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PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

Securing our future

**Europe's 2040 climate target and path to climate neutrality by 2050 building a
sustainable, just and prosperous society**

1	Contents	
1	A Vision beyond 2030.....	2
2	Ambitious global climate action	4
3	The 2040 target and a pathway to climate neutrality	5
3.1	The target	5
3.2	Cost of inaction	8
4	Delivering the 2040 target.....	9
4.1	Implementing the 2030 policy framework.....	9
4.2	The EU's energy system	9
4.3	An EU Deal for sustainable industry and competitiveness.....	12
4.4	Decarbonising transport and improving mobility	16
4.5	Land, food and bioeconomy	17
4.6	Investing in our future.....	19
4.7	An economy that delivers for people	22
5	Conclusion and next steps	23

1 A Vision beyond 2030

Climate change is intensifying and its real-life costs accelerating. It is clearer than ever that achieving a stable climate and safeguarding a liveable planet for current and future generations means cutting global GHG emissions sharply and rapidly and preparing for future impacts of climate change. This pathway can and must go hand in hand with shaping a prosperous society in a strong Europe in the world.

The outcome of COP28 and the global stocktake of climate action around the world shows that the rest of the world is moving as well. The EU has been leading on this path by writing climate neutrality by 2050 into law and will continue to do so.

The vision of Europe at the end of the next decade is a comprehensive one: Europe should remain a prime destination for investment opportunities that bring stable, future-proof jobs. Europe should be a leader in the clean technology markets of the future, where all major countries and businesses seek to avail themselves of the opportunities in these markets. Europe must be a region with clean and affordable energy, and be resilient against future energy crises, currently caused by disruptions in the supply of fossil fuels. Europe should be autonomous overall and the master of its fate in a volatile world. And, of course, Europe will remain a global leader in climate action.

If well designed, climate action can deliver this entire vision for Europe. The European Green Deal is the EU's long-term strategy for economic growth, with enhanced energy security and resilience, free of critical dependencies, with restored nature and biodiversity and with a circular economy where no resources are wasted. At the same time, to continue the European Green Deal into the decade up to 2040, extra focus will be needed on the enabling conditions for businesses and citizens to master the transition, such as a solid investment agenda, flanked by strong industrial, trade and foreign affairs action for a thriving European economy on a global level playing field. The earlier this process can begin the more cost-efficient it will also be.

The 2040 target is a crucial component in this transition. Predictability is something that is most sought by our citizens, businesses and industries, and that policy makers must deliver for such a major transition. A 2040 target will guide the right mix of policies and investments to shape Europe as a competitive and sustainable economy that delivers for the quality of life of people and society. The EU has the policy framework in place to reduce emissions by at least 55% by 2030. This framework delivers the vision of Europe of the future. One area of action is the energy independence from fossil fuels from volatile countries. In 2022, the value of fossil fuel imports soared to EUR 640 billion in 2022 (4.1% of GDP), close to four times the annual EU budget in 2022. In 2023, when prices came down substantially, net fossil fuel import costs accounted for about 2.4% of GDP ⁽¹⁾. Climate action and sustainable economic growth can go hand in hand. Experience shows that economic growth can be decoupled from the growth of greenhouse gas emissions. Provisional data show that, in 2022, total net GHG emissions were 32.5% lower than in 1990⁽²⁾ while the economy has grown by 67%.

⁽¹⁾ Based on trade data for the first 10 months and projected GDP

⁽²⁾ Climate Action Progress Report 2023.

In this context, this Communication proposes the next recommended milestone on the path to climate neutrality. The European Scientific Advisory Board on Climate Change (ESABCC) advised 90% as the minimum target to shape a sustainable and prosperous society in Europe. This target option also provides the strongest push in line with the global momentum to keep 1.5°C degrees warming within reach, whilst both limiting disruptions to economies and the risk of reaching irreversible climate tipping points.

In line with that scientific advice, and based on a thorough Impact Assessment, this Communication presents 90% net GHG emission reductions as the target towards 2040 (“the 2040 target”). The 2040 target ensures the corresponding overall greenhouse gas (GHG) emissions budget for the EU between now and 2050, in line with the provisions of the European Climate Law and as a credible pathway to a strong and sustainable society in Europe.

(Placeholder for concrete examples of industry investments and initiatives for households)

The EU is installing a record level of renewables and low carbon technologies. The EU built a record 17 GW of new wind energy, and a record of 56 GW of solar (DC) in 2023. In 2022, about 3 million units of heat pumps were sold. The EU has an excellent basis from which to build this reality across our continent. The legislation is now in place for meeting the EU’s 2030 climate and energy targets. To ensure stability, this policy framework for 2030 will not change (and in fact an extension of current policies towards 2040 would already lead to a -88% reduction by 2040). Instead, its full implementation is a precondition for the EU to stay on course to the proposed 2040 target, to climate neutrality in 2050 to reap the full potential of the transition. More focus is however needed on additional policies that provide citizens and businesses with the enabling framework to align economic competitiveness and liveable societies with the climate transition, in the next decade and beyond. This includes industry and economic policies, jobs and social policies, and trade and foreign affairs action to ensure a level playing field for businesses. The path to climate neutrality is a whole of society transition that can and should generate sustainable growth in every sector of the economy, in the most cost-efficient way, while transforming those sectors that are now major polluters.

Many investments to be undertaken to realise the 2030 climate and energy targets have impacts spanning decades. Defining a climate target for 2040 now will provide predictability for all and will help EU decision makers, Member States and stakeholders to take the necessary investment decisions in this critical decade, so that these are compatible with the 2040 target and the climate neutrality objective, minimising the risks of lock-in to costly, sub-optimal paths and stranded assets.

In this endeavour, the Commission is aware of the worries that some citizens and industrial actors have and some of the pushback to individual measures. The imperative that this transition has to be just is at the heart of this work. Climate action has to take everybody along. That’s why the Communication is the start of a dialogue and an extensive outreach to citizens, businesses, NGOs and other stakeholders on the right 2040 pathway to climate neutrality by 2050. Such dialogue with industry is already taking place through Clean Transition Dialogues organised with the key industrial sectors. That dialogue and outreach will allow the next Commission to table legislative proposals for the post-2030 policy framework needed to deliver the 2040 target in a fair and cost-efficient manner.

The first-ever European Climate Risk Assessment will also be published in the coming months and will further inform the decisions of the next Commission (3). It will assess our exposure to climate related hazards and form the basis for future measures on building societal resilience and managing climate risks.

2 Ambitious global climate action

The EU's leadership and success in reducing its GHG emissions since 1990 means that the EU's share of global emissions is now 7% and falling. Now is the time to continue on this path to show others that climate action can create a prosperous society. We must empower European businesses to benefit from the global transition and increasing demand for clean technologies.

In a volatile geopolitical environment, the EU will continue to develop stable partnerships with reliable international suppliers to ensure its long-term energy security and predictability of supply throughout the energy transition. This will also help us to reduce external dependencies and costs while de-risking our supply chains.

At global level, the first global stocktake under the Paris Agreement found that parties have been putting increasingly ambitious climate policies in place, whilst urgent additional action is needed to put parties collectively fully on track towards achieving the purpose and long-term goals of the Paris Agreement. To ensure a global level playing field for businesses in Europe, the Commission will increase its efforts to replicate the success of the EU Emissions Trading System (ETS) by incentivising and supporting other countries to introduce and improve their own carbon markets.

The parties at COP28 agreed that limiting global warming to 1.5°C requires deep, rapid and sustained reductions in global GHG emissions of 43% by 2030 and 60% by 2035 compared to 2019 levels and reaching net zero CO₂ emissions globally by 2050. The global stocktake highlighted that the fossil fuel era should draw to an end, recognising the need for all to transition away from fossil fuels. The agreement also calls on the parties to accelerate efforts globally towards net zero emission energy systems, making use of zero- and low-carbon fuels well before or by around mid-century, and to triple global renewable energy capacity and double the rate of energy efficiency improvements by 2030. It also calls on parties to accelerate efforts to phase down unabated coal, emissions from road transport, tackle methane, and other non-CO₂ emissions this decade, and phase out as soon as possible inefficient fossil fuel subsidies that do not address energy poverty or just transition. This will require a shift in investment patterns across the globe to ensure finance flows are consistent with low emission and climate resilient development pathways.

The results of the COP put others on the trajectory that the EU is already on – from the broad policy framework to investment in some of the key technologies such as renewable energy. The COP sets the minimum expectation for action from the whole global community. The

EU will continue to provide an essential contribution to building the means and momentum for increased global action and persuade and support other countries to follow suit. International cooperation and climate finance will remain at the heart of the EU's contribution to global climate action. Together, the EU, its Member States and the European Investment Bank (EIB) are the biggest contributor of public climate finance to developing economies, with a contribution of €28.5 billion in 2022 and mobilising an additional €11.9 billion of private finance.

The EU's contribution over the years to getting the world on track to meet the Paris agreement goals is wide ranging, going beyond climate finance. The EU's support for scientific research has contributed extensively to our understanding of climate change and of the solutions available. The EU's stable policy framework has allowed the development and widespread uptake of innovative technologies creating new markets and bringing down costs through economies of scale. The EU will further strengthen climate diplomacy in bilateral, plurilateral (G7, G20, OECD, Climate Club among others) and multilateral fora. It will continue to promote carbon pricing to cut emissions and generate revenues that support the transition and will continue to push for high integrity domestic and international Paris-aligned carbon markets.

The Green Alliances and Green Partnerships concluded with ambitious partners since 2021 should sustain the EU and partners' pathways to climate neutrality.

Trade policy and international cooperation should be fully aligned with the EU climate and environmental objectives, including through EU Free Trade Agreements, with a view to promoting sustainable value chains and opening markets to clean technologies and products for European manufacturers, and creating a fair and non-discriminatory global trade notably in the clean tech sector, including by effectively addressing unlimited subsidy schemes.

Given the significant momentum in enlargement negotiations, the European Commission will need to support candidate and potential candidate countries to align with the EU's climate acquis, building on the existing Governance Regulation, 2030 energy and climate targets, and commitments to climate neutrality by 2050 made through the Energy Community process. Commitment to and transition in line with the 2040 milestone will also be an important factor in the accession process of future EU Member States.

The 2040 target, once agreed, will be the basis of the EU's new Nationally Determined Contribution (NDC) under the Paris Agreement, to be communicated to the UNFCCC in 2025. A net greenhouse gas figure for the EU in 2035 will be derived once the 2040 target is agreed, for communication as part of the new NDC.

3 The 2040 target and a pathway to climate neutrality

3.1 The target

To put the EU on a firm path to climate neutrality, this Communication proposes **a 2040 climate target for the EU of 90% net GHG emissions reduction compared to 1990 levels.**

To deliver a reduction of net GHG emissions of 90%, the level of remaining EU GHG emissions in 2040 should be less than XXX MtCO₂-eq⁽⁴⁾ and removals from the atmosphere through land based and industrial carbon removals at least XXX MtCO₂.

The proposed target is based on a thorough impact assessment that looked in detail at the implications of three target options for 2040:

- Option 1, a reduction of up to 80% compared to 1990, consistent with a linear trajectory between 2030 and 2050 ⁽⁵⁾;
- Option 2, a reduction of 85-90%, compatible with the level of net GHG reduction that would be reached (-88%) if the current policy framework were extended to 2040 and
- Option 3, a reduction of 90-95%.

Option 3 leads to the lowest GHG budget for the EU, with net cumulative GHG emissions (the indicative GHG budget) of 16 GtCO₂-eq for 2030-2050. It is the only option that corresponds to the advice of the ESABCC ⁽⁶⁾, minimises the total GHG emissions we put into the atmosphere, and is in line with the provisions of European Climate Law to present a GHG budget that does not put at risk the EU's commitments under the Paris Agreement. With the remaining global carbon budget ⁽⁷⁾ shrinking fast, it is essential that all parties minimise their cumulative emissions. Setting the EU on this pathway as early as possible will make this transition cheaper and more predictable, that's why Option 3 provides the EU with the strongest climate action, needed more than ever to avoid reaching irreversible tipping points with unknown and potentially catastrophic impacts on human societies and ecosystems. The more climate action is delayed, the greater the human and economic costs from climate change and the greater the needs to fund restoration and adaptation, drawing resources from the EU economy.

The Impact Assessment ⁽⁸⁾ shows how a reduction in net emissions of 90% by 2040 could be achieved based on all sectors strongly decreasing their emissions and assuming that necessary preconditions (as outlined in Chapter 4) are met.

There is a clear difference between the target options in terms of the importance of novel technologies. Option 3 is accompanied by a faster deployment of low carbon technologies such as hydrogen production by electrolysis, carbon capture and use and industrial carbon removals between 2031 and 2040 than Option 2. Option 1 largely leaves the deployment of new technologies to 2041-2050, so risks not reaching climate neutrality by 2050. Option 3 assumes the large amount of carbon removals that is needed to reach climate neutrality by 2050 and deliver net negative emissions beyond.

⁽⁴⁾ Excluding emissions from the LULUCF sector.

⁽⁵⁾ Consistent with the trajectory referred to in Article 8 of the European Climate law, a linear trajectory between the agreed 2030 target and climate neutrality in 2050, reaching around 78% in 2040.

⁽⁶⁾ ESABCC (2023). Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050. DOI: 10.2800/609405

⁽⁷⁾ For further details, see Annex 14 of the Impact Assessment.

⁽⁸⁾ Reference

Investment needs for 2031- 2050 are similar across options. Option 3 requires higher annual investment needs in 2031-2040 than Options 1 and 2, but then lower investment in 2041-2050. However, with the exception of energy-intensive industries, the differences between Options 2 and 3 in terms of resulting total energy system cost, GDP and competitiveness on global export shares remains limited. Option 3 sets a clear transition path away from fossil fuels as called for by COP28, providing the greatest benefits in terms of energy independence and enhanced protection against fossil fuel price shocks. It strengthens the EU's strategic autonomy in the highly volatile international context where dependence on fossil fuel imports is a risk for the security of the EU and its economic stability. By reducing the EU's dependence, the transition will also free up money to invest in infrastructure, innovation, education, and other essential areas for the EU to keep its competitive edge in global markets.

The target entails a rapid deployment of low carbon technologies by 2040, creating a large domestic market for EU clean tech manufacturers, incentivising innovation and the creation of a strong European industrial basis, which will better place the EU to take a leading position in the global clean technology race rather than delaying action to the last decade to 2050. However, with more action in the decade 2031-2040, Option 3 also involves moderately higher needs for raw materials (and less in the following decade), and a higher risk of potential environmental trade-offs if novel technologies are not deployed fast enough, notably in terms of land use and role of biomass in the energy system.

A target of 90% will require a greater focus and effort to ensure a just transition than for less ambitious target options, as the transition is somewhat accelerated. While the difference across options in costs for households is small, the post-2030 policy framework should include adequate policy measures and redistributive instruments to address social impacts.

All options show strong improvement in air quality and associated health benefits and limited environmental impacts.

How the target options compare

Investments and costs

All options require a similar level of investment over 2031-2050 and entail the redirection of resources that would otherwise, in the absence of action, also need to be invested in more carbon intensive technologies in order to provide for the economy's energy needs. Energy system investment needs amount to close to XXX (equivalent to XXX% of GDP) per annum on average over the entire period (against XXX over 2011-2020, a decade with relatively low investments in the energy system), with additional spending of about XXX in transport (equivalent to XXX% of GDP, a similar proportion of GDP as in 2011-2020)⁽⁹⁾. Option 3 brings some energy system investments forward to the first decade, with an average annual investment of XXX over 2031-2040.

The resulting energy system costs are also similar across options, ranging from XXX% (Option 1) to XXX% of GDP (Option 3) in 2031-2040, a moderate increase compared to the XXX% of GDP spent in 2011-2020, and then fall to about XXX% for 2041-2050. The cost of fossil fuel imports decreases significantly under Option 3, falling to less than 1.4% of GDP by 2040 and less than 0.6% in the last decade, against 2.3% over 2010-2021 and 4.1% in 2022 during the recent energy crisis.

⁽⁹⁾ The transport related spendings include the acquisition costs of private vehicles, which represents about 60% of the total.

Importantly, there is significant potential to reduce costs through progress in the circular economy and changes in mobility or food consumption choices. The assessment shows that together (under the “LIFE” variant), they can reduce overall investment needs by about XXX% over 2031-2050, (representing yearly savings of EUR XXX). This leads to lower energy system costs of XXX% of GDP in 2031-2040 and XXX% in 2041-2050, a full percentage point of GDP less than in 2011-2020.

Environment

All three target options offer significant co-benefits, including improvements in air quality, biodiversity, enhanced health, and reduced healthcare costs.

3.2 Cost of inaction

The costs and human impacts of a changing climate are large and growing, with all facets of life, society and the economy potentially affected. Climate-related extreme events have risen between 1980 and 2020, causing 220 000 deaths and EUR 650 billion in economic losses over the period in the EU.⁽¹⁰⁾ A historically high acceleration in climate disruption in 2023, saw global warming reaching 1.48°C above pre-industrial level, and ocean temperatures and Antarctic Sea ice loss breaking records by a wide margin ⁽¹¹⁾. We now face increasing risks of reaching irreversible climate tipping points, with unknown and potentially catastrophic consequences for societies, ecosystems and economies ⁽¹²⁾. While the challenges linked to the transition to climate neutrality should not be underestimated, the process itself will generate major new opportunities while securing a sustainable future for all.

In contrast, inaction would lead to far larger and growing costs in the coming decades, not only in terms of output losses, but also in terms of lives lost and worsening living conditions. The impact assessment estimates that achieving the 90% target could reduce premature deaths due to air pollution from 466 000 per year in 2015 to 196 000 per year in 2040, with a related reduction in costs from about EUR 1 700 billion in 2015 to EUR 670 billion in 2040, based on the value of statistical life (high valuation method). In turn, net imports of fossil fuels would be reduced by a cumulative EUR 2.8 trillion over the period 2031-2050, compared the average annual level of net imports in 2011-2020, with a smaller economy and hence lower energy demand. The impact assessment further estimates that the cost of stylised fossil fuel price shocks in terms of lost output and employment would be halved if they were to take place in a significantly decarbonised economy (as attained under the 2040 climate target). Although estimates of the costs of extreme weather events are shrouded with uncertainty, the impact assessment estimates conservatively that such costs could lower GDP by about 7% by the end of the century. Over the period 2031-2050, the cumulative additional GDP cost of a higher global warming pathway is estimated to amount to EUR 2.4 trillion, compared the costs under a pathway compatible with the 1.5°C objective under the Paris agreement. Finally, investment in climate action yields a range of benefits that are very tangible, though difficult to quantify. A trajectory that is compatible with the 1.5°C objective is necessary to avoid the worst effects on ecosystems and natural resources that sustain

⁽¹⁰⁾ European Environment Agency (2023). Economic losses from weather- and climate-related extremes in Europe.

⁽¹¹⁾ Copernicus, The 2023 annual climate summary, Global Climate Highlights 2023

¹² Add

human societies and economies. It is the best insurance against the potentially catastrophic impacts of crossing climate tipping points, and it is also a means to reduce investment needs in adaptation.

4 Delivering the 2040 target

While the differences between target options in terms of total energy system cost, GDP, competitiveness and cost to households are small, delivering the 2040 target will depend on the full implementation of the 2030 climate and energy framework and calls for the development of a post-2030 policy framework that builds on current climate and energy policy. This must be complemented with a broad enabling framework for the two equally important objectives of the European Green Deal, namely competitive sustainability and just transition. This double focus on competitive sustainability and just transition will trigger the necessary investment decisions and mobilise finance, roll-out innovative technologies and ensure that all EU citizens can benefit from the transition and access affordable solutions for fairness and social justice.

4.1 Implementing the 2030 policy framework

Ensuring the successful implementation of the 2030 energy and climate package is crucial to reaching the 2040 target. The on-going update of the National Energy and Climate Plans (NECPs) is a key element in monitoring the progress towards the 2030 climate and energy targets. The initial assessment of the draft NECPs ⁽¹³⁾ highlights the need for the increased level of ambition and adjustments in the final submissions due from Member States by June 2024, in order to reach the 2030 targets. The Commission calls on Member States to take decisive measures in implementing the commonly agreed policies and is ready to collaborate with Member States, sectors and social partners to facilitate the necessary actions and thus ensure predictability.

4.2 The EU's energy system

The 2040 climate target corresponds to a close to full decarbonisation of electricity in the second half of the 2031-2040 decade or shortly thereafter.

Renewable energy, zero and low carbon solutions

Renewables such as solar and wind will make up the vast majority of solutions. All renewable energy, zero and low carbon solutions (including energy efficiency, nuclear, storage, CCS, CCU, industrial carbon removals, and all other current and future net-zero energy technologies) are necessary to decarbonize the energy system. Together with this Communication, the Commission is taking further action on some alternatives. The Communication on Industrial Carbon Management sets out a roadmap to deploy the necessary CCS and CCU technologies. The Commission has announced an Industrial Alliance to accelerate the deployment of Small Modular Reactors (SMRs) and ensure a strong EU supply chain, including a skilled workforce. This will leverage EU's manufacturing and innovation capacities to accelerate the deployment of first SMR projects

⁽¹³⁾ COM(2023) 796 final

in the EU by early 2030 under the highest standards of nuclear safety, environmental sustainability and industrial competitiveness.

On the one hand, the Commission will pursue its policies to ensure a fast deployment of all renewable energy, zero and low carbon solutions, a further development of energy efficiency, and an ambitious electrification with smarter grids, system integration, demand flexibility and storage solutions.

On the other hand, affordability of energy prices is a crucial element to ensure that the benefits of decarbonisation are brought to the whole economy. Fossil fuel prices are volatile and set by global markets. Costs of renewable electricity have consistently been lower than those generated by fossil-fuels for more than a decade. Wholesale electricity prices may come down as generation plants with high fossil fuel costs are substantially and if investments in grids, storage, batteries and demand flexibility are delivered in a cost-efficient way to avoid bottlenecks in the electrification of the economy. This trend be further accelerated by full implementation of the updated electricity market design by Member States and market operators, and the further integration of EU (cross-border) power systems, and efficient uptake of clean flexibility sources. In particular, promoting and expanding the use of PPA's will help to stabilise prices and shield companies from high and volatile prices caused by fossil fuels.

Complementary policies will however be needed to ensure a smooth transition from current energy price levels to affordable clean energy. EU and Member State energy frameworks allow for the protection of lower-income and middle-income households from steep increases in energy prices. Particular support will be needed for energy-intensive industries that face the dual challenge of investment in production methods that use clean energy, and energy prices in that interim period. Policies should offer bridging solutions for that transition. As a start, the Innovation Fund matches innovation support with such solutions in the form of carbon contracts for difference. Investments in grids are necessary to avoid any price increases due to bottlenecks. Avoiding excessive high network tariffs for end users due to the pay-back of upfront grid investment and electrification will be a key regulatory objective and focus for policies to boost efficient financing and energy allocation models.

Energy efficiency and buildings

The 'Energy Efficiency First principle' is a central policy principle. The impact of the energy efficiency 2030 target will extend up to 2040. Together with instruments like eco-design, energy audits and energy management systems, additional policies should encourage energy performance contracting, as well as innovative and market-based financing solutions to make renovations and overall energy efficiency as attractive as possible for citizens. This will leverage private financing across all sectors and can unlock a European marketplace for energy efficiency investments. The circular economy also merits a serious boost. Circular business models can reduce energy consumption from production and use to the end-of-life. The public sector, at all levels, should lead by example, including through green public procurement that also takes into account sustainability criteria, and provide the blueprint for further initiatives to facilitate the transition to a sustainable and truly circular economy.

The EU building sector accounts for 42% of final energy consumption, more than half of natural gas gross inland consumption and about 35% of energy related greenhouse gas emissions. Around 80% of energy consumption in buildings stems from heating and cooling needs. Renovation, energy efficiency, distributed renewable energy, electrification, heat pumps, as well as low-carbon building materials could reduce the emissions in buildings by about XXX% compared to 2015. Carbon pricing for all fuels, foreseen as of 2027, will create a level-playing field for electricity, and generate revenues for the Social Climate Fund that could be used for structural reforms.

Electrification, grids and infrastructure

Electrification with a fully decarbonised power system by 2040 is the main driver of the energy transition. The share of electricity in the final energy consumption will double from 25% today to about 50% in 2040. Renewable energy in majority⁽¹⁴⁾, complemented by nuclear energy, will generate over 90% of the electricity consumption in the EU⁽¹⁵⁾ in 2040.

This will require acceleration of the concerted efforts and substantial investments in expansion of the EU's power grids, as well as in upgrading to smarter and more flexible grids. New interconnectors expanded distribution grids, energy storage facilities, dispatchable energy supply, flexibility market solutions, and sector coupling will be needed to ensure flexibility and security of supply of the whole energy system. The recent EU Grid Action Plan is a first step and its swift implementation should remain a priority for the Commission, Member States and industry in view of delivering on the 2030 and 2040 targets. Security and resilience of critical energy infrastructure is a key priority to ensure a secure and stable energy supply. Today, the average yearly gain from the integrated electricity market for European consumers is about EUR 34 billion per year ⁽¹⁶⁾, and this integration will be even more crucial with higher renewable shares.

Energy system integration, storage, digitalisation and flexibility

Energy system integration links the various energy suppliers and end-uses like electric cars to deliver efficient, flexible, decarbonised, reliable and resource-efficient energy services at the least possible cost. System integration requires joint infrastructure and cross-border grid and planning at the distribution as well as the transmission level. Further policies and a lean environment for investment will be needed to boost such system integration.⁽¹⁷⁾ The digitalisation of the energy system, including AI, is key for more flexible energy sources ⁽¹⁸⁾.

⁽¹⁴⁾ Including bioenergy conversion technologies (e.g. biogas), coupled with a sustainable biomass supply.

⁽¹⁵⁾ The remaining 10% are compensated by negative emissions or supplied with low carbon solutions including use of carbon capture and storage.

⁽¹⁶⁾ ACER (2022). Final Assessment of the EU Wholesale Electricity Market Design.

⁽¹⁷⁾ Current policy measures include the revised TEN-E Regulation, whilst the Renewable Energy and Energy Efficiency Directives, the revised electricity market design, and the Grids Action Plan promote the uptake of energy storage and demand response to increase the flexibility.

⁽¹⁸⁾ Commission Action Plan for the Digitalisation of the Energy System.

Further initiatives will also be needed for networks, storage and flexibility market solutions as a key element to decarbonise and electrify the economy, smarten the grids, reduce the price volatility in peak hours and empower consumers to adapt their consumption to market conditions and their own local needs.⁽¹⁹⁾

Fossil fuels

Whilst electrification is key to the energy transition, fossil fuels will continue to play a role in the energy transition. The gas market structure will change significantly, with an increasing role for low-carbon and renewable liquid fuels and gases. Gas infrastructure will need to adapt to the decentralized production, and a significant share of the oil and gas network may gradually be repurposed for e-fuels, biofuels and zero-carbon hydrogen.

In 2040, the consumption of fossil fuels for energy would reduce by approximately 80% compared to 1990. Coal will be phased out, while oil in transport (road, maritime and aviation) would represent about 60% of the remaining energy uses of fossil fuels. The remaining use of natural gas would be divided between industry, buildings, and the power system, and policies should ensure that any remaining fossil fuel combustion will be coupled as soon as possible with carbon capture and storage. Non-energy uses, such as feedstock for manufacturing, would account for about 1/3 of the remaining fossil fuel consumption.

4.3 Industry decarbonisation deal

To make the European Green Deal succeed in the next decade, a firmer and renewed European agenda for sustainable industry and competitiveness must complement it now and in the coming years. Creating the right framework conditions for industry to fully embrace the industrial transformation is a precondition for the successful transition. [If the transformation succeeds, the EU will maintain its competitive advantage in sectors like wind power, hydropower, and electrolyser, where it already has a trade surplus and try to continue building new competitive advantage in growing sectors like batteries, electric vehicles, heat pumps, solar PV, CCU/CCS, biogas technology, and circular economy.] The development of strong green and circular domestic industries will strengthen the EU's competitive sustainability, but also create economic value and jobs to help and ensure that the climate transition is socially just and inclusive.

This agenda must reflect the global and geopolitical context. As more countries embark on the climate transition, in line with the Global Stocktake at COP28, global demand for low

⁽¹⁹⁾ All forms of storage, demand response and dispatchable could play a significant role in providing flexibility, stability, and reliability. The energy system in 2040 will need to adapt to supply and demand changes in both time and location. A more granular approach to market prices better reflects congestions in the grid and can steer more efficiently the market reactions, and investments decisions in renewable generation, and transmission capacity, as well as consumption location. Self-consumption of the prosumers and dynamic price signals will further optimise the grid and reducing potential congestion risks.

emission technologies and sustainable products and services grows rapidly. In clean tech manufacturing alone, the market will triple to [XX] billion euros by 2030 alone.

But equally, global competition for these technologies will be intense. Large recourse to public subsidies and policy initiatives from our main competitors are distorting fair and free trade at a global scale. Net-zero technologies are the focus of strong geostrategic interests and a global technological race. In China, long term planning, the vertical integration of entire sectors, and public subsidies have artificially driven down costs, leading to China's dominance in many cleantech supply chains, from raw materials to components and end products. In the US, the US Inflation Reduction Act provides generous and administratively simple fiscal incentives that foster investment and production in cleantech manufacturing. Europe must seize its own leadership role in this race, playing to our core strengths whilst improving on other factors that guide companies' decisions to invest and maintain a production presence in Europe.

Europe's strength lies, amongst others, in its stability and its predictable policies.

An enabling framework for competitiveness in Europe....

Close attention will be needed to secure a conducive regulatory and financing environment to attract investment and production to Europe. The Critical Raw Materials Act and the Net Zero Industry Act are key instruments to deliver strategic autonomy, including by scaling up domestic production, processing and recycling, diversification, strategic projects and easier permitting across technologies and infrastructure. A set of appropriate policy tools to monitor and anticipate emerging threats to the security of supply could complement these initiatives.

Moreover, industrial policy should be strengthened by excelling in novel approaches e.g. industrial alliances and symbiotic industrial clusters/ecosystem. Such clusters would help suppliers of clean technologies to scale up their operations, and improve their commercial viability by supplying several industrial off-takers within a cluster, while manufacturing industry could more effectively decarbonise their operations and at a lower cost by securing access to clean technologies and sharing costs.

But far more will be needed. Sizeable private investment is necessary to make the economic transition succeed and for that, the EU must be an attractive destination for investment. A true Capital Markets Union could give a strong boost to making it easier for financiers to invest across Europe. Due attention is also needed to allow businesses that need investment to be economically attractive. Deepening the Single Market by proactively removing with Member States undue national regulatory and other barriers in key technologies, can allow businesses to sell standard solutions across Europe, boosting their business case. Simplification of the overall regulatory environment for business and investment will merit constant attention.

Public investment must be well-targeted, with the right mix and pooling of large-scale grants, loans, guarantees and other public capital, which is accessible in the quickest and simplest

manner. The Innovation Fund, estimated to amount to EUR 40 billion by 2030, can play a big role, including through EU-wide competitive bidding instruments and ‘auctions-as-a-service’.

Efforts should accelerate to monitor supply and demand in skills and jobs in the sectors relevant for the green transition; rolling out up-skilling and re-skilling programmes; and supporting the recognition of qualifications across Member States and from third countries.

With due attention for decarbonised and competitive manufacturing industry

Electrification, low carbon fuels and a full deployment of capture for process emissions will allow industry to reduce CO₂ emissions by about 85% in 2040 compared to 2015. The EU ETS with its common carbon price, provides a market-based tool to innovate with long-term predictability for Europe’s main emitters. For some industries, this implies investing in a profound transformation of the production process.⁽²⁰⁾ Carbon capture, use and storage is a solution in hard-to-abate sectors in the absence of other solutions. Energy costs are key for the competitiveness of industry and in particular European Energy Intensive Industries⁽²¹⁾ and merit particular attention with dedicated policies to allow early movers to clean energy to benefit from a smooth transition in energy prices. As a start, the adopted Electricity Market Design Reform makes energy bills of companies more independent from the short-term market price of electricity. Further expansion of the principle of competitive sustainability by rewarding European companies investing in low carbon technologies, including through public procurement processes, will be key both to create a thriving domestic manufacturing base in clean tech and achieve climate ambition.

... built on a more circular economy [Input by GROW and ENV in ISC]

The circular economy can wed action against climate change and excessive resources use, with new economic opportunities inside of Europe as well as more EU autonomy towards the outside.

A renewed agenda for the circular economy obviously has environmental benefits. Through repairing, renewing, reusing and recycling existing products and thereby extending their lifetime on the market, resources are used more efficiently in production and primary raw materials can be substituted with secondary raw materials that are less carbon-intensive or other environmentally-friendly innovative materials.

⁽²⁰⁾ This includes electrification and switching to alternative fuels (e.g. renewable hydrogen, e-fuels or bioenergy), symbiotic industrial clusters, innovation in low carbon processes, energy and resource efficiency, material replacement and circular business models.

⁽²¹⁾ According to the International Energy Agency, the strong fossil fuel dependence of the EU exposes European EIs to higher share of energy expenditures in total cost of production than competitors in the US or China. In the aftermath of the 2021-2022 energy shock due to the EU’s dependence on fossil fuel imports, recent data suggests that part of the reduction in natural gas consumptions has been driven by a decrease in industrial output, in particular by energy intensive industries.

A stronger circular economy also has economic benefits. It offers opportunities for value creation as the next step of refining and processing of critical raw materials inside of Europe. It offers innovative business models in view of evolving consumer preferences and digital solutions. For example, circular business models like product-as-a-service, circular product design, shared economy or on-demand production can reduce economic cost of energy and material use and make waste via a loop back into the economy a resource with economic value. Circular business can create significant greenhouse gas emissions reductions in hard-to-abate sectors. Examples include the built environment through better management of construction and demolition waste, heavy industry through material management solutions, clustering of resource-intensive complementary industrial activities, transport through shared mobility and reverse logistics, and the food sector. Reducing materials input through re-use and recycling has the potential to boost growth and create up to 580,000 high-quality jobs in the EU, with upgraded knowledge and skills.

Last but not least, circularity can boost the EU's security and strategic autonomy, reducing EU dependence on imports of especially critical raw materials, and reducing the environmental pressure and risks associated with natural resource extraction and consumption in the EU.

For all these reasons, the circular economy will play an ever bigger role in the transition towards 2040. Implementation of the Second Circular Economy Action Plan and its initiatives should be accelerated, to achieve a doubling of the circular material rate by 2030. [DG GROW in ISC: can add text on and ideas for an industrial policy leg to the regulatory leg of the circular economy?]

With a growing need for industrial carbon management and carbon removals

While the EU ETS provides a common carbon price and long-term predictability for Europe's main emitters, each production process requires specific technical decarbonisation solutions and tailored approaches by industrial sector. Industrial decarbonisation will also have to address GHG emissions not related to energy combustion ("process emissions"). For these, the carbon capture is a solution at hand.

The 90% target entails an earlier deployment of carbon capture, which needs to expand to more than 300 MtCO₂/year by 2040. The generation of about 75 MtCO₂ of industrial carbon removals would complement land-based removals sequestering carbon in biomass and soils to contribute to the overall carbon capture target.

This will require a large portfolio of options such as BioCCS⁽²²⁾, DACCS and possibly other novel approaches. Carbon Capture, Utilisation and Storage (CCUS) technologies enable the decarbonisation of industrial sectors without alternative decarbonisation solutions by storing carbon permanently underground or in products, and by replacing the fossil carbon currently

⁽²²⁾ Carbon capture and storage of biogenic CO₂ emissions originated from the combustion of biomass to produce energy (BECCS) or from the processing of biomass in industrial applications.

used as feedstock in various industries with non-fossil carbon. Likewise, the development of CO₂ value-chains through carbon capture and use (CCU), nature-friendly biobased materials, mechanical and chemical recycling can all boost the development of non-fossil feedstock to substitute fossil fuels in carbon-based products. Carbon capture will also remain important to reach net-zero by 2050 and absolute negative emissions thereafter. To reap the economic opportunities of these technologies, it is key for the EU to develop its own full economic value chains for them. That is why the Commission will be presenting alongside this Communication a dedicated Industrial Carbon Management Communication with a strategy for the policy framework, more innovation and investments to unlock this potential.

On a global level playing field.

The transition will only be successful if Europe remains a sovereign and resilient economy that reduces trade dependencies and that is resilient to supply disruptions, price volatility and other shocks. As the EU reduces its dependence on imported fossil fuels, it should not create new vulnerabilities through its imports of net-zero technologies or low-emission energy commodities.

Alongside the efforts to create value chains for key technologies on our own continent, the EU must apply a more strategic approach on global markets, especially to ensure a better access to strategic commodities including critical raw materials at more affordable prices by applying and adjusting trade defence mechanisms. The EU should also leverage its greatest strength, the Single Market through the joint purchase instrument and by allowing industrial actors to engage in various cooperation models to jointly negotiate better conditions, including prices from global producers with important safeguards encouraging the transfer of benefits to end users and the involvement of smaller companies. In parallel, the EU should ensure global cooperation and make trade work for the green transition. The EU should promote European standards on the global stage.

As the EU is leading in decarbonising its industry, additional measures are needed to ensure competitiveness of the European exports on global markets and to prevent carbon leakage by implementing measures complementing the Carbon Border Adjustment Mechanism (CBAM). A true level playing field for businesses in Europe and globally, however, is created when other countries adopt carbon markets of their own. Now and into the coming years, efforts should accelerate towards a strong carbon market diplomacy around the world, where Europe offers its expertise and staff to help countries to set up carbon markets of their own.

4.4 Decarbonising transport and improving mobility

In the transport sector, the “Fit for 55” measures, combining technological solutions and carbon pricing, will allow emissions to decrease by around 70% in 2040 relative to 2015, which can be brought to close to XXX% through a deployment of low carbon fuels.

Emissions vary greatly across transport modes. Reductions of CO₂ emissions from road transport will accelerate over time and will come with significantly improved air quality in cities through the deployment of zero emission vehicles driven by the CO₂ standards,

quadrupling the electrification of the sector over 2031-2040 and a rise in the shares of battery-electric and zero emissions vehicles in the fleet to 60% for cars and 40% for vans and heavy-duty vehicles by 2040. This transformation is a fully-fledged industrial policy opportunity for a sector vital for the EU economy, through investments in infrastructure and the full integration of the sector in the electricity grid, the development of critical raw materials supply chains and the establishment of a skilled workforce. Beyond CO2 standards, carbon pricing and updated fuel policies will enable the decarbonisation of the stock of existing vehicles already on the roads that constitute the legacy fleet.

Maritime and air emissions will reduce through the combined effects of “Fit for 55” measures including achieving the targets in FuelEU Maritime and ReFuelEU aviation, spurring the deployment of low carbon fuels, and of effective carbon pricing and strengthening action by all countries to meet the Paris Agreement goals. Through the ETS, the EU is the first jurisdiction to put an explicit carbon price on emissions from these sectors, which will generate revenues providing a resource for speeding up the deployment of renewable and low-carbon fuels. Part of the ETS revenues and Innovation Fund can be redistributed for future proof, carbon neutral changes in the maritime or aviation sectors.

Extensions to the scope of carbon pricing for the aviation and maritime sectors ⁽²³⁾, as well as a contribution to fossil fuel taxation across the economy, including on kerosene, would ensure that all sectors contribute their fair share to economy-wide action and would further incentivise innovation. Addressing barriers to the deployment of alternative low- and zero-emissions fuels (including e-fuels and biofuels) in aviation and maritime and giving them priority access to these fuels over sectors that have access to other decarbonisation solutions, such as direct electrification, will enable these sectors to contribute to the EU’s climate objectives and to the global climate agenda ⁽²⁴⁾. Finally, a future 2040 policy framework should duly consider the full climate impacts of aviation, in line with the latest scientific findings, and a system for airlines to monitor, report and verify non-CO2 emissions and climate effects of aviation. Further action to reduce black carbon emissions in the maritime sector could be considered.

Modal shift, in particular of passengers and freight from air and road transport to rail, will reduce overall emissions. Moreover, deployment of different models based on mobility as a service, multimodality, digital solutions and optimised green logistics (e.g. for freight) will modernise and decarbonise the transport sector. Promoting sustainable urban mobility, through adequate urban planning, will be important to enable more public transport, active mobility (i.e., walking and cycling) for short distance trips, and to allow citizens to choose sustainable transport modes with benefits for both the climate and people’s health.

4.5 Land, food and bioeconomy

Decarbonising the land sector

⁽²³⁾ E.g. to cover excluded business aviation and vessels below 5000 GT.

⁽²⁴⁾ Including to the meet the IMO Strategy on Reduction of GHG Emissions (net zero GHG by 2050, at least 70% striving for 80% compared to 2008 by 2040).

Farmers and foresters offer multiple vital services to society. They ensure the production of primary food and bio-based materials and are at the core of agri-food and bioeconomy value chains. As managers of the land, they also provide ecosystem services such as biodiversity protection and restoration or carbon removals.

Agricultural activities such as livestock and use of fertilisers will remain one of the core areas to reduce EU GHG emissions by 2040. However, with the right policies and support, it should be possible both to reduce non-CO2 GHG emissions in the agriculture sector by at least 30% in 2040 compared to 2015 ⁽²⁵⁾ thereby contributing to the 2040 climate target and, at the same time, to enhance the capacity of soils and forests to store more carbon ⁽²⁶⁾. This would mean that the EU's combined agriculture and forestry sectors could become climate neutral as early as 2035. In addition, bio-based materials that are sustainably sourced can not only store carbon over long periods (e.g., if wood is used as a construction material) but also replace fossil-based materials, and in this way the land sector contributing to the decarbonisation of other sectors. More resource-efficient and biodiversity-friendly management of the land sector will also increase its resilience to the impacts of climate change, improve soil fertility and protect and restore nature, thereby contributing to food security and the productivity of land.

Policies addressing the food sector in a holistic way are more efficient than looking at the farming sector in isolation, because many decisions with a large mitigation potential are taken outside the farm gate: the chemical composition of fertilisers, the circular use of agricultural waste (crop residues, manure), the reduction of food waste at the manufacture and retail stages, the choice of ingredients for manufactured food products, and consumers' dietary choices.

The food industry plays an important role in driving farmers' and consumers' decisions and should receive the right incentives to procure more sustainable food ingredients from farmers and to make healthier diets based on diversified protein intake more affordable choice for consumers ⁽²⁷⁾. One way to create business opportunities for a more sustainable agrifood value chain could be to better reflect the price of agricultural emissions into the food value chain, thereby influencing decisions of industrial actors and better rewarding sustainable farming practices ⁽²⁸⁾. Further support by means of public funding, including through a new Common Agricultural Policy, will be an essential part of any transition.

Thanks to advancements in digital monitoring technologies and advisory services, farmers and foresters will be able to quantify their GHG balance using reliable and harmonised

⁽²⁵⁾ Many solutions exist to reduce livestock emissions at relatively low cost, to produce biomethane from manure, or to optimise fertiliser application through precision farming

⁽²⁶⁾ E.g. by switching to regenerative agriculture, agroforestry, or paludiculture on peatlands. Peatlands, in particular, present a very significant mitigation and biodiversity potential on relatively small areas.

⁽²⁷⁾ COM(2020) 381 final

⁽²⁸⁾ See recent study on "*Pricing agricultural emissions and rewarding climate action in the agri-food value chain*", [link](#). The study outlines five options to design an emission trading system covering agricultural emissions and targeting different actors in the agri-food value chain, including food processors and input providers, such as fertiliser producers.

certification methodologies ⁽²⁹⁾. Approaches such as carbon farming and biodiversity credits enable certified climate action to be appropriately rewarded through result-based contracts with other actors in the value chain or through public support. A better governance of soil and forest data ⁽³⁰⁾ will also lead to better recognition of farmers' and foresters' climate action in the national GHG inventories.

Finally, as fossil-based carbon is phased out of the EU economy, farmers and foresters will have new business opportunities to deliver in a sustainable manner biomass and bio-based materials for different uses in the bioeconomy, including in industry, construction, chemicals, energy or mobility. The enhanced use of biomass residues and waste, advanced biofuels, BECCS technologies, and biobased products should be supported with clear rules that promote sustainability and consider the impacts on the size of the natural carbon sink in the LULUCF sector.

Healthy ecosystems, sustainable land use, nature & biodiversity

A 2040 target and clear pathway from 2030 to 2050 should exploit and encourage synergies between climate neutrality, biodiversity and other environmental objectives.

Climate change threatens nature, water resources, agriculture, food production, and other essential services that rely on healthy ecosystems. It exacerbates risks to Europe's unique biological diversity and threatens the capacity of the agriculture and forestry to ensure food security and feedstocks for a sustainable and circular bioeconomy.

Cutting GHG emissions and increasing carbon removals can improve resilience and biodiversity, whilst healthy nature and biodiversity are essential for climate change mitigation and resilience. Fire-prone areas are expected to expand across Europe due to climate change, threatening carbon sinks and biodiversity. Water ecosystems are highly vulnerable to climate change. High ozone levels, and air pollution damage forests, ecosystems and crops, reducing the potential for carbon removals and adaptation. A systemic change in modes of production in agriculture will protect it from severe risks from climate change and biodiversity loss.

Given the intensifying competition for land and water, policies can be designed to ensure the sustainable, water efficient production and consumption of food, materials and bioenergy, which should go in priority to sectors where the potential for electrification is limited, such as air or maritime transport.

4.6 Investing in our future

Modernising the EU economy

⁽²⁹⁾ COM(2021) 800 final. The Communication on Sustainable Carbon Cycles announced an objective that, by 2028, every land manager should have access to verified emission and removal data to enable a wide uptake of carbon farming. In 2022, the Commission adopted a proposal for a Regulation establishing a Union certification framework for carbon removal, which is currently in co-legislation procedure.

⁽³⁰⁾ COM(2023) 416 final, COM(2023) 728 final. The Commission proposals for a Soil Monitoring Law and a Regulation on a monitoring framework for resilient European forests put in place a monitoring framework for all soils and forests across the EU.

This Communication intends to further strengthen the ongoing debate on finance for the transition and the appropriate mix between public and private investment to modernise the EU economy. The investment agenda will be make-or-break for delivering on the climate and economic transition.

If the EU is able to attract and deploy investment in its manufacturing capabilities for key technologies, it will build up strategic autonomy and create jobs in key technologies for which competition is fierce.

A comprehensive investment agenda requires first and foremost that the EU is an attractive global destination for investors, notably in times of elevated public debt levels and limited EU budget resources.

A comprehensive investment agenda

In a context of very intense global competition for attracting investment (e.g., with very attractive tax credits being deployed in the US with the Inflation Reduction Act), the EU should develop a significant policy initiative to attract and mobilise private investment.

The EU has a strong basis to stand on. The stable and predictable policy framework, including with a clear 2040 target, gives investors the predictability they need. The EU sustainable finance framework has already helped to enhance the transparency of corporates' business decisions and to increase the contribution of the financial sector to the transition.

However, the transition will not be achieved through predictability and regulation alone. The Commission, Member States and industry must jointly work towards creating a business case for the new business models in key sectors of the economy needed for the transition and notably in clean tech and decarbonised energy intensive industries.

Europe must deepen its Capital Markets Union to unleash the potential of all forms of finance for the climate transition. Further dedicated policies to promote the EU as a leading destination for sustainable investments are needed to further amplify the impact of regulatory policies and public support. This requires a comprehensive reflection on all elements leading to private investments: from taxation to access to finance, from skills to regulatory burdens and energy costs. In this context, far more attention is needed for a simplified regulatory environment for business and a true Single Market for key technologies. This allows businesses to ramp up standard solutions across Europe, thus boosting their economic attractiveness for investors. Fresh impetus for simplification and the Single Market, closely coordinated with Member States, are a crucial element for the future success of the EU agenda. Particular attention should be paid to the creation of lead markets for clean technologies and products in Europe.

Public sector support and direct investment should be strategically deployed, also by frontloading and maximising existing resources with a joint, large-scale pooling of funding, accessible in the fastest and simplest way possible. Coordination between EU and Member State-level actions is crucial to maximise the impact of financing initiatives, with EU-level actions providing a framework to optimise policies and mobilise financial resources, while Member States tailor initiatives to specific regional and national needs.

From a public sector perspective, diversifying the financial landscape by using innovative financial instruments and targeted grants is crucial to attract private capital and to meet the

investment targets. There is a clear need for a more efficient and tailored use of public financial resources, and the use of innovative financial products and blending of financial sources to catalyse private investments.

Grants should only be strategically deployed to support early-stage low carbon projects such as renewable energy, in the industrial sector, and other projects, where projects lack commercial viability, private investment is still nascent and difficult to market investments. For mature projects with proven revenue streams, market-oriented financial instruments, such as green bonds and equity finance, can play a pivotal role. The role of the EIB is critical to mobilise private investments, especially to de-risk projects that are crucial for delivering the 2040 target, for example critical raw material projects.

Financial instruments should be simplified to make them more attractive to investors and project developers, including by tailoring instruments to specific investment types, providing clear terms, streamlining application processes and developing user-friendly platforms, guidance and reducing administrative burdens. Simplification throughout EU financial funds is needed to offer true one-stop shops for finance, which allows for pooling of resources, accelerated and easy access to finance, limiting the number of forms to access funding areas. These measures are necessary to ensure a level playing field for access to finance, which is particularly relevant for smaller businesses with limited organisational capacity.

It is important that sufficient fiscal space is preserved in Member States for investment, within the frame of long-term debt sustainability. The Innovation Fund as well as the national revenues under the EU ETS provide Member States with an important amount of funds that can be used for future proof structural reforms. Ending fossil fuel subsidies, including all favourable tax treatments, should free up further resources in addition to ensuring an appropriate incentive structure. Similarly, the EU budget should be geared towards promoting, enabling and encouraging green investment, while continuing to implement the “do no significant harm” principle.

The 2040 target should also guide the financial sector and supervisory authorities when assessing the climate transition risks of investments, leading to favourable conditions when risks are minimised and adequate risk mitigation measures when they are not.

Research, innovation and skills

Technologies to be deployed to meet the EU’s 2040 target include some that are market-ready, such as solar power, as well as a number that still need to be improved and scaled up.

It is therefore paramount to keep investing in the research and demonstration of innovative net-zero technologies, coordinating the EU and national R&I efforts, and strengthening efforts to bring innovations to the market and to scale them up.

Revenues from carbon pricing are a clear source of financing for the deployment of innovative low carbon technologies and solutions. Since its creation in 2005, the ETS has generated more than 180 billion euros. As the largest share of the ETS revenues go to the Member States, they should be incentivized to invest the revenues into structural forward-looking reforms, making it possible to significantly accelerate the demonstration and early deployment of industrial near zero solutions and manufacturing of innovative clean tech equipment.

At EU level, the EU ETS Innovation Fund provides a strategic tool to support and scale-up innovation in net-zero technologies towards full technological and commercial maturity. It is a key instrument to deploy the EU green deal industrial strategy. In its first three rounds, the Innovation Fund allocated EUR 6.5 billion to around 100 pilot projects and demonstration plants for innovative low-carbon technologies. The amount and sectoral distribution of applications to the Innovation Fund show strong engagement of industrial actors in this transformation, a promising project pipeline, and the need to increase available funding: all large-scale calls for proposals were heavily over-subscribed. For example, in the first two rounds of applications projects applied for EUR 33.8 billion of funding⁽³¹⁾, for a total budget of EUR 1.1 billion. EU industry clearly has an investment challenge ahead that constitutes a new industrial revolution, for which the Innovation Fund can be an EU based driver for cost efficient investments. The Commission will therefore seek to maximise the budget under the Innovation Fund until 2028 by frontloading the commitment of available funds. The Commission will also strengthen the synergies with other instruments and develop the Innovation Fund as a platform, through auctions and grants as a service, to help Member States select and support the most promising projects with national funds in a cost-effective way.

New net-zero business opportunities lead to job creation and demand for new skills. Demand for additional skilled workers will come with investment made ahead of 2030 to meet the 2040 target, in net-zero technologies, in building renovations and in servicing of net zero equipment. The skill sets of workers in declining fossil fuel or emission-intensive activities cannot always be easily transferred to new activities. An ambitious training and re-skilling development agenda coordinated at EU and Member State level should be developed to address the needs for new skills and jobs. It should ensure new and improved job opportunities for those currently employed in sectors that are phasing out, and that the transition is not hampered by skills mismatches and shortages.

4.7 An economy that delivers for people

EU citizens are at the heart of the Green Deal. The lower income and most vulnerable segments of our population are much more exposed to climate hazards as they lack the means to protect themselves against such risks. This makes the EU's climate agenda even more important, alongside the support to ensure that no one is left behind during the transition to a more secure future.

A just transition for people

The transition to climate neutrality is happening alongside the development of artificial intelligence, digitalisation and ageing amongst other trends. Together they will lead to changes in the way we produce and consume goods and services, with implications for most people.

In terms of employment, impacts will vary by sector and by region, according to their dependence on specific activities. A large share of workers, particularly in service sectors,

will not be significantly impacted by the transition to net zero emissions. Fossil fuel-dependent sectors such as transport and energy intensive industries will go through a fundamental transformation. Workers, communities and regions dependent on carbon-intensive activities will be the most impacted, calling for continued just transition support as the transition takes shape. The transition will bring new opportunities for business and job creation, for workers at all skill levels, but will benefit some regions more than others. EU cohesion policy and national measures to support the economic diversification and reconversion of impacted territories and communities play an essential role in supporting the most affected communities.

Access to affordable and reliable net zero energy and mobility solutions is essential for all. Support is needed for investment in energy efficient buildings, decarbonised heating and cooling, and clean mobility for lower income households. An efficient and targeted use of public funds is important in this regard. Financing instruments for energy efficiency measures can reduce household energy consumption and energy poverty. Fossil fuel subsidies should be removed in a way that protects vulnerable social groups and removes perverse incentives for excessive consumption of polluting fuels. Carbon pricing, such as under the EU ETS, is reducing emissions at least cost to society. It generates revenues for Member States to tackle climate change and increasingly to support industrial innovation and households for a fair transition. The ETS funded Social Climate Fund will mobilise EUR 87 billion to support vulnerable households, transport users and micro-enterprises. Used effectively, these funds can support people through the transition and have a lasting impact on their quality of life. Such EU level support will continue to be necessary after 2030, supplemented by Member State measures.

The impact of lifestyle choices

Personal choices about lifestyles, consumption and investment play a role in reaching climate neutrality, through their impact on GHG emissions. Recent surveys show that Europe is a continent where consumers increasingly include sustainability considerations into their everyday purchasing decisions, with a strong interest to fight greenwashing of product claims. Policies can allow markets to offer goods and services that make it easier for people to opt for healthier and climate friendly lifestyles.

The assessment of the 2040 target shows that an increase in sustainable lifestyle choices can significantly reduce the efforts needed to decarbonise other sectors, by improving material and resource efficiency. Households empowered to make environmentally friendly choices can directly reduce their climate and overall environmental impact, as well as generate significant co-benefits, particularly in terms of individual health and well-being.

Many of these markets offer promising business opportunities, such as with the concept of healthy diets. Other examples are in the realm of the circular economy, for instance from consumer demand for reconditioned mobile phones, to dematerialisation via bike/car sharing apps to businesses cutting costs through the circular use of materials.

5 Conclusion and next steps

Securing the prosperity and well-being of current and future generations requires the EU to continue its transformation to climate neutrality and a sustainable, competitive economy resilient to climate hazards, geo-political risks and free of critical dependencies.

The 2040 target provides a vision of the most cost-efficient path to achieve the GHG reductions, framing long-term decisions and allowing better investment decisions to be made today. It is the first step towards the development of a detailed climate, energy and enabling policy framework for the period after 2030. This communication and impact assessment outline the contributions needed from different sectors to reach a 90% net greenhouse gas emission reduction in the EU by 2040 and climate neutrality by 2050. It also provides reflections on the policy and enabling measures needed to get there.

[10] key conclusions and policy insights for the transition can be drawn from the Commission's analysis (text box below) to inform a broad debate on the action needed within the EU and in cooperation with our partners worldwide.

This Communication paves the way for a political debate and choices by European citizens and governments on the way forward. The next Commission should draw the conclusions of this debate and make the necessary legislative proposal to include the 2040 target in the European Climate Law. Preparations will then begin for an appropriate post-2030 policy framework to be tabled in the coming years. The work done from 2024-2029 will shape Europe's path to 2040 and onwards to 2050. The policy framework will need to ensure a balanced and cost-effective contribution of all sectors to greenhouse gas emission reductions and carbon removals.

Setting the EU's 2040 target will demonstrate the EU's determination to stay at the forefront of the global trends in expanding cleantech manufacturing and harnessing the opportunities for economic growth and job creation. Moreover, it will send a clear signal to the rest of the world that Europe remains fully committed to the Paris Agreement and to multilateral action providing the example and the means for others to act.

10 building blocks for achieving the 2040 target

1. A resilient and decarbonised energy system for our buildings, [road] transport and industry.

- To achieve the decarbonisation of the energy system, renewable energy will need to continue its growth, coupled with other zero and low carbon solutions (energy efficiency, more sustainable bioenergy, nuclear, storage, CCU, industrial carbon removals, and all other current and future net-zero energy technologies). Policies will need to facilitate their development, manufacturing, and deployment.
- The transition away from fossil fuels will increase the EU's independence and strategic autonomy and reduce the risk of price shocks. Solid fossil fuels should be phased out. In line with REPowerEU, gas and oil use should decrease over time in a way that guarantees the EU's security of supply. A clean hydrogen supply chain should contribute to seasonal storage and hard to decarbonise sectors.
- Electrification will be at the heart of the transition. Rapid electrification in the road transport and heating sectors is needed also through the deployment of recharging infrastructure. The electricity sector should come close to full decarbonisation in the second half of the 2030s, with increased flexibility through smart grids, energy storage, demand response and low carbon dispatchable power energy storage. This will require an important reskilling effort in the manufacturing and servicing sectors.
- Changes in the energy mix will require significant investments over the coming 10-15 years and hinge on the ability to establish the right regulatory framework, integrated infrastructure planning, competitive manufacturing and incentives for resilient supply chains.

2. **An industrial revolution with competitiveness, circularity, resource efficiency, industrial decarbonisation and clean tech manufacturing at its core.**
 - Carbon pricing and targeted investment support, will be the principal drivers for change. To enhance our competitiveness and strategic autonomy, increased and frontloaded public support will be needed for innovation and deployment of new technologies and infrastructure, coupled with de-risking private sector investment.
 - A comprehensive investment agenda to attract private capital and ensure the EU remains an attractive destination for investment.
 - A strengthened EU industrial policy with resilient value chains, notably for primary and secondary critical raw materials, and increased domestic manufacturing capacity in strategic sectors and principle of competitive sustainability fully incorporated in public procurement. This would require well-resourced funding mechanisms at EU level and the creation of lead markets, including through public procurement rules, market-based incentives, standards and labels to steer consumption towards sustainable, near-zero carbon materials and goods.
 - This will also require a more strategic approach to securing strategic commodities on the global market through trade measures and joint purchase mechanisms. Measures addressing the risk of carbon leakage and complementing CBAM, may also be needed to ensure fair trade practices.
3. **Infrastructure to deliver electricity and to transport and store hydrogen and CO₂.**
 - Targeted public intervention can act as a catalyst to accelerate investment, including at European level. Particular attention should be paid to the development of a smart integrated energy infrastructure at the distribution and industrial cluster levels.
 - Urban and city planning will allow citizens and business to decarbonise their environment, be it via recharging infrastructure or district heating.
4. **Enhanced emissions reductions in agriculture.**
 - Agriculture will become the largest source of emissions as other sectors decarbonise, but it can play an increasing role in the green transition. With effective policies that reward good practices there is room to decrease emissions [by at least XX%] through enhanced carbon removals in soils and forests. This could make the combined EU agriculture and land sector climate neutral as early as 2035 and a net carbon sink thereafter.
 - Clear policies and incentives should be put in place to realise the innovation potential in the agri-food value chain and the bioeconomy at large.
5. **Carbon pricing incentives to make these changes happen efficiently.**
 - The current Emission Trading Systems will need to be supplemented with the efficient use of energy taxation, the phase out of fossil fuel subsidies and the necessary adjustments at the border (CBAM) to ensure a level playing field on the EU market.
6. **Climate policy as an investment policy.**
 - An additional [x]% of GDP should be invested annually in the green transition – moving resources away from less sustainable uses like fossil fuel subsidies. A strong mobilisation of the private sector will be pre-requisite to make this possible. The private sector will deliver most of these investments if the policy framework incentivises low carbon investment and discourages carbon intensive investment, provided there is a strong business case for these investments.
 - Dedicated policies are needed to promote the EU as a leading destination for sustainable investments. This requires a comprehensive reflection on all elements: from taxation to access to finance, from skills to regulatory burdens and energy costs. This is a crucial element for the future success of the EU agenda and should be coordinated with EU Member States.
 - Public support at scale in the sectors faced with high business risks and for households, where equity is a concern, will be essential. This will require a more active engagement and less risk-aversity from institutional financial actors and notably the EIB. Further reflection will be

needed on how to make these industrial investments commercially viable, and how to best use the available EU fiscal space and on the role of the EU budget and the next MFF in fostering this investment push.

7. Fairness, solidarity and social policies at the core of the transition.

- A climate neutral and resilient economy will ensure the long-term prosperity and well-being of EU citizens. However, public policy and funds will have to tackle challenges for certain groups and regions, supporting decarbonisation investments by households.
- Addressing social concerns will require a clear policy focus on fairness, solidarity and social policies that not only alleviate the direct impact of carbon pricing where needed, but also allow low-income households to make the effective transition towards no carbon emissions.

8. Lifestyles and sustainable choices of citizens to reduce necessary investments and speed up the transition.

- Households should be empowered to have the opportunity to make environmentally friendly consumption, investment and lifestyle choices that can reduce their climate and overall environmental impact. New business practices, especially circular approaches, can make it easier for consumers to adopt climate friendly lifestyles, and for example clean energy communities give citizens the possibility to invest together in and earn money from solar panels or wind energy.
- If replicated across the population at large, this allows a considerably easier pathway towards climate neutrality with significant co-benefits, particularly in terms of individual health and well-being and reduced overall investment needs.

9. EU climate diplomacy and partnerships to encourage global decarbonisation.

- The EU should continue to lead by example and provide a wide-ranging contribution to achieving the Paris Agreement goals.

10. Risk management and resilience.

- Climate change will nevertheless impact our societies for years to come, so we must prepare and adapt in parallel. Stepping up risk prevention measures in a coordinated manner will improve the resilience of the whole of our economy and reduce the costs.

