MICAT tool, in order to produce the desired co-benefit indicators in a transparent, consistent and replicable way across EU Member States. The mapping described in this note is implemented as a local calculation pipeline, which processes predefined Pathways Explorer scenarios and generates the corresponding MICAT inputs. The resulting co-benefit indicators are stored online and made accessible through the Climate Action Benefits Explorer (CABEX), which is developed through WP2 of this project.

5.2 Climate Action Benefits Explorer: Connecting national decarbonization scenarios with robust modelling of the socio-economic benefits

The approach is to deliver the requested EU level and national level evidence through a coherent and transparent workflow, the Climate Action Benefits Explorer. It connects national decarbonisation scenarios with structured and comparable co benefits calculations, allowing CAN Europe and Plan4Climate partners to rely on consistent assumptions, clear source tracking, and documented treatment of uncertainty across countries.



This allows us to create evidence through a transparent and open-source calculation framework, ensuring traceability, credibility and ease of review. Beyond producing figures, this workflow avoids the weaknesses of disconnected indicator by indicator aggregation of heterogeneous studies. It reduces inconsistency risks across Member States, ensures assumptions are applied systematically, makes uncertainty treatment explicit and comparable, and improves delivery efficiency. Once the mapping between scenario outputs and indicator modules is established, adding countries, updating evidence, or refining assumptions becomes a controlled update rather than a full rework.

This work builds on the experience and content developed for the Paris Pact Payoff report and upgrades it with a more comprehensive and methodologically robust approach by connecting two state of the art tools in a single delivery pipeline.

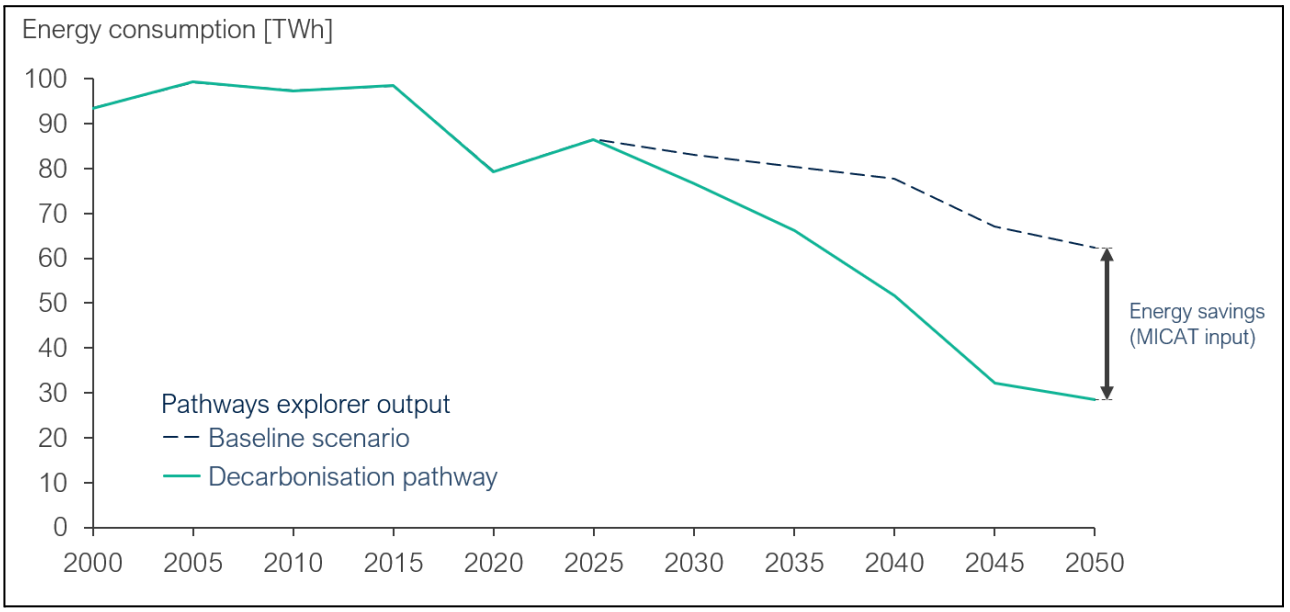
5.3 Basic Mapping of Pathways Explorer Outputs to MICAT Tool Inputs

The Pathways Explorer builds a decarbonisation pathway by letting the user specify the amount of ambition for a set of measures, or "levers", across different subsectors. These levers represent a wide range of actions: behavioural changes, energy efficiency improvements, technological shifts, fuel switches, and the deployment of renewable capacity. For each combination of lever choices, the model outputs absolute energy consumption by subsector and by energy carrier, for example oil consumption in road transport or gas consumption for residential heating.

The MICAT tool works differently: rather than modelling absolute consumption, it quantifies the co-benefits associated with a specific energy-saving action, such as the health, employment or GDP impacts of reducing energy use in a given sector. Conveniently, the types of actions MICAT recognises map closely onto the levers available in the Pathways Explorer. This natural correspondence is the foundation of the linking approach used in this project: **each lever in the Pathways Explorer is associated with a matching action in the MICAT tool**, allowing co-benefit indicators to be derived directly from scenario outputs.

One important translation step is needed, however. The Pathways Explorer outputs *absolute* energy consumption figures, while MICAT requires as input the *energy savings* in a specific subsector. To compute these savings, we compare two scenarios in the Pathways Explorer: a **baseline scenario**, and the **decarbonisation scenario**. The difference in energy consumption between these two scenarios gives the energy savings that are passed to the MICAT tool. This is illustrated in Figure 17 below.

Figure 17: Energy savings are computed by comparing the energy consumption of two Pathways explorer scenario



The baseline is defined as a "historical trends" scenario, in which each lever is set so that future energy consumption follows historical trends, which amounts to a business-as-usual projection.

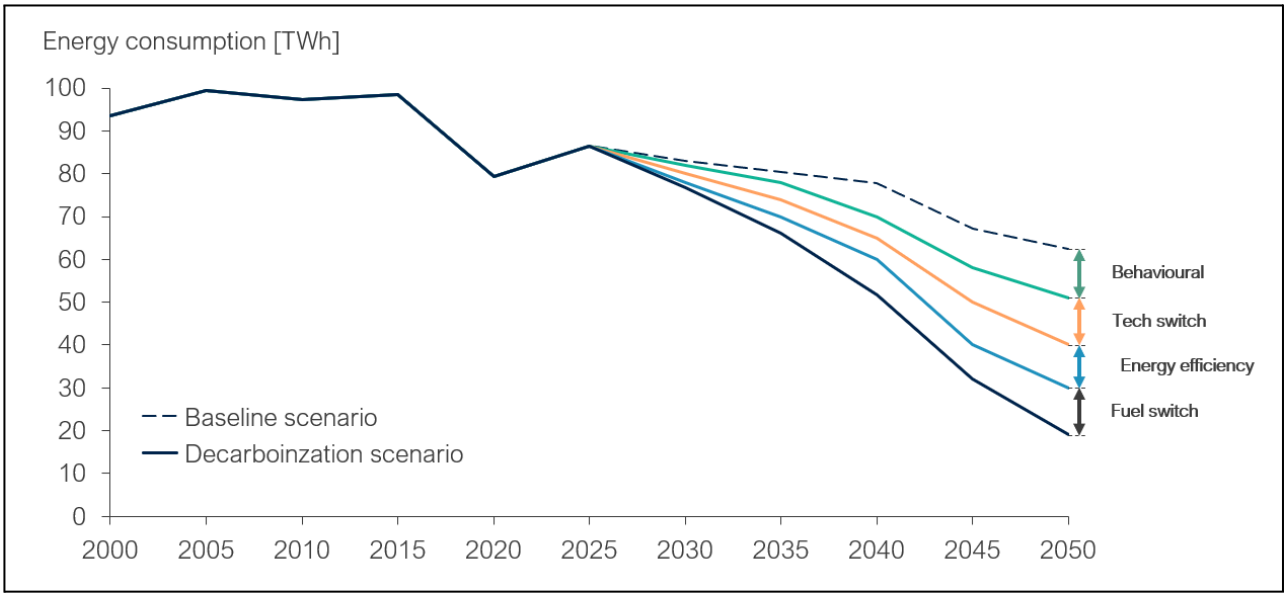
Successive lever activation

The action types in the MICAT tool can be divided into roughly three categories: behavioural changes, technology improvements and fuel switches. A similar energy saving for different action types will result in different results, so there is a need to isolate the impact of each action in the Pathways explorer scenario. To do this, each lever in the Pathways Explorer is mapped to one of the main categories. Starting from the baseline scenario, each category is then activated one by one, in a fixed order. With each category activation, the Pathways explorer outputs are compared against the outputs of the previous step, yielding

the energy savings that can be attributed to that specific category. This is illustrated in Figure 18. The order of activation follows the following logic:

Baseline scenario -> Behavioural changes -> technology changes -> energy efficiency improvements -> fuel switches -> decarbonisation scenario

Figure 18: Successive activation of Pathways explorer levers determines the effect of individual measures.



Note that we distinguish between two types of fuel switches in the Pathways explorer. The first is a fuel switch induced by a technology switch. This type of fuel switch often comes with efficiency gains from electrification. The second type is a fuel switch within the same technology. Both of these fuel switches are mapped to the general "fuel switch" action in the MICAT tool.

As a concrete example, for private road transport (passenger cars), the full cascade of actions could correspond to the following sequence:

Baseline -> transport demand reduction -> switch to electric vehicles -> improvement of car efficiency -> switch to biofuels -> decarbonisation scenario.

This ordering reflects the internal logic of the Pathways Explorer itself. Beyond this internal consistency, the order also follows an intuitive narrative of how a real-world transition unfolds. Behavioural changes are activated first, as the cheapest and fastest interventions, since they reduce overall demand before any new technology is deployed. Technology changes follow, replacing existing equipment with cleaner alternatives in an already more efficient system. Energy efficiency improvements then optimise the performance of those technologies, before fuel switching covers the residual consumption that could not be addressed by the preceding measures. When two levers affect the same energy stream, the one activated earlier claims the

associated savings first, and subsequent levers operate on the remaining consumption. The ordering is therefore deliberate, but it directly influences the energy savings that can be attributed to each measure. The sensitivity of the MICAT indicators to this order is left out of scope. The next sections explain in more detail how each lever category is mapped to MICAT actions, for each sector. It also lists how Pathways explorer subsectors are mapped to corresponding MICAT subsectors. The full mapping of individual levers to lever categories and their order of activation is available in the associated excel[91]. Note that levers which cannot be mapped to a specific MICAT action are still activated in this cascade. They simply do not generate a corresponding MICAT input, but they are required to correctly reconstruct the full decarbonisation scenario step by step, starting from the baseline scenario.

Buildings

Lever categories

The buildings sector has an extra "building envelope" action type, corresponding to energy savings coming from better building insulation. The "efficiency" category is mapped to different actions depending on the end use of the energy demand in the Pathways explorer.

Lever category	MICAT action	Comment
Behaviour	Behavioural changes	
Building envelope	Building envelope	
Technology switch	Heating fuel switch	
Efficiency	Energy-efficient heating	For end uses heating
	Electric appliances	For end uses electric appliances and cooling
	Cooking and water heating	For end uses cooking and water heating
Fuel switch	Heating fuel switch	

Subsectors

The residential and non-residential sectors of the Pathways explorer match perfectly with the residential and tertiary subsector of the MICAT.

[91] Methodological note - Pathways explorer lever mapping.xlsx

Transport

Lever categories

Lever category	MICAT action
Behaviour	Behavioural changes
Technology switch	Fuel switch
Efficiency	Consumption reduction
Fuel switch	Fuel switch

Subsectors

The Pathways explorer distinguishes passenger transport from freight transport, and computes energy demand for several vehicle types. All of these are mapped to the four MICAT subsectors, which make no distinction between passenger and freight transport. Note that aviation and navigation only include domestic transport; international transport is excluded from the analysis.

Pathways explorer vehicle type	MICAT sector
2 wheelers	Road
Bus	
Light-duty vehicles (passenger cars, freight LDV)	
Heavy-duty vehicles	
Rail	Rail
Aviation	Aviation
Navigation	Navigation

Industry

Lever categories

Lever category	MICAT action
Material production	Process-specific savings
Behaviour	Process-specific savings
Technology switch	Fuel switch
Efficiency	Process-specific savings
Fuel switch	Fuel switch
Carbon capture	Fuel switch

Subsectors

The Pathways explorer distinguishes 14 subsectors in industry, which are mapped to 9 subsectors of the MICAT tool.

Pathways explorer sector	MICAT sector
Steel	Iron & steel
Aluminium	Non-ferrous metals
Non Ferrous	
Cement	Non-metallic minerals
Ceramic and others	
Glass	
Paper	Paper, pulp & printing
Food processing	Food, beverages & tobacco
Wood	Wood & wood products
Other Industries	Average industry
Lime	Non-metallic minerals
Chemical (Other)	Chemical & petrochemical
Chemical (Olefin)	
Chemical (Ammonia)	

Agriculture

Lever categories

Lever category	MICAT action
Behaviour	Process-specific savings
Technology switch	Fuel switch
Efficiency	Process-specific savings
Fuel switch	Fuel switch

Subsectors

The AFOLU sector in the Pathways explorer is mapped directly to the "Average agriculture" sector in the MICAT tool.

Renewables

The following renewables from the Pathways explorer are mapped to the MICAT tool.

Pathways explorer renewable	MICAT renewable
Biomass and waster electricity plant	Biomass & Waste
Geothermal	Geothermal & other RES
Tidal	Geothermal & other RES
Solar PV	Solar PV (rooftop)
Solar csp	Solar PV (utility-scale)
Offshore wind	Wind (offshore)
Onshore wind	Wind (onshore)

5.4 Action-specific parameter selection

Each action in the MICAT tool requires the user to provide at least one primary input: either the **energy savings** associated with the measure, or, for actions related to renewable energy deployment, the **amount of renewable capacity installed**. How these primary inputs are derived from the Pathways Explorer scenarios is described in the previous section.

Beyond this primary input, MICAT allows the user to define a range of additional, action-specific parameters that refine how co-benefit indicators are calculated for a given measure. This subsection documents the methodological choices made for these action-specific parameters. Where specific MICAT input parameters are not explicitly addressed in this note, default MICAT values are assumed. This is generally the case for assumptions on monetary values.

1) Energy savings: affected fuels

This parameter allows the user to specify the breakdown of total energy savings by energy carrier. Since the Pathways Explorer already outputs energy consumption disaggregated by carrier, the share of each carrier in the total savings can be directly read from the scenario outputs and passed to MICAT without additional assumptions.

The mapping of final energy carriers modelled in the Pathways explorer to the MICAT energy carriers is listed below.

Pathways Explorer carrier	MICAT energy carrier
Hydrogen	H2 And Synthetic Fuels
Gas Synthetic	H2 And Synthetic Fuels
Biomethane	Gas
Gas Natural	Gas
Liquid (Synthetic)	H2 And Synthetic Fuels
Liquid (Bio)	Oil
Liquid Oil	Oil
Solid Biomass	Biomass And Waste
Solid Fossil fuel	Coal
Electricity	Electricity
District heating	Heat
Ambiant heat	/

2) Fuel switch, efficiency

When an energy saving is induced by a fuel/technology shift, the reduction in fossil fuel consumption is accompanied by an increase in the consumption of alternative carriers, most often electricity. To compute the exact reduction and increase of different fuel usages, the MICAT tool allows the input of two sets of action-specific parameters: fuel switch parameters and efficiency parameters. The fuel switch parameters determine which fuels are removed from the energy mix, and which fuels are added to the energy mix. The efficiency parameters determine the efficiency with which final energy is converted into useful energy. These efficiencies are not directly available across sectors in the Pathways Explorer outputs. Instead, they are calibrated: for each action, the efficiency values are chosen such that MICAT reproduces exactly the energy savings per carrier returned by the Pathways Explorer. The efficiencies should therefore be read as a calculation device rather than as physical conversion efficiencies.

5.5 Global MICAT parameter Selection

In addition to action-specific parameters, the MICAT tool allows the user to input several global parameters that apply to all relevant subsectors. For example, the user can set the price of different energy carriers, or the price of CO2. Two global parameters in the MICAT tool require explicit methodological choices: the **fuel mix for electricity generation** and the **fuel mix for heat generation**.

The two obvious candidates for these mixes are either the mix of the baseline scenario or the mix of the decarbonisation scenario. The choice matters because MICAT, for each measure, also computes results based on the primary energy implications of electricity or heat generation. For example, switching to electric vehicles in the transport sector does not only reduce fuel consumption directly. It also creates additional demand for electricity, which in turn draws on the underlying generation mix (gas, coal, renewables, etc.).

If the baseline scenario were used as the electricity generation mix, there is a risk of double-counting: the displacement of fossil fuels in electricity generation would be counted once through the renewable energy deployment measures, and a second time through the indirect primary energy calculation applied to end-use measures that save electricity such as renovation and efficiency.

For this reason, the **decarbonisation scenario energy mix** is used as the global parameter. Using the decarbonisation mix avoids double counting and ensures that the contribution of each measure is attributed cleanly and consistently. In short, we use the decarbonisation mix to avoid inflating the benefits of energy saving measures.

5.6 PAC 2.0 scenarios used as reference decarbonization scenarios

The reference decarbonisation pathway used throughout this study is the Paris Agreement Compatible (PAC) 2.0 scenario. PAC is a civil-society energy and climate scenario for Europe, built to be consistent with the Paris Agreement's 1.5 °C objective rather than with the trajectory of current policies. Its first iteration (PAC 1.0, 2018–2020) was developed by CAN Europe and the European Environmental Bureau (EEB) as a single EU-wide pathway, in dialogue with the European transmission system operators on the assumptions underpinning their Ten-Year Network Development Plan. The second iteration (PAC 2.0, 2021–2024) extends that work to the national level: with Climact acting as the professional modeler. Coordinated by CAN Europe together with the Renewables Grid Initiative, REN21 and the EEB, it delivers 27 national pathways whose aggregation forms the EU27 pathway used here.[92]

Process : The scenario was built in three steps:

1. **Co-construction of a scenario at the EU level.** The civil-society positions articulated in PAC 1.0 were translated into policy boundaries and additional modelling constraints under the oversight of the PAC 2.0 Advisory Committee.
2. **Modelling of the scenario on the Pathways Explorer.** Energy demand and supply were modelled in the Pathways Explorer 2050, using more than 180 levers per country, each set on an ambition scale from 1 (business-as-usual trend) to 4 (most transformative pathway) in steps of 0.1, with linear

[92] *CAN Europe, Renewables Grid Initiative, REN21 and EEB, Paris Agreement Compatible Energy Transition Scenarios – Technical Report, November 2024.*

trajectories and 2015 as reference year. Power system and infrastructure implications were modelled separately with PyPSA-Eur.

3. **Downscaling of the scenario at the national level, with refinements and quality checks.** Draft national pathways were discussed with CAN Europe's member organisations, which reviewed the proposed ambition levels against national realities. Ambition levels were adjusted in response, and the 27 revised national pathways and their EU27 aggregation were then finalised.

Description of the reference scenario used

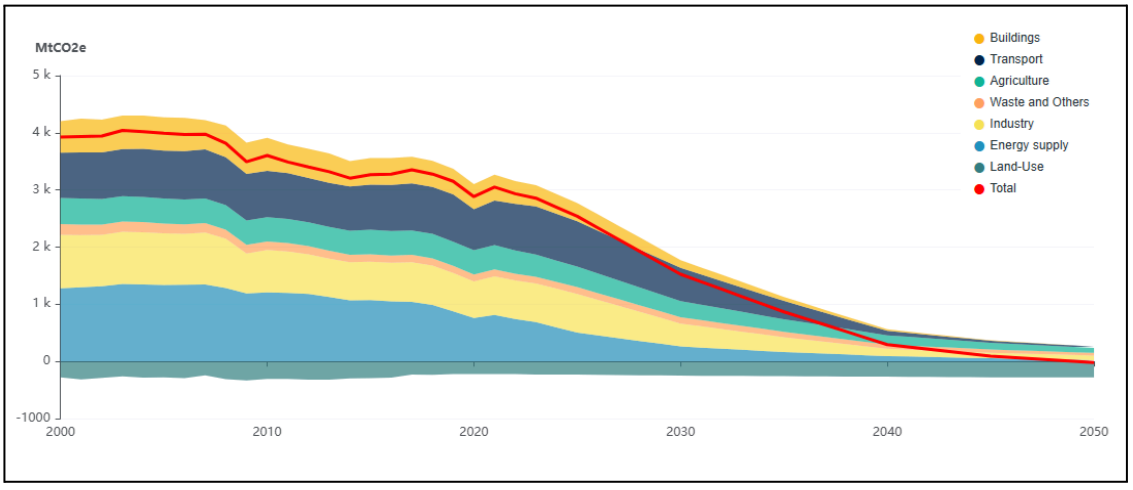
The defining ambition of PAC 2.0 is climate neutrality in the EU27 by 2040, reached through demand reduction and a fully renewable energy system rather than through offsetting. Measured against 1990 levels, the pathway achieves gross emission reductions of 65% by 2030, 82% by 2035 and 92% by 2040. Reaching neutrality in 2040 rather than 2050 avoids 16.5 $GtCO_2e$ of emissions, a 37.5% difference relative to an otherwise comparable 2050 pathway. The scenario is framed by explicit sustainability criteria:

- at least 50% renewable energy in gross final energy consumption by 2030, and 100% by 2040;
- at least 20% energy efficiency in 2030, relative to the 2020 EU Reference Scenario;
- an EU-wide coal phase-out by 2030, a fossil gas phase-out in the power sector by 2035, and a phase-out of fossil oil products by 2040;
- a gradual nuclear phase-out by 2040;
- an end to the sale of new internal combustion engine cars no later than 2035;

These criteria translate into the steep demand reduction that drives most of the co-benefits assessed in this report. Final energy consumption falls to 685.8 Mtoe in 2030, 20.7% below the PRIMES 2020 Reference Scenario projections, and to 460.5 Mtoe in 2040.

Because it is the national pathways that are aggregated, the EU27 results presented in this report inherit both the granularity and the country-level assumptions of that process. The full description of the PAC 2.0 scenario at EU27 and national level is to be found back in the PAC 2.0 report.

Figure 19: The modelled PAC 2.0 scenario emission pathway in the Pathways Explorer



Limitations of the scenario

- The depth of the national quality-assurance process varies across Member States. Not all countries completed a thorough review of their pathway, so the quality of the underlying modelling is uneven between countries.
- The Pathways Explorer has evolved since the PAC 2.0 exercise was closed. Model updates and data revisions mean that some indicators reported here differ slightly from those published in the 2024 PAC 2.0 technical report, even where lever settings are unchanged.
- Agriculture and waste were covered in PAC 2.0 through emission projections rather than detailed sector-wise modelling, and LULUCF requirements were acknowledged rather than optimized.

5.7 Limitations

Unmapped levers

Certain Pathways Explorer levers or outputs have no corresponding input in the MICAT tool and are therefore excluded from the co-benefits assessment. These are typically cross-cutting levers that span multiple sectors or fall outside the boundaries of MICAT's indicator modules. Important examples include:

- Waste management levers
- International aviation and navigation are excluded from the analysis. Only domestic transport energy demand is covered.
- Non-energy use of fuels in industry (e.g. for chemicals) is excluded. The MICAT tool focuses on fuels used for combustion.
- Agriculture and land-use measures: their benefits are addressed on a more qualitative level in section. *"Assessment of the co-benefits of other measures at the EU level"*

Incomplete mapping / Modelling simplification

Even when a mapping exists, the exact scope of a Pathways explorer lever often does not correspond perfectly with the scope of the corresponding action. Good examples are the material production levers in the Pathways Explorer. These set the projected amount of material production for every available industry subsector (steel, aluminium, etc.). There is not a corresponding 'Reduced production' action in the industrial sectors of the MICAT tool. Instead, as a modelling simplification, the energy savings from a potential material reduction is mapped to the "Process-specific savings" action in the MICAT tool.

Scope of the climate damage indicator

The social cost of carbon indicator values the CO_2 avoided by the modelled measures at a global damage cost (UBA[93]: €335/tCO_2 in 2030, €435/tCO_2 in 2050). It measures the climate damage avoided worldwide by EU emission reduction, not the part of that damage occurring in the EU. Only CO_2 is covered, and MICAT uses an older set of damage values than the latest available[94], so the indicator is likely an underestimate.

[93] Matthey, A., Bünger, B. and Eser, N., "Methodological Convention 3.2 for the Assessment of Environmental Costs – Value Factors," German Environment Agency, October 2024, https://www.umweltbundesamt.de/en/publikationen/methodological-convention-32-for-the-assessment-of

[94] Eser, N., Matthey, A. and Bünger, B., "Handbook on Environmental Value Factors – Methodological Convention 4.0 for the Assessment of Environmental Impacts," German Environment Agency, February 2026, https://www.umweltbundesamt.de/en/publikationen/handbook-on-environmental-value-factors

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