Paris Pact Payoff

SPEEDING UP THE GREEN TRANSITION FOR SOCIO-ECONOMIC CO-BENEFITS

CAN
CLIMATE ACTION NETWORK
Europe

Together for 1.5
ACCELERATE CLIMATE ACTION IN EUROPE

Date of publication:

Published in January 2024 by Climate Action Network Europe, Brussels, Belgium.

Authors:

Olivier Vardakoulias, Giulia Nardi (CAN Europe)
Special thanks to Dimitris Tsekeris and Joni Karjalainen (CAN Europe)

The following members and partners contributed to the development of the country sheets:

BBL - Bond Beter Leefmilieu (Belgium), Za Zemiata (Bulgaria); DOOR – Society for Sustainable Development Design (Croatia); CDE – Centre for Transport and Energy (Czechia); Danish 92 Group (Denmark); Estonian Fund for Nature (Estonia); Réseau Action Climat - France (France); Germanwatch (Germany); Friends of the Earth Hungary (Hungary); ISD – Institute for Sustainable Development (Poland); ZERO (Portugal); FOCUS – Association for Sustainable Development (Slovenia); SEO Birdlife (Spain)

The Together For 1.5 project has received funding from the LIFE Programme of the European Union. The information and views set out in this document are those of the authors and do not necessarily reflect the official opinion of the European Commission.

CAN
CLIMATE ACTION NETWORK
Europe

Together for 1.5
ACCELERATE CLIMATE ACTION IN EUROPE

www.1point5.caneurope.org

Contents

Executive summary

CONTEXT

The effects of climate change are already tangible and are increasing in both their strength and frequency over time. The devastating impacts on people and the planet are evident - with those most vulnerable being hit the hardest. The science is clear - delaying climate action is simply not an option.

Still, despite the significant social costs associated with the impacts of climate change, the economic cost argument continues to be employed as a rationale for postponing the energy transition and climate action. **The available evidence suggests, however, that the benefits of a 1.5°C compatible pathway are very significant and far outweigh the cost of ambitious climate action[2].**

Aim of the report

This report brings further evidence that transitioning to a climate neutral society along a 1.5°C global warming compatible pathway is not only necessary, but also beneficial in economic terms.

A transition towards climate neutrality by 2040 with tangible plans to save energy and build a 100% renewable-based energy system shields us from the impacts of climate change and at the same time can result in various socio-economic 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, the co-benefits would include a reduction of air pollution and the corresponding improvement of health outcomes. For an holistic assessment of the benefits of ambitious climate action, both dimensions (avoided climate impacts and co-benefits) need to be taken into account.

As such, this report highlights the potential to both avoid the impacts associated with non-Paris aligned emissions pathways on our economy and society, and to unleash additional co-benefits that include improved health, increase of green jobs creation, reduction of energy poverty and material footprint, and avoided climate-related welfare losses.

1) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. Accessed 9 January 2024

2) European Commission (2020), Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people impact assessment.

3) Co-benefits are defined as the ancillary benefits of mitigation measures and investments, beyond the avoided climate losses implied through more ambitious climate action. For example, improved air quality and health outcomes as a consequence of reduced air pollution is classified as a co-benefit.

OUR KEY FINDINGS

Higher climate ambition in Europe that is in line with the Paris Agreement objectives[4] is possible and the pathway to make this happen is beneficial in absolute terms.

- For the EU as a whole, the benefits of ramping up and accelerating climate action by implementing a 1.5°C-aligned pathway significantly outweigh the costs, by a factor ranging between 1.4 and 4 to 1, illustrating an unequivocal rationale for taking action.
- Avoided losses: Adopting a 1.5°C compatible pathway brings considerably less economic losses than any other less ambitious pathway. This pathway would allow the EU to avoid cumulative losses of €46,000 or €8,500 per capita compared to the inaction and current policies scenarios, respectively.
- Co-benefits: The direct co-benefits arising from a 1.5°C-compatible scenario amount to at least €1 trillion by 2030 for the EU27 as a whole.

It is important to note that in order to get there, policy makers need to propose **just, equitable and cost-effective climate and energy transition measures.** The design of policies plays a fundamental role in ensuring that the positive effects of climate action are fairly distributed and not only the prerogative for the wealthiest segments of society.

METHODOLOGY AND KEY RESULTS

This analysis goes beyond the energy system modelling by unveiling the socio-economic case for an accelerated energy transition pathway compared to less ambitious pathways not aligned with the Paris Agreement objectives. The report includes calculations quantifying the benefits of climate action at both EU and national levels. For the European level the benefits are compared with the potential additional investment needs, uncovering an overwhelmingly positive result - as we detail in the following - **the benefits of ramping up climate action significantly outweigh the additional costs.**

CALCULATION OF AVOIDED LOSSES

This report compares the costs of inaction - drawing from existing assessments - to the costs of action, and looks at the relative co-benefits at the EU level.

The "Paris Agreement Compatible Scenarios for Energy Infrastructure" (PAC 2.0) project carried out by CAN Europe and partners, provides a pathway for the EU's energy transition aligned with the Paris Agreement 1.5°C goal.

To measure the avoided losses triggered by a 1.5°C aligned scenario versus less ambitious scenarios, we assessed the available data for the EU27 through a comprehensive literature review of the cost of inaction (the cost of not taking climate action) and *moderate* action (emissions reduction targets that are not Paris-aligned), based on the "CO-designing the Assessment of Climate CHange costs" (COACCH) model[5].

4) What is the Paris Agreement? https://unfccc.int/process-and-meetings/the-paris-agreement . Accessed 9 January 2024.

5) See Section 3.2.2 for further details on the COACCH model

The findings highlight the possibility of **costs soaring to 347 billion euros annually to 2100, in case of no action.** In contrast, adopting the 1.5°C-aligned transition pathway (as described in PAC 2.0), would require a substantially lower expenditure, 94 billion euros annually - a magnitude of almost 4 times lower. Fig. A shows the comparison of avoided economic climate change losses resulting from three different scenarios:

1. The above mentioned *inaction scenario*

2. The *stated policies* scenario, which is based on the current global aggregate climate commitments framework leading to approximately 3°C temperature increase not only in the EU27, but globally

3. The *1.5°C* scenario (corresponding to ambitious climate action as described in the EU-level PAC 2.0 scenario to limit global warming to 1.5°C)

The graph compares the difference in avoided losses between the 1.5°C scenario and the inaction scenario, as well as between the 1.5°C and the stated policies. **The data shows** positive differences meaning that **adopting a 1.5°C compatible pathway brings considerably less economic losses than any other less ambitious pathway. In terms of per capita figures, this pathway would allow people in the EU to avoid corresponding cumulative losses of €46,000 and €8,500 compared to the inaction and current policies scenarios, respectively.**

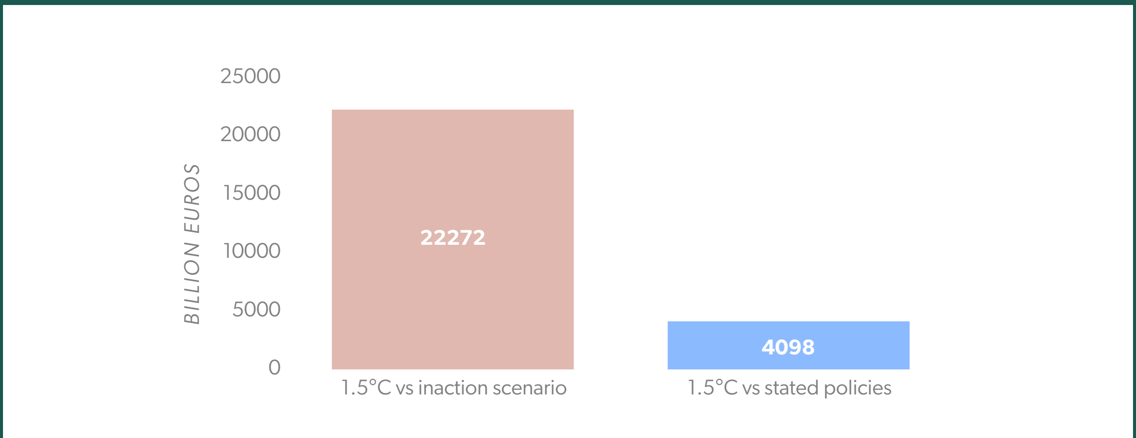


Figure A: Avoided climate change losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 in Europe

Source: CAN-E calculation based on COACCH model

CALCULATION OF CO-BENEFITS

To estimate co-benefits, we use an existing model that closely matches the PAC 2.0 scenario pathway, namely the "Calculating and Operationalising the Multiple Benefits of Energy Efficiency in Europe" (COMBI) EU-Horizon 2020 project[6].

The results reflect the positive welfare impacts of ambitious energy savings targets to 2030, which trigger several co-benefits including: energy system savings, positive welfare impacts in economic terms, avoided resource use and positive health impacts. Figure B below illustrates a substantial positive economic impact both at the EU and country levels.

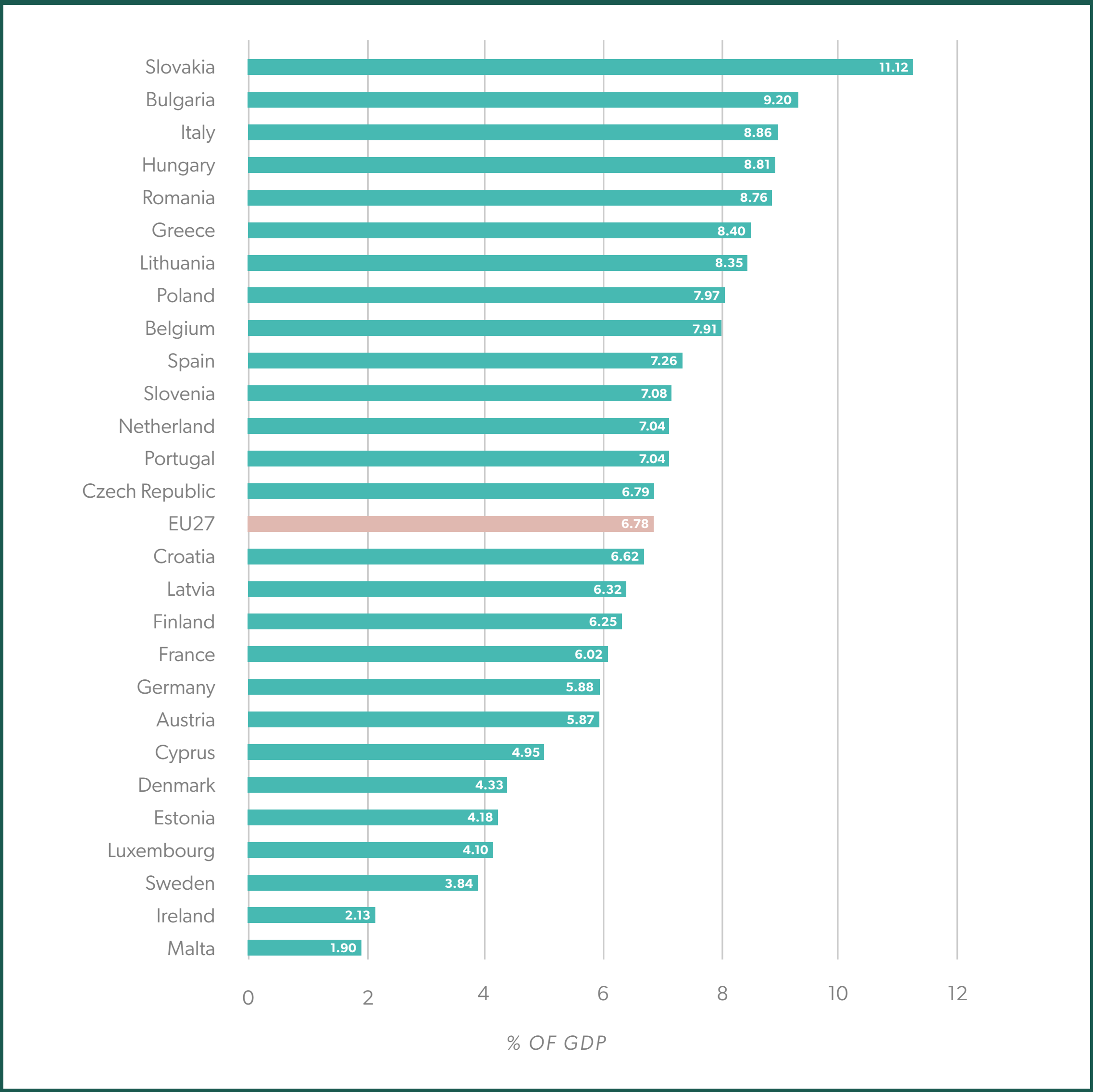


Figure B: Co-benefits of a 1.5°C compatible energy transition pathway to 2030, % of 2022 GDP

Source: CAN Europe calculations based on COMBI

Beyond ensuring a healthy and fair future for everyone, the economic figures also indicate that performing a Paris Agreement aligned transition then presents significant co-benefits, adding to the welfare gained through the avoided climate change losses. The quantification of various direct co-benefits arising from a 1.5°C PAC-compatible scenario amounts to at least €1 trillion by 2030 for the entire EU27 as a whole.

6) https://combi-project.eu/

COMPARISON BETWEEN ADDITIONAL COSTS AND BENEFITS OF CLIMATE ACTION FOR THE EU

We used the forecasted baseline (business-as-usual) investment and energy system costs to 2050 provided by the European Commission to estimate the additional costs that would be implied for implementing a 1.5°C compatible pathway (achieving net zero by 2040, across the EU). These figures can be used indicatively for a comparison of costs with co-benefits and avoided climate change losses.

Our indicative findings suggest 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 (Figure C below) by a factor ranging between 1.4 and 4 to 1, illustrating an unequivocal rationale for taking action.

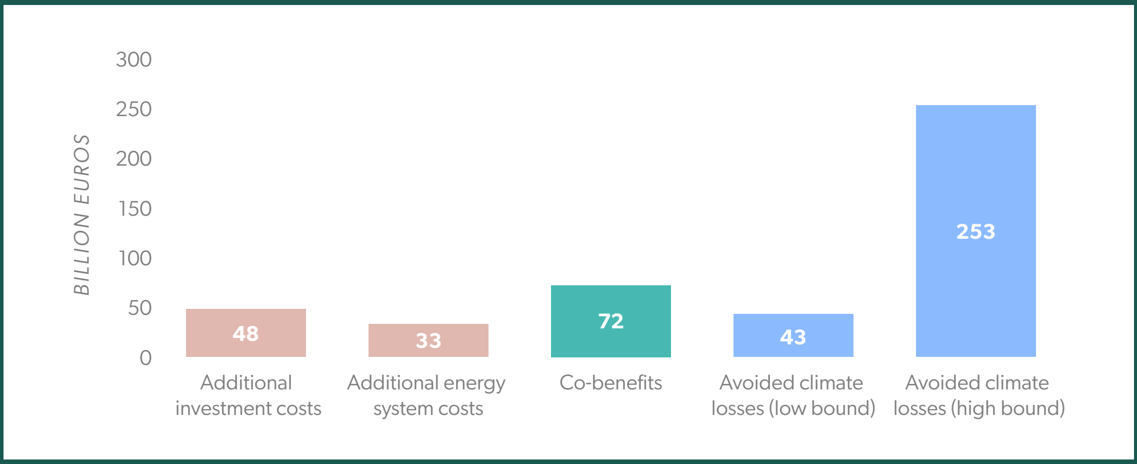


Figure C: Indicative comparison of annual costs and benefits to 2030

Source: European Commission and CAN Europe analysis based on COMBI and COACCH models

Finally, in this report the aggregated data at the EU27 level is broken down to the national level and the respective co-benefits of climate action are calculated for a subset of 13 EU Member States: Belgium, Bulgaria, Czechia, Denmark, Croatia, Estonia, Slovenia, Germany, Hungary, France, Spain, Portugal, Poland (see Section 3.3)

Overview

2.1 INTRODUCTION: LIMIT TO 1.5°C

Science has been clear for decades: our world is warming fast and human-induced greenhouse gas emissions are the cause. The recent IPCC synthesis report of the Sixth Assessment Report[7] has confirmed one more time that with incremental global warming, the risk of irreversible damage and coming close to or even crossing systemic tipping points, increases. The Stockholm Resilience Centre's latest update reports that six out of nine planetary boundaries have been crossed already[8].

In light of the current +1.2°C increase of global temperature and the available science, we will not be able to fully avoid the effects of climate change[9]: even in a 1.5°C warming scenario, the world will experience worse and more frequent impacts such as extreme weather events and rising sea levels, with related losses and damages to people and social cohesion, national economies, agricultural production and nature. These devastating effects of climate change are no longer a vague possibility in the distant future, but a tangible reality that we are already experiencing today. Heat waves, droughts, forest fires, floodings and failed crops —along with others—are all features we will need to cope with more and more in the coming years.

And yet, there is (still) hope. While the window of opportunity is rapidly shrinking, the IPCC report clearly indicates that **we are still in time to limit global temperature increases to 1.5°C** by the end of this decade and avoid the worst impacts of climate change. We know what needs to be done to achieve that objective: governments need to act now to reduce global greenhouse gas emissions by 2030 and accelerate a fair energy transition, phasing out fossil fuels while reducing social inequality.

The EU and its Member States need to take decisive and bold climate action. First, for a matter of justice. Both the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement emphasise the need for countries to act faster based on their historical responsibilities for greenhouse gas emissions and due to their respective economic capabilities. It is clear that the **EU has both the historical responsibility and the capacity to act faster than others,** as it has both greater than average historical emissions and greater than average GDP per capita. Against this backdrop, the EU must achieve at least 65% gross emissions reductions by 2030 and net zero emissions as well as a 100% renewable-based energy system by 2040 at the latest. These targets are ambitious, but feasible and needed. It is a matter of global equity: people who will suffer the most disastrous impacts of the climate crisis in many countries and communities around the world are the ones who have contributed the least or negligibly to causing climate change.

But the climate crisis is also having **tangible and devastating impacts on people in the EU,** to which EU governments are directly accountable. Europe is one of the regions of the world warming up faster than the global average. According to the European Environmental Agency (EEA)[10], the mean annual temperature over Europe in the last decade was already above 2°C warmer than during the pre-industrial period. Many climate impacts are already worsening in Europe. Those most affected tend to be those already at a disadvantage, because of their age, health or socio-economic status.[11]

7) https://www.ipcc.ch/report/ar6/syr/. Accessed 9 January 2024.

8) https://www.stockholmresilience.org/research/planetary-boundaries.html. Accessed 9 January 2024

9) https://climate.copernicus.eu/record-warm-november-consolidates-2023-warmest-year#:~:text=Every%20month%20since%20June%20was,and%20two%20record%20breaking%20seasons. Accessed 9 January 2024.

10) https://www.eea.europa.eu/ims/global-and-european-temperatures. Accessed 9 January 2024.

11) https://www.eea.europa.eu/publications/just-resilience-leaving-no-one-behind. Accessed 9 January 2024.

Among other impacts, human health is significantly influenced by climate change. The effect of worsening air quality, pollution, frequency and intensity of heat waves and anomalous disease outbreaks is already consistently affecting people. In large parts of Europe, lower-income groups are more likely to face higher exposure to air pollution living next to busy roads or industrial areas.[12] Heatwaves are another devastating example: latest estimates by the WMO[13] determine that in summer 2022 – the hottest European summer on record – more than 16,000 people died across the EU due to heat-related causes. This is even an underestimation according to a study published by Nature[14] where over 60,000 deaths have been reported.

Similar discourses can be applied to air pollution that is responsible for the premature death of thousands of Europeans (300,000 deaths/year due to anomalous particulate matter levels alone), floods, droughts, fires and extreme storms, and the situation is only going to get worse if we remain on the current track. The European Commission's Joint Research Center (JRC) reports that without a proper mitigation strategy, the annual death-tolls from heat waves by the end of the century are projected to be more than 30 times higher as of today[15]. According to the IPCC, the health of low income households is disproportionately affected by climate change, for example, during heatwaves in the Mediterranean[16]. The elderly, women and people with disabilities are also disproportionately affected by heat. Energy-poor households often live in thermally inefficient homes and cannot afford air conditioning to adapt to overheating in summer.

Despite the dramatic social costs of climate change, the economic argument is still used as a justification to delay the energy transition and climate action in both policy circles and the media. However, the available evidence suggests that the co-benefits of a 1.5°C compatible pathway far outweigh the cost of ambitious action[17] on many levels– which should be sufficient for decision makers to provide bolder answers to the climate crisis.

2.2 CLIMATE ACTION IS ECONOMICALLY BENEFICIAL

Accelerating and scaling up climate action will be economically beneficial for all EU countries both in the short term and the medium to long term. The range of economic co-benefits that EU countries will harvest by investing in an accelerated climate transition in line with 1.5°C is articulated in a wide spectrum of direct and indirect economic benefits.

By **co-benefits**, *we refer to all positive impacts related to climate mitigation measures,* i.e. related to climate and energy policies, measures and actions on the economy. The positive impact on employment of a well-designed policy boosting renewable energy production would be such an example. Direct economic co-benefits could also comprehend ancillary impacts of climate action, including improving the productivity of resources and people (affected or not by climate change impacts), boosting innovation by seeking solutions amid new challenges, increasing the environmental benefits or improving ecosystem services.

By **avoided losses,** *we refer to all the benefits related to avoiding the worst impacts of climate change and the related welfare losses.* Climate change is already an expensive business for Europe even when accounting for a restrictive set of impacts: according to the EEA, welfare losses just from weather and climate-related extremes between 1980 and 2021 amounted to over half

12) https://www.eea.europa.eu/publications/healthy-environment-healthy-lives , page 70. Accessed 9 January 2024.

13) https://library.wmo.int/doc_num.php?explnum_id=11698. Accessed 9 January 2024.

14) https://www.nature.com/articles/s41591-023-02419-z#Sec8 Accessed 9 January 2024.

15) JRC, Preseta IV https://joint-research-centre.ec.europa.eu/system/files/2020-09/11_pesetaiv_heat_and_cold_sc_august2020_en.pdf. Accessed 9 January 2024.

16) https://www.ipcc.ch/report/ar6/syr/. Accessed 9 January 2024.

17) European Commission (2020), Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people impact assessment.

a trillion euros[18] across the EU27. While we acknowledge that it's not straightforward to allocate a precise figure correlating climate action and avoided costs, Figure 1 also illustrates the constant increase of losses from climate-related extreme events since the 1980s.

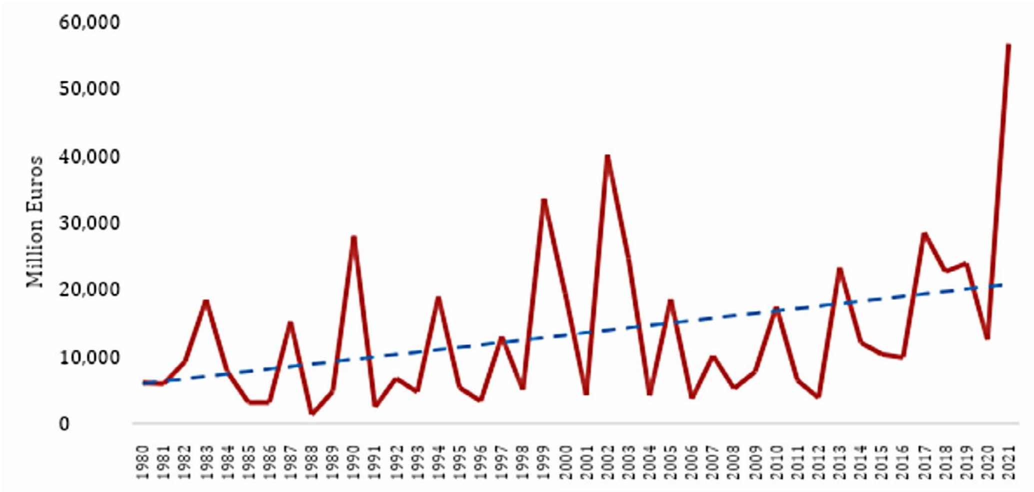


Figure 1: Climate-related economic losses, EU27 (1980-2021)

Source: Eurostat

2.2.1 OVERVIEW OF BENEFITS

The societal and environmental benefits of climate action in general and the transition to renewable energy and energy savings in particular are obvious and include effects on e.g. jobs, biodiversity, air quality, water management, human health, emissions reductions themselves. However, we are not looking at how these societal benefits will be shared within societies as this will ultimately depend on the measures put in place to ensure a fair distribution of such benefits and of the costs to finance climate action.

Examples of avoided economic losses and co-benefits concerning health, reduced material footprint, the cost of living, employment (green jobs creation) and reduction of energy poverty are reported below:

HEALTH

The World Health Organisation (WHO) reports that, if its respective guidelines for fine inhalable particles[19] would have been attained in the EU in 2019, we would have registered 58% less premature deaths in the EU-27 for the same year[20]. Indeed, the health costs of premature mortality and morbidity in the EU due to exposure to air pollution from fossil fuel combustion remain extremely high in the majority of EU Member States (Figure 2 below).

18) https://www.eea.europa.eu/publications/assesing-the-costs-and-benefits-of. Accessed 9 January 2024. The exact amount is EUR 560 billion, based on euro values in 2021.

19) with diameters that are generally 2.5 micrometres and smaller (PM 2.5) of 5 µg/m3

20) *https://www.eea.europa.eu/publications/air-quality-in-europe-2021/health-impacts-of-air-pollution Accessed 9 January 2024.*

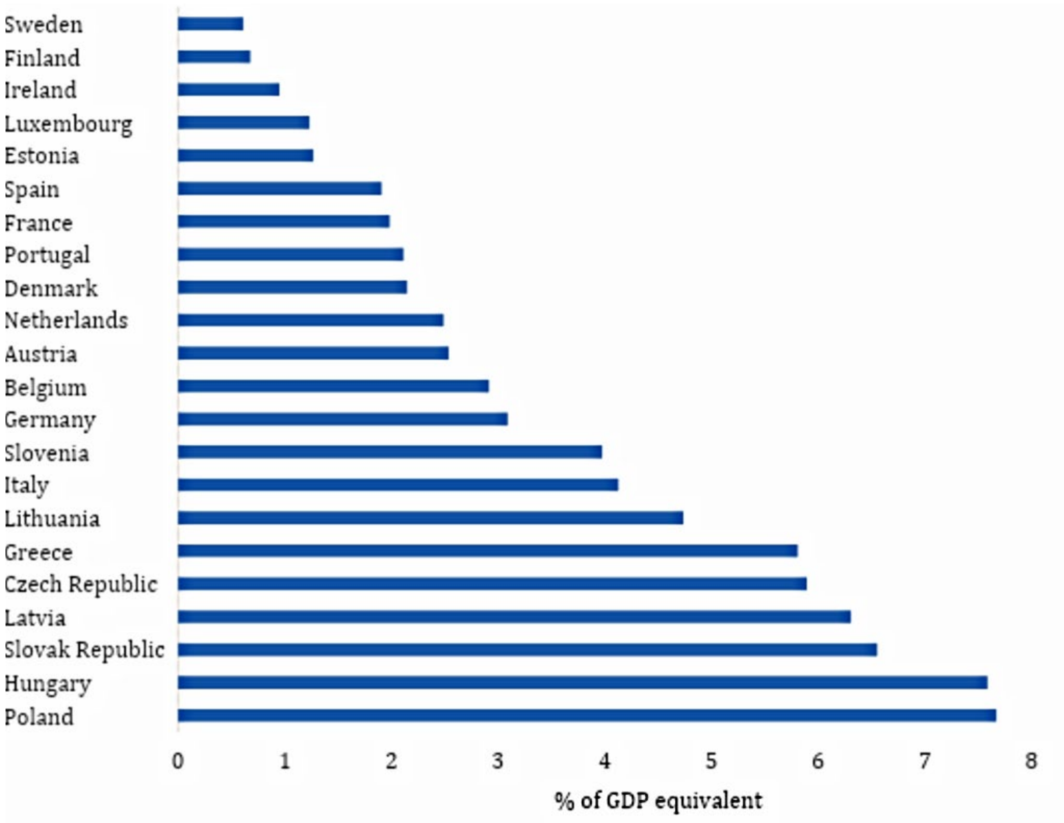


Figure 2: Cost of premature mortality and morbidity due to exposure to PM 2.5

Source: OECD 2021

ENERGY SUPPLY & SECURITY

Safer and affordable energy supply, less dependent on geopolitical turmoil is crucial for prosperous societies and a resilient and sustainable economy. A virtuous energy transition thus entails being able to diversify the sources of energy and cut import dependency. Adopting measures to avoid fossil fuel imports and combustion generation investments would not only reduce the overall energy intensity, but also the price and use of energy.

REDUCED MATERIAL FOOTPRINT

Resources[21] are at the core of the European Green Deal, as their consumption needs to be cut and at the same time revised thoughtfully to equip societies with what is needed to perform the transition. In these terms, a transition where ambitious energy efficiency and energy consumption reduction targets are adopted, would allow to reduce the resources extraction, the relative costs and material footprint. This is possible as cutting the final energy consumption also means reducing the input of raw materials needed and the emissions avoided from its consumption.

EMPLOYMENT

The European Commission, through the 2019 Employment and Social Developments in Europe (ESDE) report[22], investigated the effects on employment that a scenario to stay within 2°C by 2050 would imply in the EU. The main findings register a +1.1% employment and +0.5% GDP

21) Resources include raw materials such as fuels, minerals and metals but also food, soil, water, air, biomass and ecosystems (A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy)

22) https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8219&furtherPubs=yes Accessed 9 January 2024.

growth that correspond to 1.2 million jobs in the EU by 2030 and 12 million jobs expected to be created under this baseline (from 2015 to 2030)[23]. The most recent ESDE report (2023)[24] states that almost all occupational categories are expected to benefit from the implementation of the European Green Deal but that at the same time: "*without the right policies, potential losses could reach up to 494,000 jobs (-0.26% at aggregate level by 2030, and up to 1.7 million jobs (-1.4%) in market services)*".

Furthermore, data from the International Energy Agency and other academic studies suggests that the employment intensity with energy transition investments is significantly higher compared to investments in fossil fuel infrastructure, internationally. Although these assessments are not EU-specific, they do indicate that for the same level of investment, more jobs can be created in green sectors compared to fossil fuel sectors. Evidently, macro-quantitative figures do not assess important qualitative dimensions, such as who will access those jobs, where the new jobs would be created, or whether they will consist in decent jobs - pointing to the need of well-designed accompanying policies for a socially just transformation.

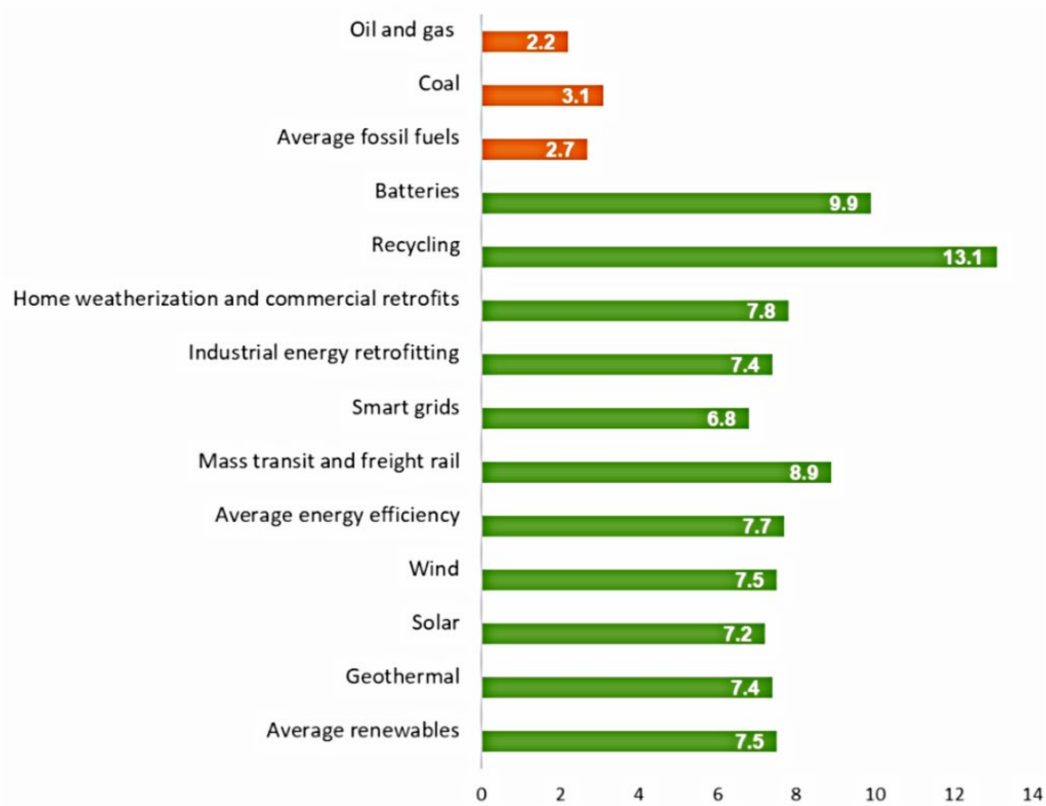


Figure 3: Full time equivalent jobs created per USD million invested, synthesis of evidence

Source: IEA, 2020[25]; Garrett-Peltier, 2016[26]; Garrett-Peltier & Pollin, 2009[27]

Similarly, the International Labour Organisation (ILO) reminds us that 40% of world employment relies directly on a healthy and stable environment suggesting that by 2030 over 2% of working hours worldwide may be lost each year due to climate change[28].

23) The positive impact on GDP and the number employed is largely due to the investment activity required to achieve such a transition, together with the impact of lower spending on the import of fossil fuels

24) https://ec.europa.eu/social/BlobServlet?docId=26989&langId=en. Accessed 9 January 2024.

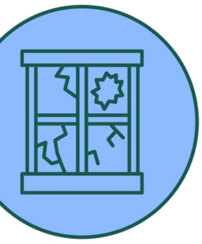
25) IEA (2020), Sustainable Recovery, IEA, Paris https://www.iea.org/reports/sustainable-recovery. Accessed 9 January 2024.

26) Heidi Garrett-Peltier (2017). Green Versus Brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model. Economic Modelling Vol 61.

27) Garrett-Peltier, Heidi and Pollin, Robert (2009) Job Creation per $1 Million Investment. Political Economy and Research Institute, University of Massachusetts

28) https://www.ilo.org/global/topics/green-jobs/WCMS_824102/lang--en/index.htm. Accessed 9 January 2024.

COST OF LIVING



Climate action can generate savings for EU citizens on basic social necessities like heating, lighting, or cooling their homes. The International Energy Agency states that: *"EU electricity consumers are expected to save an estimated 100 € billion during 2021-2023 thanks to additional electricity generation from newly installed solar PV and wind capacity."*[29] The ESDE report cited above highlights that lower consumer prices connected to solar photovoltaic electricity are likely to have positive impacts on incomes and consumer expenditure capacity. However, it is also important to note that without adequate financial and non-financial support to access renewables, households facing energy poverty or precarity risk being locked into fossil energy infrastructure and excluded from the energy transition's benefits.

This connects to the efforts to fight energy poverty, a multifaceted phenomenon which, in 2022, left 42 and 50 million people in the EU (2022) unable to keep their home adequately warm[30,31]. Energy poverty finds its roots in three main factors:

- low energy efficiency and energy performance of buildings
- high energy prices
- low income levels[32]

The energy transition should be designed to provide affordable and accessible clean energy to households, and the energy performance of homes should be improved through equitable renovations and measures to install renewable heating and cooling systems, which do not place an economic burden on low income households. While the energy transition cannot replace adequate policies to end poverty and reduce inequality, it has the potential, if well designed, to address two causes of energy poverty: high energy prices and poor energy performance of buildings. Tackling energy poverty through climate action is an opportunity to demonstrate that ambitious measures to combat climate change can be an investment in a more just society and not simply a cost to be compensated for.

With the right measures in place, improving the energy performance of buildings would reduce energy demand and increase living comfort, while permanently reducing energy bills and vulnerability to price hikes, as well as creating new jobs. This win-win scenario would enable low-income households to adapt successfully to potential short-term rises in energy prices while simultaneously facilitating their transition to renewable heating.[33]

29) https://www.iea.org/reports/renewable-energy-market-update-june-2023/how-much-money-are-european-consumers-saving-thanks-to-renewables. Accessed 9 January 2024.

30) https://www.eesc.europa.eu/en/news-media/press-releases/energy-poverty-42-million-people-eu-cannot-afford-heat-their-homes-adequately. Accessed 9 January 2024.

31) https://righttoenergy.org/. Accessed 9 January 2024.

32) https://energy-poverty.ec.europa.eu/system/files/2022-06/EPAH%20handbook_introduction.pdf. Accessed 9 January 2024.

33) https://caneurope.org/content/uploads/2022/05/01_The-social-benefits-of-climate-action_14.pdf. Accessed 9 January 2024.

REDUCING INEQUALITIES

However, climate mitigation and adaptation measures need to be properly designed, not to increase socio-economic and gender inequalities. Avoiding the exacerbation of other forms of discrimination and marginalisation means for example that greening urban spaces shouldn't be a prerogative of the wealthiest parts of cities, but also of neighbourhoods inhabited by low-income people. It also means that adequate financial support should be provided to low and middle-income households to renovate their homes together with measures to encourage energy communities especially in marginalised areas.

Policies to deliver a just climate transition also imply that public transportation is extended to remote areas inhabited by people who basically depend on their cars to move around, including for work and that these people get realistic access to electric vehicles. For workers in sectors that will be phased down, such as the fossil fuel industries and coal mining, proper planning aimed at guaranteeing no loss of income, adequate training and access to new green jobs close to their living place must be conducted beforehand. Whilst the evidence is conclusive on the fact that climate change impacts will exacerbate inequalities, especially if the Paris Agreement targets are not achieved, it is also important to stress that climate mitigation and adaptation policies can be socially just and contribute to reducing inequality, or can exacerbate them – depending on how they are designed.

Our findings in this report focus on aggregate data on job creation and health benefits of climate action – which are very important as they show that overall, climate action generates societal benefits.

Overall, these benefits are also showing that climate action is fundamental to pave the way towards a more resilient and just society where future challenges, needs and the worst impacts on climate, society, biodiversity and ecosystems are cushioned thanks to a farsighted vision.

Methodology and findings of this study

3.1 ABOUT THIS STUDY

The present assessment of benefits is based on the Paris Agreement Compatible (PAC 2.0) scenario, and its underlying modelling[34], which aims to construct an energy scenario aligned with the Paris Agreement's objective to limit global warming to 1.5°C, for all 27 EU Member States and the EU on an aggregated level[35]. PAC energy transition pathways are provided for each individual EU Member State. Using this data allowed us to derive country-specific estimates of the co-benefits of the energy transition, and to compare them against a business-as-usual pathway or other, less ambitious scenarios.

The PAC 2.0 scenario, for the EU and its Member States to contribute their fair share to limit temperature rise to 1.5°C, is guided by three major goals:

- At least 65% reduction in greenhouse gas emissions by 2030
- Net-zero greenhouse gas emissions by 2040
- A 100% renewable energy system by 2040 in all sectors

In order to achieve the above, the PAC 2.0 follows a drastic energy demand reduction pathway across all demand sectors (transport, industry, buildings and lifestyle changes), leading to a reduction of more than 50% by 2040 over 2020 in terms of final energy consumption. In the scenario, this is achieved through more soundly organised societies, energy efficiency measures, and increasing electrification rates. At the same time, PAC 2.0 foresees an ambitious deployment of renewables (at least tripling renewables capacities), while rapidly phasing out fossil fuels.

To derive both the avoided losses and the co-benefits of this 1.5°C compatible scenario, we respectively use an existing climate-economic model and an existing energy-economic model that match closely the emissions and energy transition targets of the PAC 2.0 scenario. The models we use, that are described in the following sections are the COACCH interface to quantify avoided losses and the COMBI project to calculate co-benefits. The chosen variables included in our quantitative assessment, as well as EU and national-level results, and their limitations, are further detailed below.

34) https://www.pac-scenarios.eu/. Accessed 9 January 2024.

35) PAC scenarios for energy infrastructure, "How a Europe on track of meeting the 1.5°C goal would look like in 2030" https://www.pac-scenarios.eu/pac-scenario/how-a-europe-on-track-of-meeting-the-15c-would-look-like.html#Introduction. Accessed 9 January 2024.

3.1.1 MEASURING CO-BENEFITS

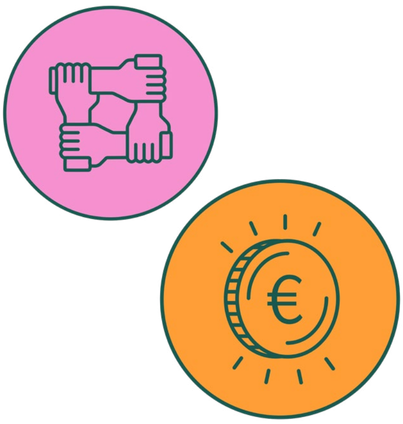
Given that the PAC 2.0 scenario does not embed socio-economic co-benefits within the model, we reviewed existing data, tools and models that closely match a 1.5°C aligned pathway, in order to provide an estimation of co-benefits at both the EU level and for individual Member States.

The co-benefits of climate action are multiple and not always easy to quantify in a holistic way, especially when it comes to translating those in monetary terms. For example, in several of its impact assessments of overall climate targets or components of the energy transition, the European Commission mostly captures a restrictive set of co-benefits such as impacts on GDP and employment (through the PRIMES model).

Throughout our review, we screened quantification possibilities based on existing models, and key criteria such as (a) whether they capture a holistic set of co-benefits associated with an accelerated energy transition and (b) whether they provide national level estimations.

Based on those criteria, we determined that the most appropriate model for the purpose of the present analysis is the "*Calculating and Operationalising the Multiple Benefits of Energy Efficiency in Europe*" (COMBI) EU-Horizon 2020 project[36] coordinated by the Wuppertal Institute with several research partners[37].

The COMBI model aims to quantify the multiple energy and non-energy co-benefits of ambitious energy efficiency and energy consumption reduction measures in the EU-28 area, over and above baseline, existing targets.

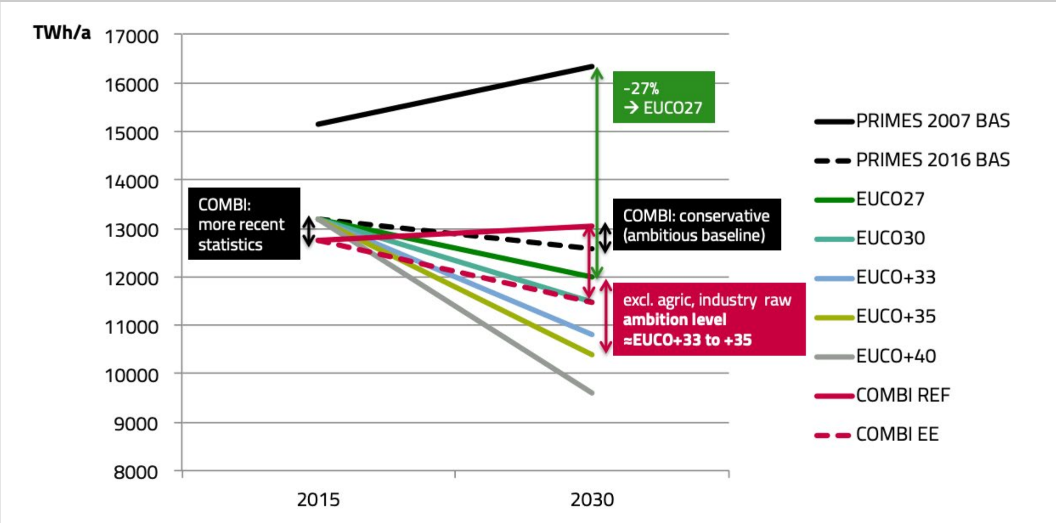


36) https://combi-project.eu/. Accessed 9 January 2024.

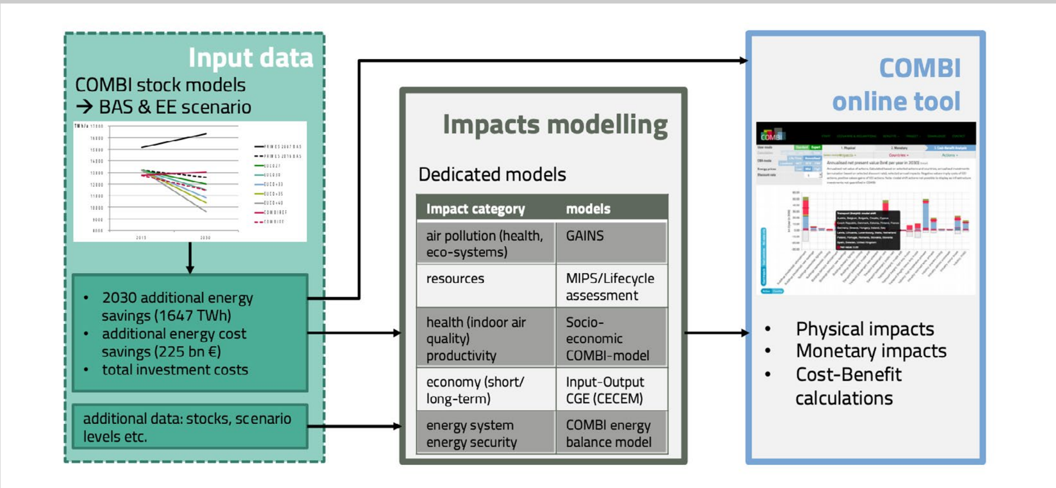
37) University of Antwerp, University of Manchester, Copenhagen Economics and ABUD/Advanced Buildings and Urban Design.

Box 1: The COMBI model

The COMBI input data modelling exercise produced a baseline scenario (based on existing EU legislation) and an efficiency scenario (based on ambitious assumptions on technology implementation following more ambitious policies), resembling the EUCO+33 scenario of the EU Energy Efficiency Directive impact assessment.



To achieve a more ambitious target (than current policy target), the COMBI model assesses the impacts of 31 individual impact indicators spread across 5 Work Packages, both in terms of energy savings as well as the co-benefits entailed through these measures. The impacts represent the additional co-benefits compared to a baseline scenario which is based on existing policy commitments.



As further analysed below, although not all impacts can be quantified, it provides for an extensive "monetisation" of co-benefits, allowing us to calculate estimates of the latter at both EU and national level. Overall, despite the fact the PAC 2.0 scenario is based on even stronger energy savings objectives, the COMBI results can be used as a basis for the measurement of the co-benefits associated with ambitious energy savings targets.

The choice of the COMBI model entails significant advantages and several disadvantages. Its advantages include:

- That it measures the co-benefits associated with an ambitious energy savings target, beyond "baseline" measures, which is close to the PAC 2.0 ambitious energy savings target.
- That it encompasses a broad range of co-benefits, as opposed to more restrictive models.
- That it provides not only EU-level figures but national level estimations for individual Member States as well.

On the other hand, a key limitation is that this approach models the co-benefits of one aspect of the energy transition, namely investments for aggressive energy savings, while leaving aside the other part of the equation: clean energy investments and related infrastructure. For the latter, we found no consistent model for capturing impacts at the national level. As such, this study documents one side of the equation, which equally means that our findings consistently underestimate the total co-benefits of a 1.5°C aligned pathway.

Although the COMBI model quantifies in total 31 individual impact indicators spread across 5 Work Packages, not all of those impacts can be monetised and captured, as outlined in Annex II. As further described in the following sections, the quantifiable monetary co-benefits considered in the framework of the present report notably encompass:

- Economic activity (including from household energy savings), and fiscal impacts of a 1.5°C aligned energy transition.
- Social outcomes, such as employment and positive health impacts of a 1.5°C aligned energy transition.
- Reduced energy system costs and energy security impacts.
- Reduced material footprint and avoided resources extraction costs resulting from ambitious energy efficiency and energy consumption reduction targets.

3.1.2 MEASURING AVOIDED LOSSES AND THE COST OF INACTION

It's pivotal to stress that **adopting a 1.5°C compatible pathway would bring substantial less welfare losses than less ambitious pathways.**

For the purposes of quantification, we reviewed a wide range of existing climate-economic models, for determining which of those can be used to measure the avoided losses generated by a 1.5°C compatible pathway compared to inaction and to less ambitious climate mitigation scenarios. Key criteria in the selection process included (a) the breadth of climate impacts examined within those models, (b) the breadth of geographical coverage in order to provide estimates not only for the EU, but also for individual Member States.

The range of results relative to the impacts of climate and weather-related events on the economy, is considerably wide and diverse in the scientific literature. The high variability across the different studies reflects the complexity and different kinds of methodologies that can be adopted in conducting such analyses. Selected studies and models are described below to show existing differences in methodologies and approaches, as well as our selection process for quantifying the avoided climate losses in the context of the present report.

Box 2: Variability of results relative to the impacts of climate and weather-related events on the economy

The IPCC 6th Assessment Report (2021, 2022, 2023) provides a comprehensive overview of this variability where different models result in a wide range of outputs: for instance statistical models tend to lead to higher welfare loss estimates than structural modelling. The IPCC doesn't provide figures per se on the cost of climate change events, but rather depicts the variability of results coming from research on the subject. There are several reasons that explain their high variance, these models are in fact based on different specifications, societal assumptions, they consider diverse sectoral, geographic and time scopes from which different economic implications eventually arise. In addition, since these models are usually taking into account only a certain number of factors in their scope, they are also likely to offer underestimated projections. In this regard, the cost of inaction estimates made since the 5th Assessment Report (2014) by the IPCC show a trend going towards higher estimates than the ones made before, suggesting an overall underestimation in the previous ones. The wide range of estimates and the lack of comparability between methodologies does not allow for identification of a robust range of estimates with confidence.

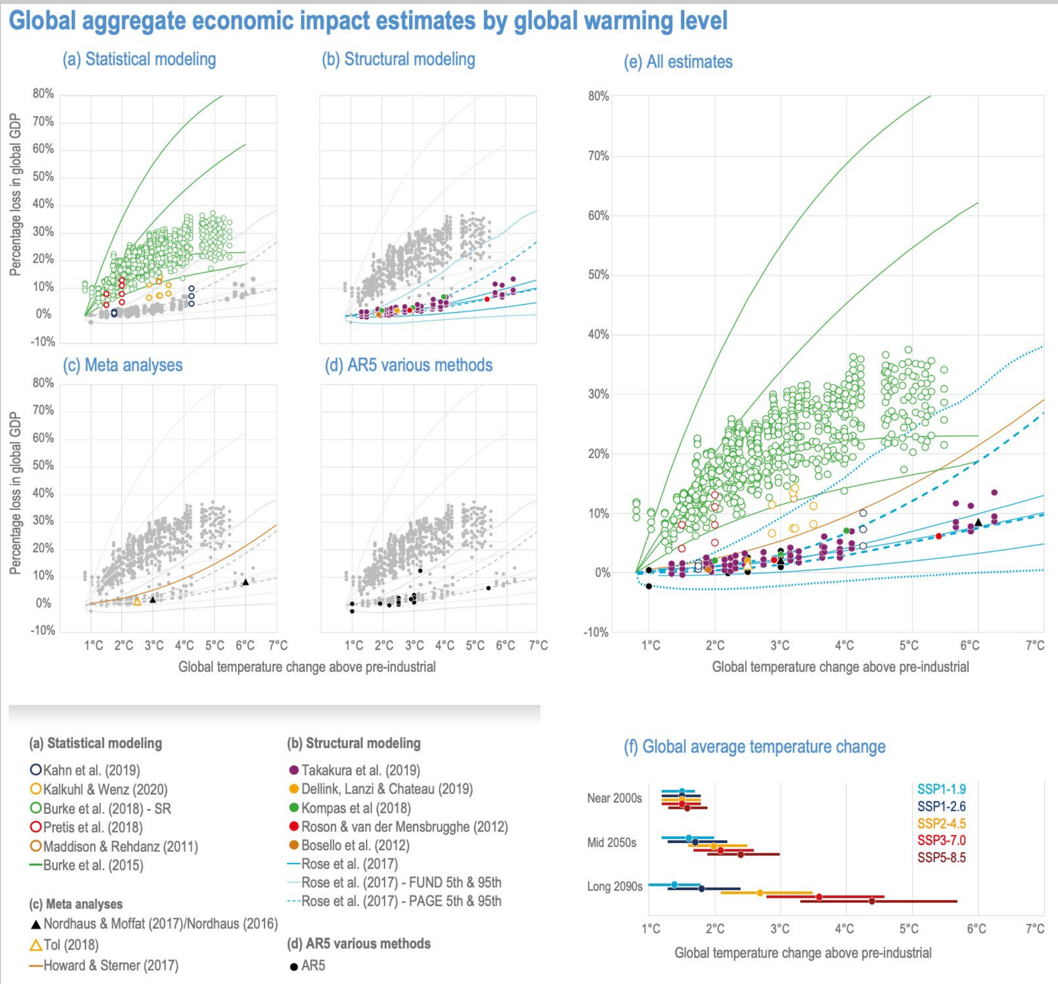


Figure 4: Global aggregate economic impacts of climate change by global warming level

Source: IPCC 6th Assessment Report

According to the PESETA IV project (2020)[38] conducted by the European Commission's Joint Research Center, for the EU a 2°C global warming scenario entails facing a welfare loss of 83 billion euros/year (0.65% of GDP), while a 3°C global warming scenario would account for at least 175 billion euros/year (1.38% of GDP) to 2100. Vice versa, keeping global warming to 1.5°C would reduce the additional welfare loss to 42 billion euros/year (0.33% of GDP). This means that, if we look at the longer term, the benefits (avoided losses) of acting to limit global warming to 1.5°C would amount to 41 billion euros/year compared to a 2°C pathway, and to 133 billion euros/year compared to a 3°C pathway to 2100. However, the PESETA IV project entails only a sub-set of benefits and national-level climate losses are not publicly available.

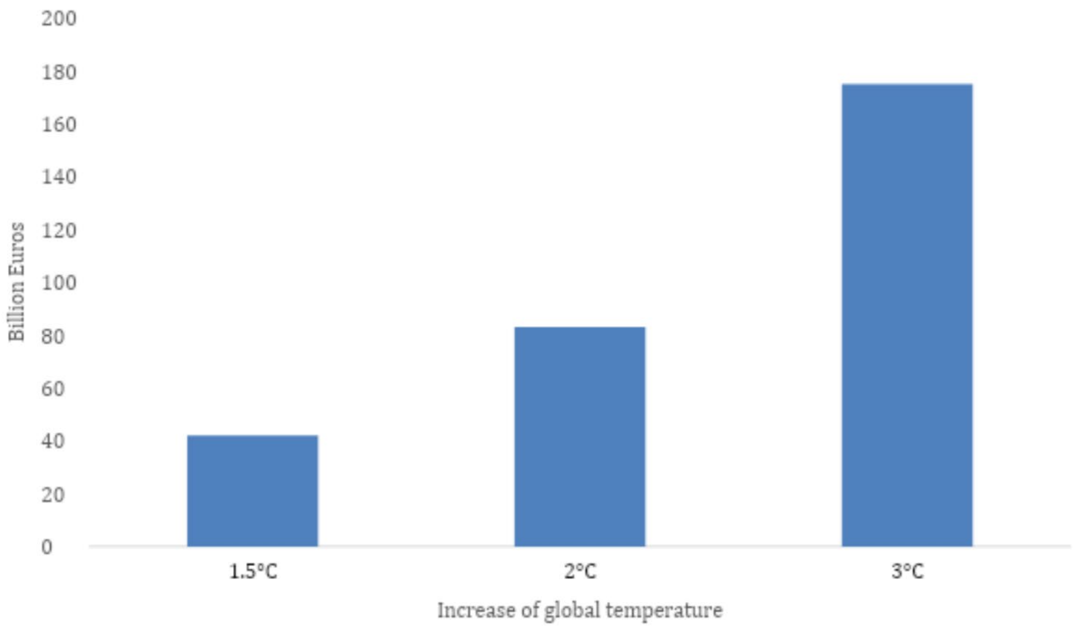


Figure 5: Additional annual welfare loss of the PESETA IV study under different climate change scenarios, EU27 +UK

Source: Joint Research Center, European Commission 2020

Burke et al. (2018) provide a model where the damages estimations are global and correspond to 20 trillions of US $, assuming the European global GDP share of ~17%, its corresponding figure is between 3,000 and 4,000 billion euros in 2100. Their approach measures potential global and country-level damages using gross domestic product (GDP), therefore their analysis is likely to provide underestimated figures as it doesn't take into account several sector-specific impacts e.g. impacts on agriculture.

The "CO-designing the Assessment of Climate CHange costs" (COACCH 2021) model coordinated by the Euro-Mediterranean Center on Climate Change (CMCC) is based on detailed sector by sector projections of economic costs related to climate change in Europe. Its estimations state that the cost of inaction could be as high as 347 billion euros/year to 2100 versus the much smaller amount of 94 billion euros/year from performing a greenhouse gas reduction pathway that is similar to the PAC 2.0 virtuous transition scenario.

38) https://joint-research-centre.ec.europa.eu/system/files/2020-09/14_pesetaiv_economic_impacts_sc_august2020_en.pdf. Accessed 9 January 2024.

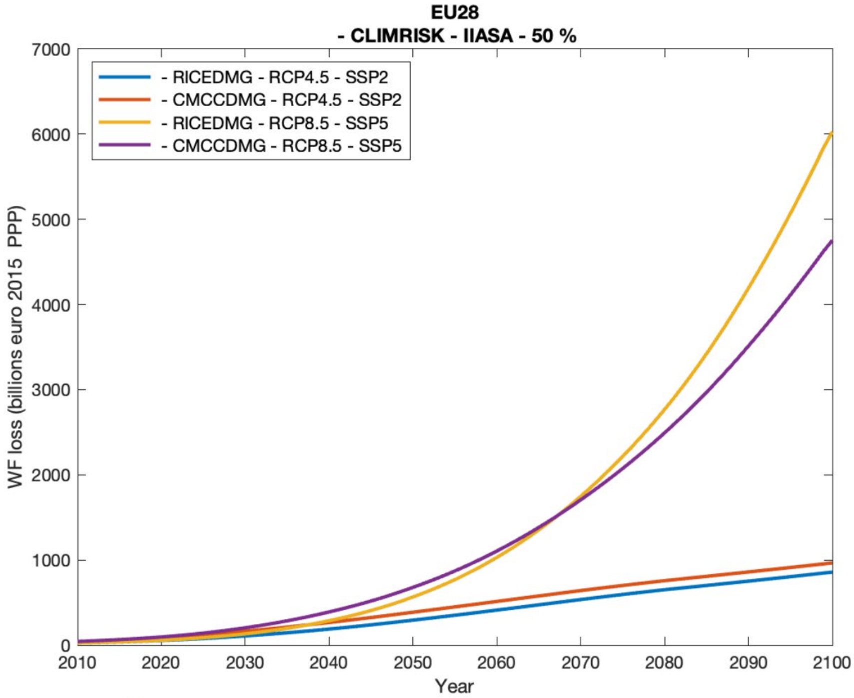


Figure 6: Evolution of climate costs in the 21st century Europe for various climate scenarios under the COACCH model

Source : Van der Wijst et al[39]

COACCH is a multi-country model including the direct impacts and the cross-sectoral linkages[40] on agriculture, forestry, marine fisheries, sea level rise, river floods, transport, energy supply, energy demand, labour productivity, human health, ecosystems. The cost of inaction is expressed as annual economic cost connected to damages in Euro reported as an equivalent of GDP % and also in this case it is likely to be underestimated as it doesn't take into account important non-market effects, like climate or biodiversity and climate or socio-economic tipping points.

Amongst the different methodologies and approaches, **this report showcases the cost of inaction figures based on the assumptions and considerations emerging from the COACCH model.** This assessment is in fact bridging the gap between econometric literature and general equilibrium models, historically leading to the high variance of results and, furthermore it offers:

- More accurate calculations regarding European Member States: other modelling studies such as Burke et al. and the other IPCC models are generally referring to a global scope and Europe-specific estimations are extrapolated only afterwards.
- Regional dynamics considerations, and has an accessible platform available for countries (the ICES model results have been downscaled at a more local disaggregated level).
- Aggregated as well as results at the regional level.
- Main messages that can be aligned with PAC 2.0 as well as its co-designed approach to climate change impact assessment that is in line with PAC 2.0 methodology.
- A strongly documented and transparent assessment.
- Data that are used by the European Environment Agency.
- An assessment funded with EU money and co-designed approach with a lot of different organisations (NGO, academics, etc.), which makes it a well recognised basis to work upon.

39) https://www.coacch.eu/wp-content/uploads/2018/03/D4.3_revMAR2022.pdf. Accessed 9 January 2024.

40) CGE approach brief explanation here? Or explanatory picture by Climact as annex

Box 3: Climate scenarios quantified in the COACCH model

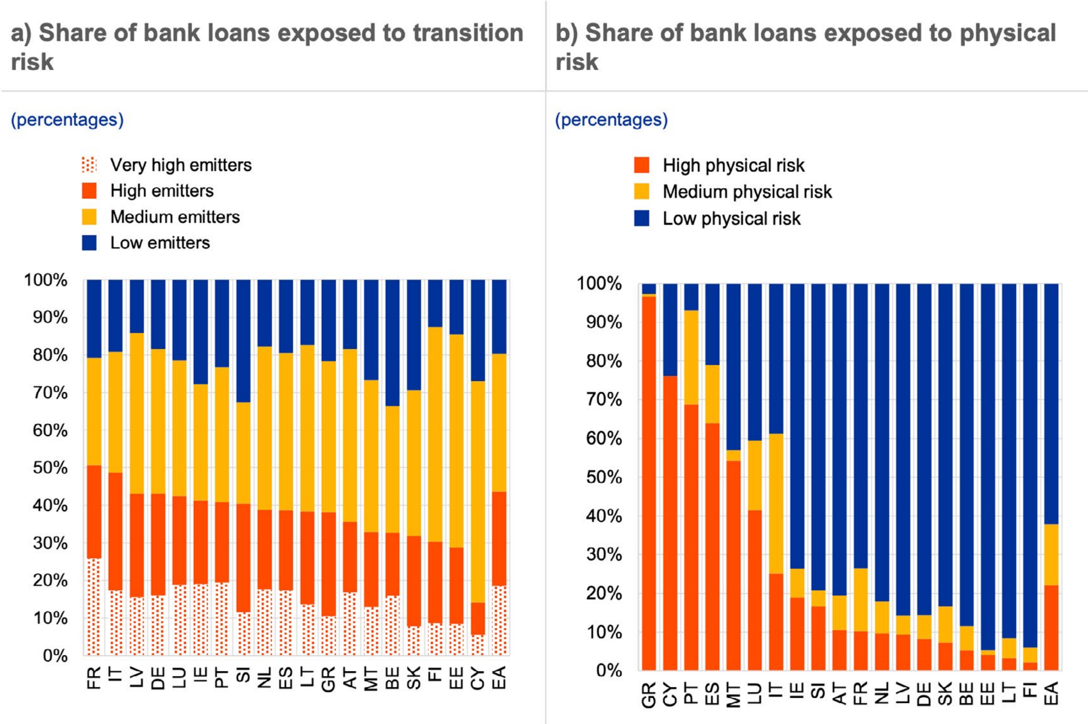
Following other Integrated Assessment Models and IPCC scenarios, the COACCH quantifies the economics impacts of climate change under four different scenarios (on which sub-scenarios are subsequently added):

- RCP 2.6, which reflects strong mitigation action and is the closest, quantified by the COACCH model, to a 1.5°C compatible pathway (temperature increase of 1.7°C by the end of the century as a central estimate)
- RCP 4.5 is a moderate action scenario (temperature increase of 2.7°C by the end of the century as a central estimate)
- RCP 6.0 reflects the current policies scenario (temperature increase of 3.6°C by the end of the century as a central estimate)
- RCP 8.5 reflects a very high emissions scenario (temperature increase of 4.4°C by the end of the century as a central estimate)

In short, the avoided losses (benefits) of a 1.5°C compatible pathway can be understood as the difference in economic losses between the RCP 2.6 scenario and the other, less ambitious scenarios, both for the EU and for individual Member States. This quantification exercise is presented in the following section.

However, there are limitations that need to be stressed, as all climate-economic models tend to understate the future impacts of dangerous climate change and consequently the benefits of bolder climate action. First, several non-market impacts are not included, such as direct impacts on ecosystems and biodiversity. Second, the fact that non-linear "systemic" economic risks and tipping points are not considered may translate into a significant underestimation of current and expected climate-related losses. As an example, the exposure of the European banking sector to climate-related risks, as documented by the European Central Bank (see Figure 7), could result in a cascade of financial losses, which in turn would translate into economy-wide impacts. Likewise, as analysed by a United Nations Environmental Programme report, significant increases of global food prices resulting from climate change could trigger significant macroeconomic impacts and climate-related fiscal risks[41].

41) https://www.unepfi.org/fileadmin/documents/ERISC_Phase2.pdf. Accessed 9 January 2024.



Sources: ECB calculations based on AnaCredi, Urgentem, and Four Twenty Seven Data (2018). Notes: Exposures are categorized as (very) high emitters if a firm's relative emissions are above the 70th (90th) percentile; exposures are categorised as low emitters if a firm's relative emissions are below the 30th percentile. Emission intensities include Scope 1, 2 and 3. Exposures are categorised as high physical risk if a firm's probability of suffering from a wildfire or a river or coastal flood in a given year is over 1%, exposures are categorised as low physical risk if a firm's probability of suffering from a wildfire or a river or coastal flood in a given year is less than 0.1%. Exposures are classified based on euro area creditor countries.

Figure 7: share of bank loans exposed to climate-related risks in the Eurozone

Source: European Central Bank[42]

Overall, while a wide range of studies have been conducted on the economic losses related to climate change impacts under different scenarios – and a wide range of different methodologies applied – **they all concur that, in the longer term, the more global temperature increases, the higher welfare losses will be across the globe and in Europe. As if it wasn't enough, it's worth stressing that these studies likely underestimate the economic impacts of inaction, as they do not account for harder to predict phenomena,** such as reaching tipping points or triggering more systemic and indirect impacts (e.g. migration, wars).

In addition (regardless of the fact that the estimations of the cost of inaction varies between studies) **all the models agree on the cost of inaction increasing overtime as well as on the significant avoided losses resulting from carrying out a timely climate and energy transition.**

42) https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op281~05a7735b1c.en.pdf. Accessed 9 January 2024.

3.2 EU LEVEL FINDINGS

3.2.1 CO-BENEFITS OF CLIMATE ACTION

To estimate direct co-benefits, we adjusted figures from the COMBI model, to reflect the fact that the PAC 2.0 scenario entails a more ambitious final energy consumption reduction target. More concretely, while the combination of policies and investments included in the COMBI model result in a final energy consumption of 11,500 TWh, the PAC 2.0 pathway results in about 8,500 TWh.

Two caveats are necessary for understanding our results, and the co-benefits measured through the COMBI assessment.

First, the COMBI model only includes an assessment of co-benefits associated with reducing energy demand through energy efficiency and related measures that lead to the aforementioned significant demand reduction. This means that, for example, co-benefits associated with a faster roll-out of renewable energy (e.g. employment creation) are not factored in the analysis despite their importance. In other words, only a sub-category of benefits are included and therefore their quantification is underestimated.

Second, although the COMBI model examines a wide range of channels through which investments and policy measures for drastically reducing energy demand generate socio-economic co-benefits, only a subset of those can be monetised in economic terms. This is due to both avoiding double counting as well as difficult-to-monetise impacts (e.g. value of biodiversity and ecosystem services).

Notwithstanding these caveats, a broad range of key economic and social indicators are captured, they are outlined and splitted in categories in Table 1.

Co-benefit category	Monetised indicators
Energy system/security	Avoided fossil fuel imports
	Avoided combustion generation investments
GDP / Welfare impact	Aggregate demand effects
	Public budget effects
Resources	Material Footprint (sum of abiotic & biotic & unused)
	Life-Cycle wide fossil fuel consumption (additional to direct combustion)
	Metal ores avoided extraction
Health	Avoided life years lost and premature mortality PM2.5
	Avoided premature mortality due to ozone
	Avoided excess winter mortality and winter morbidity (asthma)

Table 1: Typology of co-benefits monetised in the COMBI model

Source: CAN-E summary based on COMBI project[43]

43) https://combi-project.eu/wp-content/uploads/D8.1_tool-guide.pdf. Accessed 9 January 2024.

The results suggest that an accelerated energy transition pathway as described in PAC 2.0 that is aligned with 1.5°C, would generate direct co-benefits of at least €1 trillion already by 2030 for the EU-27 as a whole, factoring in energy system savings, positive welfare impacts in economic terms, avoided resource use and positive health impacts.

Although the largest economies logically experience higher co-benefits in absolute terms for a scale effect (Figure 8), in relative terms the expected co-benefits range from 2% of 2019 GDP for Malta and Ireland to more than 10% for Slovakia, with an EU average of approximately 6% (Figure 9). These results suggest that even if taking into account co-benefits only, the benefits of an accelerated energy transition pathway are significant and point to an unequivocal rationale for taking more ambitious action. Given that the COMBI model allows us to estimate impacts only up to 2030, it is important to note that the positive impacts would be higher if extrapolating those to 2040 and 2050 compared to a business-as-usual scenario.

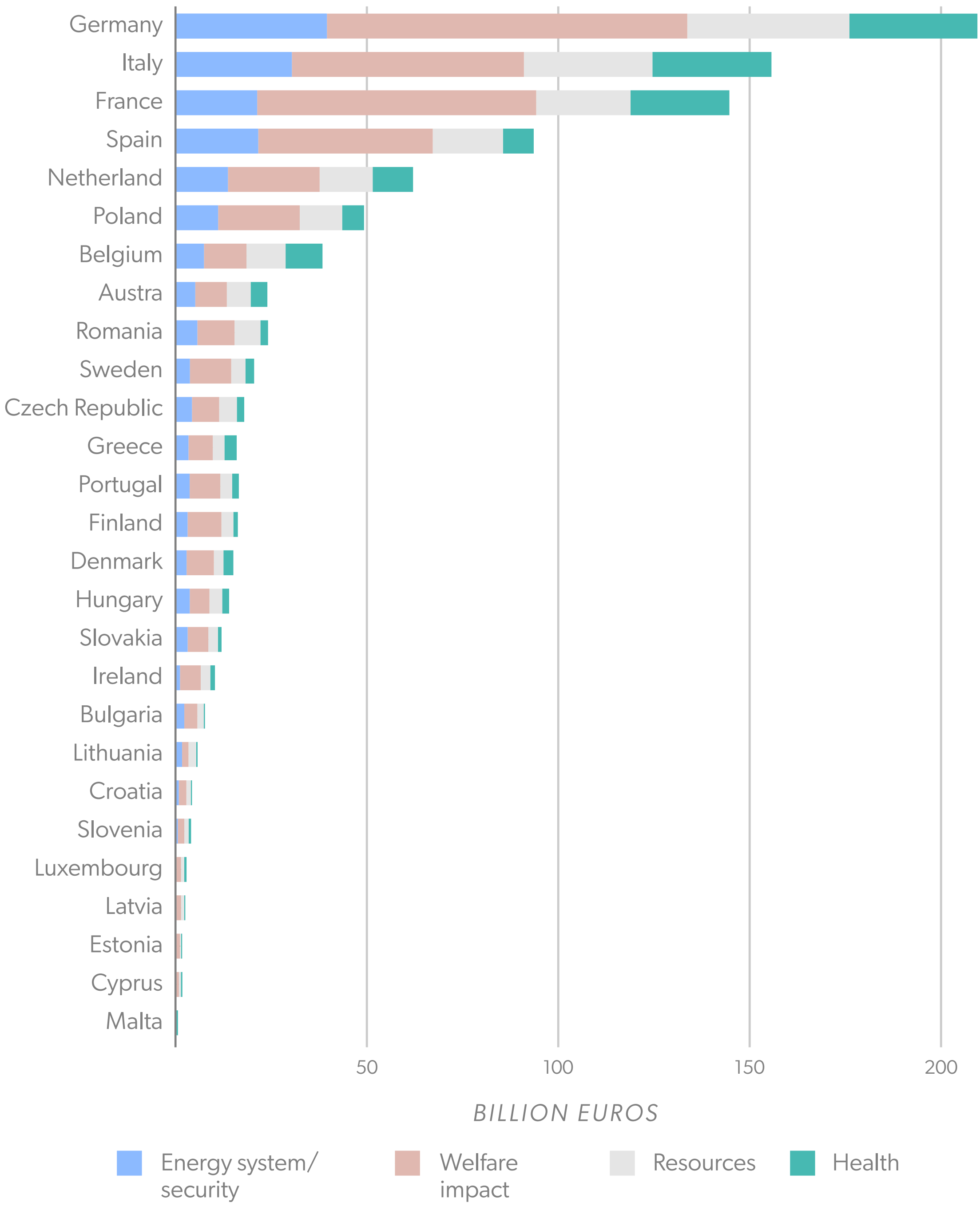


Figure 8: Direct co-benefits of a 1.5°C compatible energy transition pathway to 2030

Source: CLIMACT and CAN-E estimation based on COMBI project

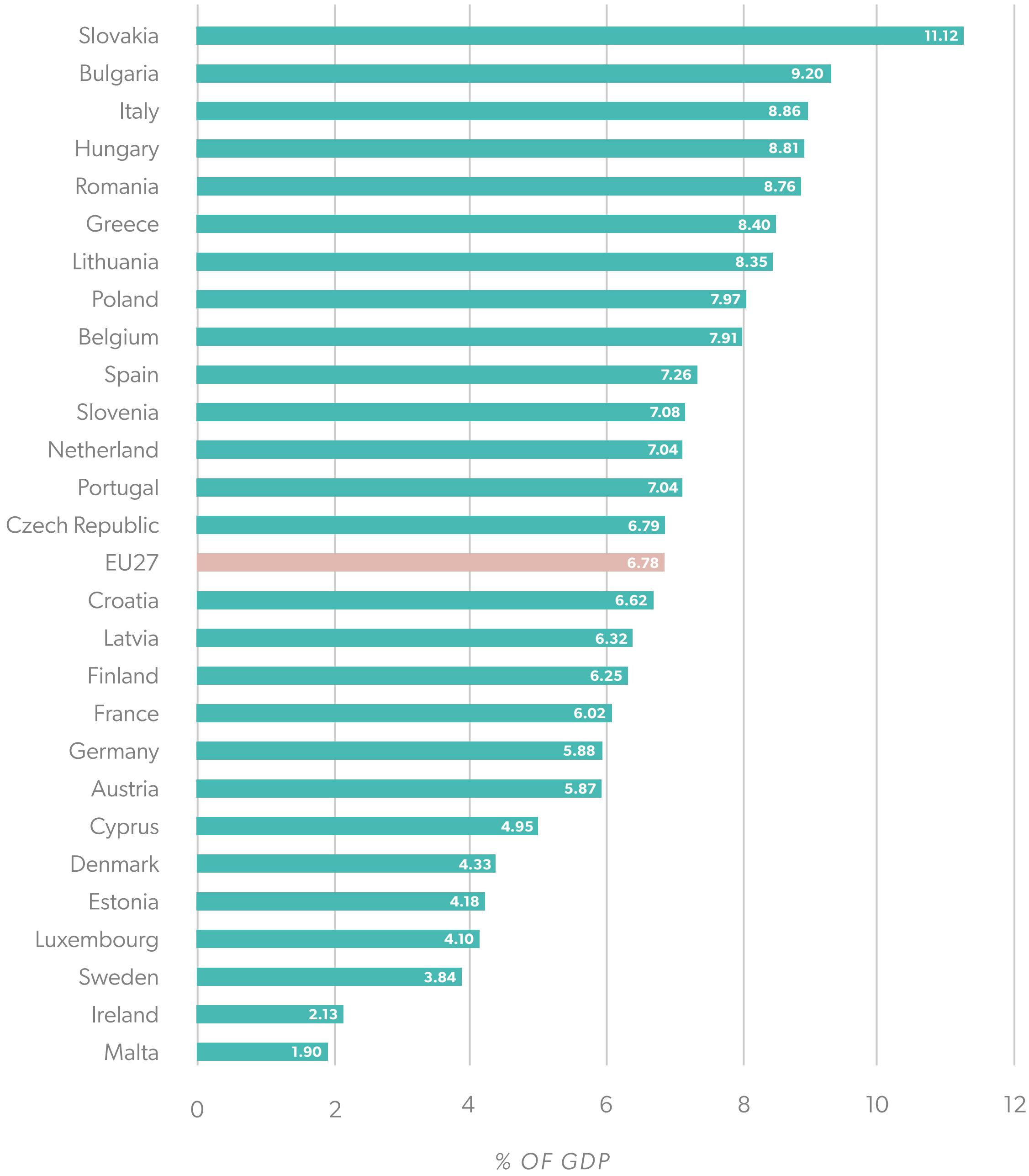


Figure 9: Direct co-benefit of a 1.5°C compatible energy transition pathway to 2030, % of 2022 GDP

Source: CLIMACT and CAN-E calculation based on COMBI model

Crucially, Figure 10 provides an overview of cost-benefit ratios[44] of the totality of measures included in the COMBI model, by country. Each Euro invested in energy efficiency and energy savings measures generated between 1.4 (Malta) and 4.7 euros (Luxembourg) of co-benefits. Every national level calculation yields then a favourable cost-benefit ratio, confirming that the pursuit of climate-neutral economies through a cost-effective implementation of a fully renewable energy system, coupled with the optimisation of energy efficiency and savings opportunities, outweighs investment costs.

44) Using the Benefit-Cost Ratio (BCR) calculation

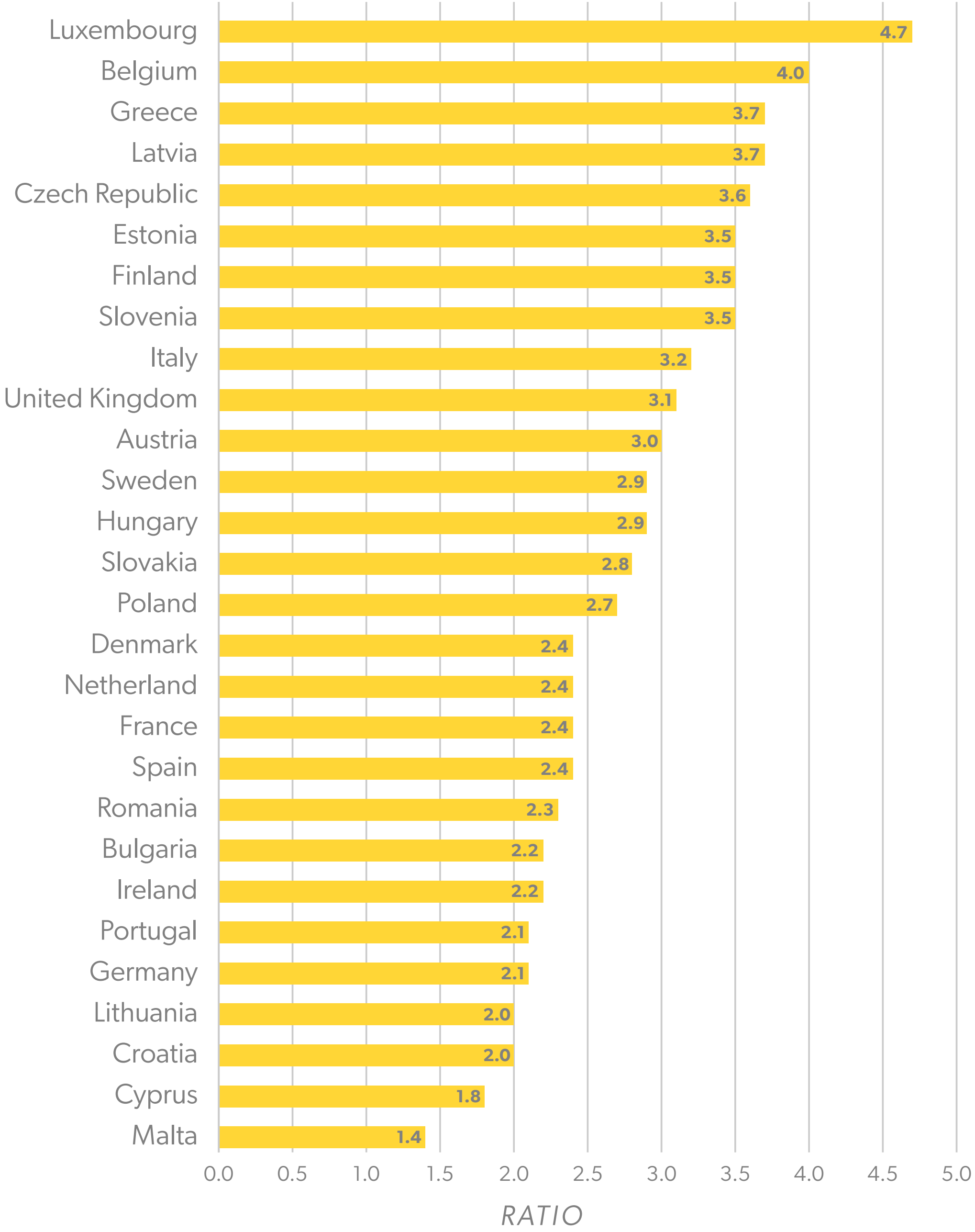


Figure 10: Cost-Benefit Ratio (BCR calculation) of investments and policy measures for achieving more ambitious energy savings targets

Source: COMBI model

3.2.2 BENEFITS IN TERMS OF AVOIDED CLIMATE CHANGE LOSSES

Using the COACCH model (see section 3.1.2), the costing of avoided losses is carried out at both the EU level and national level considering three different scenarios. The *inaction scenario* (no action undertaken), the stated policies scenario based on the current global framework leading to approximately 3°C temperature increase (therefore not only the EU-27 but globally) and the 1.5°C one corresponding to carrying out ambitious climate action as described in the PAC 2.0 scenario to keep global warming at 1.5°C.

The avoided losses are measured as the difference between the economic impacts of a 1.5℃ *scenario* with the *inaction scenario* and the stated policies scenario respectively.

In terms of the climate impacts considered to measure those avoided losses, Table 2 provides a comprehensive summary of the sectors that are considered in the analysis and the relative indicators used to retrieve the corresponding figures.

Sector / category	Quantified indicators
Agriculture	Crop yield changes induced by climate change and the associated macroeconomic costs.
Forestry	Net physical wood production induced by climate change and the associated macroeconomic costs
Fisheries	Changes in marine fish and the associated macroeconomic costs
Sea level rise	Direct physical and economic consequences from sea level rise and the associated macroeconomic costs.
Riverine floods	Direct physical and economic consequences from riverine floods and the associated macroeconomic costs
Transport	Economic losses from climate change impacts on road transportation and the associated macroeconomic costs.
Energy supply	Climate change impacts on wind and hydropower supply and the associated macroeconomic costs
Energy demand	Climate change impacts on energy demand and the associated macroeconomic costs.
Labour productivity	Climate change effects on labour productivity and the associated macroeconomic costs.

Table 2: Typology of avoided losses quantified in COACCH model

Source: CAN-E summary based on COACCH model

Figure 11 compares the difference in terms of avoided losses between the 1.5℃ *scenario against the inaction scenario and the moderate policies one.* It shows that adopting a 1.5°C compatible pathway brings considerably less economic losses than any other less ambitious pathway and, in terms of per capita figures, people in the EU would avoid a corresponding loss of 46,000 euros and 2,100 euros (by the end of the century) relative to the inaction and current policies scenarios respectively.

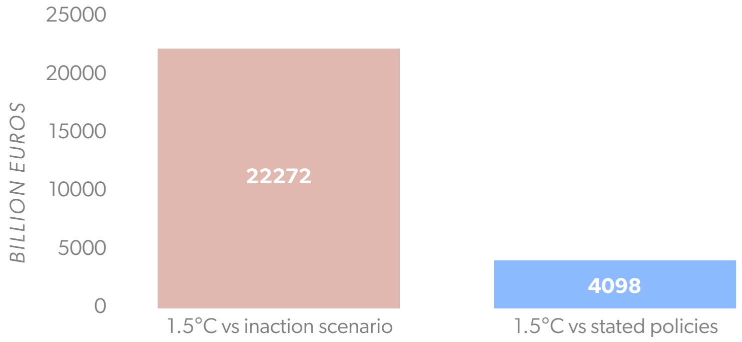


Figure 11: Avoided climate change losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 in Europe

Source: CLIMACT and CAN-E calculation based on COACCH model

The COACCH model also allows to retrieve disaggregated figures at the country specific level and Fig 12. offers a representation of the avoided climate change losses if countries would undertake a PAC 2.0 compatible transition. Each country considered presents a positive net effect under this kind of scenario up to 2100, the different size of the net indirect benefit is attributable to the scale effect, for which different economies experience different scales of avoided losses effects. It's possible to retrieve a more specific take on 13 different countries in section 3.3.

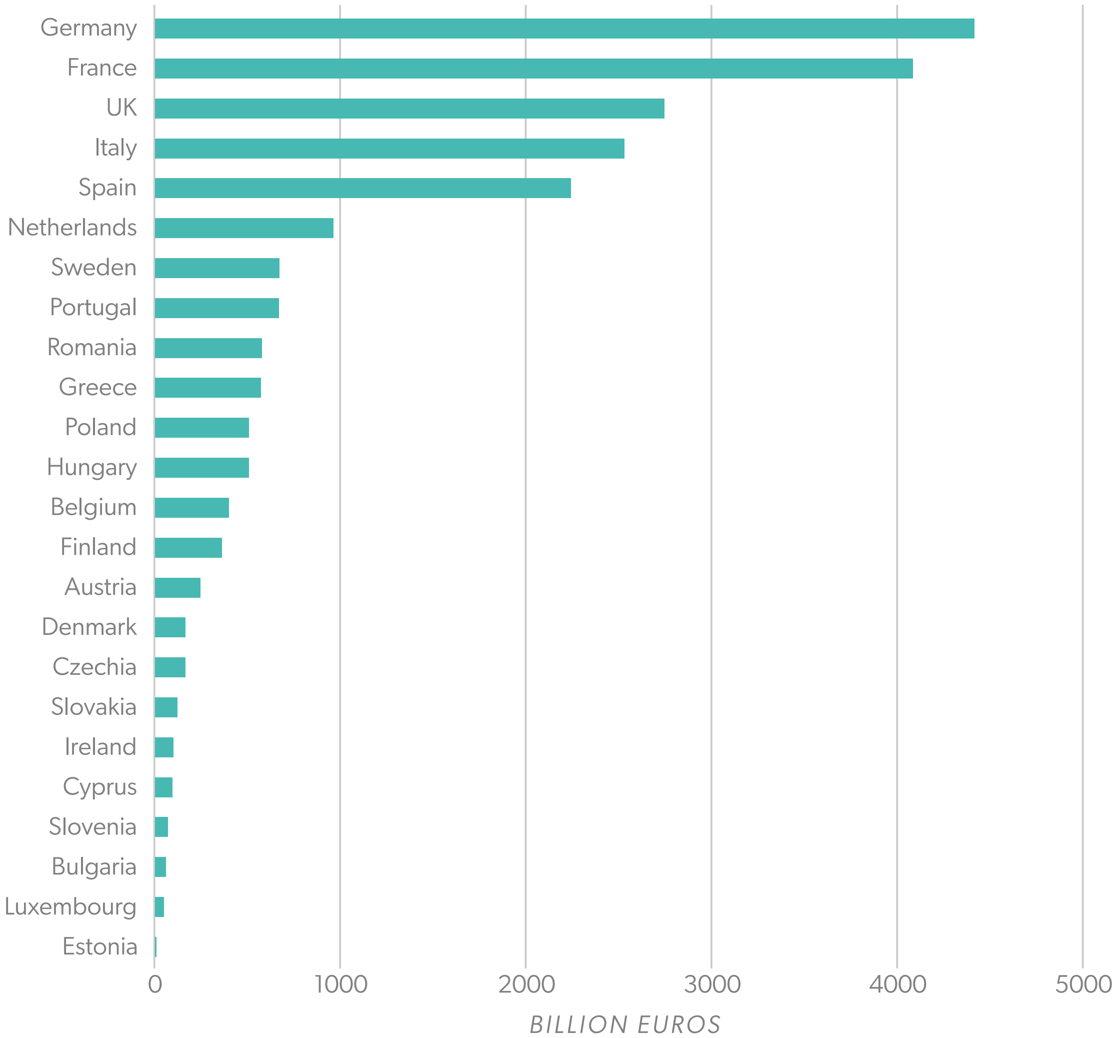


Figure 12: Avoided climate change losses under a 1.5°C compatible climate pathway to 2100
Source: CLIMACT and CAN-E calculation based on COACCH model

3.2.3 COMPARISON BETWEEN INVESTMENT UPFRONT COST AND BENEFITS OF CLIMATE ACTION: ECONOMIC BENEFITS OF ACTION SIGNIFICANTLY OUTWEIGH THE ECONOMIC COST OF ACTION

The costs of climate action reflect the sum of additional societal expenditures for achieving a full decarbonisation of the economy, including energy system expenditures and capital expenditures (investments).

Those costs are measured as "additional" compared to a business-as-usual pathway, as it is evident that even without the energy transition there would be both energy system costs and investment costs associated with the energy system, that are simply replaced with clean energy related investments (e.g. investments in existing or new fossil-based power plants that would happen anyway being replaced with investments in renewables). Furthermore, it is important to note that both the energy system and investment costs bundle together the expenditures of different economic actors, including the public sector, households and companies' investments and expenditures, and across different sectors. For example, the purchase of electric vehicles can be classified as a household investment cost (if not publicly subsidised) whereas cycling infrastructure as an investment cost borne by the public sector. In short, aggregate estimates should be used with caution as they reflect a multitude of costs borne by multiple different actors and sectors.

The PAC 2.0 scenario model allows us to measure the gross investment and energy system costs associated with a 1.5°C pathway for the EU. Starting from those estimates, we used the forecasted baseline (business-as-usual) investment and energy system costs to 2050 provided by the European Commission[45], to estimate the additional costs that would be implied for implementing a PAC 2.0 scenario pathway, achieving net zero by 2040, across the EU. These figures can be used indicatively for a comparison of costs with co-benefits and avoided climate change losses.

Our findings suggest that, for the EU as a whole, the benefits of ramping up climate action by implementing a 1.5°C pathway significantly outweigh costs (Figure 13 below) by a factor ranging between 1.4 and 4 to 1 (depending on the climate scenario) illustrating an unequivocal rationale for taking action.

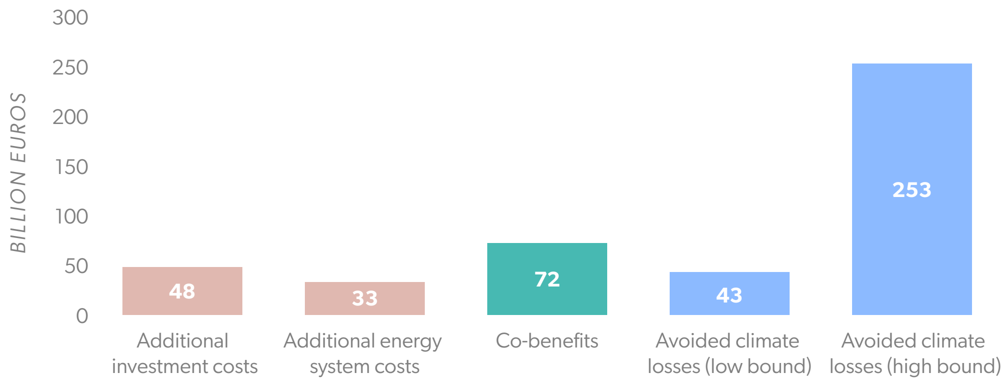


Figure 13: Indicative comparison of annual costs and benefits to 2030

Source: European Commission and CAN Europe analysis based on COMBI and COACCH models

45) European Commission (2020), Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people impact assessment. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020SC0176. Accessed 9 January 2024.

Country level findings

Belgium

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[46]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	7.2
GDP and public budget (bn €)	11.2
Resource savings (bn €)	10.2
Health benefits (bn €)	9.6
Total monetised benefits (bn €)	38.2
Total monetised benefits (% of 2022 GDP)	7.9%
Direct additional employment (person-years)	32,686
Avoided mortality (premature deaths per year)	332.5

Table 3: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Belgium, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

46) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

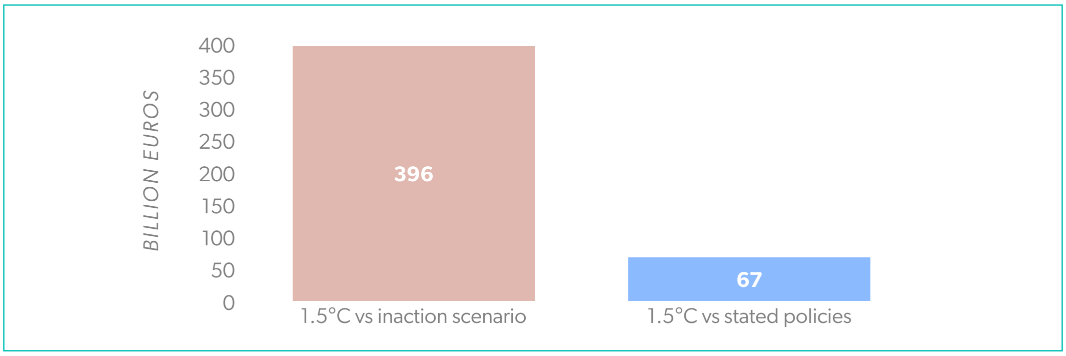


Figure 14: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Belgium)

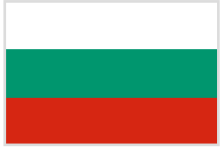
Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (396 bn euros) than the ones predicted under a stated policies scenario (67 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

The Belgian government agreed on 8 December 2022 to reform the European Emission Trading System (ETS) and the setup of a Social Climate Fund (SCF). The most controversial aspect of the agreement is the creation of a new ETS system (ETS2) in which households and small businesses would have to contribute (indirectly) to European emission rights. Thanks to the SCF and national revenues from the emission trade, unequal impacts and social consequences can be compensated and tackled in a structural way. Revenues coming from ETS2 and SCF should target the most vulnerable groups and be directed to (regional) public transport, renovations of the building stock and sustainable heating for the 40% of the households that cannot afford the refurbishment with their own financial means. Therefore, Belgian policy makers have the responsibility to embed the instruments in a well supported, effective and socially just transition starting with preparing socially just climate plans and connecting it to an acceleration of their own policy.

Bulgaria



CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[47]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	2.1
GDP and public budget (bn €)	3.4
Resource savings (bn €)	1.8
Health benefits (bn €)	0.3
Total monetised benefits (bn €)	7.6
Total monetised benefits (% of 2022 GDP)	9.2%
Direct additional employment (person-years)	68,576
Avoided mortality (premature deaths per year)	1,098

Table 4: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Bulgaria, to 2030
Source :CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

47) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

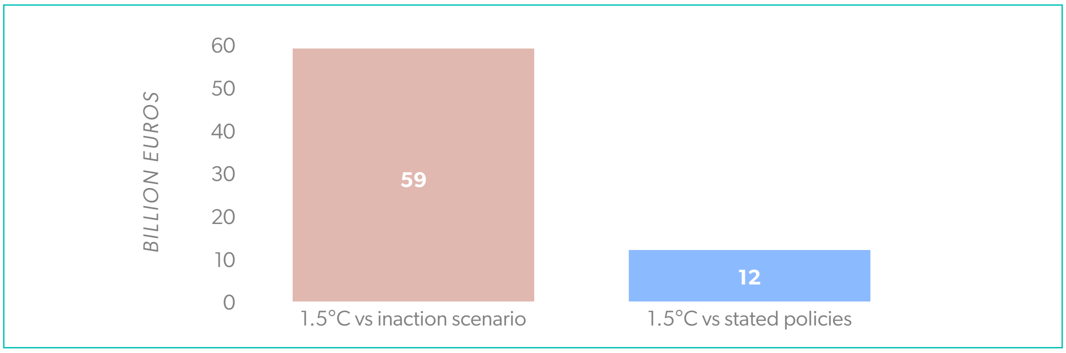


Figure 15: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Bulgaria)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (59 bn euros) than the ones predicted under a stated policies scenario (12 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

In a scenario where the stated policies in Bulgaria are not providing a structured path and, considering that the reported effect on avoided losses is even underestimated, it is possible to state that more progressive climate policies would result in greater co-benefits. The COMBI model estimates the total monetised co-benefits of 9.2% of 2022 GDP, second highest in EU27 after Slovakia, which is already a significant motivation to take timely climate action. In addition, the positive impacts on health achievable through the transition are often neglected, especially for the local communities near coal-mines and plants (TPPs). In TPPs like Brikel and Maritsa 3 for example, the facilities are in a very deteriorating state and the working conditions are far from decent. The new green alternative jobs that are being planned in the just transition regions and especially into the biggest region - Stara Zagora - represent a valid alternative. This is even more relevant in cities where coal-related jobs are an important source of income for families: the shift to green jobs would represent a step forward to provide all the local citizens, who are yet breathing polluted air, improved air quality and reduction of the connected health damages.Croatia

Croatia

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[48]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	0.8
GDP and public budget (bn €)	2
Resource savings (bn €)	0.2
Health benefits (bn €)	0.3
Total monetised benefits (bn €)	4.3
Total monetised benefits (% of 2022 GDP)	6.6%
Direct additional employment (person-years)	33,308
Avoided mortality (premature deaths per year)	369

Table 5: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Croatia, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

48) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION - DATA NOT AVAILABLE FOR CROATIA

COUNTRY SPECIFIC CONTEXT

A 1.5°C-compatible energy transition pathway in Croatia holds the potential for a multitude of co-benefits that extend far beyond mitigating climate change. Increasing reliance on domestic renewable energy sources enhances energy security by reducing dependence on imported fossil fuels, making Croatia more resilient to global energy market fluctuations. The renewable energy sector is labour-intensive, and a transition to cleaner energy can create jobs in manufacturing, installation, maintenance, and research and development, thus boosting economic growth. Furthermore, many renewable energy projects, such as wind and solar farms, are located in rural areas. This can stimulate rural development, attracting investment and creating opportunities for local communities. Relying on renewables improves air quality which then has an effect on the improvement of citizens' health and decreasing premature deaths linked to lung and cardiovascular diseases. Allocating funds to install more RES power plants, the Croatian government can achieve multiple co-benefits while at the same time getting to the 1.5°C-compatible energy transition path.

Czech Republic

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[49]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	4.2
GDP and public budget (bn €)	7
Resource savings (bn €)	4.6
Health benefits (bn €)	1.9
Total monetised benefits (bn €)	17.7
Total monetised benefits (% of 2022 GDP)	6.8%
Direct additional employment (person-years)	57,305
Avoided mortality (premature deaths per year)	505

Table 6: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Czech Republic, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

49) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

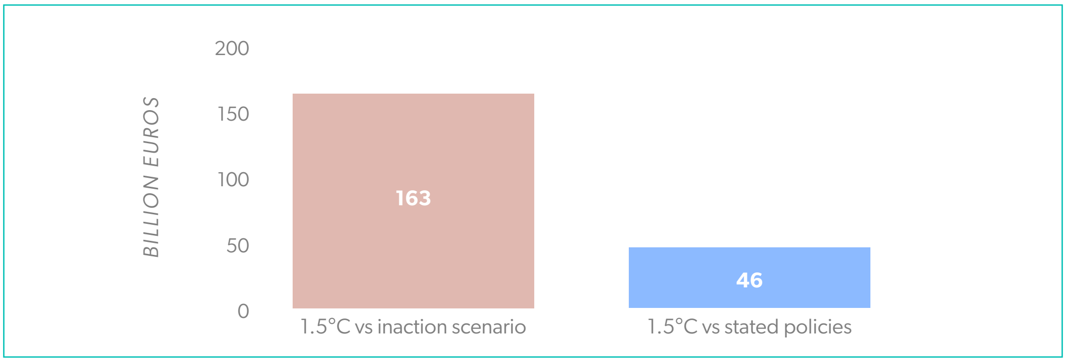


Figure 16: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Czech Republic)

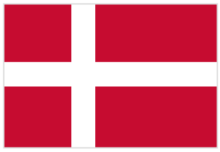
Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (163 bn euros) than the ones predicted under a stated policies scenario (46 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

The Czech Republic could significantly benefit from a more ambitious climate policy but the country's lack of ambition threatens to have significant negative impacts on the economy and society. Notably, the country has one of the highest benefit-cost ratios of investments and, accelerating renovations making energy savings and renewable heating accessible to everyone (especially targeting lower-income households) should be a clear national policy priority to address the increasing energy poverty issue. Beyond climate-related impacts, the Czech Republic also ranks among the worst five EU countries when it comes to the cost of premature mortality and morbidity due to exposure to PM 2.5. Accelerated energy transition and a clear fossil fuel phaseout strategy would help alleviate those costs too. All of those potential benefits of climate action should be seriously taken into account by the Czech government as it drafts its new climate and energy strategies, including the revised National Energy and Climate Plan and the national Long-Term Strategy. In order to profit from all the benefits of climate action, both higher ambition and a clear plan for implementation are necessary.

Denmark



CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[50]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	2.6
GDP and public budget (bn €)	2.7
Resource savings (bn €)	7.1
Health benefits (bn €)	2.6
Total monetised benefits (bn €)	15.1
Total monetised benefits (% of 2022 GDP)	4.3%
Direct additional employment (person-years)	22,151
Avoided mortality (premature deaths per year)	186

Table 7: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Denmark, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

50) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

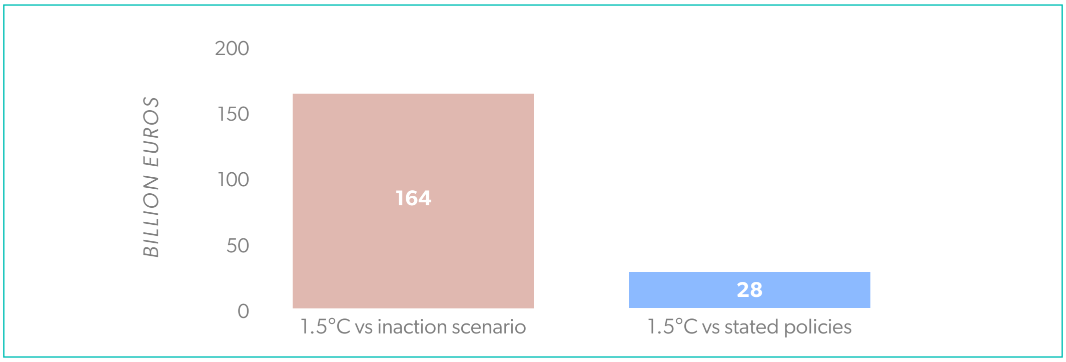


Figure 17: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Denmark)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (164 bn euros) than the ones predicted under a stated policies scenario (28 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

Decreasing dependence on fossil fuels is not only necessary to address the climate crisis but has significant geopolitical benefits while improving the air quality, which in turn will positively impact Danish citizens' health. In monetary terms the co-benefits of following a 1.5°C path towards 2030 is estimated at 15 bn euros. Despite the introduction of the Danish Climate Law in 2019, Denmark's Council of Experts on Climate Change has repeatedly shown that Denmark is not on track to meet its climate targets. This is mainly due to insufficient measures planned in the agriculture sector, energy efficiency and electrification of transport and industry. In addition to this, Denmark relies heavily on false solutions such as the burning of imported biofuels. Latest figures (August 2023) show that 62% of Danes believe that the Danish government should do more to mitigate climate change, and this report gives evidence that it will also benefit the Danish economy. The government needs to develop a national transition plan and to enact corresponding policy measures to establish clear price signals supporting the just green transition.

Estonia

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[51]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	0.1
GDP and public budget (bn €)	0.8
Resource savings (bn €)	0.4
Health benefits (bn €)	0.1
Total monetised benefits (bn €)	1.4
Total monetised benefits (% of 2022 GDP)	4.2%
Direct additional employment (person-years)	6,342
Avoided mortality (premature deaths per year)	40

Table 8: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Estonia, to 2030
Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

51) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

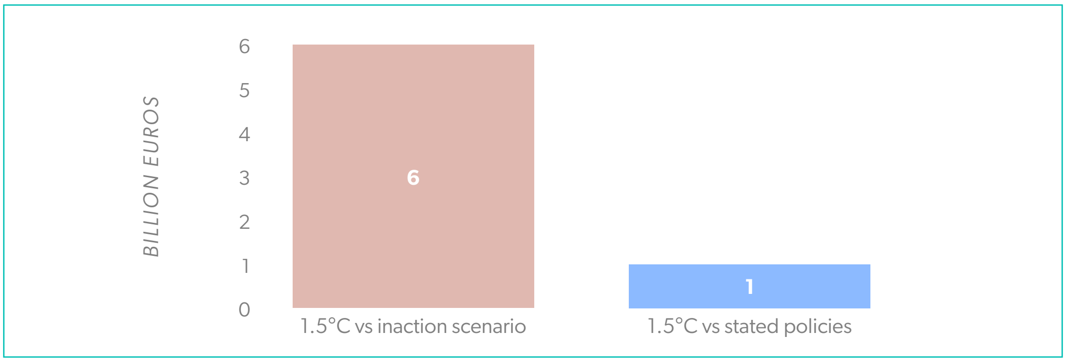


Figure 18: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Estonia)

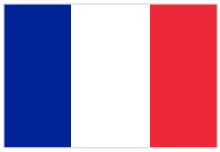
Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (6 bn euros) than the ones predicted under a stated policies scenario (1 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

In the Estonian media landscape, there is the tendency to focus on the challenges and costs of the green transition while it is essential to highlight the associated co-benefits. The country in fact is projected to experience positive economic benefits equal to the country's 4.2% of GDP already by 2030. Policy makers should consider the cost of inaction and take up solutions at the national level for the wider adoption of renewable energy, the overhaul of the transport sector, and the conversion of the LULUCF sector from a net emitter to a net binder. Distributed and decentralised renewable energy production would ensure energy security, affordability, as well as better health in regions where oil shale mining and processing takes place such as the Eastern Ida-Viru County. In order to fully reap the benefits of a successful and socially just energy transition, the region calls for substantially greater investments for the creation of alternative sustainable industries and jobs.

France



CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[52]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	21.2
GDP and public budget (bn €)	72.8
Resource savings (bn €)	24.7
Health benefits (bn €)	26
Total monetised benefits (bn €)	144.7
Total monetised benefits (% of 2022 GDP)	6%
Direct additional employment (person-years)	240,246
Avoided mortality (premature deaths per year)	2,926

Table 9: Synthesis of co-benefits of a 1.5°C compatible climate pathway for France, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

52) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

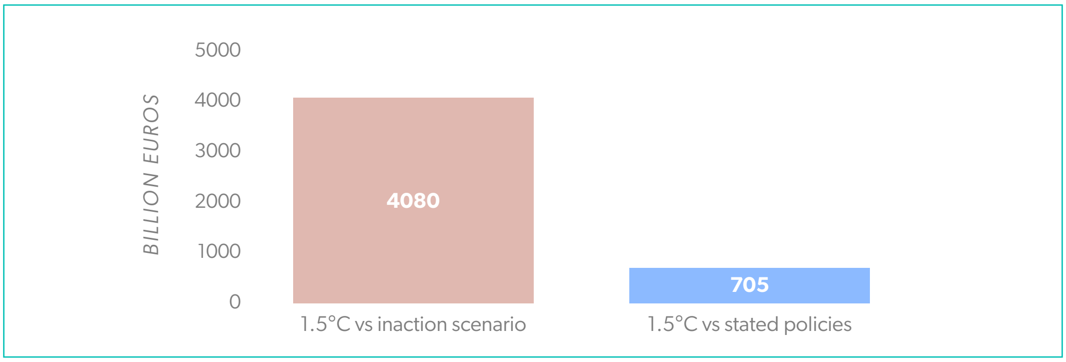


Figure 19: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (France)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (4080 bn euros) than the ones predicted under a stated policies scenario (705 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

With more than 140 bn euros of estimated co-benefits, France ranks among the EU countries with the most to gain in absolute terms from climate action by 2030. However, to reap these benefits, it's crucial that France not only fast-tracks climate and energy policies but also ensures that there are measures in place to provide a just and smooth transition, as well as a phase out of harmful policies. Planning and protection measures are crucial to support the smooth transition of the job market and impacted workers. Unfortunately, the government is not anticipating the job losses and there are currently no mechanisms to guarantee a just transition in the carbon-intensive and polluting sectors that will need to phase down and out their activities. One other point of concern: harmful policies currently in place could cancel out France's efforts and co-benefits of the ecological transition. According to our estimates, the 2023 State budget included 67 bn euros of direct and indirect subsidies fueling the environmental and climate crises. This outweighs by far the 7 extra bn euros promised by the government for 2024 to support NECP implementation.

Germany

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[53]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	39.4
GDP and public budget (bn €)	94.1
Resource savings (bn €)	42.5
Health benefits (bn €)	33.5
Total monetised benefits (bn €)	209.5
Total monetised benefits (% of 2022 GDP)	5.9%
Direct additional employment (person-years)	374,702
Avoided mortality (premature deaths per year)	3,288

Table 10: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Germany, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

53) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

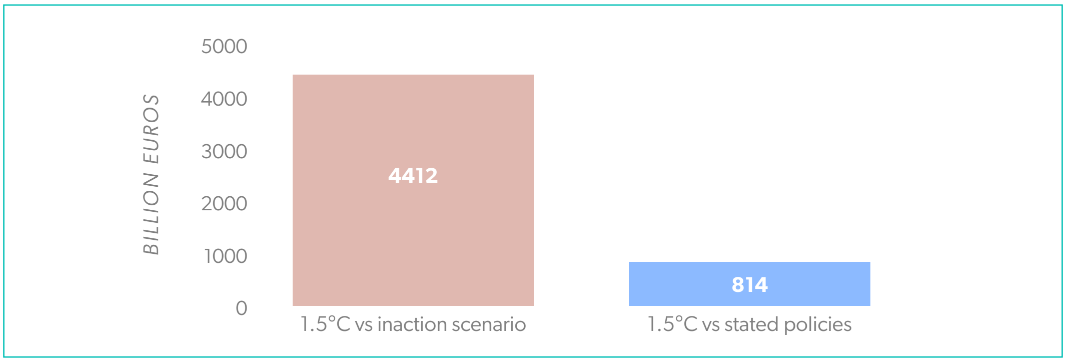


Figure 20: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Germany)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (4412 bn euros) than the ones predicted under a stated policies scenario (814 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

Despite the possibility to gain an estimated 200 bn euros in co-benefits through ambitious climate action, Germany is not even on track to meet its own climate targets, mainly due to insufficient measures planned in the transport and building sectors. As the EU's largest emitter and wealthiest Member State, Germany should lead by example when it comes to climate protection and increase the ambition of its climate measures. This would not only create monetizable co-benefits, with positive health and employment outcomes, but also considerably reduce the climate crisis burden placed on future public budgets. Furthermore, Europe's oil and gas consumption often supports undemocratic institutions in the producing countries. It is therefore a central cause of oppression, corruption and wars.

Hungary

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[54]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	3.5
GDP and public budget (bn €)	5.1
Resource savings (bn €)	3.4
Health benefits (bn €)	1.9
Total monetised benefits (bn €)	13.9
Total monetised benefits (% of 2022 GDP)	8.8%
Direct additional employment (person-years)	51,353
Avoided mortality (premature deaths per year)	1,604

Table 11: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Hungary, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

54) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

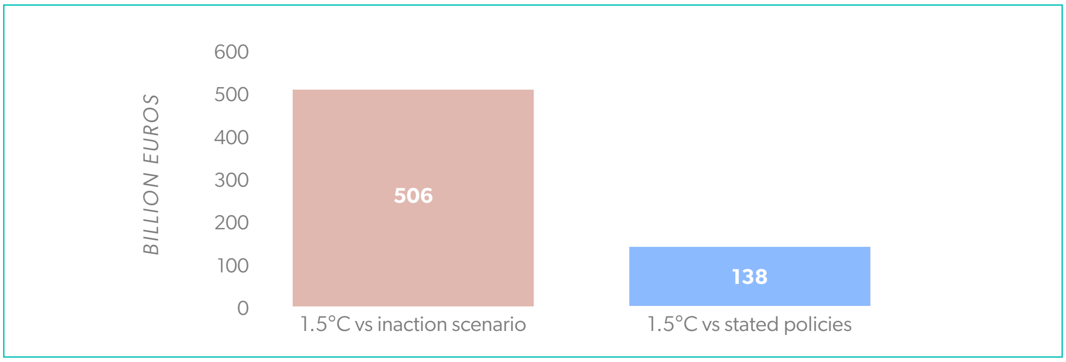


Figure 21: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Hungary)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (506 bn euros) than the ones predicted under a stated policies scenario (138 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

Hungary would save 8.8% of its GDP (by 2030) by increasing its climate ambition and speeding up the energy transformation and decarbonisation to reach the 1.5°C target. In the updated NECP, the Hungarian government supports reindustrialisation (battery-related factories) rather than increased climate ambition. Fundamental transformative policies and measures on energy savings, the uptake of wind and renewable community energy initiatives, systemic measures for public transport and LULUCF sector reform - seem to only receive limited funds allocations. Increased climate ambition would prioritise a huge comprehensive energy renovation program for residential buildings, big emitters and energy consumers in Hungary. Increased climate action would contribute to build a healthier environment for residents: Hungary experiences the second highest cost of illnesses and deaths due to exposure to PM 2.5 in the EU. 60% of Hungarians would be willing to pay more income tax to help lower-income households cope with the costs of a green transition.

Poland

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[55]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	11
GDP and public budget (bn €)	21.4
Resource savings (bn €)	11
Health benefits (bn €)	5.7
Total monetised benefits (bn €)	49.1
Total monetised benefits (% of 2022 GDP)	8%
Direct additional employment (person-years)	165,592
Avoided mortality (premature deaths per year)	2,792

Table 12: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Poland, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

55) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

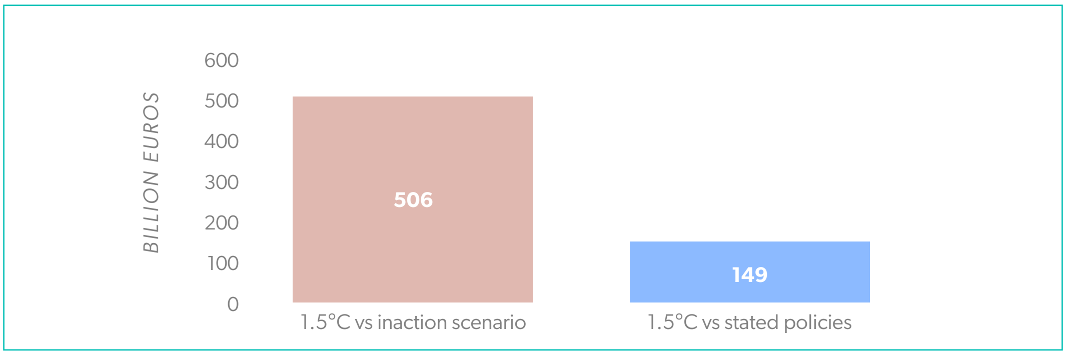


Figure 22: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Poland)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (506 bn euros) than the ones predicted under a stated policies scenario (149 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

Poland is currently one of the EU countries that uses the most fossil fuels. Its carbon driven economy already creates a lot of additional costs including donations to unprofitable coal mines - about 3 bn euros yearly. In addition, it imports crude oil and gas from outside of the country, over 50 bn euros yearly, since the invasion of Russia to Ukraine. The Fit for 55 proposal is being criticised for placing too much of a financial burden to the Polish economy and the concern is on the national budget and people of the country cannot withstand 60 bn euros more costs of climate policy which would be around only 2% of yearly Polish GDP. In light of this report findings, only the most important additional benefits can be as high as 1% of Polish GDP yearly. However, not everything is about GDP and in a scenario where the country presents the highest number of premature deaths due to air pollution - over 5000 yearly- an ambitious climate policy could save over 2700 Polish lives yearly and bring much more security to the Polish energy system. Click here for more information.[56]

56) More information can be found in Polish language publication of the ISD Foundation "We are debunking myths of Fit for 55": InE_FOLDER.pdf (pine.org.pl). Accessed 9 January 2024.

Portugal

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[57]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	3.6
GDP and public budget (bn €)	8
Resource savings (bn €)	3.3
Health benefits (bn €)	1.5
Total monetised benefits (bn €)	16.3
Total monetised benefits (% of 2022 GDP)	7%
Direct additional employment (person-years)	59,922
Avoided mortality (premature deaths per year)	1,386

Table 13: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Portugal, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

57) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

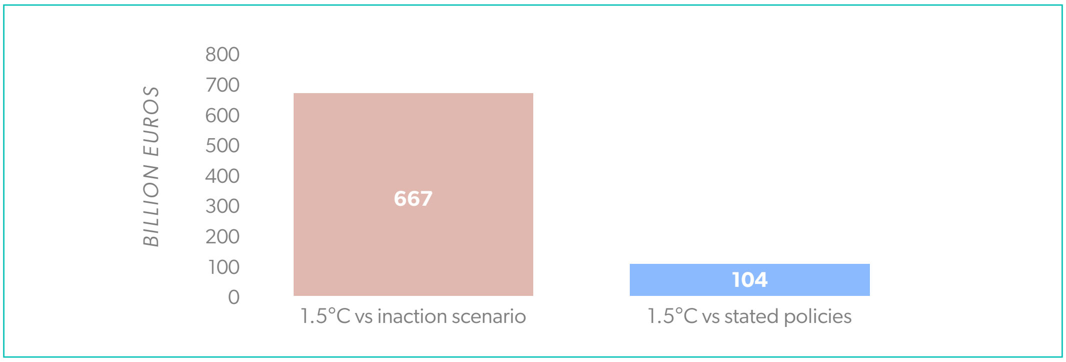


Figure 23: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Portugal)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (667 bn euros) than the ones predicted under a stated policies scenario (104 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

In Portugal there's a critical sector which scores increasing emissions every year, going in the opposite trajectory to meet the targets set in national plans, and which represents a bigger share of national emissions every year – transport. According to the latest data submission to the UNFCCC, the transport sector was responsible for almost a third of GHG emissions in 2021, with important consequences on air quality and public health. Even if the economy-wide GHG emission reduction target is not yet aligned with the 1.5 °C goal of the Paris Agreement and there are other sectors with increasing emissions that also need special attention, given the representativeness of the transport sector, it would be a priority to reform many of its measures to bring it on track with a low emission pathway. Acting now in accordance with the PAC 2.0 scenario, would not only bring more than 16 bn euros of economic benefits to the country but, more importantly, avoid more than 1300 annual premature deaths.

Slovenia

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[58]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	0.3
GDP and public budget (bn €)	1.8
Resource savings (bn €)	1.1
Health benefits (bn €)	0.6
Total monetised benefits (bn €)	3.7
Total monetised benefits (% of 2022 GDP)	7.1%
Direct additional employment (person-years)	11,351
Avoided mortality (premature deaths per year)	124

Table 14: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Slovenia, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

58) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

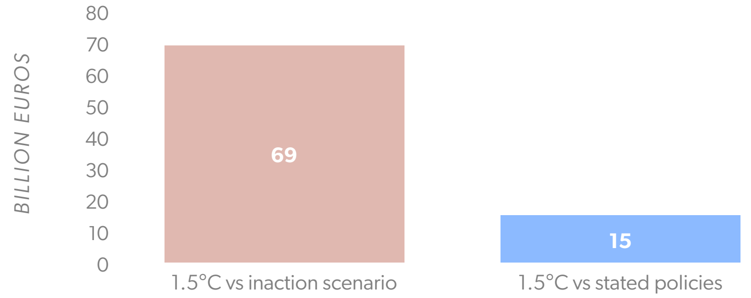


Figure 24: Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Slovenia)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. The graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (69 bn euros) than the ones predicted under a stated policies scenario (15 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

According to this study Slovenia would save 7.1% of its GDP (by 2030) by increasing its climate ambition to reach the 1.5 °C target and ranks among the countries that would gain more than EU average. Slovenia is currently lagging behind when it comes to climate and energy targets and measures, especially the target for renewable energy sources and transport sector. The results of the study present a clear argument that increasing ambition and action is not only necessary to meet climate targets, but also has a number of direct economic benefits. The need for faster and more ambitious action is further supported by the findings of a survey by the European Investment Bank, which found that 71% of Slovenians would support stronger national action to combat climate change. More attention is needed in particular in the area of transport demand management (integration of public passenger transport, lowering speed limits, reducing the number of working days, restrictive parking policies), faster construction of rail infrastructure and the deployment of renewable energy sources (especially solar energy), with a particular focus on community energy projects.

Spain

CO-BENEFITS OF 1.5°C COMPATIBLE ENERGY TRANSITION PATHWAY

The data are retrieved from calculations made by Climact and CAN Europe based on the COMBI project model[59]. The amounts describe the monetary benefits resulting from an energy system transition along a pathway that is compatible with the 1.5 °C limit of the Paris Agreement (at the respective country level).

Category	Co-benefits (rounded)
Energy system / security (bn €)	21.6w
GDP and public budget (bn €)	45.5
Resource savings (bn €)	18.4
Health benefits (bn €)	9
Total monetised benefits (bn €)	93.4
Total monetised benefits (% of 2022 GDP)	7.2%
Direct additional employment (person-years)	185,648
Avoided mortality (premature deaths per year)	3,027

Table 15: Synthesis of co-benefits of a 1.5°C compatible climate pathway for Spain, to 2030

Source: CLIMACT and CAN-E calculations based on COMBI model

The energy system/security category entails co-benefits resulting from avoided fossil fuel imports and avoided investments into fossil fuel power generation. Effects on GDP and public budget are calculated estimating the total demand for goods and services and the effects the investments would have on the public budget. The resource savings are referring to the material footprint, life-cycle wide fossil fuel consumption and metal ores avoided extraction. Benefits on health are calculated as avoided life-years lost and premature mortality due to PM2.5, avoided premature mortality due to ozone, avoided excess winter mortality and winter morbidity (asthma).

59) https://combi-project.eu/. Accessed 9 January 2024.

AVOIDED CLIMATE LOSSES FROM 1.5°C COMPATIBLE CLIMATE MITIGATION

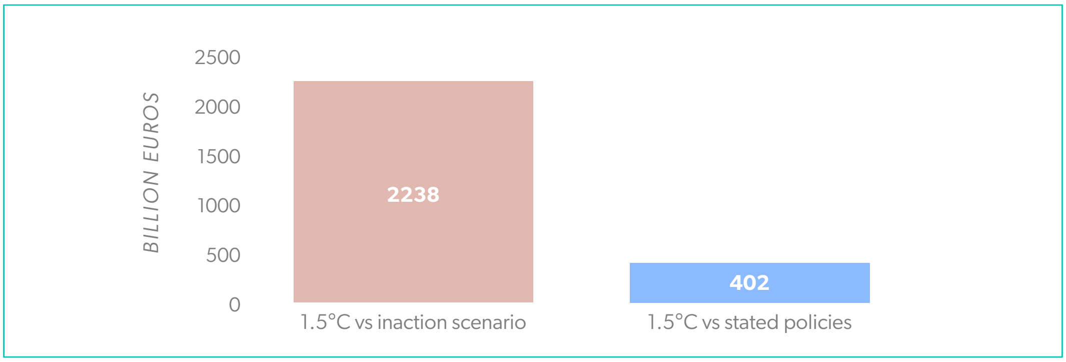


Figure 25 Avoided losses under a 1.5°C pathway vs inaction and stated policies scenarios to 2100 (Spain)

Source: CLIMACT and CAN-E calculation based on COACCH model

Avoided climate losses have been calculated following the methodology described in section 3.2.2 and data have been broken down to the respective country level to understand the magnitude of avoided losses under a 1.5°C pathway versus the inaction and stated policies scenarios to 2100. Although it is estimated that achieving the updated Spanish NECP targets will require a total accumulated investment of 294 billion euros until 2030, the graph clearly shows that in the first case the losses expressed in billion euros are significantly higher (2,238 bn euros) than the ones predicted under a stated policies scenario (402 bn euros), thus the direction to undertake is clear.

COUNTRY SPECIFIC CONTEXT

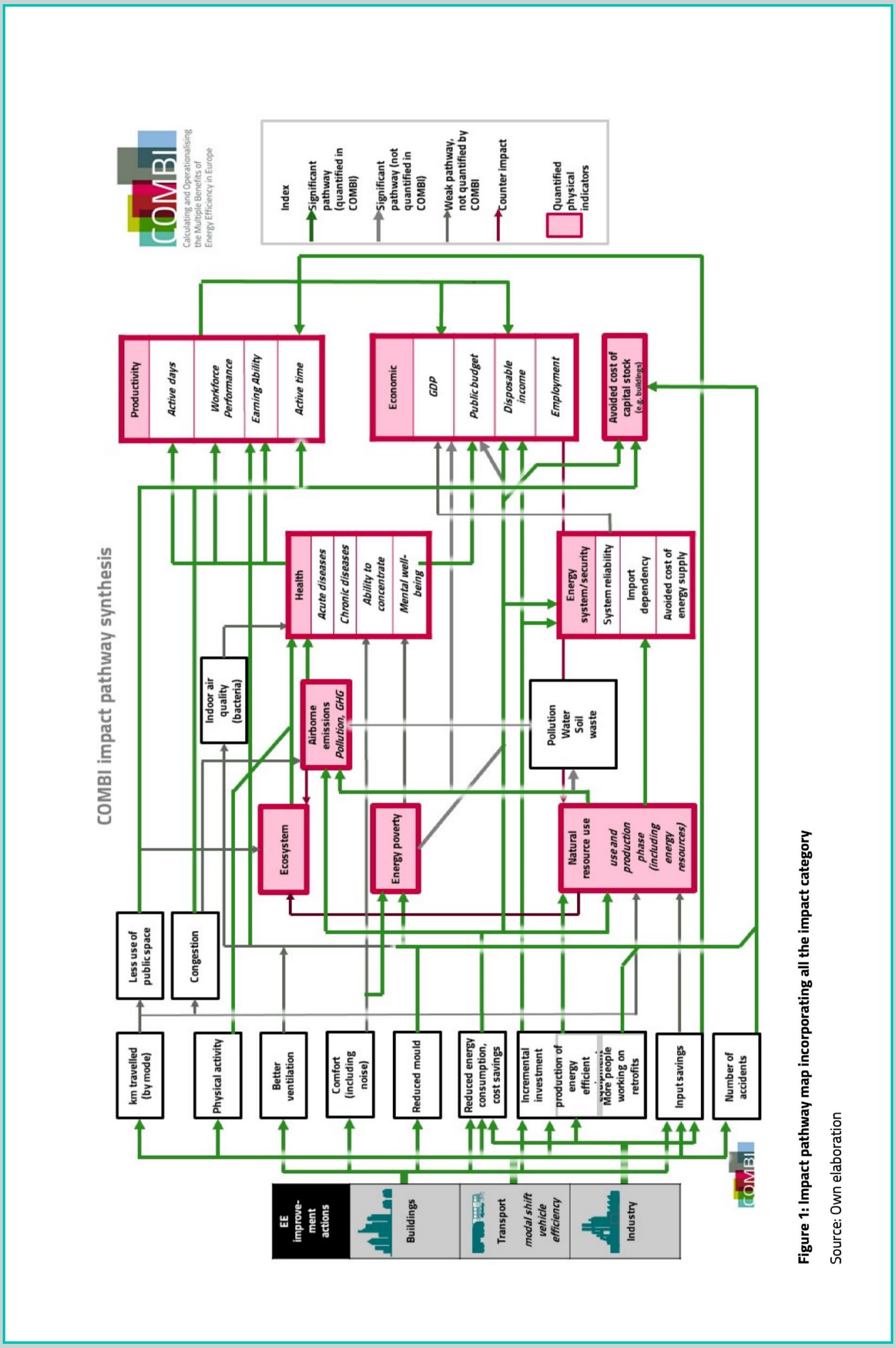
Spain exceeds 93 bn euros of estimated co-benefits and ranks among the most benefited EU Member States in absolute terms from ecological transition and climate action by 2030. Also compared to % of 2022 GDP, Spain would save 7.2% by 2030 in a 1.5°C compatible energy transition pathway. The country is moving towards a decarbonized economy and a climate neutral society, however, it still relies on harmful fossil fuel-related policies and measures to undergo the energy transition. More attention is therefore needed around building renovation (especially, low-income houses), carbon sinks protection, cities transformation, distributed generation energy models (especially, collective renewable self-consumption and energy communities), territorial vertebration, phase out of fossil fuels subsidies and public investments (especially, additional 140,000 million euros from the Next Generation EU), among others.

4. ANNEX

1. Literature review: scope of different scenarios for the cost of climate inaction (avoided losses)

PESETA IV – 7 impact categories considered	1. River floods 2. Coastal floods 3. Agriculture 4. Energy supply 5. Droughts 6. Windstorms 7. Human mortality	https://joint-research-centre.ec.europa.eu/system/files/2020-09/14_pesetaiv_economic_impacts_sc_august2020_en.pdf
COACCH – 9 sectoral impacts (+2) considered	1. Agriculture 2. Forestry 3. Fisheries 4. Sea level rise 5. River flooding 6. Transport 7. Energy supply 8. Energy demand 9. Labor productivity 10. (Health) 11. Ecosystems	https://www.coacch.eu/wp-content/uploads/2018/03/COACCH_Policy-Brief-4_Macroeconomic-results-EuropeWEB.pdf
Burke et al. - 9 sectoral impacts considered	1. Future demographic Economic development 2. Regionalization 3. Energy production 4. Energy use 5. Technology 6. Agriculture 7. Forestry 8. Land use	https://www.nature.com/articles/s41586-018-0071-9

2. COMBI impact pathway map incorporating all the impact categories



Source: Thema et al[60]

60) https://combi-project.eu/wp-content/uploads/D2.7_COMBI_quantification_report.pdf. Accessed 9 January 2024.