ISSN 1831-9424

European Commission

TOWARDS A FAIR AND SUSTAINABLE EUROPE 2050: SOCIAL AND ECONOMIC CHOICES IN SUSTAINABILITY TRANSITIONS

EU Policy Lab

JRC SCIENCE FOR POLICY REPORT

STRATEGIC FORESIGHT

SUSTAINABILITY

SYSTEMIC CHANGE

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JRC133716
EUR 31545 EN

Print ISBN 978-92-68-04197-0 ISSN 1018-5593 doi:10.2760/561899 KJ-NA-31-545-EN-C
PDF: ISBN 978-92-68-04196-3 ISSN 1831-9424 doi:10.2760/804844 KJ-NA-31-545-EN-N

Luxembourg: Publications Office of the European Union, 2023

How to cite this report: Matti, Jensen, Bontoux, Goran, Pistocchi, Salvi, *Towards a fair and sustainable Europe 2050: social and economic choices in sustainability transitions*, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/804844, JRC133716

TOWARDS A FAIR AND SUSTAINABLE EUROPE 2050: SOCIAL AND ECONOMIC CHOICES IN SUSTAINABILITY TRANSITIONS

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Contents

Abstract

This foresight study explores possible and necessary changes in the European social and economic systems as the European Union engages in managing sustainability transitions towards 2050. With this focus, the study presents strategic areas of intervention covering a new social contract, governance for sustainability, people and economy, and the global perspective on sustainability. The study reflects on the agency of EU actors (such as government at various levels, business, and communities) to address the strategic areas of intervention as part of collectively addressing sustainability transitions. The study builds on a participatory foresight exercise, which generated four foresight scenarios for a climate-neutral EU in 2050. Based on each scenario, a corresponding transition pathway was co-created and analysed through the process. The study presents and analyses these outputs of the process. The outputs can also serve as input to policymakers and practitioners interested in conducting new participatory exercises on sustainability transitions.

Acknowledgments

This study would not have been possible without the expertise and insight of the many contributors involved along the way. Their input and reflections guided the development of the content of this study from start to finish.

The authors are indebted to the workshop participants for dedicating their time and knowledge to this project and enabling the co-creation that this study draws on. We express our sincere gratitude to all the participants.

The study was conducted as the fourth foresight exercise in the context of the European Commission's annual strategic foresight reports. The preceding strategic foresight reports and underpinning JRC foresight studies form a foundation that this study builds on to examine the many aspects of the possible future for the EU and its citizens.

We would also like to give special thanks to the many experts from the Joint Research Centre for their support and feedback throughout the process. Their contributions and counsel helped to ground many of the discussions and deepen the content of this study. In addition, we are particularly grateful for the advice of the peer reviewers of this study.

Sincere thanks are also due to the Foresight Team of the Secretariat-General, Clementine Agosta, Grzegorz Drozd, Cornelius Hermelink, Beata Kolecka and Tanja Zegers. We are truly grateful for the close collaboration and valuable suggestions throughout the process. For sharing their advice and knowledge, we also express many thanks to the members of the European Commission's Strategic Foresight Network, as well as several colleagues across the Commission services.

We thank our colleagues Anne-Katrin Bock, Valerie Enjolras, and Thomas Hemmelgarn for their guidance and support to this project. In addition, we would like to thank Teodora Garbovan for her instrumental contributions in the communication of the results of this study, as well as Alessandro Borsello for the graphic design and layout. Finally, the authors express our deep appreciation for the help and support of Sara Armas del Rio and Maya Lamanna in the organisation of this project.

Executive summary

Amidst the pressing challenges posed by the climate crisis and related extreme weather events, environmental degradation, as well as biodiversity loss, it becomes increasingly evident that swift and extensive action is imperative worldwide. **As a leading force in the fight against climate change, the European Union is resolute in its commitment to achieve climate neutrality by 2050.** Expanding on the previous year's foresight analysis, which outlined 14 requirements for successful "twin" digital and green transitions, this study provided the foresight input to the European Commission's 2023 Strategic Foresight Report by delineating key areas and measures in the social and economic spheres. It places the wellbeing of people, as well as social and economic fairness as fundamental principles within all sustainability endeavours.

Faced with an epochal challenge, the European Union is taking action to steer the continent through the green transition and harness its opportunities. However, in order to become sustainable, the next years and decades require both collective action and profound changes to improve the social and economic aspects influencing people's lives. These range from **redefining wellbeing, strengthening democracy and governance to promoting new business models from a sustainability and climate neutrality perspective**. The profound and sometimes radical changes described in this foresight study are part of the multiple possible ways in which the EU can collectively address sustainability transitions. What is more, they are necessary to enhance the EU's capacity to act in a complex and constantly changing global context.

This foresight study identifies a range of crucial **social and economic changes** required for sustainability transitions to become a reality in the EU in the coming decades. It presents the key messages that:

- **A just transition and a new social contract founded on sustainability** are essential to strengthening the EU's social foundations and establishing it as a strong and reliable partner on the international stage.
- **Governance models need to be reformed to address sustainability challenges effectively**. This entails fostering strong collaboration and defining new roles between the various levels of governance in the EU

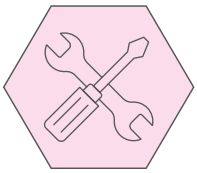
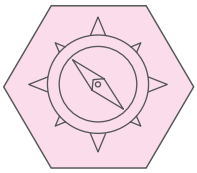
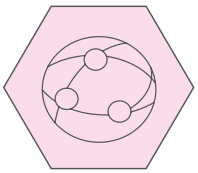
(European, national, regional and local), with local-level governance playing a central role in both a vibrant and transparent democracy, and in climate adaptation.

- **A future sustainable world starts with the reinterpretation of what wellbeing and a functional economy mean**. Strategic interventions in many areas are needed to shift the common understanding of wellbeing by redefining it in terms of quality of life and fairness rather than only material wealth. A rethinking of the economy is also necessary to ensure that it delivers the necessary goods, services, and quality jobs, while functioning within planetary boundaries to be truly sustainable.
- **A global perspective for the EU's sustainability transitions is necessary to ensure their success**. This entails navigating the current geopolitical changes and forging alliances with like-minded partners in the fight against climate change. The primary challenge lies in finding the optimal balance between maintaining autonomy and embracing a more effective path for multilateralism within a decolonised framework and in a shifting geopolitical landscape.

GO TO CHAPTER 4
TO LEARN MORE ABOUT THE
STRATEGIC AREAS OF INTERVENTION
FOR SUCCESSFUL SUSTAINABILITY TRANSITIONS

KEY MESSAGES ON STRATEGIC AREAS OF INTERVENTION ACROSS THE TRANSITION PATHWAYS	
A NEW SOCIAL CONTRACT The transformation towards sustainability requires a new social contract, calling for urgent action to address inequalities and transform the economy	Democracies face growing discontent and inequality, while fairness, social cohesion and participation are crucial elements for adaptation and a renewal process. Future generations face major climatic, economic and social challenges that current policies should address, striving for intergenerational fairness as a guiding principle for a new social contract. Well-being is evolving into a holistic concept encompassing quality of life, health and a wide range of socio-economic and environmental factors for long-term sustainability, moving beyond material wealth. The provision of essential services to ensure quality of life and well-being, as well as improved working conditions, should be a policy priority to enable a just transition and promote a fair and sustainable economic development.
GOVERNANCE FOR SUSTAINABILITY A shift is needed in public policy towards a policy mix approach to foster systemic change	Public finance and tax systems need to be redesigned to remain effective in the face of new pressures created by climate change, ageing and economic conditions, while tackling inequalities, targeting investment priorities and supporting the exit from unsustainable sectors. Agile multi-level governance mechanisms are critical for a successful transition to sustainability and to use public resources effectively while promoting change through synergies with the private sector. Investments that support the transition to sustainability can be promoted through a mix of innovation, environmental and sectoral policy instruments in synergy with sustainable finance and public-private sector collaboration. Regions and cities are crucial for transformative investments as they have the appropriate competences on industrial development and natural resource management.
PEOPLE AND ECONOMY FOR SUSTAINABILITY People's behaviour and their competences and skills will be critical to address the necessary changes toward sustainable lifestyles	New circular and collaborative business models are critical to the transition to sustainable production and consumption, while current business practices require significant changes to create options to promote sustainable lifestyles. The transition to sustainable lifestyles is a long-term change that involves a reduction in material and energy consumption. It requires a radical change in current practices and supportive policies that lead to behavioural change while ensuring an affordable sustainable lifestyle. A renewed education system is needed to address the transitions to sustainability, in terms of the considerable range of competences and skills that cover lifelong learning and emerging needs, while ensuring equal opportunities in society.
GLOBAL PERSPECTIVE ON SUSTAINABILITY The global order of the coming decades will be complex as the number of significant players grows and global economic activities are reconfigured towards resilience	Industry will adapt to the reorganisation of global value chains by addressing critical issues of interdependence, resilience and the emergence of new sectors. The EU faces the corresponding challenges posed by the geopolitical situation and competitive markets, while the development of the needed skills and the relocation of activities offer opportunities. A new logic of globalisation and the shifting geopolitical landscape bring changes to multilateralism, with corresponding effects on international trade and the composition of global value chains. Fostering international partnerships and sustainable development in a decolonised context can pave the way for global sustainability transitions.

Building capacity to act of EU actors in sustainability transitions

Shaping  *Change through systemic policy mixes*	**Reformulating the social contract** **Renewing democracy** **Accelerating the development of sustainability competences** **Rethinking the mix of policy instruments** **Exiting unsustainable production and consumption**
Navigating  *Uncertainty and complexity*	**Forming a strategy for complexity in geopolitics and multilateralism** **Building new capacity to act** **Managing the uncertainties of new technologies** **Steering change in global markets towards resilience** **Reducing dependencies through diversification**
Orchestrating  *Processes and relations*	**Enabling portfolios of systemic interventions** **Removing barriers for collaboration between public and private sectors** **Strengthening the crucial role of regions and cities** **Supporting sustainable lifestyles** **Discouraging unsustainable consumption**

GO TO CHAPTER 5 TO LEARN MORE ABOUT **AGENCY OF EU ACTORS** IN SUSTAINABILITY TRANSITIONS

The foresight study highlights the crucial need for coherent action across the EU to address these areas of intervention effectively. By strengthening the capacity to act **(agency) and promoting collaboration throughout all parts of the EU, the challenges of achieving sustainability can be overcome.** This involves harnessing engagement at all levels of governance, fostering public-private partnerships and collaboration to tackle the

wide-ranging challenges linked to sustainability, as well as including and engaging citizens in decision-making processes. Through collective action, the EU can shape framework conditions, navigate uncertainty and geopolitical change, and forge strategic collaborations to drive sustainability transitions. These strategies can help to build new agency over time, through reinforcing interventions and by addressing external events decisively.

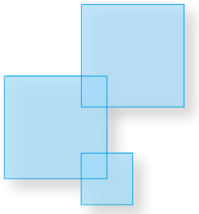
This report is the result of an open, year-long inclusive and collaborative foresight process to gather valuable insights involving experts, policymakers, and social partners. **Four foresight scenarios were developed to better envision what a climate-neutral European Union could look like in 2050**; as well as **four related pathways which could allow the EU to reach these possible sustainable futures**. They are the result of a co-creation process based on planning backwards from the scenarios. A comparative analysis across the four pathways towards sustainability led to the identification of strategic areas of intervention, which are summarised above. They represent the **key areas of change required in the coming decades for sustainability transitions**.

The outputs of this foresight study can serve as **valuable resources for policymakers and practitioners engaging in sustainability transitions elsewhere**. By using the actionable findings and recommendations, future exercises and initiatives can be developed to help drive sustainable change within the EU, at multiple levels of governance.

GO TO CHAPTER 2 TO LEARN MORE ABOUT THE **METHODOLOGY** AND **CHAPTER 3** TO EXPLORE THE **FOUR SCENARIOS** AND TRANSITION PATHWAYS IN DETAIL

Summary of EU 2050 scenarios and transition pathways

ECO-STATES



National governments and the EU drive change – motivated by climate change impacts

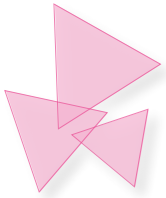
CONTEXTUAL FACTORS

SOCIAL	Trust in governments, focus on the common good, equality and social conformity
TECHNOLOGICAL	Public funding for top-down innovation, high-tech digital tools, transparency and monitoring
ECONOMIC	Highly regulated social market economy, new taxes, strong public budgets
ENVIRONMENTAL	Nature & climate highly valued to serve society, focus on food security
POLITICAL	Strong governments, top-down decision making, the EU empowered in a few new areas (e.g. energy, taxes)
GEOPOLITICAL	Persisting world order with international organisations

TRANSITION PATHWAY – KEY PATTERNS OF CHANGE

- Using legislation, education and public engagement to turn consumers into ecology-conscious citizens
- Substantial fiscal reforms for sustainability
- State-led technology development for sustainability

GREENING THROUGH CRISIS



Crisis-response and the EU drive change – motivated by geopolitical instability and climate change impacts

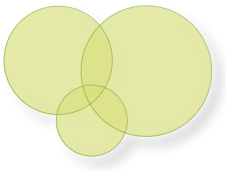
CONTEXTUAL FACTORS

SOCIAL	Trust in government and the EU, focus on stability and security
TECHNOLOGICAL	Public-private partnerships for innovation, EU-based and EU-made digital tools and & infrastructure
ECONOMIC	Constrained liberal economy, re-shoring & friend-shoring, industry 5.0
ENVIRONMENTAL	Nature & climate valued for capacity to serve society, focus on mitigating risks
POLITICAL	Strong Member States, top-down decision making, EU empowered in a number of areas (e.g. defence, energy)
GEOPOLITICAL	The world is more hostile and fragmented, multilateralism significantly reduced

TRANSITION PATHWAY – KEY PATTERNS OF CHANGE

- An emerging consensus on Green Strategic Autonomy
- Shifts in governance and democracy towards more EU competences and important local governance
- A profound reconfiguration of global supply and value chains

GREEN BUSINESS BOOM



Incentivised (global) markets drive change – motivated by high costs, scarcity, and unreliable supply chains

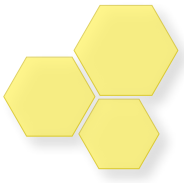
CONTEXTUAL FACTORS

SOCIAL	Individualistic, hardworking, high trust in innovation & tech, inequalities persist
TECHNOLOGICAL	Thriving innovation, private funding, biotech, high-tech digital tools
ECONOMIC	Dynamic circular economy, green taxes, low regulation
ENVIRONMENTAL	Nature respected as a limited resource
POLITICAL	Pragmatic EU and Member States, strong influence of corporate interests, esp. large EU-wide companies
GEOPOLITICAL	The EU makes strategic alliances fore resources and coordinates actions for big EU corporations

TRANSITION PATHWAY – KEY PATTERNS OF CHANGE

- Liberal government action spurred a technology-led green systemic reconfiguration
- Strong cooperation between public and private actors boosts a deep transition
- New models for enabling social mobility

GLOCAL ECO-WORLD



People and behaviour drive change – motivated by government inaction

CONTEXTUAL FACTORS

SOCIAL	Communitarian, highly participative and egalitarian, focus on wellbeing and sufficiency
TECHNOLOGICAL	Bottom-up innovation focused on local needs, lack of public funds and infrastructure
ECONOMIC	Local collaborative economy, service-based business models and social entrepreneurship
ENVIRONMENTAL	Nature highly valued for human well-being and given rights
POLITICAL	Member States lost competences to the local level for resilience and the EU level for security
GEOPOLITICAL	Fragmented world with a relatively weaker, but locally resilient EU

TRANSITION PATHWAY – KEY PATTERNS OF CHANGE

- People started taking things into their own hands, leading to a new social contract
- Economic shift towards sufficiency, a first step towards strategic autonomy
- Towards a redesigned EU and new forms of local democracy

CHAPTER 1

Introduction and framing

A socially and economically sustainable Europe with a strong global role

The coming decades demand profound transitions towards sustainability from Europe and the world. The European Union has committed to climate neutrality by 2050 and has proposed comprehensive policy initiatives under the umbrella of the European Green Deal. While this provides a general direction for sustainability transitions, there is still a lot of debate and uncertainty around what a future sustainable EU would look like and what is needed to get there. A myriad of policy decisions still need to be taken and coordinated to ensure coherent and sufficiently rapid progress. The complexity of the changes that need to happen brings major challenges that require a future-oriented systemic approach looking at EU as a whole, beyond current agendas and policies. The purpose of this foresight study is to support this debate. Through its focus, the study aims to bring attention to interactions between economic, social and environmental systems and to explore how they may unfold in the future towards 2050.

This foresight study looks at sustainability from a holistic perspective but emphasises the changes that European economic and social systems should make to address sustainability transitions. The EU has committed to sustainability and sustainable development, covering the three dimensions (environmental, social and economic) of sustainability. The United Nation's Sustainable Development Goals[1] provide a broad framework for the EU to address sustainability transitions. In this context, it is essential to recall that sustainable development is a global endeavour and that European interventions for sustainability must be situated in a global context. To complement the well-established need for action on the environmental dimension of sustainability, this study reflects on challenges and opportunities in the coming decades for the social and economic dimensions of sustainability. Finally, the study focuses on the EU and its capacity to act in sustainability transitions to provide a forward-looking exploration and to identify key areas of intervention, taking into account essential partnerships within a broader global landscape.

1 SDGs include 17 overarching goals, each with its specific targets and indicators, covering aspects of the natural world, society and economy. The EU has integrated them in its own monitoring tools: European Commission (2023)

This study builds on, and complements, previous foresight exercises behind the annual strategic foresight reports of the European Commission and their underpinning JRC studies – on resilience,[2] open strategic autonomy[3] and twinning the green and digital transitions.[4] This previous work provides insights into the strategic direction and key challenges for Europe in the coming decades, many of them closely connected to sustainability transitions. Such transitions are complex processes that affect all aspects of the economy and society, as well as the EU's role in the world. The foresight exercise of 2023 built on the basis of the previous work to explore sustainability transitions and what they mean for social and economic issues. The present, and the ambitions set for the future, provide essential context for this foresight exercise.

A challenging context for achieving a sustainable Europe

Climate and environmental crises threaten the survival of human civilisation. Even as this study was being carried out, current affairs provided ample evidence of the immense pressure of climate change in Europe. Losses of forests to fire are reaching unprecedented levels[5] at a time when tree mortality is increasing fast (+54% over 10 years in France).[6] In the spring of 2023, Spain is breaking heat records in a spectacular fashion: 60 heat records were broken in April 2023![7] Overall, southern Europe has also been breaking drought records over the last two years[8,9] with serious long-term threats to agriculture and energy production in Italy, France and the Iberian Peninsula. Indeed, and in line with well-documented warnings such as those from the International Panel on Climate Change (IPCC) and the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES), the world and the EU are experiencing disruptions that would have been unthinkable by most people as recently as five years ago. Leaving these climate change trends and their associated environmental degradation to run their course would create existential challenges for human survival.

Several EU policy initiatives are being rolled out to address the environmental dimension of sustainability. There is momentum for the European Green Deal, where legislation spans environmental, climate, energy, biodiversity and agricultural policies but also includes initiatives addressing social challenges, economy and finance. The overarching target for net greenhouse gas emissions reduction of at least −55% by 2030, compared to 1990 levels, has been made legally binding by the European Climate Law.[10] Based on the EU Biodiversity Strategy,[11] the proposed Nature Restoration Law[12] aims to set binding targets to restore degraded ecosystems such as forests and rivers, protect pollinating insects, etc. As part of its zero pollution action plan,[13] the European Commission has recently proposed stronger rules on ambient air, water pollutants and urban wastewater, building on long-standing directives on water and air quality.[14] The farm to fork strategy[15] aims at making food systems sustainable, fair, resilient and capable of delivering a healthy diet to all Europeans.

2 European Commission (2020a)
3 Joint Research Centre (2021a)
4 Joint Research Centre (2022a)
5 EURONEWS (2022)
6 IGN (2022)
7 Cadena SER (2023)
8 Joint Research Centre (2023a)
9 The Guardian (2023)
10 European Parliament and Council of the European Union (2021)
11 European Commission (2023b)
12 European Commission (2022a)
13 European Commission (2022b)
14 Directive 91/271/EEC,60/2000/EC and Directive 2008/50/EC
15 European Commission (2022c)

The social dimension of sustainability must be addressed together with the green transition, and there are many policy levers available. One key aim of the European Green Deal is to leave no person and no place behind, thus promoting the social fairness of the green transition. There are tensions to address related to the societal acceptance and fairness of the green transition. Beyond that, broader social changes are ongoing in Europe, and in many social areas there is progress to be made. The 20 principles of the European Pillar of Social Rights and its action plan[16] contribute to this aim by focusing on improving the lives of Europeans through education, employment, access to basic services, care, pensions and a number of other areas. For example, the Skills Agenda[17] has been the cornerstone of the EU's upskilling and reskilling efforts, providing support and funding to stakeholders across the EU. Dozens of other initiatives also contribute to ambitious headline targets for boosting employment and training while reducing poverty across the EU. Complementing the Cohesion Policy objectives, the Just Transition Mechanism[18] addresses territorial inequalities, focusing on the regions facing the greatest challenges in implementing sustainability transitions. The Social Climate Fund, on the other hand, aims to help vulnerable citizens across the EU who are most affected by energy and transport poverty.

EU initiatives on sustainability address economic aspects and must also react to the wider geopolitical context. As a response to Russia's military aggression in Ukraine in 2022, the European Commission proposed the RePowerEU plan[19] to diversify its energy imports as quickly as possible while improving energy efficiency and speeding up investments in renewable energy. The transformation of the economy in line with European Green Deal targets requires fundamental changes in technologies, infrastructure, legislation, markets, behaviours and other systems. For example, the recently proposed European Green Deal Industrial Plan[20] focuses on achieving a 'net-zero industry' and is backed by initiatives on raw materials and reform of the electricity market design. The Sustainable and Smart Mobility Strategy[21] encompasses 82 initiatives aiming at cutting 90% of greenhouse gas emissions by 2050 while transforming transport systems to make them smart, competitive, safe, accessible and affordable. Since 2020, the new circular economy action plan[22] has provided a basis for initiatives on batteries, packaging, textiles, consumer empowerment, repair of goods, etc. The Strategy for Financing the Transition to a Sustainable Economy[23] helps direct investments towards sustainable production and services.

The EU's efforts in steering sustainability transitions go hand in hand with its global actions. Addressing climate change is inherently global, and the EU engages with global partners in multiple vital and urgent actions for the health of the climate and environment. The EU has a major responsibility in showcasing sustainable solutions while supporting the least developed countries in climate change mitigation and adaptation and in achieving social progress and well-being. The European social market economy provides high-quality welfare for its people and has been attracting workers and other people to Europe. Sustainability transitions will require novel solutions to ensure sustainable well-being, and strengthening the effectiveness of the EU's social model can empower it as a global sustainability standard. The success of the EU

16 European Commission (2023c)
17 European Commission (2023d)
18 European Commission (2023e)
19 European Commission (2023f)
20 European Commission (2023g)
21 European Commission (2020b)
22 European Commission (2020c)
23 European Commission (2023h)

in addressing sustainability transitions will likely benefit its position in the geopolitical context as much as its economy and society. The Global Gateway[24] as a new European global strategy encompasses environmental, economic and social aspects of its external action.

The challenge for Europe is profound. Material consumption around the world measured as ecological footprint is exceeding Earth's capacity to regenerate, with wealthy countries accounting for the largest share of the burden.[25] No country with a high level of well-being has yet managed to operate within environmental limits, and no country operating within environmental limits has managed to achieve a high level of well-being.[26] This state of affairs indicates clearly that current practices and paradigms need to change and evolve to bring about a sustainable future. At the same time, profound disruptions are taking place in fast succession, increasing complexity and uncertainty. The COVID-19 pandemic was followed by a raft of extreme weather events around the world. The Russian war in the Ukraine is still destroying lives and livelihoods and will have consequences for the decades to come. The war has contaminated more than 10 million hectares of Ukraine's best agricultural land, a quarter of the total.[27] The EU and the world are indeed facing unprecedented challenges, and there are indications that these will likely increase until 2050 and beyond.

Several megatrends[28] will also put strong pressure on the EU in the coming decades. Demographic trends and projections point to an older and smaller European population by 2050 as a share of world population.[29] The smaller population will likely go hand in hand with reduced global economic clout and higher demand for

24 European Commission (2023t)
25 The ecological footprints of countries around the world. EU countries are marked in red. Source: European Environment Agency (2019a)
26 Several studies outline the relationship using various metrics to account for well-being, see for example Fanning et al. (2022) or the previously cited data from European Environment Agency (2019a).
27 Nickel (2023)
28 Joint Research Centre (2023b)
29 United Nations (2021)

social spending through pensions, healthcare and social care. Megatrends also interact and can compound each other, for example, ageing may contribute to climate change, as older citizens tend to emit more greenhouse gas emissions.[30] In parallel, many countries around the world, especially in Africa, will see significant population growth.[31] This growth will be matched by demand for development in those regions. Rapid technological evolution, especially in digital tools and in artificial intelligence (AI), is continually becoming more relevant to social and economic development, including changing the nature of work, education and learning.

The future can be shaped by actions today – but action is urgent. These trends, such as climate change, environmental degradation and rapid technological development, result from conscious policy and values choices over the last century and possibly earlier, meaning something can be done about them. Indeed, history (and foresight) teach us that the future can be shaped to a large extent by actions taken in the present, especially when taking a long-term strategic outlook. Considering the time needed to engage in necessary, profound changes in socioeconomic systems, the scale of the potential consequences if nothing is done and the speed of climate change, taking drastic actions is a matter of urgency. The challenge is not only to avert the worst consequences of these threats (react and adapt to what we cannot change)[32] but also to build the future EU that its citizens may desire and deserve (act on what we can change).

Motivation and structure of the study

The study explores strategic areas of intervention that the EU needs to engage in over the coming decades to chart its own course towards sustainability. The purpose of this study is to provide elements to answer the question '*What strategic decisions need to be made in the next decades to ensure a socially and economically sustainable Europe with a stronger role in the world?*' to inform the European Commission's 2023 Strategic Foresight Report. In doing so, the study highlights a number of topics that emerged as key areas of intervention for Europe's sustainability transitions. From this, the study reflects on Europe's agency in leading such processes of change in the coming decades.

The general direction addressing the transformative change needed for sustainability is set, but the future is uncertain. The policies and initiatives outlined above provide a broad picture of the direction and goals of the sustainability transitions that Europe is engaging in. Looking forward to 2050, the study projects these established directions to envision a sustainable Europe and explores how different uncertainties might affect it across a set of different transition pathways. While this approach has been operational to the foresight process, it must be emphasised that Europe's sustainability transitions, even in the environmental dimension, are not a given for the future, but rather an epic challenge and an opportunity to build a better future.

This study aims to contribute to policymaking by highlighting key areas of action for the coming decades, gathered through an open and inclusive process. In addition, the process generated actionable knowledge[33] through several instrumental outputs that can be used to continue the exploration of Europe's sustainability transitions. To discuss sustainability, the study contains normative statements that are based on the results of the participatory process and complementary

30 Joint Research Centre (2023)
31 United Nations (2022)
32 See for example this overview of possible actions: Joint Research Centre (2020a)
33 Joint Research Centre et al. (2022)

evidence. These statements serve to provide insights to identify possible courses of action as part of an analytical exercise. The study offers a broad perspective that incorporates a range of different aspects to consider in the coming decades. It aims to help policymakers working at different levels and in different fields to better address policy design and implementation as part of a broad policy framework for achieving sustainability transitions in Europe.

The study is structured as follows:

- Chapter 2 describes the participatory foresight process designed for this study and the intermediate outputs developed at each step of the process.
- Chapter 3 presents four foresight scenarios of a sustainable EU in 2050 and four corresponding transition pathways towards 2050 developed through a forward-looking analysis and participatory process.
- Chapter 4 covers the systemic analysis of the transition pathways. It describes strategic areas for intervention.
- Chapter 5 concludes the study with a reflection on the agency of EU actors to address sustainability transitions in the coming decades.
- The annexes contain the full version of the foresight scenarios and the associated transition pathways as well as a detailed description of the methodology.

CHAPTER 2

Methodology

This chapter presents the methodology developed for this study and provides a step-by-step description of the foresight process. The process aimed to produce knowledge that could be applied by policymakers when reflecting on sustainability transitions and to enable further use of the study outputs by a wider range of stakeholders. This chapter is supported by an annex describing the methods applied and the different outputs produced in this study.

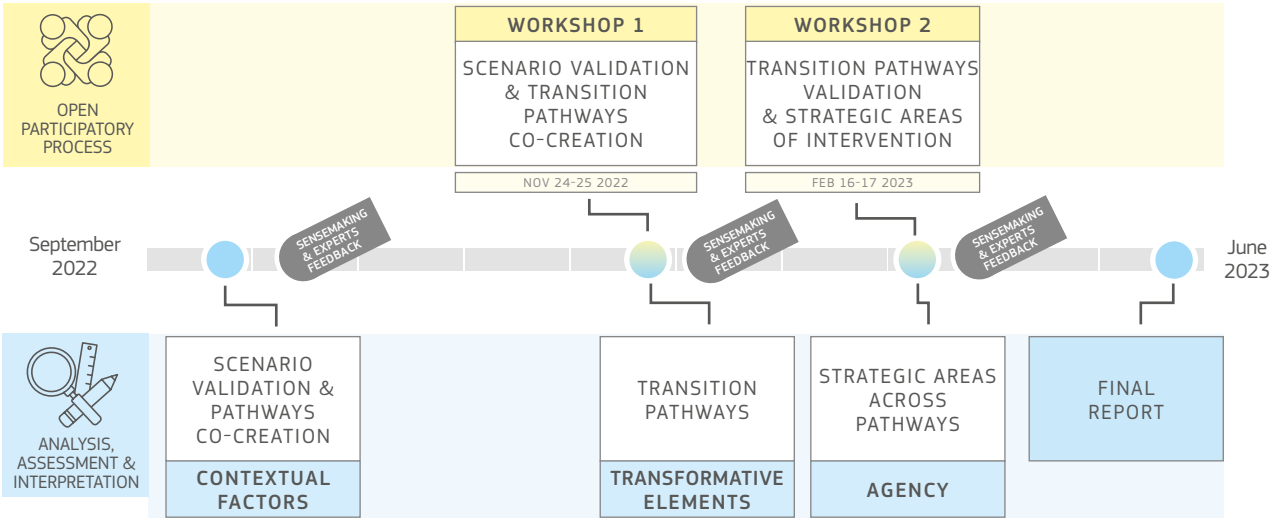
Foresight process

Foresight is a discipline based on the fundamental premise that the future is open and cannot be predicted but that it can be shaped by actions in the present. It deals with the medium- to long-term future, i.e. 'beyond the planning' timescale. It is a collective intelligence-building exercise which is structured, systematic, participatory and inclusive. Foresight aims to inform present-day decisions and facilitate joint actions.

The process behind this study was designed, in line with good foresight practice, to be inclusive and participatory to build collective intelligence. To generate a good understanding of the various simultaneous transformative processes that need to take place for sustainability, concepts from academic research on sustainability transitions were applied in the design of the foresight process and in the analysis of the results. This interplay between the foresight process and the concepts related to sustainability transitions resulted in a robust collective intelligence that facilitated analysis and interpretation of the results of the foresight process by combining different perspectives relevant to European policy. To this end, the team explored the relationships between the findings using additional insights from several sources, including European Commission policy documents and JRC publications.

In this study, sustainability is defined following the logic of sustainable development as the capacity to meet the needs of the present while ensuring that future generations can meet their own needs. It includes three dimensions: economic, environmental and social. To achieve sustainable development, policies in these three areas must

Figure 1 The foresight process and related timeline



work together and support each other.[34] In line with this, the process illustrates several processes of change and interventions relevant to Europe's sustainability transitions in the coming decades. By taking a step back to examine changes and challenges across the whole of society, a big picture of the necessary transformation emerges.

This study builds on a combination of two parallel processes:

1) an open participatory process including two in-person workshops and exchanges with experts, and

2) in-house analysis, assessment and interpretation activities involving secondary research and expert reviews.

Figure 1 shows the chronological sequence of the foresight process. It also highlights the intermediate outputs and related analytical element that characterises each step: Scenarios (contextual factors), transition pathways (transformative elements) and strategic areas of intervention (agency).

The process included several steps and feedback loops to explore possible future change processes. The work started in autumn 2022 with the creation of a set of four normative foresight scenarios[35] describing different versions of how the EU could reach climate neutrality by 2050. The scenarios were validated through a workshop and through exchanges with experts. Four transition pathways (one per scenario) were then co-created in workshops and validated with experts. The scenarios and pathways developed in the foresight process are not predictions. While they present plausible trajectories of the EU over the next 30 years, it is not possible to attach any meaningful probability to them in view of the scale of the uncertainties. What matters is to consider what might happen, to better understand what drives change and to explore areas where decisions need to be taken. By comparative analysis across these pathways, areas of intervention were identified collectively during the open participatory process. These areas were elaborated, analysed and consolidated with experts and desk research to prepare the strategic areas of intervention. Finally, the study offers a reflection on agency of EU actors in addressing social and economic change as part of sustainability transitions.

34 European Commission (2023u)

35 Normative (or prescriptive) scenarios describe a prespecified future, presenting "a picture of the world achievable (or avoidable) only through certain actions. The scenario itself becomes an argument for taking those actions" Ogilvy (2002)

The JRC, in close collaboration with the Commission's Secretariat-General, involved a broad range of expertise in the open participatory process with:

- two face-to-face workshops with a broad range of experts from the European Commission, EU agencies, academia, think tanks, foresight professionals, social partners and civil society on 24-25 November 2022 (from scenarios to pathways) and 16-17 February 2023 (from pathways to cross-cutting areas)
- online workshops with experts from across the JRC covering relevant fields
- consultations in the context of European Commission's networks on strategic foresight including representatives of Member States and Commission services
- bilateral meetings on specific topics with experts from across the Commission, EU agencies, think tanks and other organisations.

Actionable knowledge to inform policymaking

The knowledge produced through the foresight process has been translated into concrete outputs applicable for the decision-making processes of policymakers.[36] The foresight process generated a discussion of multiple change processes that sustainability transitions would entail. The concepts related to sustainability transitions were instrumental in analysing these changes by highlighting the processes of systemic transformation. This analysis improved the usability of the knowledge created to make it actionable for policymaking.[37]

The process delivered a coherent sequence of outputs:

1. a set of four foresight scenarios for a sustainable EU 2050 **– see Chapter 3 -**
2. a set of four corresponding transitions pathways **– see Chapter 3 -**
3. a set of four clusters of strategic areas of interventions addressing the necessary changes on the way towards sustainability across all areas of intervention **– see Chapter 4 -**

These outputs can be used by policymakers and foresight practitioners to facilitate discussions about the future through sense-making sessions targeting all or selected elements that describe social and economic change. In addition, the three sets of outputs can be used flexibly to design short foresight sessions on specific topics (such as open strategic autonomy, green and digital transitions and climate adaptation) with the purpose of developing new transitions pathways and related areas of strategic interventions at different governance levels. The emphasis on the social and economic dimensions of sustainability provides an added value for exploring possible transition pathways.

METHODOLOGICAL AND CONCEPTUAL FRAMEWORK.

Annex 1 (p. 97) contains a detailed description of:

- Instrumental concepts on sustainability transitions and transformative change
- Methods and tools
  - Scenario Building
  - Transitions Pathways and backcasting
  - Strategic areas of intervention

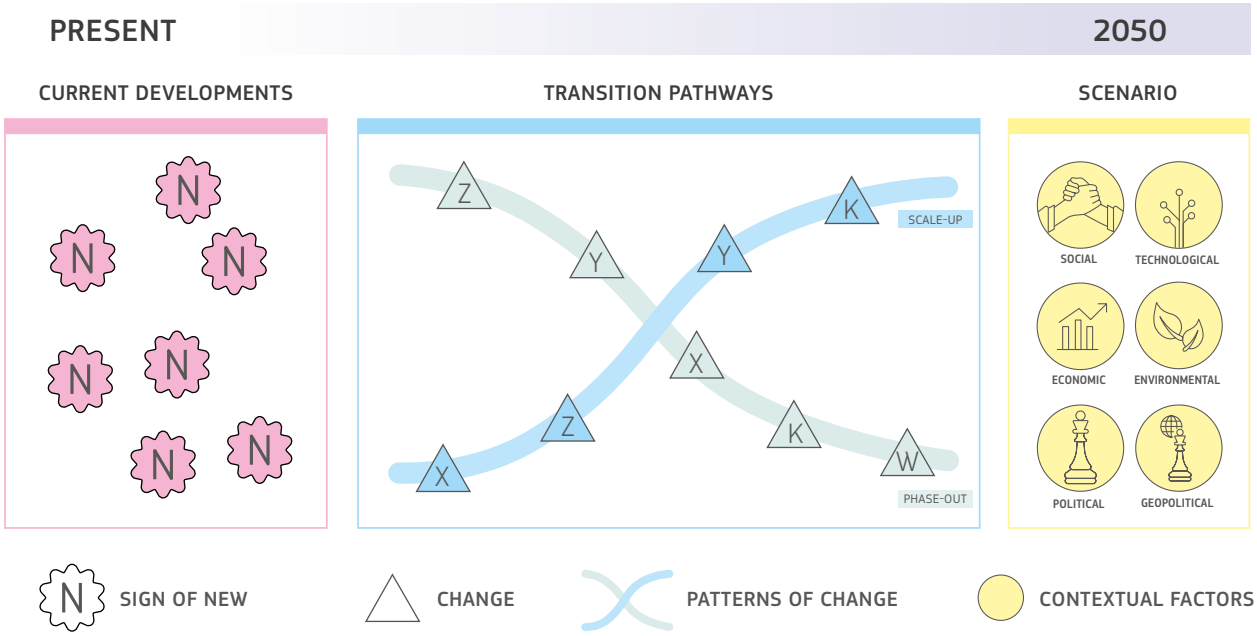
36 Joint Research Centre et al. (2022)
37 Turnheim and Nykvist (2019)

Foresight scenarios and transition pathways for EU 2050

This chapter presents the four foresight scenarios and related transition pathways to the EU in 2050 that were developed for this foresight study. The four scenarios present alternative possible futures in 2050, where the EU has reached climate neutrality and become more environmentally sustainable in line with European Green Deal targets. Each scenario illustrates different social and economic conditions, with different trade-offs depending on how the European Green Deal targets are reached. The transition pathways illustrate the processes of change that could lead to the respective scenarios from today until 2050. To facilitate understanding and inform decision-making, the foresight process helped highlight the triggers and dynamics of change.

- **Sustainable EU 2050.** The four scenarios presume an EU in 2050 that has reached climate neutrality and shifted away from an unsustainable use of resources (fossil fuels, raw materials and ecosystems). Each scenario features a different primary driver of change in the environmental dimension of sustainability. Some scenarios and pathways reflect conscious shaping of the change processes by various actors (e.g. governments, businesses), while other scenarios are more driven by exogenous changes, which actors must navigate.
- **Sustainable production and consumption.** In the scenarios, the necessary transitions in production and consumption happen through a change in lifestyles that leads to a drastic reduction in consumption and phasing out of unsustainable practices. This change occurs after an existential shock, through a profound technological innovation that enables the green transition or through a combination of both, each in a less radical way.
- **Public finance.** The scenarios show variations in the size of the public budget and the effectiveness of redistributive policies through income support, public services and other means. The role of Member States or the EU in managing public budgets and their capacity to correct distortions that cause social inequalities and secure access to basic services (including health, education, food, energy, housing and mobility) are also different.
- **Sustainable investment.** Some pathways indicate the importance of orchestrating

Figure 2 Logic flow for EU 2050 scenarios and related transition pathways



public-private collaboration. Other show the role of communities and citizens in seeking social well-being. The constraints on financial and technical resources for public services, including healthcare and infrastructure, also vary. By following the scenario-building logic, the design of strategic investment to reinforce other policy instruments such as regulatory and fiscal frameworks as enabling conditions for change differ significantly among the scenarios.

- **Democratic practices.** The role of communities, citizens and participatory democracy, prevailing values and social norms, the degree of connectedness between people, individual freedom and lifestyle constraints, and political voice and democratic participation also vary significantly between scenarios.
- **Business models and innovation.** The role of economic sectors such as service, industry and finance for shaping markets and pursuing the sustainability agenda is different across the scenarios. The mechanisms by which innovation can be shaped or accelerated by multiple, sometimes contradictory, objectives such as profit-making, social equity and redistribution also vary.
- **Geopolitical aspects.** In all scenarios, the EU is assumed to be necessary for Member States to secure a geopolitical role and navigate the instability of the global order. However, its form depends on the scenario: It can remain essentially an intergovernmental coordination structure to protect the Single Market or evolve into a full federal state.

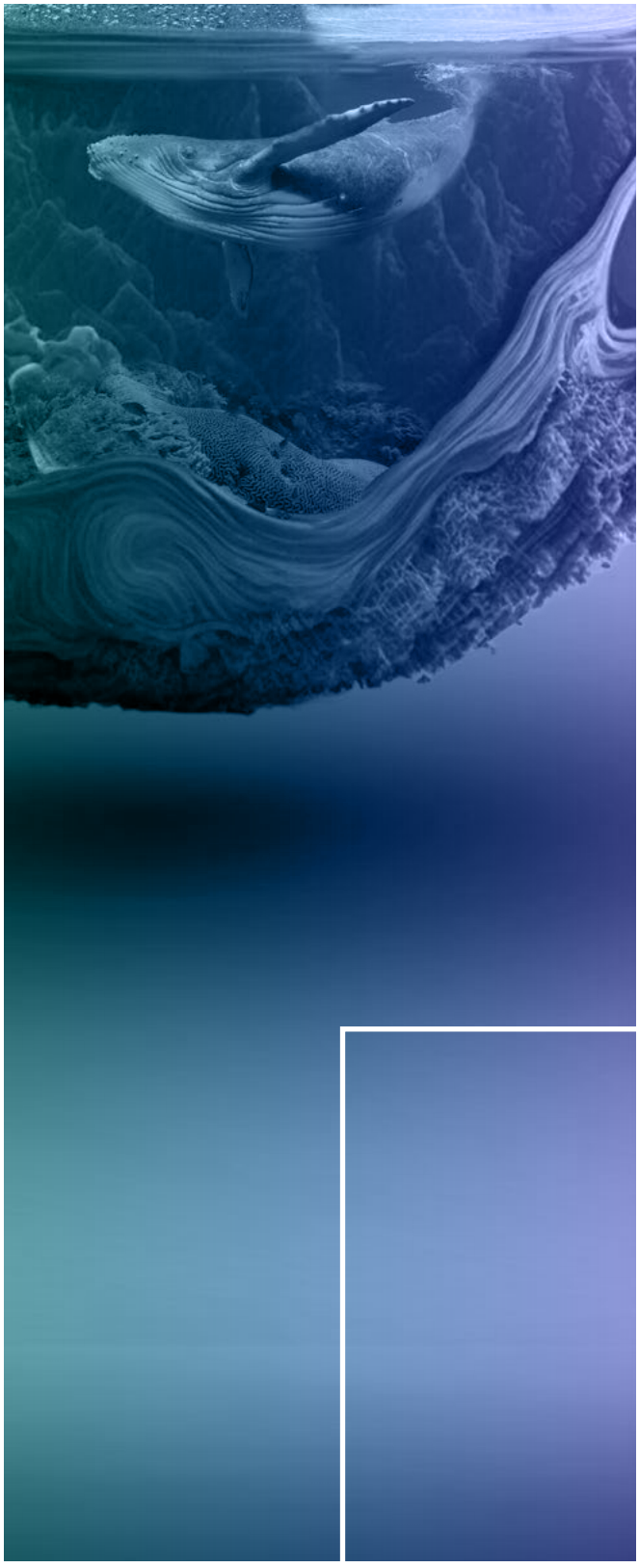
Figure 2 illustrates the backcasting exercise implemented during the foresight process. In this chapter, each EU 2050 scenario is first outlined with a set of contextual factors in a summary covering social, technological, economic, environmental, political and geopolitical aspects of the EU in 2050. This outline is then followed by the corresponding transition pathway from today to 2050.

Three aspects of each transition pathway are presented, namely:

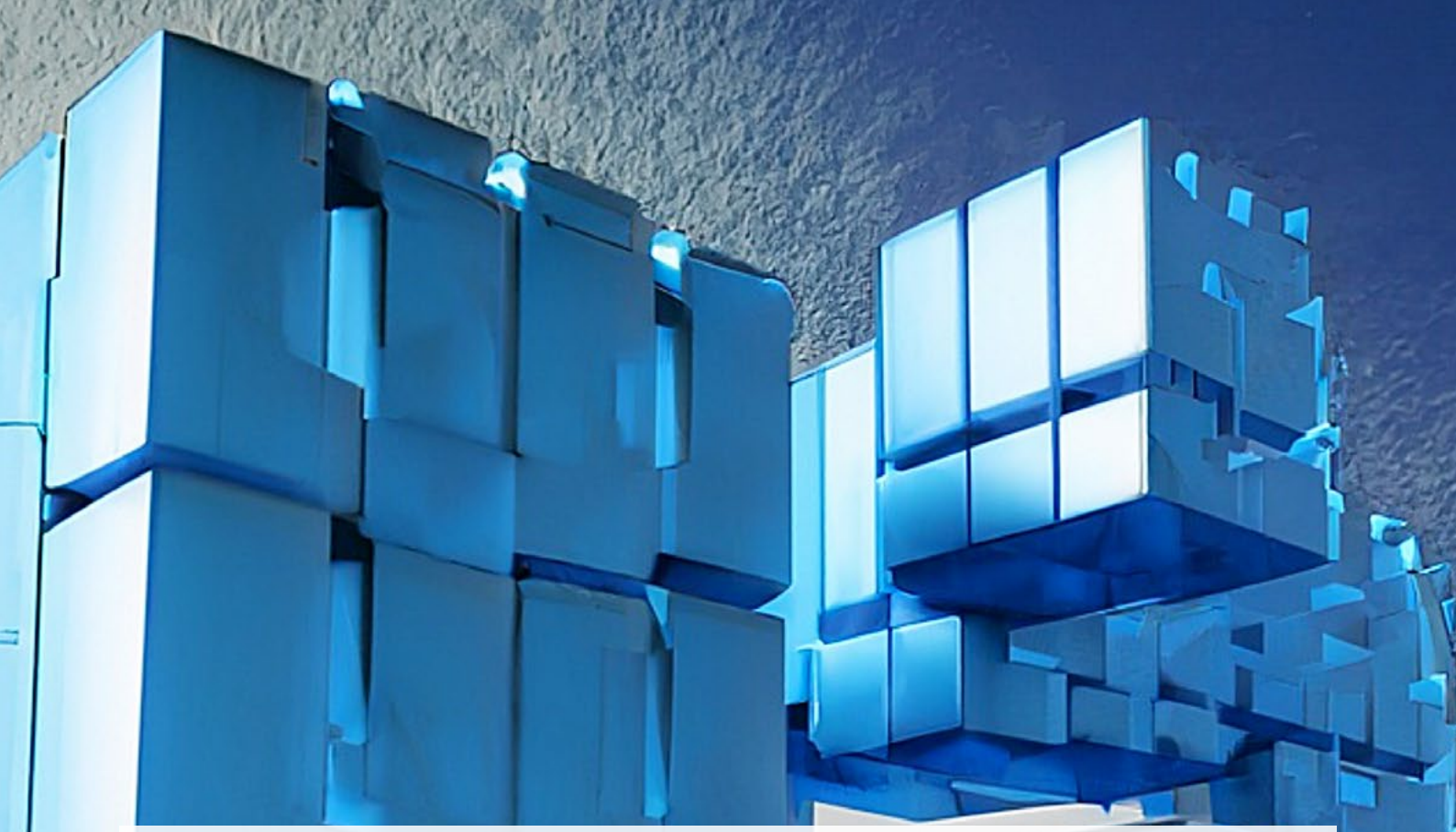
- **signs of new**, which point to current developments that are compatible with the given pathway. These signs were developed from secondary research by gathering evidence of relevant change in the present.
- **main patterns of change**, which indicate the main change processes that define each pathway. They include narratives of critical areas that enable transformative change towards sustainability, emerging from the results of the foresight process. They describe potential changes, associated actions and the roles of different actors.
- **transformative elements** are trends, trade-offs, synergies and conditions that can be identified along the transition pathways from today to 2050. They are elements that can influence system dynamics, through reconfiguration of power or changes in economic and social relations, thereby affecting the entire process of change.

The transition pathways are developed by combining the X-curve and the three horizons approach, with a first horizon allowing for analysis of the changes required for the destabilisation and phasing-out of practices characteristic of the present world, while the second horizon deals with the changes in terms of acceleration, emergence and, finally, scaling-up of new practices that bear witness to the construction of the new world. The pathways indicate the processes of change towards sustainability going from today to each scenario in 2050.

The four scenarios are presented in the following order: eco-states, greening through crisis, green business boom and glocal[38] eco-world.



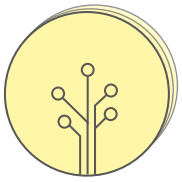
38 Glocalisation refers to the declining power of the territorial state in a globalised context by highlighting a contradictory reconfiguration of superimposed spatial scales, including those on which the territorial state is organised. Glocal can be defined as the reconfiguration of the territorial organisation of the state in which the state scale is re-articulated and re-territorialised in relation to the sub- and supra-state scale by focusing on promoting the global competitive advantage of large urban regions, see Brenner (1998)



ECO-STATES

In this scenario, Member States shape a social and economic transformation of the EU by improving the effectiveness and efficiency of their government action, in particular via policy mixes. They prove capable of implementing reforms that allow an inclusive green transition while strengthening their coordination to jointly address challenges that countries cannot tackle alone. Governments and the state are dominant and have a high capacity to shape the lifestyles of individuals.

Table 1 Eco-states – Overview of scenario dimensions

Dimension		Contextual factors
 SOCIAL	1	Society **values** stability, conformity to social rules and a utilitarian approach to nature. **National identities** remain strong, but people also share a European identity. Patriotism takes over nationalism.
	2	**Social inequalities** have been reduced through redistributive policies. Social protection, healthcare and other public services are strong, with universal access for all.
	3	Data governance is strong, and governments fight **disinformation**.
 TECHNOLOGICAL	1	Governments invest in **digital infrastructure** and in technological innovation for sustainability. Digital tools are widespread and allow governments to closely monitor production, natural resources and society.
	2	Global platforms and virtual worlds are popular and used by governments to test and promote their policies and **sustainable lifestyles**.
 ECONOMIC	1	A sustainable social market economy is supported by comprehensive changes in the Member States' tax systems and by fiscal reform coordinated at the EU level.
	2	The **financial** sector redirects financial flows towards sustainable activities, also based on a comprehensive 'green taxonomy' of economic activities.
	3	Businesses have adapted to the highly **regulated** environment in the best interest of society. Unemployment is low, with public **jobs** widely available and flexible.
 ENVIRONMENTAL	1	Governments focus on **food security** and related risks, including investing in alternative foodstuffs.
	2	**Energy markets** are highly centralised, with the EU regulating prices.
	3	The green transition is shaped by strong **national governments**. By combining multiple instruments into a policy mix, they set the direction and coordinate with local and EU levels.
 POLITICAL	1	Top-down decision-making with **new competences** such as **taxes**, energy and some social policy shifted to the EU level.
	2	Strong central governments at the national level consult **regional and local** authorities, as well as **citizens and civil society**, but keep a strong policy focus on sustainability to which individual liberties are sometimes sacrificed.
 GEOPOLITICAL	1	Persisting world order with international organisations and military **alliances** coordinating peace, climate, trade and **security** talks.
	2	The EU among leaders of global climate change mitigation and adaptation, with the USA and China achieving similar levels of **climate neutrality**.
	3	Internet, digital infrastructure and satellite systems are interoperable globally.

Transition pathway towards EU 2050

Signs of new in 2023

The crises at the beginning of the 2020s found the EU only partly prepared to respond, with Member States eager to retain competences and leeway on their budgets and internal matters. However, progressive, conservative and occasionally populist forces have found themselves compelled to take similar lines in such cases, resulting in an overarching nonpartisan agenda on how to respond to the crises. Measures addressing the effects of the COVID-19 pandemic and escalation of the Russian war in Ukraine are paving the way for new competences and working methods at the EU level with strong economic and political coordination,[39] as well as binding objectives and comprehensive legislation on the green[40] and digital transition[41] and investing in social equality and cohesion.[42] The 2021 global agreement on minimum corporate tax may signal new momentum for fiscal reforms.[43]

Main patterns of change

Using a portfolio of interventions, such as legislation, education and public engagement, to turn consumers into ecology-conscious citizens

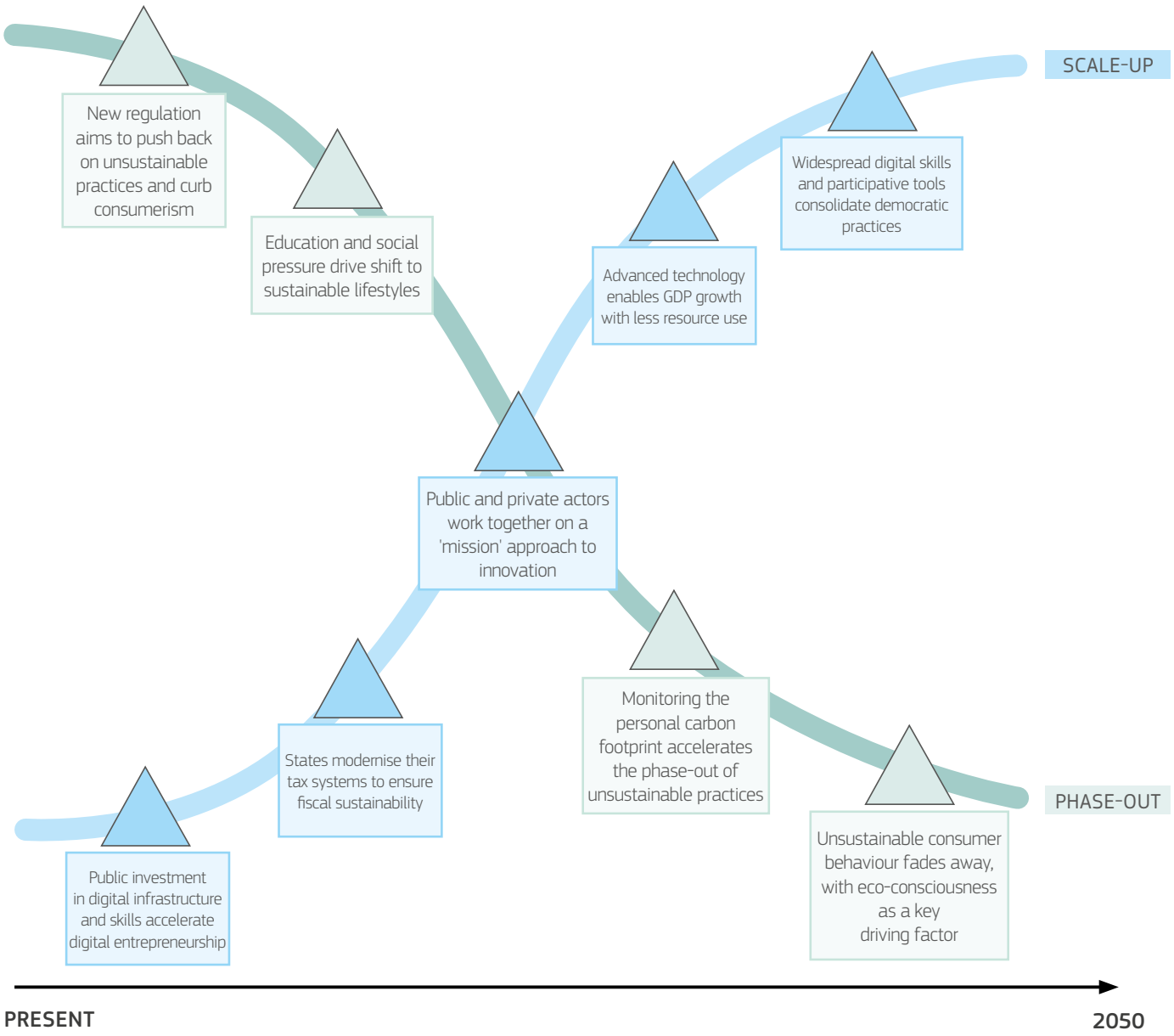
By the late 2020s, the combined pressure from a fast-changing climate and unprecedented weather extremes had pushed EU governments to accelerate the green transition. During the 2020s, they adopted ambitious reforms that explicitly promoted 'green' lifestyles and discouraged pollution and wasteful production. Subsidies on fossil fuels or non-renewable materials were removed, and industrial production was forced to save on resources through stringent requirements on recycling, reuse and repair of goods. Even the advertisement of some products and practices commonly considered environmentally unsustainable, such as frequent flying or powerful private cars, became unpopular and were gradually restricted. In parallel, Member States started to use nudges and awareness-raising campaigns, also through targeted communication using AI, to steer people's behaviour. As an example, influencers were paid by public authorities to promote sustainable diets and lifestyles, including certified sustainable food supply chains and sufficiency. Publicly funded research was directed to develop and bring to the market a variety of alternative, lower impact consumption goods.

By 2030, Member States agreed to review educational curricula and lifelong learning programmes to mainstream sustainability competences and invest in fostering digital literacy and participatory decision-making. This change increased people's consciousness about the environmental impacts of their consumption and empowered them to adopt new lifestyles. At that stage, the EU had invested in developing measuring tools for personal carbon footprints, which start to be implemented across the Member States. This policy mix succeeded in transforming consumer behaviour to match new models of social status based on eco-consciousness.

In the 2030s, governments involved civil society and citizens more systematically in decision-making. Building on the follow-up actions of the Conference on the Future of Europe in 2020, they started using digital deliberative democracy mechanisms to engage directly with citizens, build trust and further empower social dialogues.

39 Lehne (2023)
40 European Commission (2022c), European Commission (2023b) and European Commission (2023g)
41 European Commission (2023i)
42 European Commission (2023j)
43 OECD (2023a)

Figure 3 Eco-states transition pathway



Note: This X-curve includes a sample of elements gathered from the transition pathways; the full version is in Annex 2

Building on its new sources of revenue, and to prevent social unrest, the EU boosted its funds for cohesion and social inclusion. This first wave of intervention was used to deliver equal access to quality services across all EU regions. After 2040, in a second wave of intervention, a strong sustainability agenda was acknowledged to be of systemic importance and adopted in all EU Member States. To secure continuity in the political endorsement of the necessary reforms, voting was made compulsory, and rules around electoral mandates were amended.

Substantial fiscal reforms for sustainability

From the 2030s, prodded by active policy and changed taxation, citizens embraced sufficiency and green lifestyles. This embrace caused consumption to lose importance as a base for taxation. At the same time, the need for social services increased steadily (in particular, health and long-term care due to the ageing population). The demand for public expenditure in climate change mitigation and adaptation, as well as for public services, kept growing, requiring substantial public revenues. By the 2030s, advanced digital technology and

AI allowed accurate monitoring and simplified collection of taxes by governments, overcoming mistrust among Member States regarding claims of corruption and tax evasion that had hurdled the way to a fiscal union during the 2020s.

By the 2040s, the Member States recognised that divergences in national tax systems hamper progress. Through changes to EU treaties, they entrusted the EU with harmonising the national tax systems. Wealth accumulation and extra profits ended up being clearly at odds with the prevalent social norms and the new political vision for sustainability. EU-level harmonisation bought political support to shift the tax burden from labour towards capital, property, high income and inheritance, VAT on nonessential products and corporate income taxes (with control of capital at the EU borders). The EU also progressed in implementing the EU Emissions Trading System (ETS) and the Carbon Border Adjustment Mechanism (CBAM) as sources of own resources income. The introduction of more environmental and health taxes created price signals delivering several collective benefits. For example, boosting taxes on alcohol, sugar and chemicals detrimental to health fostered healthy lifestyles and relieved pressure on healthcare systems.

The wars and global crises of the 2020s showed the value of international cooperation, in health and climate policies as well as in fiscal affairs. EU tax initiatives negotiated with other major economies (China, India, the USA) finally led to the implementation of an OECD-led agreement on a high minimum corporate tax internationally. This step curtailed global tax avoidance significantly, eliminating tax evasion and tax havens.

State-led technology development for sustainability

Prompted by the EU Digital Decade, by 2030 the Member States had invested heavily in digital infrastructure and implemented comprehensive digital skills agendas. The provision of digital technology and inclusion measures for vulnerable people (e.g. ensuring language support, additional tuition, AI-assisted personal learning) helped decrease digital poverty and promoted digital skills broadly. Increased public funds for research enabled broad-ranging technology development and sparked a new wave of incremental green innovation. Major investments in the 2020s helped improve the capacity of some EU Member States to become new global leaders in renewable energy technologies, particularly hydrogen and photovoltaics, electric vehicle production, desalination and waste-recycling technologies, with positive spill-over effects in the EU.

During the 2030s and 2040s, Member States fully subscribed to a ‘mission' approach to policies, pooling funds, harmonising regulation and mobilising public and private actors in setting priorities and creating sustainable long-term solutions. State-funded incubation labs flourished, while green public procurement, up-scaled smart specialisation and industrial cluster programmes facilitated the diffusion of technology. The European Investment Bank (EIB) created a public venture capital fund and started to manage a pool of patents obtained from financed businesses to be at the disposal of EU firms.

The digitalisation of the public sector in the 2020s enhanced efficiency and access to public education and training, healthcare and social services for all citizens. Henceforth, national, regional and local public authorities provided specific funding and open public databases to get innovative solutions for modernising public services, with positive effects on the social status of public jobs. By 2040, highly skilled youth were attracted to the public service and helped improve overall governance.

These transformations contributed indirectly also to an improved social equity and participatory democracy by 2040, thanks to much higher efficiency of public action and information flows.

Transformative elements of the transition pathway

- Member States actively shape **behavioural change** of citizens from consumerism to ecological consciousness through accelerating the broad adoption of technologies and use technologies to maximise their capacity to steer the change. **Transparency** of state actions and **participatory decision-making** strengthen the capacity for EU actors to act together and build trust between the state and citizens. The state is also able to effectively counter disinformation and enable fact-checking.

- States are forced to modernise their **tax systems** to ensure fiscal sustainability. They finally manage to shift taxes from labour to consumption, corporate income and wealth so as to improve social equity. The EU ensures taxation does not cause internal competition within Europe. International cooperation allows a harmonised introduction of similar measures in all large economies.

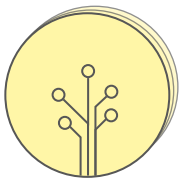
- Integrated policy mixes ensure that large-scale public investments in digital infrastructure and skills consolidate universal access to digitalised public services and participative tools, as well as widespread **digital skills**, also supporting digital entrepreneurship.

- **State-led missions** enable innovation and advanced technology, boosting the economy and public budgets. Advanced technology enables GDP growth with less resource use and improves the quality and efficiency of public services. Centralised governance has prevented radical innovation, and social and economic practices, structural relations and roles of the past persist.

GREENING THROUGH CRISIS

In this scenario, crises unfolding at the global and regional level push national governments to devolve competences and power to the EU to ensure security and protection. The European Commission is proactive in steering the process and is gradually backed by all Member States. The EU in 2050 works as a federal state, with effective decision-making particularly in foreign policy, defence and the setting of harmonised minimum standards for public services. In this way, it has strengthened its strategic autonomy despite its demographic decline, in part by capitalising on circularity and the green transition.

Table 2 Greening through crisis – Overview of scenario dimensions

Dimension		Contextual factors
 SOCIAL	1	European societies focus on **security** in the face of a fraught and unstable global order. **Democratic processes** have shifted towards the EU level, but citizens' participation is low.
	2	**Social inequalities** persist, but the gap between rich and poor has shrunk.
	3	Education is public but quality varies, limited by the **finances** and **skills** available locally. Crafts and skills related to manufacturing and to Industry 5.0 have re-emerged.
 TECHNOLOGICAL	1	There is a strong green and **digital** tech sector, and innovation is fostered through a range of public-private partnerships.
	2	Technology and **infrastructure** are primarily EU-based and EU-made.
 ECONOMIC	1	A liberal economy, but growth is constrained by the reduction of the global economy.
	2	Industry is essential to the EU economy, incl. manufacturing. EU regions specialise to optimise **efficiency**, but the EU is careful to limit **vulnerabilities** in supply and value chains as much as possible. **Jobs** in industry have grown, as has the service sector.
 ENVIRONMENTAL	1	The EU and the regions make some **investments** to restore the environment, mainly aimed at mitigating and managing risks, including through a strong monitoring of the state of the environment, also leveraging the EU's Earth observation capacity.
	2	The green transition is pursued as a means for **strategic autonomy**, and interventions of the EU and Member States are targeted to the most strategic sectors. The lack of a systemic approach has limited the scope of the green transition, and only in combination with a decrease in production and consumption due to external events was EU **climate neutrality** reached.
 POLITICAL	1	The mandate of the EU has expanded significantly in areas that are relevant for its **strategic autonomy** and security, such as energy, defence and industry. The EU makes use of protectionist measures and invests in strategic sectors for **independence**.
	2	EU-based **digital tools** are used to inform the public and improve transparency. Some strategic areas are exempt from increased **transparency** measures (e.g. space, defence). A few new Member States have joined the EU.
 GEOPOLITICAL	1	The world is more hostile, fragmented into regional or ideological spheres, and **multilateralism** has been reduced significantly. Humanitarian aid and some weak coordination on climate change mitigation are primary areas of **international cooperation**.
	2	The EU exerts dominance in its regional sphere and collaborates closely with selected partners to the east and south.

Transition pathway towards EU 2050

Signs of new in 2023

Since the COVID-19 pandemic disrupted global supply chains, the EU has been working on strengthening its open strategic autonomy,[44] notably with the adoption of the EU Chips Act.[45] Russian aggression in Ukraine has reopened the positioning of global actors in trade and peace talks, with China asserting its role in negotiating between Russia and other countries.[46] The war in Ukraine has pushed EU Member States to consider not only new mechanisms of integrating large inflows of migrants[47] but also the coordination of foreign affairs[48] and defence.[49] Divergent views of EU international relations among Member States[50] contribute to the complex geopolitical environment.

Main patterns of change

An emerging consensus on green strategic autonomy

By the late 2020s, the challenging events of the decade such as climate catastrophes, the COVID-19 pandemic, the Russian invasion of Ukraine and its escalation, an increasingly protectionist USA, attacks on democracy from China and Russia, and competition for critical raw materials had brought forward a new consensus on green strategic autonomy. Policymakers, industry and society agreed that long-term security and well-being required the EU to achieve the green transition, de-risk critical dependencies and secure essential production locally. The adoption of green and digital technologies across sectors and the development of defence and space industries became priorities for the EU.

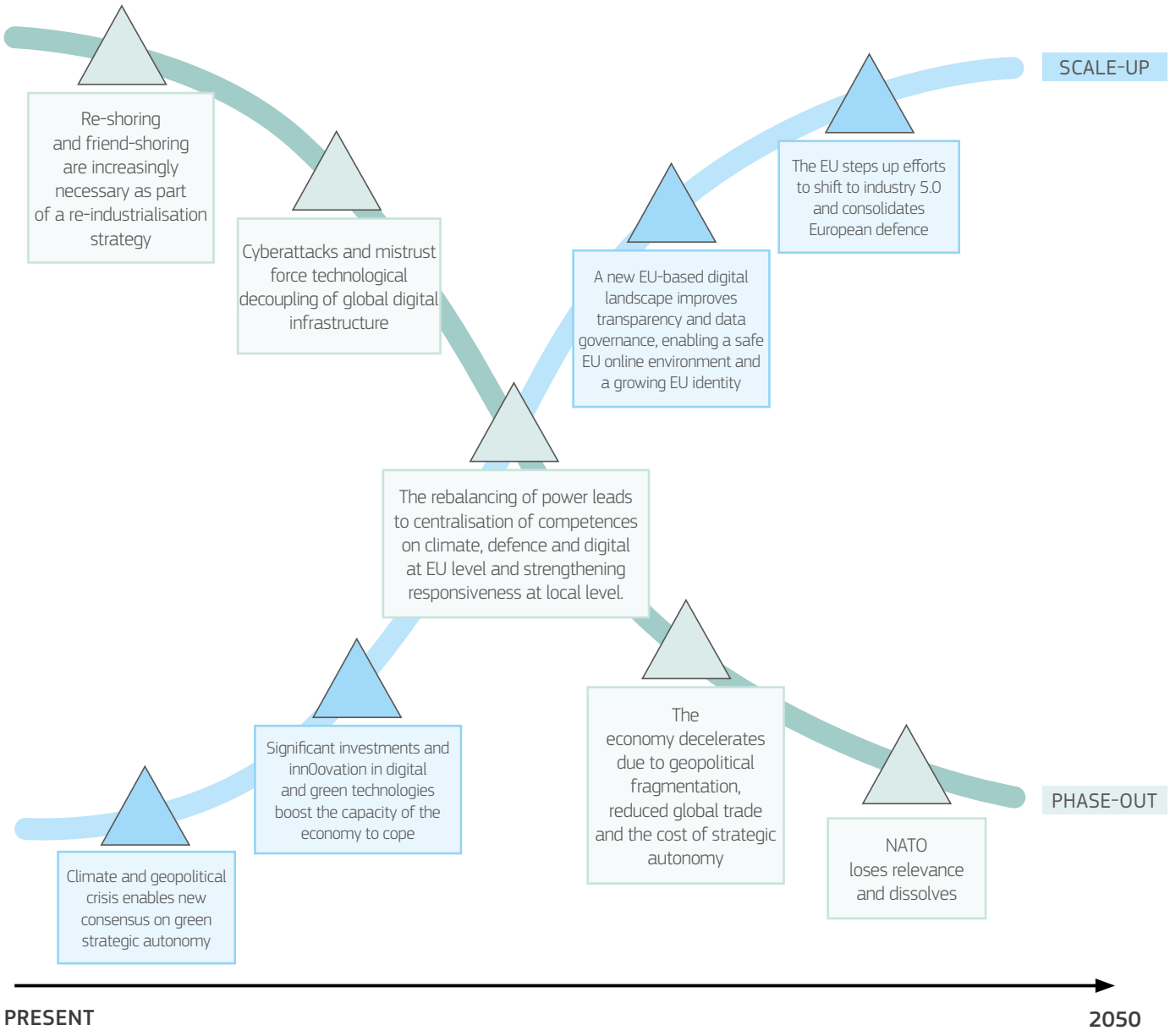
In the mid-2020s, the EU pledged that all its sources of energy and critical raw materials be both sustainable and compatible with the EU's strategic autonomy by 2050. The tipping point for this reorientation came in the wake of Russia's military aggression in Ukraine in February 2022. Member States agreed that the EU needed an enhanced common energy policy to reduce the demand for fossil fuels (especially gas) and overcome weaponisation of the EU's energy dependence.

By the early 2030s, investment in green technologies and green public procurement prompted the emergence of a European alliance for strategic sectors in green industries, ensuring more stable conditions for future businesses. Soon, the solid relationship between the financial markets and the green economy sectors enabled scaling up a wide range of technological solutions across the Member States.

Geopolitical competition between China, the USA, India and emerging powers in Latin America heated up in the 2030s and pushed the EU to establish its technological autonomy. Frequent cyberattacks and spyware scandals led the EU to double down on regulations and standards for technologies and digital services. The EU excluded many foreign technologies from European markets and in parallel weakened transatlantic relations. Technological decoupling led to EU-wide digital infrastructure and an EU-centred 'splinternet' in the early 2030s, gradually extending coverage to the eastern neighbourhood. This development was accompanied by the emergence of European

44 Open strategic autonomy refers to the EU's objective of strengthening independence in critical areas, supporting the EU's capacity to act, while being open to global trade and cooperation. For more, see for example:Joint Research Centre (2021a)
45 European Commission (2023k)
46 Bisley (2023) and Fasulo and Morselli (2023)
47 European Parliament (2022)
48 Torreblanca (2022)
49 EEAS (2023)
50 Camut (2023)

Figure 4 Greening through crisis transition pathway



Note: This X-curve includes a sample of elements gathered from the transition pathways; the full version is in Annex 2.

unicorns and growing tech companies. The availability of private providers of digital services living up to EU regulations allowed a satisfactory enforcement of standards to control disinformation, hate speech and cyber-crime.

Shifts in governance and democracy

From the mid-2020s onwards, the EU Member States gradually pooled their defence and military capacities. In the early stages, escalation of the war in Ukraine led to the deployment of EU troops with central command in 2025. The integration process continued with the adoption of EU standards for military equipment and cyber-defence. Russian military aggression on the borders of Baltic Member States in 2027 accelerated the creation of a full-fledged EU army. This step required democratic control of the army by the European Parliament, which was the key evolutionary leap towards an EU federal structure. Following the centralisation of the army and, consequently, foreign policy at EU level to deal with an increasingly unstable global

order and high competition for resources, the EU also got more competence on security. With the rise of the EU as a hard power and the USA pivoting to the Asia-Pacific area under increasingly populist administrations, NATO slowly lost relevance until its dissolution in 2045.

To boost EU resilience and facilitate swift and effective responses, the EU reconfigured its decision-making processes. Member States agreed to phase out veto rights in favour of qualified majority voting, which in turn helped facilitate the EU's eastward expansion. The European Commission was gradually tasked to take decisions in strategic policy areas, such as energy, ICT and defence. The increase in defence spending and climate change adaptation meant that many EU countries faced financial difficulties, burdened by increasing debt, and struggled to provide social services. Inequalities rose and social protection deteriorated. In response, local governments expanded their role in the social domain, helped by EU programmes, while the EU strengthened joint procurement for healthcare and eventually established EU-wide welfare in certain areas. After several failed attempts in the 2030s, lengthy negotiations resulted in a constitution in 2040, officially turning EU into a federal state.

In parallel, democratic processes adapted to the reformed governance structures. In the 2030s, European citizens still had strong national identities but supported European cooperation on security. The years of crises had disillusioned many people, and democratic engagement had been decreasing throughout Europe. People focused on their personal networks and on decisions that could affect them directly. The European Parliament elections in 2034 featured the first pan-European lists, but voter turnout was low. Urban and well-off voters remained the most engaged in European affairs and elections. Political and economic integration progressed at the cost of social cohesion. As crises put public finances under strain, the disparity between EU regions exacerbated. Towards 2050, this division in the European electorate, both between socioeconomic groups and between regions, was a growing concern, and the EU began to work more closely with local and regional authorities to address it. AI significantly lessened language barriers and facilitated accurate information flows in all European languages, as well as common entertainment content. Through this EU-wide online environment, the EU, together with civil society, regional and national governments, made efforts to foster democratic engagement and social cohesion.

A profound reconfiguration of global supply and value chains in just over a decade

Starting in the 2020s, the EU promoted 're-shoring' and 'friend-shoring' of key industries to de-risk strategic dependencies, starting with the pharmaceutical industry, energy supply, steel, chips and food, despite their environmental footprints. The reindustrialisation conformed to high environmental and resource efficiency standards also backed by a CBAM. The EU scaled up import taxes and targeted export restrictions and investment screening, while governments at all levels pushed for local consumption through incentives, influence (e.g. nudging) and regulation. Gradually, large EU companies emerged in several sectors, not least a new lithium mining industry in Portugal and rare earths mining in Sweden. Around 2035, key industries came under EU strategic control, with energy being the first sector to be 'Europeanised'.

EU industry associations and regional development agencies reoriented innovation strategies towards reconfiguration of European manufacturing by high-tech and green sectors. The EU proposed targeted lifelong learning strategies with a focus on reskilling for green industries to support the reshoring of industries. In line with this, the EU facilitated internal mobility as well as migration from partner countries towards emerging centres of industry.

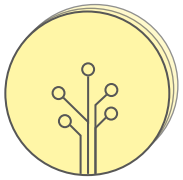
Transformative elements of the transition pathway

- Global threats push governments to **orchestrate new multilevel governance models** by delegating competences and power to be more effective at the EU level, reduce dependencies and de-risk supply chains. This forces the EU to undergo a process of **rebalancing power and reallocating competences** across governance levels. This process also strengthens the responsiveness of governance at the local, municipal level.
- Significant **investments and innovation** in digital and green technologies significantly improve the capacity of economic actors to respond to strategic autonomy needs.
- The focus on strategic autonomy and resilience feeds into a **reconfiguration of value chains towards the EU region**. The EU steps up efforts to shift to 'industry 5.0'.
- A global **technological decoupling** leads to a new EU-based digital landscape where a strong strategic collaboration between private and public actors reinforces the focus of research and technology development on systemic solutions.
- The **economy slows** due to geopolitical fragmentation reducing global trade and the costs of strategic autonomy.

GREEN BUSINESS BOOM

In this scenario, change is driven primarily by the market and by innovation. As resource costs surge, corporations find ways to decouple profits from resource consumption. They engage in circular economy, renewable energies and sustainable bio-economy. Innovation helps accelerate market opportunities for sustainable businesses models. In this way, the economy promotes sustainable behaviour while generating added-value. This movement is global, as geopolitical conflicts in the 2020s generated a strong pushback. Efforts to continue rapid globalisation contributed to a revamping of the international order based on free trade and cost-efficient supply chains. In 2050, businesses engage creatively with governments, who become more flexible and pragmatic.

Table 3 Green Business boom – Overview of scenario dimensions

Dimension		Contextual factors
 SOCIAL	1	Individualistic, self-enhancement **values** stimulate an entrepreneurial society that supports sustainability and technology development in response to economic signals out of self-interest.
	2	**Education** focuses on science, technology and creativity through an alignment between business and education systems.
	3	**Social inequalities** persist; combined philanthropy and the use of public funds to support private welfare systems contribute to their mitigation.
 TECHNOLOGICAL	1	Private R&D **investment** accelerates innovation for the green transition across value chains, supported by technology-neutral regulation and a green tax system.
	2	**Digital tools** and global platforms support the private provisioning of social services.
 ECONOMIC	1	Liberal and diversified **markets** and a cross-sector perspective on resilience characterise the economy. A green **fiscal** framework and taxonomy facilitate monitoring and push businesses to adopt sound environmental practices.
	2	**Business models** based on high-tech, service-oriented and circular strategies become mainstream across reconfigured value chains. SMEs play a significant role by upscaling innovative technologies through customisable products and services.
	3	The **finance** sector includes effective blended finance instruments and green frameworks for measuring **investment**.
 ENVIRONMENTAL	1	A well-managed sustainable **bio-economy** is now the leading green sector, enabling solutions for ecosystem protection and the industrialisation of **natural resources**.
	2	Corporations introduce carbon-capture and **climate-adaptation** technologies as a business model.
	3	The green transition is orchestrated by policymakers and economic actors, which has enabled a **decoupling** of growth and resource use.
 POLITICAL	1	National governments are increasingly flexible and pragmatic, outsourcing the provision of **public services** to private operators and relying on public-private partnerships for infrastructure development. The state's role shifts to guarantee **transparency** and guide sustainability transitions through standards and monitoring.
	2	The EU and European institutions play a role in a limited number of areas, particularly in standard-setting, **competition**, market regulation of externalities and common **fiscal** rules to foster a green economy.
 GEOPOLITICAL	1	The EU makes strategic **alliances** in Africa and Latin America, for example with producers of raw materials, simultaneously coordinating actions with big EU corporations.
	2	The **resilience** and resource **efficiency** of the EU economy makes it competitive globally. Global competition for resources has increased.

Transition pathway towards EU 2050

Signs of new in 2023

For several years, major business sector conventions including the World Economic Forum have kept flagging the need to change the economic model to preserve prosperity and, consequently, the profitability of business.[51] The reconfiguration of value chains and the associated transformation of business models through the gradual phase-out of the fossil fuel industry can support the emergence of new industries such as digital industries, mobility technologies and logistics services, which lead the economic impact. Demographic change is driving the pressure for strengthening the services and health sectors.[52] The European Green Deal, the green Taxonomy[53] and other policy measures have started to push the business sector towards sustainability. Major crises starting with the 2020s bring consensus to the political establishment to adopt nonpartisan measures for the greening of the economy.[54]

Main patterns of change

Liberal government action spurs a technology-led green systemic reconfiguration

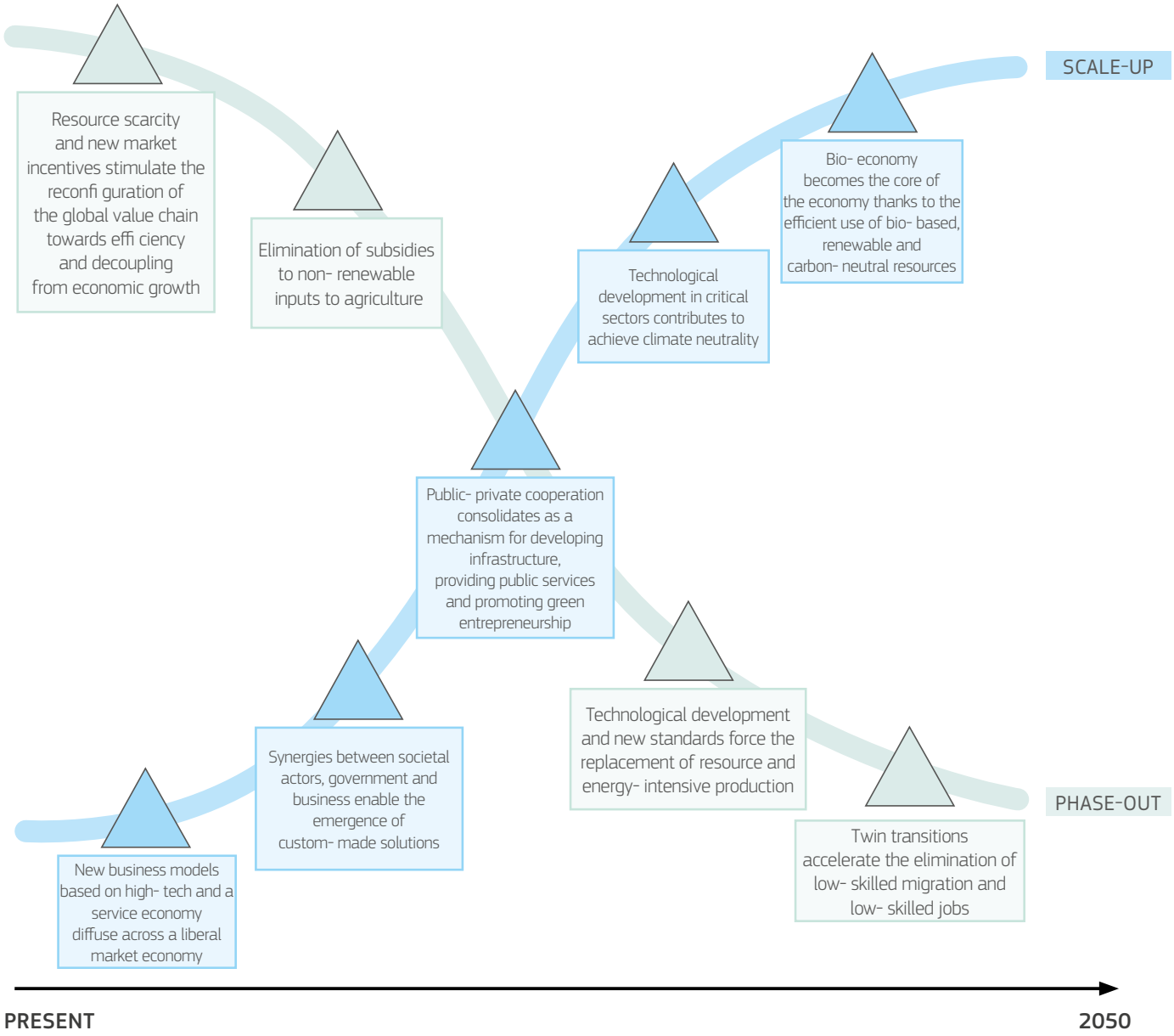
By the late 2020s, severely hit by climate change, resource scarcity and the global economic consequences of Russian aggression in Ukraine, the EU had embraced pricing nature destruction in markets correctly, through increased transparency, green taxation, emissions trading and environmental regulation. New EU standards and market incentives stimulated global value chains to start a reconfiguration process towards efficiency and decoupling from economic growth. European national governments provided support to green business and trade while introducing innovative indicators to measure cost and environmental impact. The resulting new business models based on high tech and a service economy diffused across a dynamic and efficient liberal market economy oriented to sustainable solutions.

Spurred by regulation leaving freedom to actors to choose the appropriate technologies, private R&D investment accelerated green innovation. Large corporations (including oil companies and utilities) maintained their power through the development of carbon-capture (where feasible) and climate-adaptation technologies. SMEs led the upscaling of innovative technologies through customisable products and services. Technological development in critical sectors such as transport, steel and construction helped them become greenhouse gas neutral by 2035. In addition, liberal and dynamic markets stimulated people to become entrepreneurs and shareholders. Governments provided incentives to promote an entrepreneurial culture as part of favourable conditions created by market segmentation, diversification and the business-to-business service economy. This overall context encouraged workers to become corporate shareholders in green enterprises.

By 2030, governments eliminated subsidies to non-renewable inputs to agriculture, facilitating the emergence of alternative high-tech solutions (e.g. smart agriculture, cellular agriculture). Simultaneously, a shared business-oriented vision developed by big corporations and SMEs redirected R&D investment towards the growing food security challenge. It combined agriculture optimisation, agro-ecology, biotechnologies and new practices in urban farming. By 2040, the technological development spurred by this wave of investments had consolidated the bio-economy as the core of the economy thanks to

51 for example WEF (2023a), Neate and correspondent (2023) and
52 Executive Agency for Small and Medium sized Enterprises. et al. (2019).
53 European Commission (2023l)
54 Hoffman, Andrew J. (2018)

Figure 5 Green business boom transition pathway



Note: This X-curve includes a sample of elements gathered from the transition pathways; the full version is in Annex 2.

its efficient use of bio-based, renewable and carbon-neutral resources. This development went hand in hand with the broad diffusion of high-tech, digital solutions for ecosystem protection, forestry, organic waste, fisheries, aquaculture, etc. The upscaling of technological adoption and the replication of solutions across value chains significantly improved the material and energy efficiency of the economy.

The availability of new technologies led society to seek new ways to achieve personalised sustainable lifestyles through a broad offer of low-carbon mobility, diet, tourism, fashion and other forms of consumption, as well as targeted real-time information through social media. In this context, the widespread social values of self-enhancement (the individual desire to 'get ahead') and a high faith in technological development supported resilience and sustainability. Ultimately, beyond improving resource efficiency, this spirit led all types of waste, even historical ones, to be considered critical resources.

Strong cooperation between public and private actors boosts a deep transition

By the late 2020s, the increasingly urgent search for climate-friendly solutions and global

market dynamics converged into a turning point. In a technological paradigm shift and changing economies of scale, the 2030s saw a sudden acceleration towards the exit from fossil fuels, replaced by a mix of all available low-carbon energy sources (nuclear and renewable). This acceleration resulted in a period of dynamic economic activity delivering resilience (lower dependence on imports, especially of fossil fuels), radical market changes, increased specialisation and diversification of value chains.

Guided by the societal perception of nature as a limited resource, from the late 2020s the EU progressively developed a new regulatory framework to ensure that economic activities remain within planetary boundaries. EU Member States introduced a green fiscal framework, including a new future accountability tax, pricing in all measurable environmental externalities and an ambitious sustainability taxonomy to drive investment and facilitate monitoring in the long term.

Synergies materialised between environmental civil society organisations, government incentives for sustainability and new business strategies. This enabled custom-made solutions and information flows for a smooth transition to a smart and circular market economy. Over the years, collaborative public-private policymaking grew progressively. By 2035, public-private partnerships were a widespread and effective mechanism for infrastructure development and green entrepreneurship promotion in all sectors. Payment systems for ecosystem services boosted nature-based solutions for water and natural hazards management, carbon storage and the conservation of biodiversity. In this context, the international finance sector – led by multinationals – adapted to the new rules and promoted effective blended finance instruments within new investment assessment frameworks beyond the environmental, social and governance standards of the early 2020s.

New models for enabling social mobility

By the late 2020s, technologies allowed innovative provision of services such as education and healthcare, making them more accessible for all and, at the same time, a business opportunity for providers. Governments managed to monitor the performance of service providers to guarantee transparency, quality and trust.

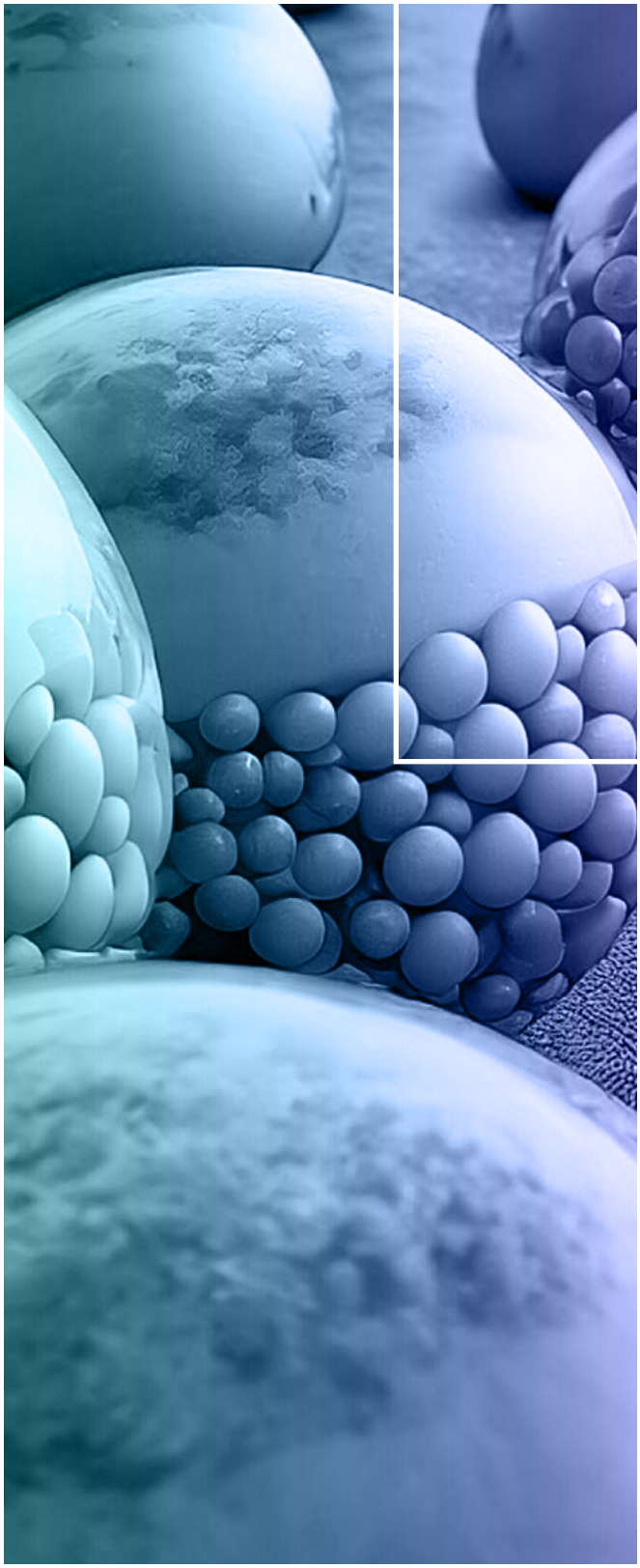
By the mid-2030s, the consolidation of digital tools and global platforms made it easier for businesses to engage fully in the provision of critical social services where transparency is key. Simultaneously, the emergence of philanthropy, a private welfare system for a growing workforce participating in supply chains, and more targeted use of public funds to support the worst off in society allowed some wealth redistribution and social mobility.

Education veered towards science, technology, engineering and mathematics, creativity and vocational training, allowing the workforce to adapt to the fast changes and automation. In addition, social dialogue between employers and trade unions facilitated the transition of the labour force towards the green and digital economy. Migration policies facilitated the mobility of qualified workers. In contrast, they discouraged unskilled non-European migration, causing tensions at the EU's borders.

The spreading of a dual education model combining apprenticeships and vocational education gained momentum in the 2030s. This change reinforced the alignment between business and the education system through a technology and service-oriented workforce. Simultaneously, dynamic and flexible labour markets institutionalised 'the ability to choose' (for both employers and employees) as a new normal, promoting social stability for the highly educated. While driven by private enterprises, the economy ensured sufficient social protection to avoid too wide a socioeconomic divide. This effort encouraged social trust in governments and private enterprises, especially after 2040.

Transformative elements of the transition pathway

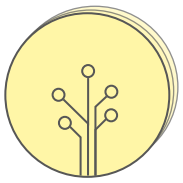
- Technological change is stimulated by **multiple innovation flows** supported by highly adaptive and segmented markets and regulations that change the framework conditions for innovation by favouring green technological advances.
- A path of value chain reconfiguration towards sustainability is **driven by market-led initiatives** and characterised by competition, market diversification and efficient management of natural resources.
- Solid R&D investment and the **synergies between new business models and a green fiscal and regulatory framework** introduce a diverse set of technological and non-technological options to make lifestyles sustainable without reducing prosperity.
- The state's role shifts to guarantee transparency and guide sustainability transitions while **a business-led model for public services** and the actions of societal organisations aim to support social mobility.
- There is **a substantial trade-off** between, on the one hand, a competitive and dynamic economy that produces a variety of solutions for sustainability transitions and, on the other hand, the need to address inequalities by reinforcing the cohesion and integration of the socioeconomic system.



GLOCAL ECO-WORLD

Policymakers failed to effectively respond to the major havoc wrought by climate change, forcing people to find new ways to adapt to more difficult circumstances. This situation brings society into a new paradigm, where people discover, through the duress they endure, the value of human relationships, connections, community help and the possibility of a dignified life with much lower levels of material prosperity.

Table 4 Glocal eco-world – Overview of scenario dimensions

Dimension		Contextual factors
 SOCIAL	1	Following catastrophic impacts from climate change, society has become more closely knit, with high levels of solidarity and a strong sense of duty to be sustainable and resilient.
	2	Communities and cities are the drivers of people's well-being based on healthy lifestyles and new forms of **public services**, with thriving social **innovation**. Redistributive policies have contributed to making society more **egalitarian**. Education and care are often community-based.
 TECHNOLOGICAL	1	Technology is used and developed based on concrete needs of communities and oriented towards frugality and resilience. There is sometimes a lack of large (e.g. **infrastructure**) developments as **public funds** are very limited. Large publicly supported R&D efforts have been scaled back for lack of **fiscal** resources.
 ECONOMIC	1	Following extreme impacts from climate change and environmental degradation, nature is understood as essential for the long-term survival of humanity and given legal rights. The public has a high level of **awareness** and care for the environment, and the importance of the commons has been recognised.
	2	**Climate adaptation** and the green transition are led at the local level in a piecemeal fashion. The vast reduction of the economy and the shift towards communities has made EU **climate neutrality** a reality.
 ENVIRONMENTAL	1	**Subsidiarity** has changed. Following the loss of fiscal resources, the national level has lost power to strong local governance.
	2	The EU level is strong in a few policy areas, as Member States had to pool resources and boost security. The EU was delegated **competences** on defence and climate mitigation and adaptation. Direct democracy is thriving at the local level and developing at the EU level thanks to **digital technology**. Large-scale issues with global dimensions are delegated to the EU level.
 POLITICAL	1	Top-down decision-making with **new competences** such as **taxes**, energy and some social policy shifted to the EU level.
	2	Strong central governments at the national level consult **regional and local** authorities, as well as **citizens and civil society**, but keep a strong policy focus on sustainability to which individual liberties are sometimes sacrificed.
 GEOPOLITICAL	1	A fragmented world with a relatively weaker but more **resilient** EU acting as an example for sustainability.
	2	High remaining reliance on the USA, in particular for security. On the other hand, the EU has significantly reduced its reliance on China and is only trading with trusted partners.

Transition pathway towards EU 2050

Signs of new in 2023

While the generations of Europeans up to the 1990s had grown up in a prosperous context where material well-being and consumerism were social norms, millennials have started signalling a shift in values.[55] Today's younger generations have started being more concerned with the future of the planet and conscious of the importance of reshaping their lifestyles to achieve sustainability.[56] The high physical and virtual mobility they enjoy fosters a sense of sharing and proximity with the same generation across the world and is a key precondition for the emergence of global movements for climate change mitigation and environmental justice.[57] As the impacts of climate change are increasing,[58] society starts to feel increasingly represented by these movements.

Main patterns of change

People start taking things into their own hands, leading to a new social contract

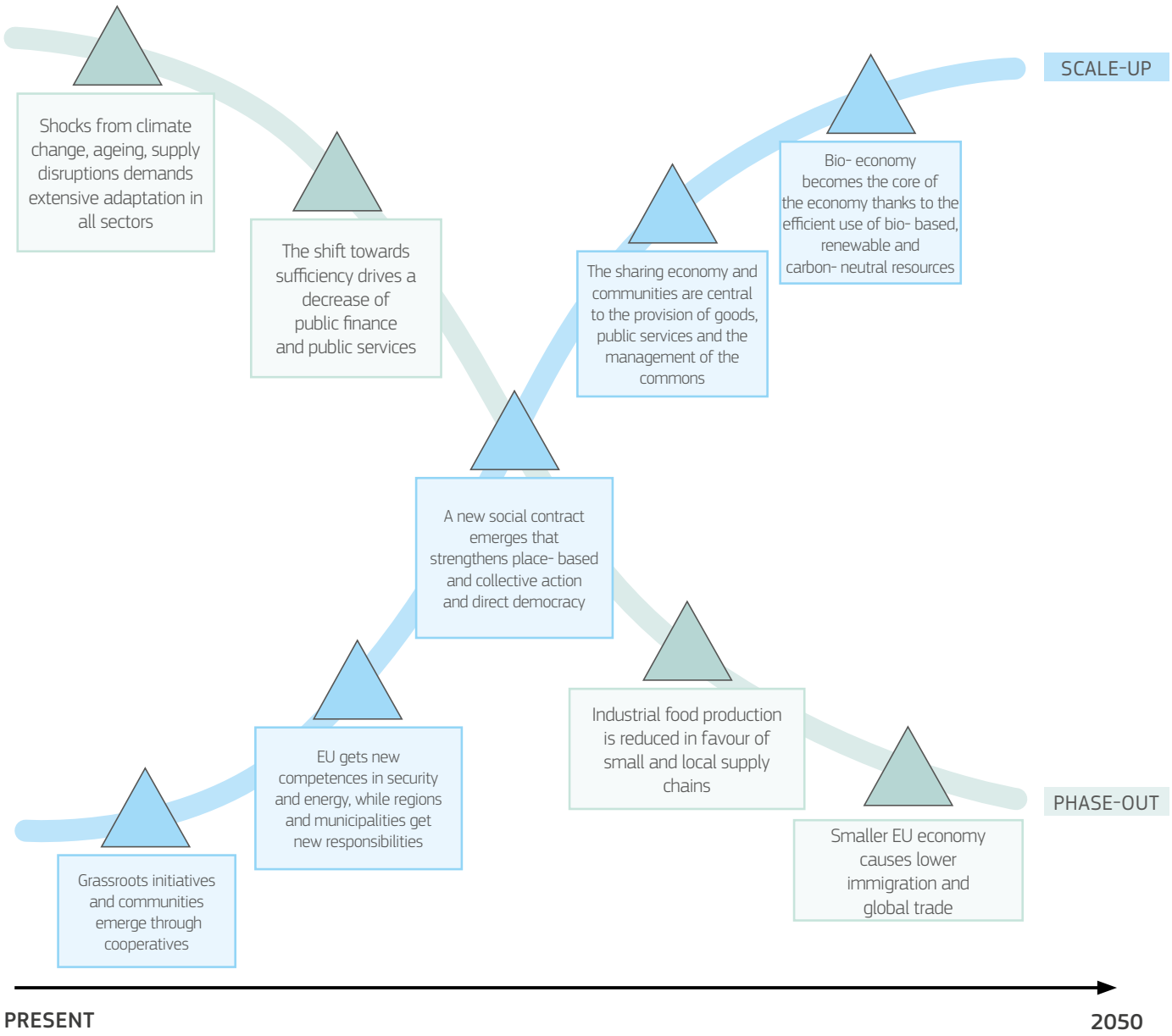
During the 2020s, people across Europe felt the impacts of climate change and demanded extensive adaptation in all sectors, from transport and housing to agriculture. As fossil fuels were difficult to replace and alternative sources were slow to develop, all Member States faced severe energy supply restrictions, hampering their economic growth and cutting their fiscal resources. This called their traditional role and legitimacy into question. Poverty and social unrest rose as state revenues nosedived and piling on more public debt became harder. Perceiving national responses as inadequate, people became more aware of the issues at stake (access to resources and energy, climate change, the limits of technology). Grassroots initiatives started to multiply, and local solidarity grew as people lost interest in national policy. Social conflicts of the 2020s eventually receded after the profound climate-related crises focused minds on adaptation.

More and more people realised that issues such as climate change and defence were best tackled at a supranational level, given the scale of the challenges and the need for collective action. A strong redistributive push fostered the development of self-transcendence and collectivist values in the new generation. A new social contract, closer to the local level, emerged. By the 2040s, daily life already revolved largely around services provided at the local level. Under duress caused by climate change, geopolitical competition and resources scarcity, citizens learned the benefits and skills of cooperation.

Over the years, the employment landscape in the EU changed profoundly as people became more oriented towards community, resilience and well-being. As society became less productive, in 2035 standard working time was reduced to a maximum of 30 hours a week, opening possibilities for collaboration and social innovation. The sharing economy expanded, reducing the number of cars, textiles and other material goods and enabling flexible models of neighbourhood care as well as food and energy cooperatives. By 2050, work-life balance improved for most people, with their contributions to society better recognised. Very high taxation of wealth supported initiatives for universal basic income and stronger redistribution mechanisms, reducing socioeconomic inequalities.

55 Gupta (2023)
56 Wood (2022) and Cheng (2019)
57 Fridays For Future (2023)
58 Weise and Zimmerman (2023)

Figure 6 Glocal eco-world transition pathway



Note: This X-curve includes a sample of elements gathered from the transition pathways; the full version is in Annex 2.

Economic shift towards sufficiency, a first step towards strategic autonomy

By the late 2020s, the progressive loss of fiscal resources at the national level caused by a slowing economy combined with increasing pressure on resources due to intense geopolitical competition. In this context, what little remains of public R&D was directed towards frugal technologies. Grassroots innovation flourished and focused on what was needed for local resilience and frugal solutions, such as nature-based solutions. Sufficiency was the new motto, contributing strongly to the EU's strategic autonomy. Food production at the industrial scale was reduced, while urban and small-scale agriculture supported short and local supply chains. Concerns about food security prompted the development of genetically modified crops and alternative food proteins. However, a strong orientation towards 'natural' products prevailed. The production of vegetables, fruits and poultry became a social activity, with municipalities lending land for community initiatives. Local business mushroomed around activities like repairing goods and equipment, exchanging or upcycling garments and clothing, increasing the GDP share of circular economy.

Trade was reoriented towards countries with similar values, strengthening strategic partnerships. Multinationals needed to adapt to a multitude of small local markets, each with its own identity. This shift affected economies of scale and competitiveness. Food security became an increasing concern in the 2020s with rising geopolitical challenges and disruptions of fertiliser and wheat from Russia. Reliance on imports had to be reduced to a minimum, and exports suffered equally. In parallel, energy supply became so critical in the EU that everyone was encouraged to generate what energy they could. By 2035, photovoltaic panels had become the dominant technology, fully produced in the EU, owing to new supplies of base metals from European mines and metal recycling. Other distributed sources of energy such as micro-biomethanisation and micro-hydropower facilities spread as fast as possible, offering the advantage of local management.

In response to tremendous pressure from climate-related disasters and environmental degradation, protecting ecosystems became a key EU policy both in Europe and globally. The EU gave nature legal, enforceable rights and worked relentlessly to promote this approach across the globe. Territorial plans were developed to protect and develop forests and wetlands, riverbeds and coastal areas. Local communities actively engaged in voluntary work on restoration and reaped benefits in terms of recreation and well-being.

As global trade receded and EU GDP shrank, many highly educated people started to become increasingly attracted by opportunities in other wealthy regions of the world. While less attractive to foreign jobseekers, the EU becomes a safe haven for migrants fleeing persecution and the impacts of climate change, helping improve the dependency ratio in aged societies.

Towards a redesigned EU and new forms of local democracy

During the 2020s, in view of the scale of climate-related, social and geopolitical challenges, the EU Member States abdicated some responsibilities to the local level for local resilience while calling on the EU for help for the grand challenges.

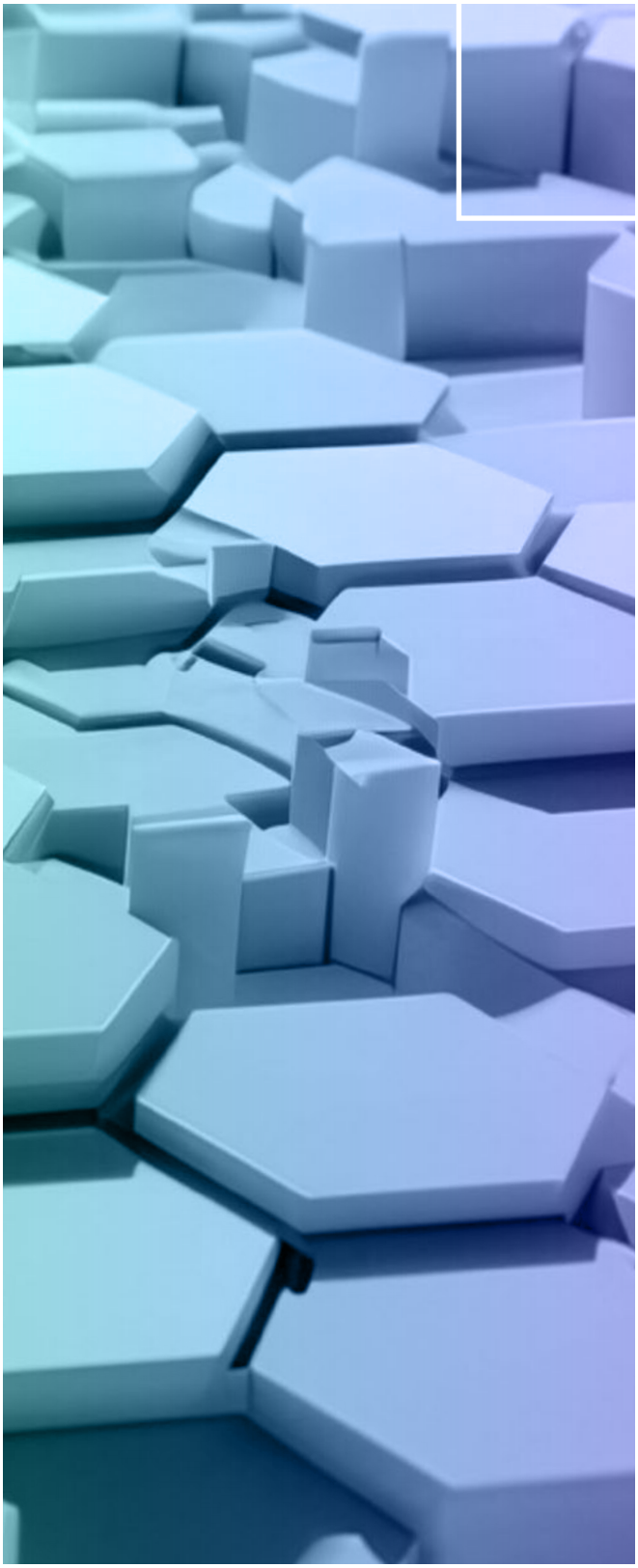
Citizens who mobilised at the local level to enhance resilience and spur collaborative economy also engaged politically, with the help of new digital tools for direct democracy. Many policies were created at local and regional levels after being prepared through deliberations in citizens' assemblies. Cities and regions led the way in developing sustainable solutions and created international networks to exchange practices and strengthen their global influence.

Member States' incomes shrank during the 2020s, making them reluctant to pay EU membership fees. This situation prompted new solutions for EU own resources (mostly from VAT), increasing from 40% to 100% of the EU budget. At the same time, geopolitical competition was rife, making it essential for the EU to maintain meaningful defence capabilities in spite of reduced national fiscal resources. Member States had reluctantly agreed to common EU defence by the early 2030s, while the EU intensified efforts to fight disinformation and foreign interference in democratic processes.

Treaty changes in the early 2030s granted the EU new competences, and a new federal constitution was adopted in 2040. An EU Senate was created, derived from the Committee of the Regions, giving a formal institutional role to EU regions. Building on the citizen initiatives of the 2020s, direct democracy, now common practice at the local level, was enshrined in the EU Constitution.

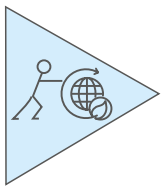
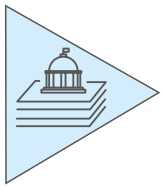
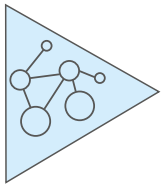
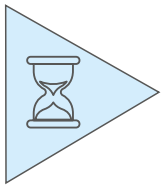
Transformative elements of the transition pathway

- Simultaneous pressure from climate change and environmental degradation, the increasing scarcity of resources and geopolitical fragmentation **upend the traditional economic paradigm** based on growth. The wealthiest members of society are highly affected by this transformation, suffering from the disappearance of growth and from social revolts. Fairness and equity are fundamental drivers of social change.
- **'Sufficiency' imposes itself** as the EU is forced to navigate the conditions to operate within planetary boundaries.
- **A new, resilient 'social market economy' emerges at the local level**, with a high level of solidarity, compensating as well as possible the failings of the national level. People have reluctantly accepted a loss in their standard of living, compensated by a focus on well-being, social contacts, resilience and a form of European solidarity.
- **Democracy adapts** to the new circumstances. Direct democracy thrives at the local level, where cities shape sustainability transitions through new practices and decision-making models shaped by citizen-led initiatives and participatory processes. Decision-making at the EU level also involves citizens' panels and representatives of local and regional authorities.



Key insights from the four transition pathways

The above scenarios are all driven by certain transformative elements driving the transition pathways from present conditions to the imagined future of each scenario. Elements suggesting the possibility of such transformation can be traced in dynamics currently observed in the EU and worldwide.

	**People as a driver for urgent action**. The roles of nature and relationships and the importance of maintaining well-being and security while being sustainable are increasingly recognised. In this sense, society is exploring new democratic practices and new models to enable social change by taking matters into its own hands and is re-evaluating the social contract.
	**Strong shift to a new EU model of multilevel governance.** The EU is becoming an increasingly proactive engine of change as its (geo)political role expands. At the same time, the importance of coordinating and harmonising policies at different levels to address increasingly complex and interconnected crises has highlighted the important role of regions and cities, as well as other societal actors, in effectively implementing a portfolio of policies.
	**A systemic mix of actions requires joint efforts.** Public and private investments can only be effective if they are complemented by a modernised, green fiscal and regulatory framework, as well as education and public engagement that enable synergies with new business models that have evolved from extractive to more environmentally and socially sustainable models.
	**The urgency to act can be guided by the search for resilience and strategic autonomy.** Although it is difficult to assess how abrupt the changes will be, a consensus on green strategic autonomy is emerging. The scale of change required is significant in all scenarios. The consequences of changing by disaster, not by design, may be dire.

The challenge of addressing change through design involves the joint formulation and implementation of a portfolio of interventions in strategic areas. The next chapter aims to unpack the knowledge gained through the foresight process by interpreting the various findings through the lens of political intelligence and sustainability transitions. From engaging with the scenarios and pathways presented here, a number of strategic areas of intervention for the coming decades are identified and analysed. In this way, the chapter aims to generate key messages about the relationship between the systemic changes and the capacity of European actors, working together, to make sustainability transitions happen.

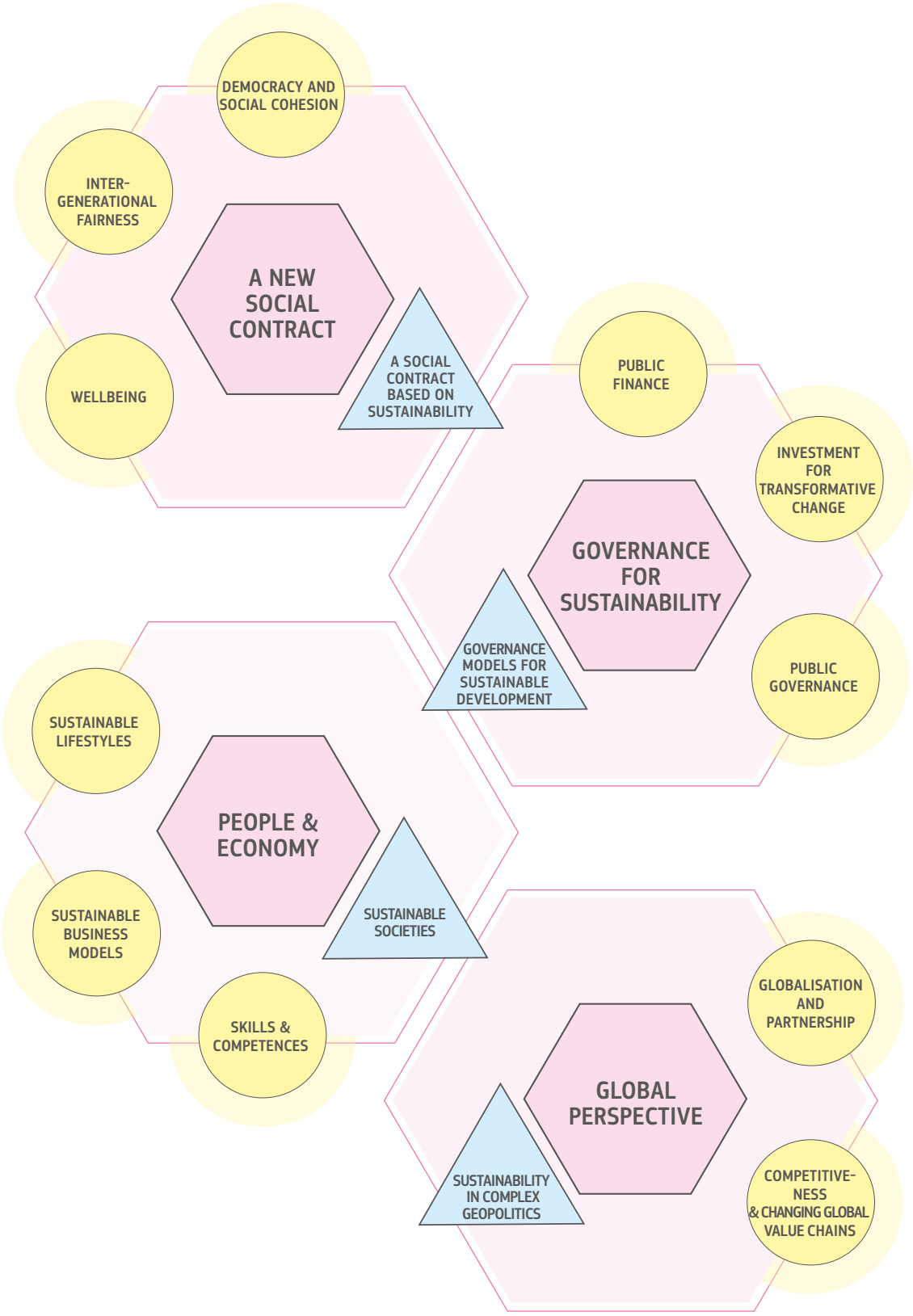
Strategic areas of intervention

This chapter presents the strategic areas of intervention developed through the foresight process. Across the four scenarios and transition pathways towards 2050, these areas were consistently deemed be significant to sustainability transitions, and in need of intervention, in the coming decades. After analysis and interpretation in terms of relevant current data and trends, they were grouped into four clusters. Figure 7 shows the structure of the four clusters.

The four clusters presented in this chapter provide context and frame the strategic areas of intervention. Each of the clusters also presents a range of key potential interventions for various actors to foster the change necessary for sustainability transitions, followed by key insights summarising the main messages of each cluster. The chapter begins with the need for a just transition and a new social contract founded on sustainability to strengthen the EU's social foundations. Sustainability transitions equally impel and provide valuable guiding principles for a new social contract. In line with this, the second cluster outlines challenges and possible changes in governance models for sustainability. Then follows an overview of the areas of intervention for people and the economy. The last cluster presents the global perspective for Europe in sustainability transitions.

The chapter presents a narrative to guide the reader through the strategic areas for intervention while helping manage the complexity inherent in the systemic aspects covered across the four transition pathways. In doing so, this chapter aims to highlight the most important aspects from a policy perspective. The strategic areas will likely require systemic policy mixes, and the possible interventions will involve collaboration and coordination across all of society. This chapter proposes actions and directions for a socially and economically sustainable EU.

Figure 7 Navigation logic for describing strategic areas of intervention



A new social contract

A new social contract is needed to keep democracies thriving and able to foster sustainability transitions. The world is taking an authoritarian turn, as liberal democracies exist in a steadily declining share of countries.[59] It is imperative to counter this decline and promote the democratic governance model in line with European values, as in the European Charter of Fundamental Rights. Democracies need to demonstrate their capacity to see citizens through the existential challenges of the coming decades. The EU cannot turn away from fundamental values and its founding principles. The health of European democracies needs to be addressed; otherwise, the EU may not be able to adapt in a fair way to the challenges ahead and foster sustainability at home and abroad. A new social contract is needed to seize sustainability transitions as processes that can inspire positive change, revive democracies and improve well-being.

Democracy and social cohesion

Democracies need to be renewed in the coming decades. There is broad consensus that democracy is in retreat in many countries, including in the EU. European citizens today are less likely to be members of a political party compared to the 1980s and 1990s, and, across Europe, less than 5% of the electorate are party members on average.[60] That political parties are no longer mass organisations is just one sign that the tenets of democracy have changed in ways that require adaptation. The reason may not be that people are less engaged, as political activism and social mobilisation, including online, are on the rise.[61] It may be more related to how trust in governments and institutions is declining.[62] Challenges to the rule of law within Europe and growing political polarisation, discontent and inequalities are also significant challenges to democratic societies today. Globally, less than half the world's population live in a democracy, only 6.4% in a full democracy, and 37.1% in an authoritarian regime.[63] It is essential for public institutions and civil society to be active and visible as people search for new identities and shift away from established ideologies. Otherwise, the risk is that the gap is filled by polarising culture wars, often fuelled by disinformation. The impact of climate change and resource scarcity is likely to raise the stakes. The coming decades need to demonstrate the legitimacy of democracy as a governance model fit to address existential challenges and secure fairness and well-being for citizens.

Growing discontent and disengagement challenge democracy. Trust in government, voter turnout and support for democracy have all decreased in the past few decades. Protests are increasing, and discontent has been rising globally since the 2008 financial crisis.[64] There is no consensus on the primary cause of this global discontent, but socioeconomic disparities and mis- and disinformation are part of the equation. New digital technologies and online networks can heighten polarisation and make people feel more isolated or unhappy. An increase in polarisation in the European demos reduces social cohesion and effectively makes it more difficult for democracies to function, as broad agreements and compromises become harder to attain. Polarisation makes it more difficult to agree on actions, and this aspect of democracy can be exploited to undermine democratic processes and democratic countries' capacity to act. In a vicious circle, this paralysis from polarisation can reduce trust in governments as they become unable to respond to citizens' concerns.

Discontent is linked to economic inequality,

59 Repucci and Slipowitz (2022)
60 Van Biezen, Mair, and Poguntke (2012)
61 National Intelligence Council (2021)
62 Eurofound (2022)
63 The Economist Group (2022)
64 OECD (2021)

where the past decades have yielded mixed results. The fast-paced globalised economy of the previous decades has significantly reduced income inequality between countries, including between EU Member States. Global extreme poverty has been markedly reduced in the past 40 years.[65] However, global wealth distribution has become extremely unequal, with 10% of the population owning 76% of the wealth and causing 48% of global carbon emission.[66] Such wealth concentration is also growing in the EU, although less so than in the USA and the UK.[67] The concentration of wealth in the hands of a small group of individuals is a risk for democracy and can lead to political polarisation.[68] Within-country income inequality, the gap between rich and poor, has been widening in the EU in the last 30 years, although stagnating since 2010.[69] Current trends also indicate a slight narrowing of the gap, though much remains to be done with a stronger focus on within-country inequality going forward.

Yet inequality is about more than income and concerns opportunities, fairness and dignity. While the EU's Gini coefficient[70] has been quite stable since 2011, even declining slightly,[71] the perception of Europeans is that inequalities are worsening.[72] Sources of inequalities are diverse and not limited to inequalities of income.[73] For example, in the EU people with university-level education on average live five years longer than those with lower secondary education-levels of less.[74] Social and economic gaps between rural and urban communities already contribute to inequalities today[75] and may grow as urbanisation continues in the coming decades. For example, low-wage jobs are more common in peripheral regions while higher-wage jobs are increasingly concentrated in capital regions.[76] If nothing is done, the coming decades could see the uneven impact of climate change and environmental degradation exacerbate inequalities between regions, for example by increasing the cost of living, and could even reverse some of the gains made in equality between countries.[77] Inequalities can be found around issues as diverse as access to opportunities, regional differences, access to technology and connectivity, as well as many other social factors. Overcoming inequalities in access and opportunity is essential to a fair society, and to a cohesive one. Yet, equality of opportunity and social mobility alone may not be enough if jobs are not fairly valued. Fair societies value everyone, and as was revealed during 'lockdown' measures during the COVID-19 pandemic, the sectors deemed essential to society are not always valued accordingly. Rethinking how jobs and contributions to society are valued may be needed for a more sustainable future; some suggest that such a re-evaluation could counter polarisation and populism.[78]

Fairness is central to strengthening democracy. Care must be taken that inequalities are ameliorated before they lead to long-lasting political consequences that could weaken democracy. Ultimately, discontent is about people feeling that society is not fair, that other groups have better standards of living and better opportunities, and that their lives are not turning out as they had hoped. Social mobility is an essential ingredient in fairness, and lack of social mobility may in fact be even more of a driver of

65 World Bank (2023a)
66 WIR (2021)
67 Blanchet, Chancel, and Gethin (2022)
68 Lipps and Schraff (2021)
69 Neef and Sodano (2022)
70 The Gini coefficient measures the extent to which the distribution of income within a country deviates from a perfectly equal distribution, Eurostat (2023a)
71 l'Europe (2023)
72 Eurobarometer (2023)
73 Joint Research Centre (2021b)
74 Joint Research Centre et al. (2020)
75 Eurostat (2022)
76 Joint Research Centre (2022b)
77 Joint Research Centre (2020a)
78 Sandel (2020)

discontent than inequality.[79] In the EU, only 28% of people with less highly educated parents go on to complete higher education, compared to 74% of people with highly educated parents.[80] Equality of opportunities is fundamental to delivering the promise of an inclusive society and supports democracy both by countering discontent and by fostering civic competences, which can empower people to act as responsible citizens and to fully participate in civic and social life, respecting shared values and human rights. Consistency and integrity in policymaking are also essential, as surveys show that most people support solidarity measures to ensure fairness in the green transition and expect policymakers to do more.[81] For example, creating exceptions for specific unsustainable products[82] or services risks decreasing the social acceptance of new measures and undermines public trust. Improving fairness in society is not only about redistribution policies and social protection; it is also about social mobility and good jobs, inclusion, equal opportunity and ensuring a just transition.

Fundamentally, social cohesion is the key ingredient for effective democratic societies. Social cohesion ensures that people share a sense of belonging and trust in one another, as well as a broad commitment to common values and goals. The past decades have changed lifestyles significantly; for example, people tend to live in smaller households, and some unintended consequences are becoming clearer. Shifts in how people and communities connect today leave gaps and cause loneliness and isolation that weaken social cohesion and trust.[83] Traditional social networks have changed, and collective institutions, such as unions and religious institutions, have seen declining memberships for decades. While many new social networks and communities have formed online, the impact on mental health suggests that more alternatives are needed. Bringing people together and fostering dialogue and understanding across groups is a part of ensuring that a key ingredient of healthy democracies is not lost. Supporting dialogue and common understanding is also central to succeeding in the many changes that are part of sustainability transitions.

Democracy can be renewed through new, participatory approaches. The challenges of the coming decades, in particular of the green transition and a new geopolitical landscape, make it critical to renew democracy to ensure that democratic countries have the necessary capacity and legitimacy to act. Demographic ageing poses another challenge, as younger generations may be marginalised in the political process. Older citizens tend to vote more frequently and have more political representation than younger ones, and older voters tend to be more conservative.[84] As the relative share of older voters grows, social cohesion and dialogue need to be promoted between generations. Participatory and deliberative democracy methods, such as citizen engagement, can be put in place much more widely to address this gap and to renew democratic engagement generally. Citizen dialogues (such as open fora to communicate with governmental authorities), civic engagement on specific policy areas (e.g. environmental protection) and direct democracy tools (e.g. referenda) are examples. Digital tools are apt to support such new approaches. Advances to be made include embedding intergenerational concerns in democratic policy design and ensuring inclusive democratic governance with proper participation of actors representing all age groups, as well as social and cultural groups, in established political systems. The new social contract needs to be founded on sustainability, including the commitment to intergenerational fairness.

79 Houle (2019)
80 Joint Research Centre et al. (2020)
81 More in Common (2023)
82 E.g. the debate on exceptions to the combustion engine production ban: Poliscanova (2023)
83 Joint Research Centre (2021c)
84 Tilley and Evans (2014)

Intergenerational fairness

Climate change is the biggest threat to intergenerational fairness. The disastrous long-term environmental outlook in large part results from the actions of previous generations. For example, some estimations indicate that children born in 2020 will experience a two- to sevenfold increase in extreme weather events, particularly heatwaves, compared with people born in 1960, under current climate policy pledges.[85] Moreover, the depletion of natural resources, such as clean water, arable land and fossil fuels has a significant impact on future generations. It raises important issues of solidarity and fairness across generations and has fuelled a surge of climate protests led by young people in recent years.[86,87] This tension could rise further in the coming years, threatening social peace and democracy in Europe. Climate anxiety has also emerged as a new and rising phenomenon among young people.[88]

Younger generations may be facing greater economic and social challenges than the previous generation. Inequality across generations in Europe has increased since the turn of the century.[89] Economic prospects for younger generations are the least promising in decades, in part due to youth unemployment and its long-term effects, rising housing costs and wage stagnation. The last 30 years have seen young people replace the elderly as the group most at risk of poverty.[90] Young adults (18-24) were also the most affected by the 2008 economic crisis.[91] These challenges can make it difficult for younger people to achieve financial stability. As young people typically also have less asset wealth than older people, they are comparatively more vulnerable to economic shocks. The COVID-19 pandemic has exacerbated pre-existing challenges for young people's mental well-being and employment, gender inequalities, poverty and social exclusion risks. For example, the pandemic and intensive use of social media by the younger generations have also created a mental health crisis that needs to be dealt with over the long term.[92,93] These conditions indicate that social protection systems are not geared towards youth, leaving them more exposed to risk compared to older citizens. As the effects of demographic ageing become more pronounced, it may be critical to review the principles of social protection with intergenerational fairness in mind.

Current policies must not create an unsustainable debt burden for future generations. The fairness of public debt is especially relevant concerning the measures taken on demographic ageing. Younger generations are very likely to have to contribute more to finance the past commitments of the welfare state (especially pensions) while receiving less than their forbears in return. Age-related expenditure is presently around a quarter of the EU's GDP and is projected to increase by about 2 percentage points of GDP between 2019 and 2070, due to higher healthcare and long-term care costs, in spite of slightly decreasing costs of education and savings from pension reforms adopted by several Member States.[94] It calls for governments to advance public finances through new taxation measures and embracing flexible ways of working to allow social protection for all workers in today's economy.

Addressing intergenerational fairness should be a guiding principle of a new social contract. Intergenerational fairness is inherently linked to sustainability. It is about the rights, access and opportunities offered to future generations and

85 Thiery et al. (2021)
86 Gordon and Press (2023)
87 Fridays For Future (2023)
88 Hickman et al. (2021)
89 Hallaert et al. (2018)
90 OECD (2015)
91 European Commission (2021a)
92 Sohn (2022)
93 Sample (2022)
94 European Commission (2021b)

about how actions today support future well-being. Participatory decision-making on how to shift to sustainable lifestyles and education and competences are needed to support the transition. Likewise, well-being is essential to the just transition and is a core component of building a healthy democracy and a fair society. Ensuring that Europeans feel that their well-being, in the many ways it can be perceived, is maintained at a high level throughout the transitions towards sustainability will be essential to overcome resistance to change. Embracing well-being economics offers a compelling way forward to finding a new balance with nature, solidarity and prosperity that respects the global ecosystem that human society relies on.

Well-being

Well-being is evolving as a concept to address quality of life, and the well-being of citizens is dependent on a range of social, economic and environmental factors. Well-being covers many different (material and non-material) aspects of a person's life. Well-being comes from having basic needs met, like healthy diets, affordable housing, and healthcare, as well as living in a place with safety, security and justice. It comes from having a sense of purpose and belonging and from social ties and relationships, access to green areas and many other aspects. Citizens also need financial security and access to meaningful employment opportunities with fair wages and benefits. The recent decades witnessed continuous economic growth, with improvement in living standards, GDP per capita and a reduction of poverty, but many aspects of well-being did not improve as significantly or reach the most vulnerable. The recent pandemic and economic trends have brought inequalities closer to a social breaking point.[95] Social connection and support are essential to well-being, as is access to social services and resources that promote social inclusion. Well-being also depends on environmental sustainability, as people need a healthy and sustainable environment to maintain their health and well-being. This need includes

95 United Nations (2020)

access to clean air and water, protection of natural resources, and efforts to reduce pollution and promote sustainable practices.

A focus on well-being can be fostered in the economy as well. Business, industry and technology providers can contribute to solving challenges for society, including climate change, social cohesion and well-being. Such ambitions are integrated into Industry 5.0, which aims at fostering a sustainable, human-centric and resilient European industry.[96] The health of the economy, and critically its ability to provide well-paying, quality jobs, is a key lever for improving equality and well-being. In fact, part of the reason increases in inequality in the past 30 years have been smaller in Europe than in the USA is that Europe's low-income groups more often have relatively well-paying jobs.[97] Quality jobs and an economy focused on well-being is part of resilience, which is also linked to skills and competences. Education and lifelong learning opportunities are important for personal growth and development, as well as for the health of the economy. Social protection and redistribution are undoubtedly needed for well-being, but it is also critical to ensure the ability of the economy to provide decent jobs across the board.

A more holistic concept of well-being is needed to guide society through sustainability transitions. The GDP indicator has long been criticised, but there is now a broadening recognition of the need to take environmental and social aspects into account to have a better view of the non-market activities, inequalities and 'externalities' to which GDP is blind.[98,99] A policy monitoring framework adapted to sustainability is an essential requirement for the transition. The European Commission is already publishing a set of indicators[100,101,102] and the 8th Environmental Action Programme monitoring framework also goes in this direction.[103] Several studies outline relationship using various metrics to account for well-being, see for example Fanning et al. (2022) or the previously cited data from European Environment Agency (2019a). to develop indicators for sustainable and inclusive well-being (such as beyond-GDP metrics and other, statistical-type partial aggregates – see figure 8 for an illustrative example). Sustainable and inclusive well-being aims to account for well-being today, resources for future well-being within planetary boundaries, intergenerational solidarity and inclusiveness. Similar activities are taking place around the world.[104,105] Success in these endeavours could provide better tools to assess progress towards sustainability in its multiple dimensions if adopted and mainstreamed by governments. In particular, such metrics can shed light on the social and environmental dimensions of development beyond the economic parameters already covered in national accounts. Bringing such efforts to fruition to be able to monitor progress in sustainability transitions will be essential to make sure the EU remains on the right track.

Health, access to healthcare and healthy lifestyles for all is essential for long-term sustainability. However, the combination of ageing, unhealthy diets, pollution, climate change, sedentary lifestyles and other factors have created long-term public health challenges.[106,107] Many of the most frequent diseases, resulting in millions of premature deaths, are preventable. The response has often focused on care and treatments rather than prevention, adding to the rise of healthcare costs. Addressing this combination of health threats

96 European Commission (2022d, p. 5)
97 Blanchet, Chancel, and Gethin (2022)
98 Bizikova, Zoundi, and Smith (2022)
99 Stiglitz, Fitoussi, and Durand (2018)
100 European Commission (2022e)
101 Eurostat (2023b)
102 Joint Research Centre (2022c)
103 Joint Research Centre (2021b)
104 Stiglitz, Fitoussi, and Durand (2018)
105 UNSCEB (2023)
106 Joint Research Centre (2023c
107 WHO (2022a)

will require creative systemic approaches over the long term at a time when public services, including healthcare, are under pressure. In particular, more attention will have to be given to prevention, such as supporting healthy, sustainable lifestyles, and addressing social (e.g. wealth) and commercial (e.g. industry incentives) aspects. Systemic preventative approaches to health, often outside the health sector, can reduce pressure on healthcare systems. When looking at a sustainable EU, a healthy population in Europe will remain fundamental for societal resilience and the economy. Taking a whole-life perspective, looking at healthy ageing and following the One Health concept[108] are useful in this respect. As a step towards improving the monitoring of well-being, work has begun on adjusting GDP to take better account of health, as shown on page 56.

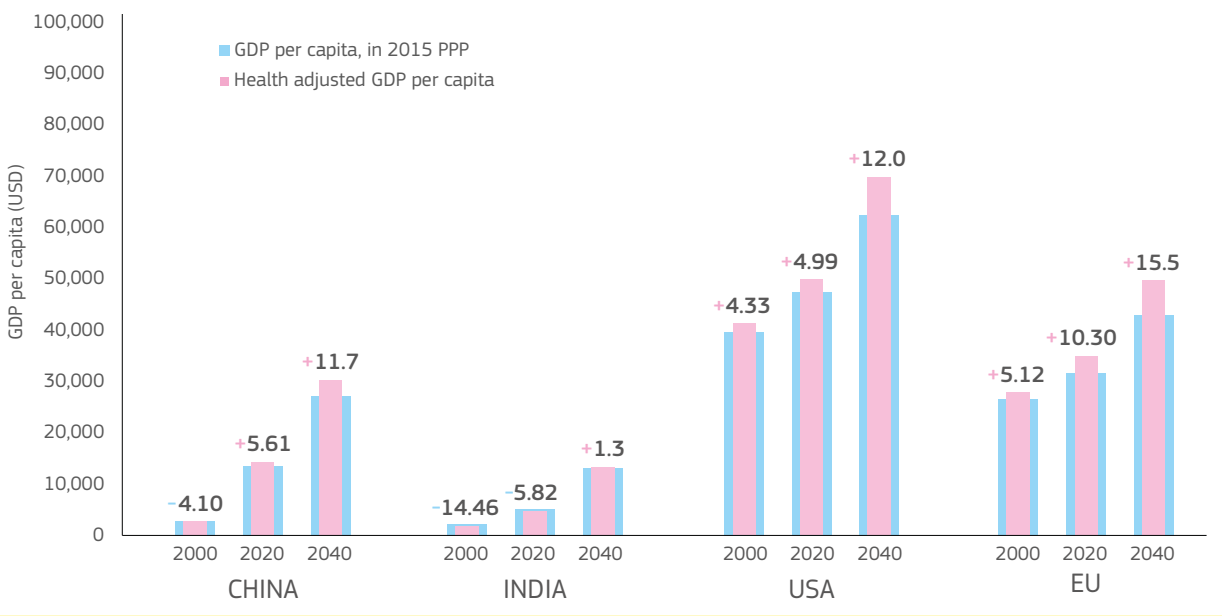
Encouraging healthy ageing and more flexible connections to the labour market can benefit both the economy and the well-being of people as they age. As Europe ages and its working-age population shrinks, new solutions are needed to close the skills and jobs gaps and adapt the workforce to be sustainable. Within EU borders, labour migration and urbanisation exacerbate demographic ageing in some EU regions. To address workforce gaps and promote well-being, labour markets need to adapt, including to suit an older workforce, by providing flexible and quality jobs and possibly adapting the pace of work. Facilitating different models of employment, e.g. through gradual retirement, can strengthen public finances, support healthy ageing and prevent the social isolation of older citizens. While improving work-life balance, a 4-day work week could also be promising and support mental health.[109] Such health-enhancing measures could not only benefit from, but also positively impact sustainability in other sectors. For example, healthy diets could help reduce environmental pressure on agri-food production chains, while shorter work weeks could help curb carbon emissions. Another aspect of a well-being economy is related to the re-evaluation of how different jobs and contributions to society are valued. For example, nurses and other care workers may be even more essential in the coming decades, prompting questions of the desired status and incentives for such jobs.[110]

There are opportunities and policy levers available to provide well-being and social protection as part of sustainability transitions. Social protection is an essential set of public services that contribute greatly to people's quality of life and well-being, as well as to the economy.[111] The provision of welfare and good public services is a core precondition of quality of life for Europeans. Public services encompass critical activities such as education, healthcare, waste management, civil protection, public transport and public utilities. The megatrends of demographic change, the rise of new forms of employment and of inequalities, the digital transition (including automation and AI) and climate change generate growing concerns about the future of the European welfare state. These concerns are becoming particularly acute in a context of rising public debt.[112] In view of the trends threatening public services, policy action will have to be continued over the long term to maintain a good level of services throughout sustainability transitions.[113,114] In themselves, public services are a critical system with many links underpinning the good functioning of society and the economy. This condition needs to be recognised throughout policy and strategic planning from the local up to the EU level. Digital technologies offer opportunities to improve access to and the efficiency of public services if the right investments are made.[58] Sound and competent public administration and other public services will be essential to help coordinate efforts and ensure cohesion in the paradigm shift that sustainability transitions entail.

108 WHO (2017)
109 Bushwick (2023)
110 WHO (2022b)
111 ILO (2021)
112 Lüdtke (2020)
113 EPSU (2021)
114 European Commission (2023m)

Adjusting GDP for different factors

Figure 8: Adjusting per capita GDP for life expectancy leads to larger upward changes (in %) for the EU in comparison to the US, China, and India



The blue columns show the value of per capita GDP in fixed-year purchasing power parity, and the pink ones the adjusted version of the same GDP figure. To obtain the adjustment, one fixes a reference level for mortality and computes the population's willingness to pay to obtain this level. The figures relate to the survival curve of the world projected for 2050 as the reference level. The EU data includes 24 countries (projections are not available for Croatia, Cyprus, and Malta).

Over the last 90 years, GDP has been one of the most widely used economic indicators and remains the most important indicator of a country's economic performance. At the same time, reflections on its limitations have started already in the 1970's. With recent developments such as climate change and the pandemic, it has become increasingly clear that GDP is incomplete as a measure of progress, as it does not fully reflect important environmental or social challenges of our times. This calls for developing complementary metrics – and progressively embedding them into policymaking –, which allow to better track the EU's sustainability transition and its performance in global comparison.

Following up on the past Strategic Foresight Reports, the Commission has launched internal work on developing Sustainable and Inclusive Wellbeing metrics for the EU to complement GDP. It brings together different strands of work for the first time, with the aim of informing future EU policymaking.

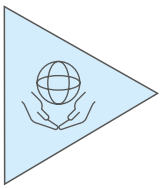
One option to develop beyond-GDP metrics consists of assigning monetary values to relevant factors of wellbeing and using these values to "adjust" GDP[115]. These can include different aspects of quality of life (e.g., health, education, and recreation), unpaid care and domestic work, inequalities, costs of environmental damage (e.g., pollution and GHG emissions), or natural resource exhaustion. The results of a pilot are reported above[116], employing life expectancy as a proxy for the health dimension of wellbeing. It shows the health-adjusted GDP (per capita) for the EU, the US, China, and India in 2000, 2020, and 2040. Work will continue to develop other complementary, beyond-GDP indicators to reflect selected factors like inequalities or environmental damages. The adjustment for inequality can be obtained by 'discounting' average income (GDP per capita) according to the level of income inequality. Environmental damages can be incorporated by subtracting their estimated economic harm. This is consistent with the global commitment, enshrined in the 2030 Agenda for sustainable development, to design measurements of progress on sustainable development that complement GDP. Going beyond GDP is also explored in the reform process of the international financial system.

The upward adjustment for the EU's GDP would be 15.5% in 2040, exceeding that of the US (12.0%), China (11.7%), and India (1.3%). The compound annual average growth rate of unadjusted GDP in the period 2000-2040 is 1.33% for the EU, while that of adjusted GDP is 1.57%. Furthermore, adjusting GDP for life expectancy leads to a higher share of the EU's adjusted GDP over total GDP of the four economies combined in 2040 (corresponding to 19.8%, compared with 18.9% for GDP).

115 There are several attempts in the scientific literature on this subject, see for example Jamison et al. (2013), Becker, Philipson, and Soares (2005) and Fleurbaey and Gaulier (2009)

116 Details of the applied methodology, data sources, additional results and a sensitivity analysis are presented in Joint Research Centre et al. (2023). The methodology is based on Becker et al, (2005), combined with the equivalent income approach of Fleurbeay and Gaulier (2009).

A NEW SOCIAL CONTRACT – **KEY INSIGHTS**



A social contract based on sustainability

The 20th century European social contract cannot meet the requirements of the 21st century. The fundamental tenet of the social contract is that of security and protection for citizens, and, in the coming decades, leaders and governments must step up to provide such protection against the most existential threat – that of climate change and environmental degradation. Citizens today are already doubting whether governments are fit to provide for their protection, security and well-being.[117] It is imperative to move beyond balancing economic growth with demands for redistribution and social protection towards a social contract based on inclusive and responsible sustainability. There are many lessons to be learned from the past. While hyper-globalisation enabled by fossil fuels led to unprecedented growth and increased welfare for many, the benefits were not fairly distributed, and some inequalities worsened. It has also led to unprecedented environmental degradation. As part of the foresight process, the discussions and analysis across the transition pathways have highlighted key needs for change in this respect:

- The transformation towards sustainability requires a **new social contract**, calling for courageous action to address inequalities and transform the economy. It is an opportunity to do better by significantly changing the rules, mechanisms, cross-sectoral arrangements and collaboration between social partners. A fresh, long-term perspective is needed for how society and the economy (incl. decent jobs and dignity of work, public services, healthcare, education and pensions) should provide solutions to meet the needs of **a more diverse society.**
- There is an urgent need for action, but many barriers are still holding back the EU's capacity for transformative change. Actively endorsing **quality of life and security** (incl. mitigating climate change) as pillars of social cohesion in the long term could help policymakers convince society to buy into a new social contract and drive **a positive agenda for the future.**
- Improving **social cohesion** and addressing inequalities requires a fundamental shift towards long-term thinking to prioritise societal well-being. A redefinition of critical strategic decision-making processes at all levels of governance and of the associated allocation of resources is needed. **Well-being economics** offer a lens to better integrate sustainable and inclusive approaches in the economic sphere.
- The capacity for change relies on meaningful and sustained engagement with all stakeholders. New **democratic practices** and models for engaging society in the political process require fundamental changes to address representativeness, the inclusion of different social groups, and a diversity of needs.

117 Willis (2020)

Governance for sustainability

Sustainability transitions require steering and investment from a multilevel and multi-actor governance configuration. Transforming the EU economy to meet global ambitions for sustainable development, including the Paris Agreement and the SDGs, will require major investments and a redirection of financial flows. In this context, public finances are essential to the well-being of citizens, but they must also provide direction to invest in steering sustainability transitions. Making the right systemic changes requires the development of robust, coherent and mutually reinforcing policy instruments to be able to engage in the desired transition pathways. Making these options available will require joint public-private efforts not only to stimulate their development and financing, but also to ensure their diffusion and adoption. The capacity of governments to ensure adequate budgets for the fulfilment of their functions is essential for the functioning of Member States and the European Union. In any scenario of a sustainable EU in 2050, whether by communities of citizens, national governments or the European Union, all policies will require specific public budget interventions. It will be crucial to anticipate their scale, reliability, purpose and systemic impact.

Public finance

Public expenditure and revenue are under growing pressure. Current trends suggest that the need for social protection and for governments to deal with geopolitical and humanitarian crises has become a top priority at a time when the healthcare needs of an ageing society are increasing. Social protection and healthcare already account for the two largest shares of government spending,[118] with age-related expenditure bound to increase in the coming decades.[119] Another area where public spending is expected to increase is defence. The EU Member States increased their defence budget to a total of €214 billion in 2021,[120] an overall investment increase of 30% since the annexation of Crimea.[121] It is estimated that an additional €70 billion per year will be needed by 2025 to regain adequate defence capacity under the pressure of growing international conflicts.[122] The combined effect of these trends points to increasing public expenditure, even as revenue looks set to decrease in line with the shrinking workforce. This contradiction suggests a need for new measures and methods in public finance.

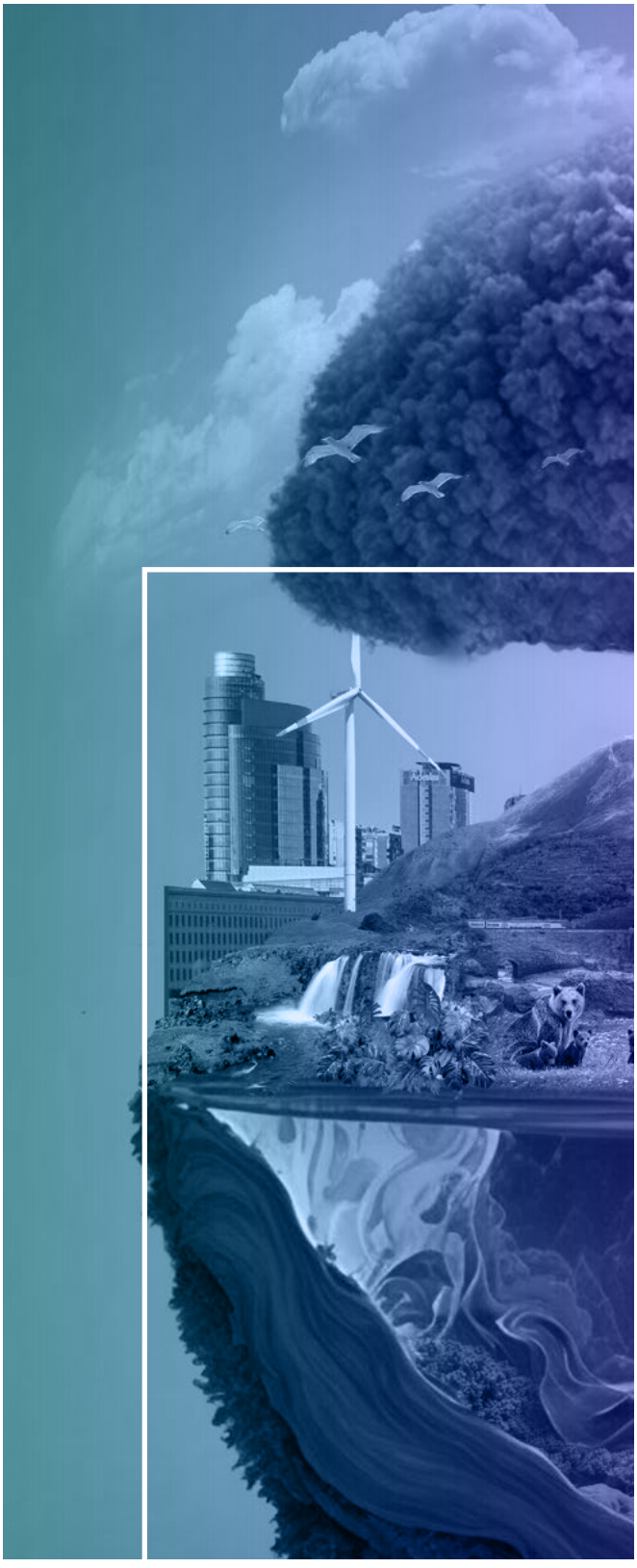
Climate change brings costs and changes to the economy, and investment priorities need readjusting to address sustainability transitions. Climate change can lead to welfare losses up to nearly 2% of GDP, as well as loss of natural resources, and human suffering.[123] The mitigation and adaptation efforts that can reduce such impacts will require public expenditure. The need for civil protection, such as from droughts and wildfires, is also likely to increase and require support from public budgets. Climate change itself could become a new source of financial instability, potentially affecting national budgets.[124] Even in the scenario where, for example, a substantial shift 'from goods to services' can sustain the size of the economy, there are other coming changes that could lead to a contraction of the tax base. Such changes include the phase-out of fossil fuels, the ongoing reconfiguration of global supply and value chains, and the reduction in our consumption footprint required to achieve the green transition, all of which could have a significant impact on employment levels. In the same vein, achieving the ambitious targets for reducing greenhouse gas emissions requires the EU to invest between 200 and 300 additional billion euro per year in the

118 Eurostat (2023c)
119 European Commission (2021b)
120 European Defence Agency (2022)
121 Torralba (2023)
122 European Defence Agency (2022)
123 Joint Research Centre (2020a)
124 Alessi et al. (2023)

coming decades,[125] mainly in the energy sector. While these investments are expected to yield benefits that largely exceed the costs, the former are not always paid for by the beneficiaries and do not necessarily trigger economic growth that generates additional tax revenues.

The phasing out of unsustainable practices and lower economic growth will bring possible trade-offs of fiscal reforms. Unsustainable production and consumption are to be phased out, while incentives for sustainable economic activities must be created by eliminating, phasing out or reforming harmful subsidies, the introduction of 'green' taxes, and the use of instruments such as cap-and-trade mechanisms. At the same time, the incentives created by appropriate cost-shifting in favour of 'green' activities can boost innovation and the competitiveness of EU companies on the global market, where sustainable solutions are in demand. However, the EU's role in the global economy is bound to diminish, as its share of world GDP is expected to fall to 12% by 2050, down from 18% in 2020.[126] This trend could be exacerbated if other economies do not commit to sustainability transitions and continue to grow based on unsustainable practices.

Being able to sustain the needed public budgets for fair sustainability transitions is very likely to require a rethinking of taxation. While current EU policies have high expectations from 'green growth', meaning that GDP does not decrease while emissions and impacts decrease, insufficient decoupling would force the EU (and the world) to reduce growth to achieve sustainability. In this case, rebalancing taxes would be unavoidable to maintain a public capacity to cover social protection and to invest, for example in innovation for the green transition. In the future, the search for a sustainable economic model would potentially lead to a shrinking labour force and lower consumption, requiring the tax



125 European Commission (2018)
126 Data source: S&P Global Market Intelligence (2023), updated on 2 June 2023

system to focus more on taxing wealth, including capital and businesses such as large digital service providers, whose revenue growth is likely to remain well above the GDP growth rate.[127]

Tax reforms are also necessary to ensure fair and sustainable transitions. Environmental, social and economic challenges compel the modernisation of current tax systems to address fairness and inequalities by shifting taxes from labour to the environment to support sustainability goals. A shift in taxation towards 'greening' may have significant implications for social equality (e.g. through an increase in fuel poverty[128]). To ensure that the burdens of greening are not placed on the less affluent section of society, it has been argued that the 'greening' of taxation should be implemented within the framework of progressive taxation, in particular by shifting taxes from labour to environmental costs and higher income or corporate taxes. Public finances need to evolve to survive the already inexorable climate adaptation and to be able to foster sustainability transitions.

Investment for transformative change

Collaboration between the public and private sectors can accelerate sustainability transitions. Collaborations that enable the mobilisation of private resources can help alleviate growing pressures on public finances but also strengthen the direction and impact of strategic investments in critical areas.They can enable the effective development of basic infrastructure services such as waste management and water and electricity supply, in combination with a circular approach, as well as healthcare, education and transport.[129] The OECD estimates that global public and private investment in energy, transport, water and telecommunications will be required to the tune of approximately €5.7 trillion per year by 2030.[130] Collaboration between the public and private sectors can contribute to the development of broader innovation ecosystems by bringing together a diverse group of actors sharing a common long-term vision and strategy.[131]

Innovation, with research and development, is part of a broader policy mix for making solutions available by combining innovation with environmental and sectoral policy instruments. Meeting the European Union's objective of achieving climate neutrality by 2050 requires multiple policies and programmes stimulating investment in critical areas. Here, political support is essential to advance innovation, from research funding to commercialisation. More specifically, R&D investment and subsidies targeting key sectors are required (e.g. renewable energy, digitalisation). Doing so from a systemic perspective requires that policymakers design appropriate policy mixes targeting a broad range of activities, including experimentation, innovation and new market creation as well as demand-side stimulation. These policy mixes should support territorial development through dynamic innovation ecosystems.[132] 'Mission-oriented processes' can help the diffusion, adoption and implementation of innovative solutions. They will require the reinforcement of governance and decision-making by improving societal engagement, public sector capabilities for experimentation and more agile finance and funding schemes that better align investment strategies between different actors across sectors and governance levels.[133]

Sustainable finance can provide strategic direction and vision for transformative and sustainable investments. Making the required transformative investment happen requires a profound transformation of public and private financing models. Sustainability transitions will need multivalent forms of capital relying on the principles

127 See e.g. Smith (2022)
128 Gore, Urios, and Karamperi (2022)
129 World Bank (2023b)
130 OECD (2018b)
131 Joint Research Centre (2020b)
132 European Commission (2020d)
133 European Commission (2019a)

of new economic thinking and a regenerative economy.[134] Estimating future investment needs requires that the proposed activities be assessed against relevant sectoral EU transition pathways[135] and take a systemic perspective.[136] The long-term vision needed to guide investment depends on correcting market incentives and reducing risk and uncertainty while incentivising private investment in strategic sectors. Tools such as the EU taxonomy can provide clear signals to market actors about the sustainable direction of economic activity. However, effective implementation of the taxonomy will require complementary instruments such as financial standards and labels, as well as information and transparency mechanisms.[137]

Innovation in blended finance is critical to accelerate joint public-private investment for sustainability. Blended finance instruments can include mixed sources such as private for-profit, impact philanthropy, public funding and mixed mechanisms such as grants with equity or with debt. The implementation of a blended finance approach can support the strategic use of development capital to mobilise additional capital to support risky but potentially high-impact projects. However, the widespread use of blended finance instruments requires a significant improvement in the joint capacity of public policy and the private sector to remove barriers to sustainable investment by implementing a portfolio of interventions in different markets, sectors and innovation ecosystems.

The transformation brings opportunities for nurturing innovation ecosystems with benefits for territorial development. The recent pandemic and the Russian war in Ukraine have highlighted the importance of the capacity of sub-national actors to manage external shocks. These events showcase the importance of the territorial dimension in the implementation of policy mixes addressing sustainability transitions.

134 ESIR Group (2022)
135 European Commission (2023n)
136 European Environment Agency (2019b)
137 EU Platform on Sustainable Finance (2021)

Regional actors need to build resilience and crisis management capacity while supporting system change in critical areas such as decarbonisation and material efficiency.[138] This shift requires a more decentralised multilevel governance structure[139] than exists today, one where a broad portfolio of initiatives enables the combination of national framing and resources with the ecosystem and place-based, specialised initiatives.[140,141] In this context, regions and cities are crucial as they have the appropriate competences and the essential knowledge for industrial development and natural resource management. Regional regulatory and planning frameworks are also crucial for targeting private investment to activate the green and digital transition.[142]

Public governance

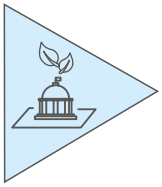
Successful sustainability transitions call for strong and adaptable multilevel governance mechanisms. The European Green Deal embodies the EU's efforts to achieve the SDGs. At the same time, the urgent need for action on climate change and the need for a rapid response to global threats urge a redistribution of power and competences between levels of government. For example, the responsiveness of government at the local, community level may be strengthened, for instance in climate adaptation. In such processes, the establishment of local-national and national-regional initiatives would pose challenges in terms of the necessary improvements in coordination and implementation capacity as part of the overall policymaking process. Addressing these challenges requires more appropriate governance models involving all levels of government, as well as the engagement of different actors, including industry, civil society and universities.[143]

Increasing pressure on public resources will make the efficiency and effectiveness of public spending crucial. Faced with a potentially shrinking fiscal base and greater demand for public investment, services and redistributive measures, governments at all levels need to improve the efficiency and effectiveness of their expenditure. To ensure efficient and effective public expenditure, effective governance is needed to ensure timely assessment, financing and implementation of investments and procurements, adequately consulting and involving stakeholders and citizens while maintaining strong public oversight. This improvement is key to addressing public finance challenges directly in each country and indirectly in the pooling of competences at the EU level, where mutual trust and political agreement among Member States require a comparable quality of governance.

Using the public budget strategically is an important mechanism for fostering change through synergies with the private sector. Beyond providing resources to match expenditure needs, public budgets may offer opportunities to steer the economy by catalysing the emergence or scale-up of sustainable business models. This steering can, for example, be achieved through public procurement[144] incentivising suppliers to adopt sustainable solutions, or pre-commercial procurement[145] driving solution innovation from the demand side. It can also be supported by collaboration with non-governmental organisations, stakeholders, and by citizen activities like public service delivery or participatory budgeting.[146] By adopting these types of practices, governments can substantially stimulate the development of economic activities more in line with sustainability.

138 European Environment Agency (2022a)
139 Multilevel governance: mechanisms and practises for the vertical distribution of decision-making powers and responsibilities between many levels of government and horizontally between numerous governmental and non-governmental organisations and actors
140 Joint Research Centre and Committee of the Regions. (2022)
141 Joint Research Centre (2023f)
142 OECD (2023b)
143 Joint Research Centre (2023d)
144 European Commission (2022f)
145 European Commission (2015)
146 Ellena (2023), Sintomer, Röcke, and Herzberg (2016)

GOVERNANCE FOR SUSTAINABILITY - **KEY INSIGHTS**



Governance models for sustainable investment

Governance models need to evolve for enabling sustainability transitions. The challenges of integrating the different dimensions of sustainability into a new economic model require a reconfiguration of the governance models that govern the decisions of public and private actors in implementing systemic portfolios of actions to address societal challenges. Public finances need to evolve and adapt to the pressures of the coming decades. Measures to strengthen the capacity of actors to use new financial models and adapt to changing economic conditions are essential to provide strategic direction and manage the scale of sustainable investment required. The discussions and analysis on transition pathways developed through the foresight process have facilitated the identification of key needs for change in this regard:

- A shift is needed in public policy towards a systemic policy mix approach to foster change across the different dimensions of sustainability (social, economic and environmental), where new priorities that **determine the direction of public finance and investment** complement regulatory and fiscal frameworks that guide the private sector towards a fair and green transition.
- New mechanisms that allow flexible and dynamic action to deal with different types of changes over time are crucial. These mechanisms should support the **capacity of European actors to act** to bring about the necessary changes at different levels of society through a more effective set of sustainable and coordinated interventions within **a multilevel governance model.**
- **Challenge-driven strategic interventions** are essential for operationalising the systemic policy mix. A clear vision and direction makes a set of reinforcing policy instruments more effective to address multiple objectives. At the same time, clear alignment and long-term orientation strengthens **collaboration between the public and private sectors** promoting sustainable investment across society.
- Institutional capacity for policy co-creation can be transformed by focusing on **modernising public systems** and making public budgets more effective instruments for interaction within a diverse policy mix.

People and economy for sustainability

A socially and economically sustainable Europe requires profound changes in the practices, skills and behaviour of society. The societal challenges associated with the transition to a climate-neutral EU by 2050 include a significant shift in behaviour towards environmentally sustainable consumption patterns and the promotion of a new set of skills required for sustainable lifestyles and new jobs. Addressing these challenges involves complex interactions between different actors to enable new business models as a mechanism to promote sustainable production and consumption, while making significant efforts to change existing structures that support unsustainable consumption. Policies are needed to promote the profound transformation of long-standing social and economic norms and institutions, but changing societal perceptions and values, for example connecting well-being with sustainability, remains a key challenge. In this context, education is an important lever to help people live more sustainably. At the same time, sustainability transitions need a workforce with adaptability and flexible skills, and education can provide the foundation that enables people to succeed as part of such a workforce. Moreover, education is crucial in providing the skills and competences that people need to cope with the rapid change and radical new approaches required in the coming decades.

Sustainable business models

New business models are emerging as a mechanism to foster sustainable production and consumption. A range of opportunities based on high-tech, service-oriented and circular strategies, as well as social entrepreneurship, place-based, cooperative and community models, are driven by the search for resilience and the direction set by the ambitions of the green transition. In this sense, new practices are emerging that aim to both create wealth and promote social well-being. They are introduced by purpose-driven corporations that serve the interests of stakeholders and shareholders.[147] Policies, and other instruments, can spur business models that minimise resource use and create new value from existing products and new services, helping maximise energy and material efficiency, reuse goods and proactively seek to generate value by enabling the sharing of resources.

A sustainable economy is more circular and collaborative. Sustainability transitions require reducing resource use, extending the useful life of products and reusing, sharing, repairing, remanufacturing and recycling materials. The expected reduction in final and intermediate consumption of material resources through the industrial circular economy depends strongly on the type of material and use. The outcome of this reduction is strongly related to a potential trade-off arising from secondary production displacing primary production, although there is a rebound effect.[148] The EU's large demand for metals and plastics could be met to a significant extent by 2050 through the reuse of materials already produced: 75% of steel, 50% of aluminium and 56% of plastics.[149] The collaborative or sharing economy sees innovative business models develop new, previously untapped value from existing products and new services, helping maximise energy and material efficiency, reuse goods for society, proactively generate value for the market and create inclusive value by enabling the sharing of resources among equals.[150] Research estimates the potential economic gain associated with better use of capacity through the sharing economy at €572 billion per year in the EU-27 and the UK.[151]

147 European Parliament (2023)
148 European Commission et al. (2022)
149 Material Economics (2020)
150 Oliveira-Dias et al. (2022)
151 European Parliament (2016, p.)

The transformation of current business practices requires significant changes to enable the transition from traditional business models. Policies are needed to remove regulatory barriers and create favourable conditions for reshaping the market and spreading the combination of different forms of innovation. For example, making repair, renting/leasing or second-hand items more attractive and available than buying new objects may increase take-up of such sustainable behaviours. Corporations could take a lead here and could be the subject of regulatory action more than individual behaviours (i.e. oblige certain business sectors to shift to 'as-a-service'). At the same time, social innovation is needed to influence consumer behaviour and mitigate perceived risks within value chains, ensure equitable access to products and services, and enable both circular and socially responsible procurement.[152]

The market needs to supply sustainable options to support sustainable lifestyles. There can be no sustainable behaviour if there are no sustainable products or services available, but this is not enough. One of the biggest challenges for public policymakers, businesses and civil society organisations that promote sustainable behaviours is the 'attitude–behaviour gap': discrepancy between what people say and what they do. Raising awareness about the impact of sustainable products and services on the environment (perceived effectiveness) improves take-up of sustainable behaviours.[153] Firms with social and environmental responsibility may attract consumers and increase profitability. Making these sustainable practices visible, transparent and recognised by consumers can therefore spur sustainable consumption.[154] This incentive alone may not be enough to shift to sustainable production and business models. Policy and regulation can support the shift and help change deep-rooted structures and consumption habits.

Sustainable lifestyles

Despite growing concern about climate change, current European lifestyles are not sustainable. Even though many believe that technical measures could decouple the benefits people enjoy from goods and services from greenhouse gas (GHG) emissions and the extraction of resources, such technical fixes are unlikely to be sufficient to remain within the limits of our planet. Other models of development, not based on continuing growth, might have to be called upon. Current impacts have already transgressed several planetary boundaries associated with emissions to the environment (air, water and soil) and the use of resources (e.g. minerals and metals, fossil fuels)[155] and are projected to keep increasing until 2030.[156]

Sustainability transitions require a drastic reduction of material and energy consumption in the EU, by some measures by a factor of 10.[157] With time, we might be able to reduce our impact through a more efficient use of resources, but this method is affected by diminishing returns and is unlikely to be enough considering the current scale of material and energy consumption: the required scale of reduction entails a change in our behaviours and lifestyles, embracing sufficiency (i.e. accepting to consume not more than adequate amounts of goods and services). In spite of a reduction of the consumption footprint of housing (−15%) and mobility (−7%), increases of those of food (+18%), appliances and household goods (+5% each) caused a net increase in the overall footprint of 4% between 2010 and 2021. This would have been higher in the absence of the COVID-19 pandemic, which influenced consumption habits to a sizeable extent.[158]

152 Dufourmont et al. (2020)
153 Nguyen, Nguyen, and Hoang (2019)
154 White, Habib, and Hardisty (2019)
155 Joint Research Centre (2023e)
156 Joint Research Centre (2022d)
157 This factor of reduction can be appreciated considering that our current emissions are close to 10 tonnes of CO2 equivalent per capita per year, and need to fall below 1 tonne by 2050 in order to limit global warming to 1.5°C. See e.g. Hot or Cool Institute (2021)
158 Joint Research Centre (2023e)

Sustainable lifestyles are long-term investments in society but can also improve well-being now. Current economic interests and social norms tie the idea of well-being to the possibility of enjoying a variety of material goods, but as already established, well-being is much more than material wealth. A shift to lifestyles based on sufficiency may be supported on the basis of positive narratives of change: research indicates that green behaviour and sustainable consumption are positively related to subjective well-being and life satisfaction.[159] However, it is unlikely to come naturally to most people. While giving a voice to the positive narratives of change, the fundamental motivations of unsustainable lifestyles still need to be addressed by promoting awareness, social norms and values. Community-level action, and communities themselves, can be vehicles for promoting sustainable behaviour.[160] A shift in values can change the common idea of well-being towards non-material goods, such as positive human relationships, access to the natural environment, and human development.[161] Younger generations are often found to show more concern for sustainability and more commitment to reducing consumption.[162] In order to affirm sustainable lifestyles based on sufficiency, such movements need to become mainstream.

The shift to sustainable lifestyles will be difficult because current practices are highly entrenched. Current consumption behaviours have been built through deliberate policies over the past three generations to stimulate the growth economy. They encompass complex interactions of governments, businesses, marketers, producers, media and other actors, within social, cultural, infrastructural, political and other contexts. Any potential change in consumption needs to stem from efforts to transform existing structures supporting unsustainable consumption. This change can only happen if driven by a variety of actors working together, acting at the systemic level.[163] However, the time already lost on inaction in global climate mitigation testifies to the central role of political power in preserving vested interests. Sustainability transitions require in-depth systemic transformation of long-standing social and economic norms and institutions currently reproducing the problems driving climate change.[164]

Policy action is needed because spontaneous behavioural change will be too slow on its own. The cultural shift towards sufficiency must start now but will take time to happen. It will require implementing an array of regulatory, fiscal, economic and technical measures. Regulation can include banning advertisement of environmentally harmful habits such as flights or combustion engine cars, just as is happening today with socially harmful products such as tobacco and alcohol. In some cases, banning the least sustainable products and services altogether can be envisaged, with a robust assessment system. Subsidies, green procurement or removing obstacles to the uptake of sustainable products and services can help increase the availability and affordability of environmentally sustainable alternatives. For example, implementing well-planned, comprehensive, free or affordable public transport or bicycle lanes can influence the uptake of such mobility alternatives.[165,166]

Affordability is a barrier to sustainable lifestyles. The prices of sustainable products and services tend to be higher than those of non-sustainable ones (e.g. food, clothes) and may be too high for many people to afford (e.g. electric cars, energy-efficient housing). Many people perceive this as inconsistent with the aims of

159 Binder and Blankenberg (2017)
160 European Parliament (2023)
161 See e.g.Isham and Jackson (2022)
162 See e.g. Wood (2022)
163 Poças Ribeiro (2023)
164 See for example Stoddard et al. (2021),Dixson-Declève et al. (2022)
165 Fiestas Carpena (2018)
166 Nicholas (2022)

sustainability and see this lack of affordability as the key obstacle in shifting to a sustainable lifestyle. 'Green' options are not necessarily more expensive to deploy (e.g. some suppliers may charge a 'green mark-up'). Social provisioning of services by the public may prove able to satisfy human needs in an inherently more sustainable way, e.g. with lower energy consumption.[167] Equally, the call for more sustainable behaviours needs to be accompanied by structural measures in order to avoid jeopardising fairness.[168] As an example, the energy poor might may be keen to meet their energy needs in a less polluting way, such as by adopting energy efficiency, but cannot afford to engage in these actions.[169]

Green taxation needs to be fair. Given the disproportionally large impact of luxury lifestyles on the environment and GHG emissions, taxes should be designed to target the wealthiest fraction of the population (e.g. private jets, yachts, second homes). Taxes can also be increased on unsustainable or unhealthy food and practices to deter people from such habits; care must be taken that such interventions do not unduly affect the poorest and create equity issues. More radical proposals, such as choice editing, 'consumption corridors'[170] or personal carbon allowances[171] are being discussed as possible solutions to eliminate the most harmful consumption. These radical measures could be just implicit consequences of high taxation on the most harmful habits. For example, flights need to become much more expensive than they are now, as must private cars, to significantly limit their use. Such measures should be coupled with improvements in public transport and infrastructure in order to provide suitable alternatives. More generally, regulatory and fiscal instruments should aim at making sustainable lifestyles (plant-based diets, public transport, cycling, local holidaying, renewable energy, etc.) more affordable and accessible. This

167 Vogel et al. (2021)
168 DellaValle and Sareen (2020)
169 DellaValle and Czako (2022)
170 See Fuchs et al. (2021)
171 See e.g. Fuso Nerini et al. (2021)

accessibility is key to overcoming the vicious circle of inertia in behaviours and government inaction justified by insufficient demand.

New behavioural approaches will play a role in influencing lifestyles in the coming decades, especially as digital tools in daily life become ubiquitous. Information, such as energy-saving labels, are often used to raise awareness and encourage people to engage in certain behaviours, like investing in energy efficiency. However, it is not just the information that matters but also how it is framed and who provides it. For example, making operating costs salient at the point of purchase or having trusted members of the community promote the information can increase its effectiveness. Behavioural approaches represent a cost-effective option. For example, nudges can include changing default settings to make a desired option easier to choose and reminders and goal-setting can make decisions easier. Importantly, in order to be ethically acceptable, nudges should be communicated in a clear and transparent way, which can be effective and might even be viewed more favourably than if kept implicit or hidden.[172] Boosts, on the other hand, target competencies rather than behaviour. They aim to strengthen the cognitive system by promoting area-specific (such as energy literacy) and general competencies (such as statistical literacy), as well as improving the related context (such as turning information into a visual and less cognitively demanding format). For example, energy literacy training could boost the necessary skills to appreciate the benefits of energy conservation behaviours.

Skills and competences for sustainability

Education is a key lever for changing behaviours and helping people live more sustainably. A broad majority of European citizens think they can contribute actively to the ecological transition and feel responsibility towards it,[173] fulfilling an important precondition for the behavioural shift. In addition to the previous section, shifting to sustainable lifestyles also requires new skills and competences.[174] Sustainability competences[175] help people understand the challenges related to climate change and the impacts of human activity on the environment and thus support engagement in action for a sustainable future. They include, among others, valuing sustainability and promoting nature, requiring regular exposure to nature and understanding of its role for human well-being. Education and awareness-raising on sustainable and healthy lifestyles can promote long-term cultural change for sustainability if supported through a comprehensive framework[176] and people empowerment[177] Children are one of the drivers of change, with young activists pushing governments and businesses to become environmentally conscious, and many parents reveal that their children push for sustainable behaviour at home.[178] Intergenerational activities may strengthen such influences for more environmentally conscious lifestyles if embedded in lifelong learning systems. Current lifelong learning systems need to adapt to implement broad, participatory, cross-sectoral actions for sustainability.

Personal, social and civic competences[179] are essential to implement change. Competences such as adaptability, systems thinking, critical thinking, futures literacy,[180] as well political agency, collective action and individual initiative are fundamental to achieving personal fulfilment and social inclusion, learning how to learn and stay employable and for participation in society. Self-awareness, flexibility, collaboration, empathy and entrepreneurship are increasingly highlighted by businesses as key for future employment. On the

172 Bruns (2021)
173 European Commission (2022g)
174 Fuchs and Kreinin (2023)
175 Joint Research Centre (2022e) European Commission (2022g)
176 Joint Research Centre (2022e)
177 European Commission (2023o)
178 Hosany, Hosany, and He (2022)
179 See for example Joint Research Centre (2020c)
180 See for example Teach the Future (2023)

other hand, schools and pupils report declining levels of well-being and widespread cyber-bullying, which hamper learning in schools and the future prospects of many young people.[181] Social and emotional learning can foster competences such as curiosity, creativity, resilience and tolerance as important building blocks for the mental and physical health and well-being of children and adults.[182]

Basic competences – reading, maths and science - remain the foundation of learning but inequalities hamper their acquisition. Children from disadvantaged socioeconomic backgrounds are almost six times more likely to perform poorly in reading, maths and science compared to their more privileged schoolmates. 9.7% of youth across the EU have not completed upper secondary education, with much larger shares of those from low socioeconomic or migrant or minority background.[183] Educational disadvantage is still transmitted between generations.[184] Inequities start with early childhood education and last throughout the working life, as adults with low qualifications (and those whose parents had low qualifications) usually participate much less in reskilling and upskilling programmes. Unless this cycle of disadvantage is addressed at its roots,[185] its implications for social cohesion and economy may put sustainability transitions at risk.

Pervading digitalisation calls for equal access to digital technology and digital competences. The share of jobs in the EU that can be done remotely already stands at 37%,[186] while only 54% of people in the EU have basic digital skills. Digital transformation of the economy and the public sector will open new opportunities in careers and access to services but comes with challenges for equality and fundamental rights.[187] Digital competences can enable children and

181 OECD (2018a)
182 OECD (2023c)
183 OECD (2018a), European Commission (2021c)
184 Joint Research Centre et al. (2020)
185 For example, through intense targeted support to families at risk of poverty or social exclusion, as proposed by the Child Guarantee: European Commission (2023p)
186 Joint Research Centre (2020d)
187 FRA (2019)

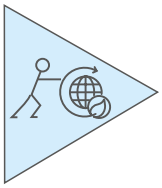
adults to responsibly use and engage with digital technologies for learning, work, and participation in society.[188] They include information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. Basic digital skills for all citizens are a must for communication, active participation in society and access to public services. All forms of learning need to incorporate necessary digital competences to enable youth and adults to adapt to the jobs and society of the future. Teachers and trainers need to regularly update their digital competences for teaching, learning and assessment purposes.

The jobs of the future are largely unknown. The speed and breadth of twin transitions requires radically new approaches to ensure flexible and continuously adapting competences of workers. Continued advances in AI, for example, will reduce certain tasks and jobs, especially for the highly skilled (44% of tasks in legal professions could be automated but only 6% in construction),[189] but will also create new jobs and tasks, for which the skills are unknown today. Recent trends show more need and social value for practical skills, such as arts and crafts, whereas the traditional benefits of academic degrees for job quality and earnings may be diminishing.[190] Vocational education and training is becoming more important in providing new technical and green skills that are demanded in the emerging sectors. Close collaboration of all the labour market stakeholders is crucial in helping improve data and skills intelligence and adapt the learning offer to the specific needs of a sector, region or country.[191] Better recognition of competences, including informal and non-formal education and work experience, could improve employability and mobility of workers across the EU. Only by giving value to all competences and skills, be they academic or practical, work-based or acquired online can people realise their full potential as citizens and workers.[192]

Sustainability transitions will require thoroughly renewed education and training systems. Traditional stages of education and training, work and retirement are becoming less rigidly defined. Inequalities in education along the lifecycle call for more personalised and blended approaches to improve competences in schools as well as later in life. Teachers and trainers need to foster learning through both traditional and digital channels, cooperating with community, businesses, NGOs and other learning providers. Labour market demand for entrepreneurship, innovation and creativity[193] means that schools and training providers have to provide space for trial and error, allowing for failure not just by pupils but also by teachers. A shift not only in education systems but also in a wider society, starting with parents, is needed. Nurturing a wide array of talents and competences means adopting less competitive and more participative approaches in learning that can improve the civic and social competences of learners and contribute to more dynamic democratic processes. It also requires radically different attitudes and learning methods. All this calls for new responsibilities and roles within the education system to cater for the well-being of learners (and teachers), for digital support, for stakeholder coordination, etc. In order to work in complex contexts and in multidisciplinary ways, school leaders, teachers, trainers and other educational staff need strong support systems but also more social recognition and better working conditions.

188 See for example Joint Research Centre (2022f)
189 Hatzius et al. (2023)
190 See for example: Brown et al. (2020) and Foroohar (2020)
191 European Commission (2023q)
192 Europass (2023)
193 Joint Research Centre (2020e)

PEOPLE AND ECONOMY FOR SUSTAINABILITY – **KEY INSIGHTS**



Sustainable societies and economies depend on people

People are at the heart of sustainability transitions. People's behaviour and their competences and skills will be critical to addressing the necessary changes towards environmentally sustainable lifestyles and navigating the huge changes that the next decades will bring. Observing the situation today, it is apparent that the commitments and actions taken have not been sufficient. Strengthening alternative narratives of a good life in combination with education and lifelong learning is an important policy lever for sustainable lifestyles. Improving equality, and ensuring the dignity and recognition of work and contributions to society, are essential efforts to overcome social challenges to sustainability. In this regard, the discussions and analysis of the transition pathways developed through the foresight process highlighted key requirements for change:

- Sustainable lifestyles are possible and desirable, but markets need to reform to enable **sustainable and affordable choices.**
- The adoption of **sustainable business models** is critical to achieving sustainability transitions but requires a radical change in current business practices and the removal of regulatory barriers to enable various forms of innovation, including novel governance models in several critical areas such as the market arena and public services.
- **Lifelong learning** systems should provide people with the necessary competences, such as adaptability and critical thinking, to be able to cope with continuous change in the coming decades. These systems need to change in profound ways to enable learner-focused and flexible learning methods.
- A shift from **competitive to more collaborative education and training systems** is needed to enhance equity, as well as to enable new business models and sectors and the sharing economy.
- Only by **giving value to all competences and skills**, be they academic or practical, work-based or acquired online can people realise their full potential as citizens and workers.

Global perspective on sustainability

The EU and the European economy must navigate a changing global system to be competitive and sustainable in the coming decades. The coming decades will reshape the global order. The EU's ability to steer sustainability transitions at home and spur them abroad depends on international partnerships, competitiveness and multilateralism. The preceding sections present the main issues for sustainability transitions within the EU. The changes outlined so far are also tied to how the global system evolves in the coming decades. Managing transformative change for the EU's future is related to accelerating strategic sectors and facing reconfiguring global value chains in terms of knowledge, skills and material intensity, as well as mitigating climate change and seizing the green transition's opportunities to achieve open strategic autonomy. Sustainable development entails global targets, and rising to the challenge means both accelerating sustainability transitions within Europe as well as fostering them elsewhere. The changes to navigate include a more complex multipolar world, a new version of globalisation that is slower and more digital, as well as a reconfiguration of global value chains. International partnerships and resilience are equal parts of a vision of EU open strategic autonomy with sustainability at the core.

Competitiveness and changing global value chains

EU industry is adapting by reshaping value chains and investing in new sectors. In a global context of economic change and rapid development, EU industry faces challenges such as the need to catch up with global competitors in terms of investment in research and development. Recent trends show that EU industry leaders increased their R&D investment by 8.9% in 2021, after a previous decline of 2.2%, compared to 16.5% for US and 24.9% for Chinese companies.[194] Recent trends suggest that the EU's industrial and services sectors have begun a recovery process, with industrial sectors growing by 7.3% and services by 4.7% in 2021.[195] A group of emerging industries, such as digital industries, mobility technologies and logistics services, will lead economic development, while ageing will lead to expanding the services and healthcare sectors.[196] Patterns of industrial change suggest that emerging cross-sectoral linkages are favoured by mirror systemic relationships in R&D developments that can accelerate the urgent reconfigurations of sectors within value chains. These patterns are increasingly affecting cross-sectoral linkages at the local level and between regions, especially in eastern European regions.[197]

Global value chains will diversify to minimise the risk of dependencies and improve resilience. Diversifying the sourcing, production and transportation of goods and services across different countries with different economic conditions and geographical characteristics can significantly reduce the risk of a single country causing a disruption in global value chains due to natural or political factors. Geopolitical risk and climate change are deemed primary risks[198] and induce adjustments in global value chains to improve resilience.[199] Resilience is being pursued in many ways and will lead to a number of changes and new linkages across the global economy.[200] At the same time, governments and companies are focusing more on the impacts of climate change by increasing their efforts to meet social and environmental standards[201] while

194 Joint Research Centre (2022g)
195 European Commission (2023r)
196 Executive Agency for Small and Medium sized Enterprises. et al. (2019)
197 Executive Agency for Small and Medium sized Enterprises. et al. (2019)
198 WEF (2023b)
199 PricewaterhouseCoopers (2022) and PricewaterhouseCoopers (2023)
200 Alicke, Gupta, and Trautwein (2020)
201 Villena and Gioia (2020)

targeting competitiveness through long-term profitability, efficiency, consumer attractiveness and even employee well-being, based on becoming sustainable.[202] In this context, repositioning EU companies in global value chains in terms of knowledge, skills and material intensity will require the EU and national governments to focus their attention on fostering research, innovation and entrepreneurship. Deepening the Single Market and accelerating the implementation of industrial change are crucial to addressing the goals of open strategic autonomy[203] and strengthening the competitiveness of European businesses.

Boosting global value chain resilience requires time and investment. A logic of supply and value chains that is less economically efficient but more resilient is becoming the new norm. However, not all companies have the same opportunities to adjust their value chains. The costs associated with shortening or diversifying global value chains entail complex calculation, and it may not even be feasible for some sectors or companies. It is likely that labour-intensive industries will relocate and diversify as wage differentials decrease[204] and the role of automation increases across the economy. The costs of change, such as relocation to minimise the risks of disruption in global value chains, may be borne by firms that, without adjustment, will instead bear the costs of disruption. In many sectors, there is likely to be a cost increase that comes from optimising resilience rather than pure cost optimisation, which might be passed on to consumers. Rising costs will need to be squared with the cost of living and affordability, especially of sustainable goods, to foster sustainable lifestyles and social cohesion.

The quest for resilience in global value chains is leading to a relocation of activities and more interregional trade. The next decades will see more reshoring and nearshoring as companies and policymakers seek to shorten supply chains.[205] The trend is clear: the share of intra-regional trade in goods has increased by 4 percentage points since the 2010s.[206] However, in building resilience, a balance must be struck to avoid accelerating global fragmentation or decoupling and to make the impact of sectoral diversification and relocation more manageable. New technologies in automation, AI, and 3D printing are making reshoring and nearshoring of production processes more economically viable and may lead to manufacturing jobs being relocated to advanced economies, but still with many fewer jobs than those industries once provided.[207] As economies and global value chains become more knowledge-intensive, countries with skilled labour, innovative ecosystems and strong intellectual property protection will benefit. Countries that focus on regional value chains, as is often the case with food and beverages, can also better protect themselves against competition from emerging economies.

Accelerating industrial transformation can help to put people at the centre and make their skills key to the competitiveness of EU industry. The centralisation and platformisation of digital business models have led many companies in the real economy into a situation of dependency, many workers into a precarious situation and many citizens into a situation of private or public surveillance. A regenerative vision for industry through an Industry 5.0 approach would provide a timely opportunity to include specific holistic sustainability and resilience goals in Europe's digital roadmap, so that digitalisation becomes a lever to reduce the carbon and material footprint of the European economy and the industry within it, and to shift to a people- and planet-centred approach. Digital technologies could be used to

202 Alves and Steinberg (2022)
203 European Commission (2023s)
204 Ezrati (2023)
205 Bringing back business activities, incl. manufacturing, to a company's origin country (also termed onshoring).
206 Lund et al. (2020)
207 European Foundation for the Improvement of Living and Working Conditions. (2019)

meet climate commitments by bringing digital and green technologies together in the right way.[208]

The process of reshoring and reindustrialisation is linked to the EU's open strategic autonomy. Industry remains the backbone of the European economy. It accounts for more than 20% of the EU economy and employs around 35 million people, with many millions more jobs at home and abroad linked to it. It accounts for 80% of goods exports and is one of the main reasons for the EU's position as a world leader and a destination for foreign direct investment.[209] However, to avoid over-dependence in the materials needed for the green transition, such as renewable energy technologies, it is necessary to increase reliable access to green technologies, as recognised in the recent American Inflation Reduction Act (IRA) and the European green deal industrial plan. The quest for sustainable competitiveness in response to climate change pressures and geo-economic risks is clearly significant for the coming decades.

The role of governments in managing security of supply is increasing in response to geopolitical risks and competitive markets. Governments and the EU are playing a greater role in organising global value chains in specific sectors to ensure necessary supply, competitiveness and resilience.[210] Governments use a range of instruments, such as trade agreements and incentives for companies, to influence decisions that affect global value chains. This role requires a coherent and coordinated set of actions at multiple levels to set priorities that drive investment, innovation and competitiveness. Such actions are needed to significantly improve the capacity to innovate and adopt new technologies and know-how while maximising the potential of the Single Market and exploring strategic positioning in global value chain shifts. Strengthening sustainability and competitiveness of EU leadership requires efforts in technologically advanced, high value-added sectors that involve reconfiguring complex value chains to improve security of supply and reduce material consumption and technology dependency, in particular in energy, materials, AI and connectivity.[211]

Reconfiguring global value chains could benefit the environment, but there are risks of doing the opposite. The reconfiguration will force corporations to consider which products will remain profitable. Corporations must assess profitability against the pressures of regulatory compliance, carbon taxes and growing consumer demand for sustainability.[212] Shorter supply chains and a shift to more circular and service-based models offer viable pathways for certain products and services to be more sustainable and profitable in the long term while improving resilience and making a positive contribution to climate and the environment. However, dealing with redundancies and inventory combined with reshoring and diversification can have a negative environmental impact as more manufacturing and extraction sites need to be opened or expanded both globally and in Europe.

The transformation of value chains poses new challenges for competitiveness and human capital development. Transformative change must be managed to accelerate the emergence of strategic sectors and manage the reconfiguration of global value chains in terms of knowledge, skills as well as material and energy intensity. Policy must continue to cultivate innovation, intellectual property, specialised skills and digital technologies for future competitiveness. However, policy must also address the needs of workers and communities affected by the trends of rapid technological development and the readjustment of globalisation. The transition to sustainability requires support for lifelong learning, occupational mobility and relocation, together with a comprehensive approach to skills and talent. The just transition should address the gaps for regions

208 ESIR Group (2022)
209 European Commission (2020e)
210 Maihold (2022)
211 European Commission (2023s)
212 Burton (2023)

and people vulnerable to the green transition. Similarly, it is essential to learn the lessons of the past, for example how doubt and resistance to globalisation can fuel protectionist and populist movements within Europe. Equality, effective redistribution, high-quality jobs and social mobility in the EU are the means to mitigate this risk, as part of a new, sustainable social contract.

Globalisation and partnerships

A new version of globalisation is emerging, along with changes in global trade and multilateralism. For the past several decades, globalisation has provided an open and cooperative framework of the global economy based on the idea that economic integration and interdependence between countries brings stability and mutual economic benefits. This version of globalisation entails respect for trade rules, optimised global value chains in terms of speed and cost and keeping economic relations independent of politics by as much as possible. Multilateralism, through participation in the World Trade Organization (WTO) and an increase in trade agreements, played key roles in enabling the fast-paced globalisation (hyper-globalisation) of the past decades, as did innovations in digital technologies (e.g. enabling 'just-in-time' delivery).[213] Slower globalisation dynamics has been a trend since the 2008 financial crisis, and the trend is reinforcing. Global trade growth has been slower than GDP growth since 2010. Cross-border digital flows have grown significantly in the past 15 years and now have a greater impact on global economic growth than traditional flows of traded goods.[214] Globalisation is becoming increasingly digital and knowledge-intensive and directed towards highly skilled labour. Multilateralism should also provide ways to guide efforts to diversify global value chains for resilience and sustainability. Bilateral and multilateral development institutions can leverage a variety of tools and financial instruments to encourage companies to participate in global initiatives aimed at diversifying their production and distribution systems. The mechanisms and institutions of multilateralism may evolve with the new version of globalisation, but signs of geo-economic fragmentation, via for example trade restrictions or technology protectionism, add to the challenge.

A changing geopolitical landscape brings changes for multilateralism. There are signs that the world is becoming more multipolar. The global economic power balance has been shifting towards Asia in recent decades,[215] with a corresponding decline in the US and EU's share of global GDP. It is possible that two geopolitical blocs are emerging,[216] one led by China and the other by the USA, but, at the moment, trends suggest more than a bifurcation of the global system. India, Brazil and Indonesia are major growing economies, and African countries will have growing shares of the global economy and population. They can navigate the geopolitical landscape selectively and resist bloc formation. Towards 2050, new major economies may be just as, if not more, interested in partnerships with each other than with choosing between blocs and ideologies. The trend is towards more centres of gravity in the global order, and likely more international structures of cooperation and trade. The role of regional cooperation initiatives is likely to increase. Minilateralism – international collaboration based on common interest at a smaller scale, for example between a few countries or focused on a specific issue – can also be taken up outside of multilateral structures (e.g. I2U2). Added to this, large multinationals and other non-state actors could continue to become more dominant in the global system than in the past decades. This growth in main players challenges the current rules-based world order, especially as newly emerging powers wish to revise elements that they perceive as too close to Western norms, including in the UN system. These challenges do not mean that a more complex, multipolar world will be without order or rules to play by.

213 Raza et al. (2021)
214 Tyson and Lund (2023)
215 Huang (2021)
216 Higgott and Reich (2022)

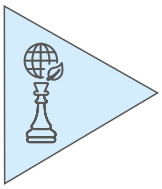
Increasing regional trade can help mitigate the impact of fragmentation in global value chains for some countries, especially as regional leaders may be bolstered by the shift. A world with more major global players, including empowered regional intergovernmental or supranational organisations, will be more complex. The case for multilateralism is even stronger in these circumstances. A reinforcement of ASEAN and Latin American cooperation could emerge and benefit multilateralism over the next decades as the latter, for example, envisions a common currency and increased regional trade.[217] Regional cooperation is likely to prove essential to resilience and to the sustainable management of natural resources. The expected resource scarcity of the coming decades, for example for water, could be a source of conflict or a driver of collaboration at the regional level.

Welfare can be lost in the changing landscape of geopolitics and global trade. There are many immediate implications of changing partnerships and trade. Breaking off from global value chains leads to a reduction of welfare, according to modelling of various scenarios with strong reshoring trends. Smaller countries with economies that are well integrated in global value chains are the most exposed to this loss of welfare. This includes many EU Member States. Larger economies suffer less welfare loss because they can better shift their own economies. Going further, a world without global value chains would mean welfare losses globally, from −68% in Luxembourg to −3.3% in the USA.[218] Beyond these estimates, retaliatory measures between countries in the case of a confrontational multipolar world add additional risks for many countries. For example, trade diversification away from China (e.g. China plus one strategy) would lead to job loss in China, which will likely prompt protectionist or retaliatory measures against competitors. Moreover, some countries stand to lose significantly if geo-economic conflict defines the next decades. Squashed between competitors, countries already facing substantial challenges could be cut off from access and resources essential to their sustainable development. A shift towards global reshoring in advanced economies could push 52 million people into extreme poverty, mostly in Sub-Saharan Africa.[219]

Strong multilateralism is essential to enable sustainability transitions, though more flexibility will be demanded. The changing nature of globalisation challenges the role of trade as a policy lever for sustainability. Trade agreements already contain explicit references and commitments to climate targets, and newer instruments continue this, like the Global Gateway which aims to build democratic and sustainable trade networks. EU's policy actions for sustainability, such as the CBAM, cause friction with major global players.[220] Transition periods and continued climate diplomacy can foster acceptance of such policy actions.[221] At the same time, it is crucial for advanced economies to build on the ongoing structural changes of globalisation as they adjust their trade policies to be more flexible and targeted, especially in pursuing open strategic autonomy. Diversification and reshoring on a sectoral basis are more manageable in terms of welfare impact; for example, a decoupling for only electronic equipment is expected to lead to a global welfare loss below 2%.[222] International trade and partnerships will be more competitive, leading to diverse partnership offers between countries, striking different balances between sustainability, dependency management, and values. In building resilience, a balance must also be struck to avoid accelerating global divisions. At the same time, international inequalities require global leadership to support strong engagement with countries engaging in sustainability transitions.

217 Financial Times (2023)
218 Eppinger et al. (2021)
219 Brenton, Ferrantino, and Maliszewska (2022)
220 DFFE (2022)
221 Pauw, van Schaik, and Cretti (2022)
222 Bekkers (2023)

GLOBAL PERSPECTIVE ON SUSTAINABILITY – **KEY INSIGHTS**



Sustainability transitions in a complex geopolitical landscape

The global order of the coming decades will be complex as the number of significant players grows and global economic activities are reconfigured towards resilience. It is imperative that multilateralism is re-envisioned and sustained to enable efforts, which must be global, towards sustainability. The foresight process, through the discussions and analyses across the four transition pathways, has enabled identification of the key needs for change in this regard:

- New narratives, and offers based on flexible and targeted approaches, are needed for trade and **multilateralism** to find solutions in a more complex global order. Revising existing mechanisms and institutions to reflect and operate effectively in a multipolar world is a priority for sustainability transitions and governance of global commons and natural resources.
- Pursuing **resilience and autonomy** in the global economy needs to be guided by thorough assessments of which sectors are strategic and feasible to reshore and nearshore, bearing in mind the costs associated for consumers and business, as well as sustainability.
- Similarly, **diversification and international partnerships** can reduce dependencies on single countries and build resilience, but a reconfiguration of global value chains must not leave vulnerable countries further behind
- Supporting **regional integration** and engaging with regional and international organisations can be a way to give new impetus to multilateralism **based on trust and common rules.**
- A **fair and sustainable social contract** and an engaged democracy are essential to the ability to act and be a reliable partner in a more complex global order.

This chapter presented the strategic areas of intervention identified through the foresight process through comparative analysis across the transition pathways. They were elaborated, analysed and consolidated with experts and desk research to prepare interconnected, strategic areas of intervention for sustainability in four clusters, namely: a new social contract, governance, people and economy, and the global perspective. The actions and key insights presented in this chapter highlight the interconnected dynamics of change in the social and economic systems in the EU. The possible interventions may take many forms in order to foster sustainability. How to make the many necessary changes happen for sustainability will be the central challenge in the coming decades. For this reason, this study concludes with a reflection on the agency of EU actors in addressing social and economic change as part of sustainability transitions.

Conclusion: Unbundling the agency of EU actors in sustainability transitions

This study results from a foresight process focused on the social and economic dimensions of sustainability transitions for the EU. The foresight process delivered a coherent sequence of outputs: a set of four scenarios for a climate-neutral, sustainable EU in 2050; a set of four corresponding sustainability transitions pathways; and a set of strategic areas of intervention covering a new social contract, governance, people and economy, and the global perspective. From the analysis of the strategic areas of intervention, and the possible futures explored in the scenarios and transition pathways, this conclusion presents a reflection on the agency of EU actors in sustainability transitions.

It emerges clearly from the foresight process and analysis that the necessary systemic changes require collaboration across all of society, calling for new mechanisms, tools and approaches to work together towards sustainability. The strategic areas of intervention indicate changes and possible actions connected to managing a fair green transition, but also to fostering a socially and economically sustainable EU. This challenge is difficult to meet because it is systemic in nature and related in complex ways to the prevailing economic, technological and social systems and the transformations taking place at the global level. When considering how the EU can manage sustainability transitions, it is essential to conceive of the EU as the sum of all its parts, such as its citizens, businesses, regions. This sum is what is examined under the term 'agency of EU actors', and it refers to the EU's capacity, as a whole, to steer the changes needed for sustainability transitions.

Table 5 Agency of EU actors in sustainability transitions through key strategic interventions

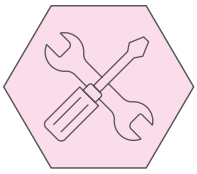
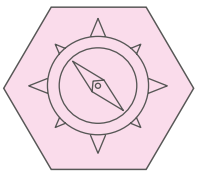
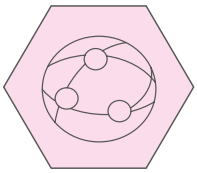
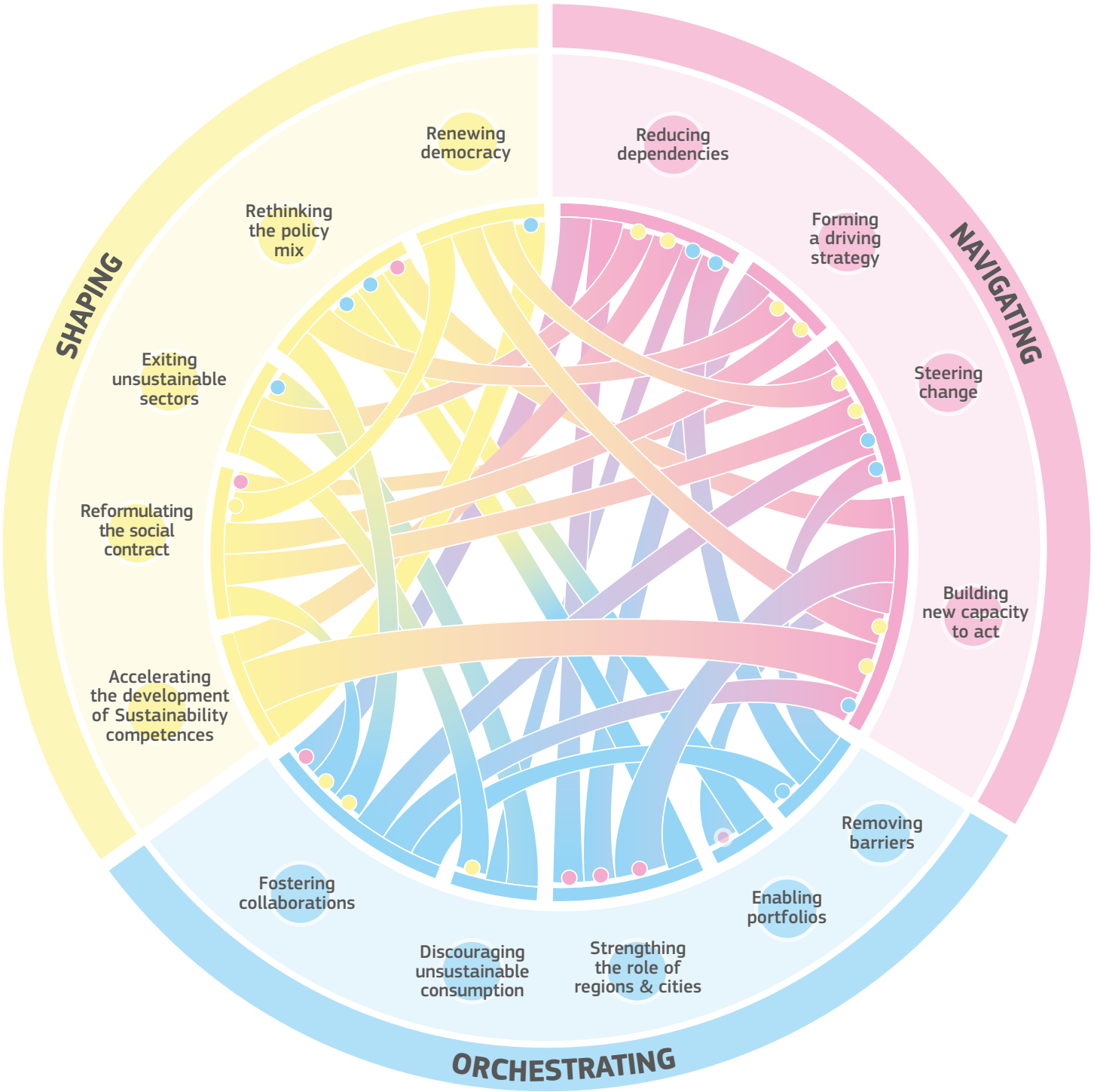
Shaping  *Change through systemic policy mixes*	**Reformulating the social contract** based on sustainability in all its dimensions with action on multiple fronts, such as redirecting activities to target well-being and sustainability more than economic growth, and improving social cohesion and equality. **Renewing democracy** and democratic engagement at local, regional, national and international levels and leveraging new tools to do so. Sustainability transitions depend on people and skills to become reality. **Accelerating the development of sustainability competences**, in particular the competences for collaboration and adaptability at both individual and institutional levels, shaping how society and the economy manage the transitions. A systemic European policy mix, with all levels of governance, can provide a general framework to support sustainability transitions. **Rethinking the mix of instruments** such as regulation and fiscal policy to be mutually reinforcing, while effective use of sustainable finance can lead to public and private investment working together in a unidirectional or mutually supportive way. **Exiting unsustainable production and consumption** through tax reforms to support a green and fair transition.
Navigating  *Uncertainty and complexity*	**Forming a strategy** for the complex and changing realities of geopolitics and multilateralism and for a new balance between functional cooperation and promoting democracy and fundamental values in a decolonised context. **Building new capacity to act** through collective consensus and transition-oriented partnerships to **manage the uncertainties** of new technologies and ongoing socio-technical transformations, especially the twin green and digital transitions and the proliferation of AI, for example the impact on the labour market. **Steering change**, disruption and reconfiguration of global markets and trade towards strategic, long-term objectives of increasing geopolitical resilience and autonomy through international partnerships and sustainable economic activities. Gradually **reducing dependencies** through strategic actions based on diversification.
Orchestrating  *Processes and relations*	**Enabling portfolios of systemic interventions** for strengthening effective multilevel governance models through reinforcing **vertical and horizontal interactions between instruments.** Simultaneously, portfolios of systemic interventions covering different arenas of collective action promote **different roles** among societal actors including **intermediation** across levels and policy domains. **Removing barriers** for new business models by **improving framework conditions** and **fostering collaboration** between the public and private sectors to create the conditions for sustainable investment and to introduce new business models. **Strengthening the crucial role of regions and cities** in creating synergies between place-based innovation strategies and industrial and regional ecosystems. **Supporting lifestyle changes** by making full use of policy levers to encourage changing **behaviours** in society, especially through community- and citizen-driven solutions. **Discouraging unsustainable consumption** by steering the public sector and building synergies with the private sector to provide sustainable and affordable options.

Figure 9 Relationships between the three aspects of agency of EU actors in sustainability transitions



The agency of EU actors is made up of all the actions and collaborations that can be undertaken and fostered by policymakers at all levels and by actors in the economy and in society. In this sense, subsidiarity is an important factor. Jointly defining, across governance levels, which level is best suited to carry out a shared responsibility, or part of it, would contribute to more effective and responsive governance. Greater flexibility in the participatory process between the different governance levels could significantly contribute to improving multi-governance relations and the way they discuss and decide.[223] Addressing implementation challenges depends on the capacity of EU actors to act together and adopt innovative perspectives on policymaking, such as systemic policy mixes, where simultaneous and interlinked interventions cover the full range of changes required in the different dimensions of sustainability (social, economic and environmental).

Understanding the nature of agency of EU actors in managing sustainability transitions can support the development of strategies even in situations of uncertainty. The necessary systemic change encompassing all three dimensions of sustainability requires that a wide range of actors be brought together and work in a common direction. The capacity to steer change (agency) differs depending on context and can change over time. The use of shaping, navigating and orchestrating as different aspects to define agency in sustainability transitions can support an understanding of the level of control and capacity to set the direction of change in the different areas over time. Using strategies to shape framework conditions, navigate uncertainty and geopolitical change and orchestrate collaborations and strategic relations can help find such a common direction. It follows that, based on the strategic areas of intervention, different strategies can be leveraged depending on the agency of EU actors in each area. Table 5 outlines the strategic interventions gathered from the analysis presented in chapter four according to the three aspects for defining agency in sustainability transitions.

The agency of EU actors can evolve over time and become a stronger force for sustainability, either purposefully through interventions or in response to external factors. TThis evolving distribution of agency between EU actors can support the whole society to take, out of an uncertain situation, new actions that were not possible before. For example, a disruption like the COVID-19 pandemic changed how agency was distributed to respond to the crisis, shifting EU competences and making orchestration a relevant strategy for the health domain. However, the key insights on the strategic areas of interventions show that this dynamic poses an important question regarding the kind of agency the EU wants to promote, where relevant areas such as intergenerational fairness and directionality around resilience and open strategic autonomy can be crucial. In order to answer this question and design the portfolio of systemic interventions, it is crucial to consider that the different types of interventions under shaping, navigating and orchestrating reinforce each other and enable the building of new agency between different actors. Figure 9 shows relationships between the different interventions over time. It illustrates how shaping, navigating and orchestrating can happen simultaneously and reinforce each other, ultimately leading to feedback loops and creating the conditions to expand agency over time.

Systemic policy mixes rely on synergies between different actors with different agency in terms of the capacity to act. In order to face the uncertainty and complexity intrinsic to pursuing comprehensive goals, taking the necessary actions at different levels of society will enable sustainability transitions. Creating an environment of dynamic policy coherence to foster the systemic changes for sustainability in European societies and economies is a primary

223 Pazos-Vidal (2019)

challenge for the coming decades. The EU will also have to find its own balance between the respective roles of governments, at different levels, and business in addressing sustainability and regarding the development, diffusion and adoption of technological and non-technological innovations. A deep reflection on how the legal competences of the EU can evolve may be needed to realise the vision of a sustainable EU that is finally adopted by EU actors. The foresight scenarios in this study illustrate alternative options in this respect, with energy and defence, for example, as good candidates for more EU-level responsibility. Moreover, the patterns of change outlined in the transition pathways have shown that active engagement in changing the capacity of EU actors to act over time, for example by strengthening ties and building capacities across governance levels, is key to effective implementation.

The four clusters of strategic areas of intervention emphasised the social and economic dynamics behind future European sustainability transitions. They present dynamics that could affect Europe through sustainability transitions and highlights a set of interconnected strategic areas for change. Embracing efforts to renew democracy is, for example, an investment in the EU's capacity to act. Given that changes in democracy can be shaped by EU actors, using this agency for the social dimension of sustainability contributes to managing sustainability transitions and to enhancing the agency of EU actors in navigating a complex geopolitical landscape. Capitalising on the different aspects of agency of EU actors to foster positive systemic changes for sustainability is imperative, and it is possible with a clear direction and vision for the future. In these areas, the EU can take the initiative to frame policy debate constructively and transparently on how to manage sustainability transitions at all levels of governance and in concert with citizens and business.

The scale, complexity and speed of changes that will be necessary means that managing sustainability transitions will require dynamic coordinated actions across most policy domains. This dynamic policy coherence will be necessary, as systemic consequences are often unpredictable and will call for regular adjustments. The challenges are steep, but the results of this study indicate that the EU can employ the available knowledge and tools, mechanisms and instruments to steer its own course in sustainability transitions. The new knowledge developed on change processes shows how the dynamic interplay of interventions over time means that the actions taken today determine our capacity to act tomorrow. What remains is for policymakers to have the courage to lead the EU through the many challenges and trade-offs that line the path to a fair and sustainable future.

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Annex 1 – Methodology

This Annex explains in detail the conceptual and methodological elements of the Foresight study. It begins with a collection of definitions that were relevant to the design of the Foresight process and the analysis of the results. It continues with a brief description of the methods used for scenario building, the development of the transition pathways and the analysis and identification of the strategic areas of intervention.

Defining sustainability for transformative change

Sustainability is defined in this study by following the logic of sustainable development as the capacity to meet the needs of the present while ensuring that future generations can meet their own needs. It includes three dimensions: economic, environmental and social. To achieve sustainable development, policies in these three areas must work together and support each other.[224]

How do we define a socially and economically sustainable Europe in this study? In the context of the Green Deal, we defined the EU as a fair, inclusive and prosperous society with a modern, knowledge-driven, resource-efficient and competitive economy with net-zero greenhouse gas emissions in 2050, protecting, preserving and enhancing the EU's natural capital.[225] In the context of this study, the economic dimension of sustainability relates to managing the transformation towards a healthy economy within planetary boundaries,[226] drawing on the capacities of all parts of the economy and all levels of governance. The social dimension of sustainability is about creating the conditions for current and future generations' inclusive well-being by managing sustainability transitions.

What do we mean by managing transformation and sustainability transitions? In this study, **sustainability transitions** are defined as an umbrella covering a series of changes involving a radical shift towards a sustainable society in response to a number of persistent challenges

224 European Commission (2023u)
225 European Commission (2019b)
226 Stockholm Resilience Centre (2023)

facing contemporary societies.[227] Transitions are transformation processes in which various social actors jointly decide on the goals of a transition and play a role in gradually bringing about structural change. They do so by identifying the collection of necessary changes through long-term thinking, reflecting and managing multiple policies that must work together as part of a **systemic policy mix**, and the role and links between actors (society, government, business) at different levels through multilevel governance models.[228]

What are systemic policy mixes? Systemic policy mixes are combinations of policies intended to trigger system change and not just improve the current system. They mobilise actors and start processes of change that unfold through a **complex collection of interactions between interventions, actors and processes** and over long periods. These interactions can be defined as horizontal between different types of instruments, policies or governments – and vertical – between different levels of goals, policies and levels of government and across sectors.[229] Systemic policy mixes are also characterised by **subsidiarity relationships**. They have a top-down orientation due to a broader policy strategy such as the European Green Deal and the Sustainable Development Goals (SDGs). They also have bottom-up implementation challenges related to actors' agency to steer change by experimenting and developing a systemic perspective on policymaking in order to situate these priorities in a local context and build local commitment and shared ownership of strategies.[230]

What agency do EU actors have to steer change? To support this systemic perspective, it is necessary to acknowledge that **agency** (capacity to act) varies from actor to actor and depends on context. A key to managing sustainability transitions is understanding the capacity of European actors, working together, to address these strategic areas in complex and uncertain circumstances.[231] This understanding of the **agency of EU actors** can contribute to developing comprehensive strategies and interventions in the coming decades.[232] Europe can make sustainability transitions happen by capitalising on the distinct nature of its agency in different change processes.[233] The evolution of the capacity of European actors to shape, navigate and orchestrate the change process over time will determine the scope and scale of the mix of interventions that can be implemented.

The various 'shaping, navigating and orchestrating' interventions not only reinforce each other but also enable building new agency between the various actors. Simultaneity, reinforcement and feedback of the systemic intervention portfolio are key in understanding how agency might evolve over time in terms of its nature and distribution between actors and governance levels.

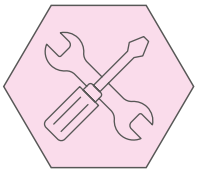
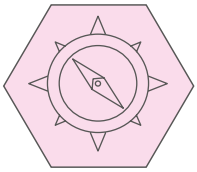
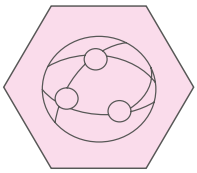
Methods and outputs

Scenario building

The starting point of the study was the creation of a set of four foresight scenarios, each describing a different version of a plausible sustainable EU in 2050. For this study, a scenario-building approach was used in which two sets of existing foresight scenarios were analysed, combined and adapted: those from a 2015 JRC study on the sustainable economy[234] and recent European Environment Agency (EEA) 'imaginaries' for a sustainable Europe in 2050.[235] Building on these reports, two key dimensions used to structure the scenarios

227 Grin et al. (2011)
228 Bulkeley (2005), Rotmans, Kemp, and van Asselt (2001)
229 Howlett and del Rio (2015)
230 Joint Research Centre (2021d)
231 Contesse et al. (2021)
232 Jørgensen (2012)
233 Pesch (2015)
234 Joint Research Centre (2015)
235 European Environment Agency (2022b)

Table 6 Three aspects for defining the agency of EU actors in sustainability transitions

Shaping  *Change through systemic policy mixes*	Steering change requires the capacity to act according to the objectives of systemic policy mixes including: • mobilising resources and introducing new policymaking mechanisms to reorient and accelerate change;[1] • planning and implementing comprehensive interventions by taking into account the complexity of sustainability transitions; • shaping markets by enabling a vision for change and direction, supporting strategic investment in critical infrastructures and facilitating exchange of practices to foster new business models.[2]
Navigating  *Uncertainty and complexity*	Navigating is understood as the ability of actors to deal with uncertainty.[3] It covers a broad range of processes and practices such as: • interpreting changing conditions on the way to sustainability transitions; • introducing new practices to deal with available options and evolving conditions; • taking decisions to maintain a course amid changing relationships and associated shifts in power dynamics.[4]
Orchestrating  *Processes and relations*	Orchestration refers to the ability of actors to manage processes and relationships to bridge differences between conflicting interests. It covers the following areas: • exploring the synergies and opportunities strategically and 'orchestrating' a way forward through a systemic policy portfolio; • facilitating alignments of social and economic actors on a long-term vision to add strategic interventions to complement financial support and regulation; • organising a safe operating space for collaboration and experimentation[5] between the public and private sectors.

1 Ghosh (2020)
2 Ottosson, Magnusson, and Andersson (2020)
3 Gomes and Barros (2022)
4 Fischer and Newig (2016)
5 Pereira et al. (2015)

in this study (see Figure 10). These were, on the one hand, whether society would become more collaborative/collectivist or more individualistic/competitive (vertical axis), and, on the other hand, whether broad policy mixes supportive of transformative change for sustainability would emerge or not (horizontal axis).

This scenario building work made use of recent methodological developments in a sustainability assessment framework for scenarios.[236] This framework enables the assessment of social, economic and environmental aspects through an inventory analysis over the collection of data on sustainability in future scenarios compared to the current situation for the definition of **contextual factors**, based on the STEEP model (social, technological, environmental, economic, political). To present the scenarios clearly in Chapter 3, the political category is broken down into EU-internal and geopolitical factors. The contextual factors then provide a qualitative description of the economic and social risks and opportunities in a future society compared to today. This approach had the merit of making it possible to consider many often-unquantifiable issues, different types of societies and diverse geopolitical circumstances.

Policy mixes highly supportive of sustainability are systemic policy mixes that support transformation, responding to a clear vision and addressing simultaneously multiple dimensions of sustainability. A policy mix applies a range of reinforcing policy instruments that increase effectiveness in achieving overarching goals. The foresight process can strengthen the analysis of the combination of interventions in different policy areas and in this way help to illustrate the systemic aspect of policy mixes that pave the way to a sustainable future along very different possible pathways.[237]

To explore a wide range of social and economic changes and interactions, the scenarios were elaborated with the framing conditions that the EU would meet its ambitions of climate neutrality in 2050. Each scenario also has one primary actor driving change in the environmental dimension of sustainability, such as national governments, people, etc.[238] These conditions reveal various trade-offs and synergies in the social and economic dimensions of sustainability. The contrast between the scenarios illustrate the point that beyond certain prerequisites (as in the SDGs), the preferences of which social and economic conditions are optimal depends in large part on subjective beliefs and values.

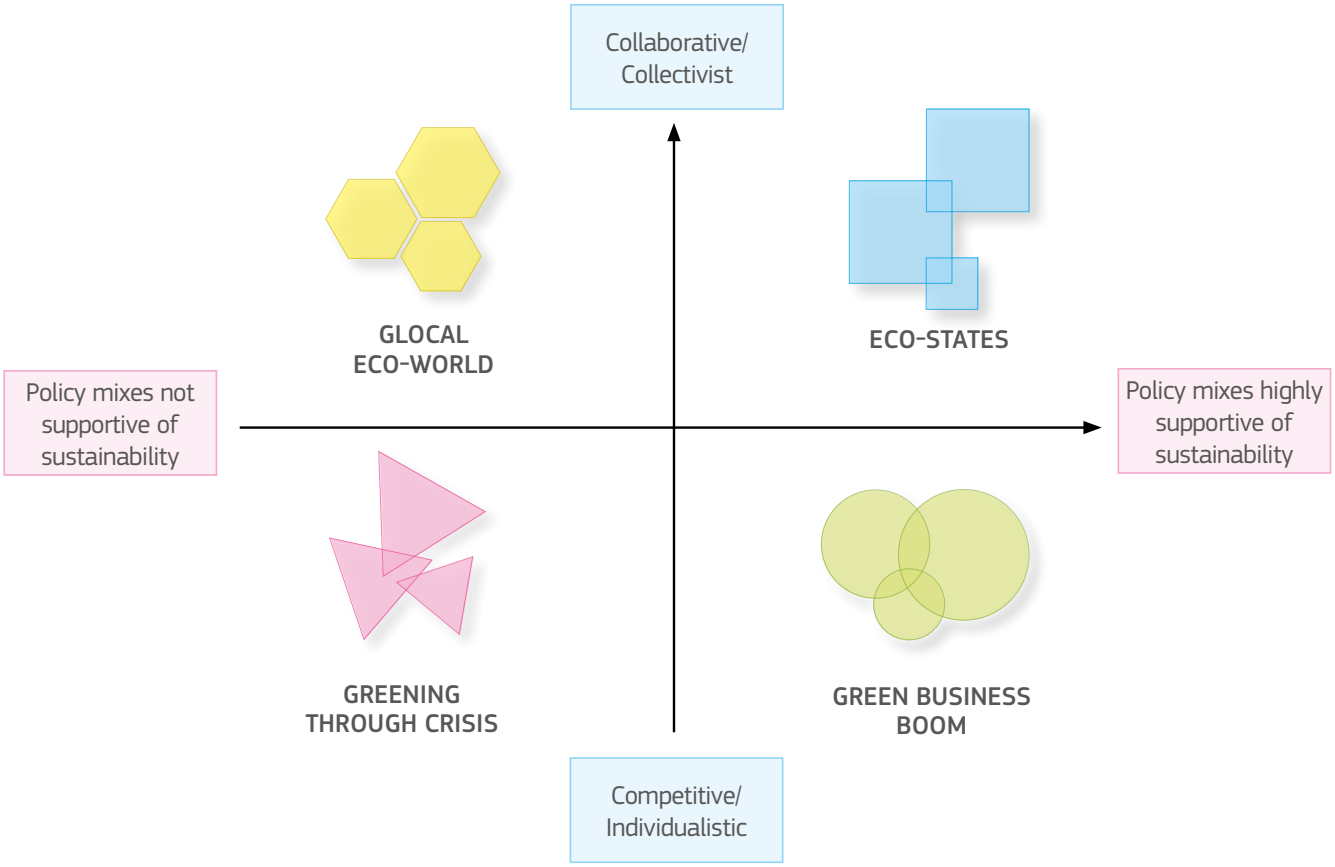
In building the scenarios, knowledge of long-term trends was harvested from experts across the JRC, desk research and the European Commission's Megatrends Hub.

Transitions pathways and backcasting

Pathways are used here to illustrate the processes of change created by the transitions towards sustainability and to outline the various necessary sectoral transitions. They were built by backcasting from the scenarios in a participatory process using the *X-curve*, a sense-making tool that enables the co-creation of collective narratives about system change.[239,240] This approach had the advantage of combining concepts from academic work on sustainability transitions with foresight as it connects closely to the 3-horizons framework.[241] The 3-horizons framework is an effective method for revealing the dynamics of transformation and exploring the diverging trends of the current system and the challenges to its sustainability into the

236 Arushanyan, Ekener, and Moberg (2017)
237 Bontoux and Bengtsson (2016)
238 The foresight scenarios developed for this study enable the investigation of transition pathways for the EU. The JRC has also developed 'reference scenarios' of the global standing of the EU in 2040. These reference scenarios are broad and adaptable, and can be used in many other foresight exercises. For the purposes of this study, these JRC reference scenarios were not a feasible option, as only one scenario will lead to a future where the EU is on track to reach climate neutrality.
239 Hebinck et al. (2022)
240 Silvestri, Diercks, and Matti (2022)
241 Wahl (2020)

Figure 10 Scenario logic for developing the EU 2050 scenarios



future[242]. The X-curve application includes two interrelated patterns of change that function as the horizon approach to emphasize what needs to be phased out and what needs to be built up. The first, **phase out**, describes the patterns of change for destabilising and phasing out practices that are characteristic of the present world. The second, **scale up**, describes the patterns of change in terms of the acceleration, emergence and, finally, scaling of new practices that bear witness to the establishment of the new world. This method is also useful for identifying critical changes and trade-offs. The combination allowed the study team to visualise the duality of 'creation vs destruction' with simultaneous processes of creation and scale-up of new, alternative practices and structures and the phasing-out of existing unsustainable practices and structures that could play out in sustainability transitions by 2050 (see Figure 11).

A transition pathway was developed for each scenario. The resulting pathways offer general narratives describing patterns of change as well as a set of **transformative elements** such as trade-offs, synergies and systemic relations to facilitate the analysis of transition dynamics. The scenarios and pathways developed in the foresight process are not predictions. While they present plausible trajectories of the EU over the next 30 years, it is not possible to attach any meaningful probability to them in view of the scale of the uncertainties. What matters is to consider what might happen, to better understand what drives change and to explore areas where decisions need to be taken.

Strategic areas for intervention across the pathways

The four scenarios and corresponding transition pathways take a wide scope of possible developments in the coming decades. Looking across the four transition pathways made it possible to identify topic areas in which critical change had to happen on the road towards sustainability, even if the specific changes

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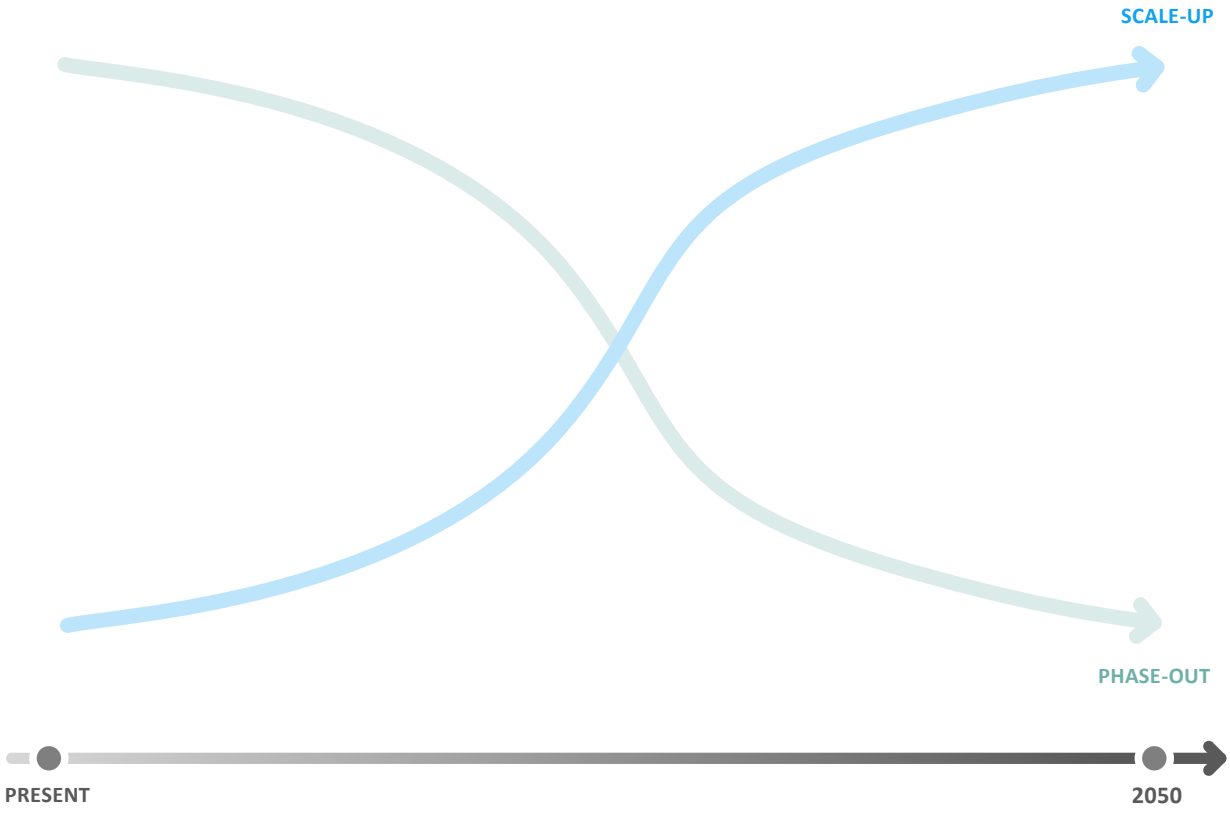
Figure 11 The X-curve for co-creating transitions pathways



could vary across pathways. This work was instrumental to shed light on what it would take from a policymaking perspective to engage in successful sustainability transitions towards 2050. These areas were first identified collectively during the open participatory process (workshop 2). As a first step, the transformative elements of each pathway were highlighted so that the experts could analyse and compare the four pathways from a systemic perspective. The identified areas were then ranked according to which would be most critical across pathways for policy action to move sustainability transitions forward. The experts were then asked to identify for each area what concrete actions would be most critical to the transition, who would have to take these actions and when the proposed interventions would best take place.

These strategic areas for intervention were then documented and analysed using current data and trends. There are many interlinkages between the strategic areas, and most interventions would affect multiple areas. The areas of intervention are presented in four clusters to facilitate a clearer understanding given the complexity inherent in the systemic aspects of the four transition pathways. Finally, comparative analysis of strategic areas in the perspective of policy interventions led to a discussion on the **agency of EU actors** in managing the changes needed to promote sustainability transitions. This analysis allowed the team to reflect on the capacity and resources of various actors (such as policymakers at all governance levels, civil society, business leaders, etc.) to address transformative change. Their agency can be effective in shaping enabling conditions, practices and processes while simultaneously navigating the uncertainty and complexity of the broader policy landscape and the dynamics of megatrends. This final step aimed at reflecting on how the capacity of European actors could evolve over time to face the challenges of managing sustainability transitions.

Annex 2 – Four scenarios of a sustainable EU 2050

Scenario 1: Eco-states. Government-driven sustainability

Abstract

To address the growing impacts of the global warming and the devastating natural disasters on European society and economy, the EU and its member states have taken drastic measures to adapt their economies and societies to the new reality. Having shifted their tax base from labour taxes to environmental, consumption and corporate income taxes, the EU Member States have also given the EU more competences on the tax policy and agreed to new EU own taxes, as well as other taxes such as on wealth. The aim of these changes is to ensure sound public finance for the green transition and climate adaptation while providing the national governments and the EU with resources to invest in public infrastructure and services. Citizens welcome these developments that respond to their concerns about secure livelihoods. People have conformed to the sustainable lifestyles that the governments have been heavily promoting through digital technologies and legislation. A sustainable social market economy and centralised energy markets provide stability in times of crisis and ensure social protection for all. Climate adaptation is funded by governments and effectively implemented. Governments steer the transformation towards a highly regulated sustainable economy and invest in innovative sustainable solutions. The businesses comply with the "polluter pays" principle and strict standards for circularity and use of resources. The jobs in public and service sectors are highly digitalised and attract qualified workforce, boosting effectiveness. Digital technologies have also improved transparency and inclusiveness of the traditional democratic mechanisms and citizens have put their trust in national and EU political leaders. At the same time, governments use digital technologies to influence social attitudes.

Social factors

- Worried about the prospects of accelerating climate change, citizens appreciate the political **stability and security** provided by the EU and the member states. They have accepted the required changes in their lifestyles, such as reduced long-distance travel options, limited living space per person and reduced overall consumption as necessary requirements of the sustainability transition.
- **National identities** are still strong, but people also feel more **European** than 30 years before, as the EU provides strong coordination in some key policies, such as energy, taxes, crisis management and sustainability standards.
- Citizens **trust their political leaders** and governments and most people cultivate a **collaborative** ethos. There is strong peer pressure to conform to the social norms and the outliers are not well looked upon. Some people call for more personal freedoms.
- **Social inequalities** have been considerably reduced through regulation, including the new tax system and redistributive policies. Public services are going strong. People consider that equality contributes to sustainable and stable systems. The states take a role of ensuring a more equal distribution of resources and strengthening social cohesion. Intergenerational justice is now enshrined in the EU Treaties.
- States have kept investing in **social protection systems** and infrastructure, as they provide the much sought-after security. Technological progress has allowed new digital services to boom, helping improve efficacy and access to social services.
- **Healthcare systems** have also profited from public investments in new digital technologies. Digital technology has permeated hospitals and health centres but also people's homes, enabling more people to enjoy home-based

care. Health monitoring devices improve prevention and early intervention, while health data systems are optimised and harmonised at the EU level, contributing to more efficient healthcare.

- **Education** is a priority. It is largely publicly funded, with a broad offer of learning opportunities for all ages. New methods, such as storyliving, are used in schools and universities to add an experiential element by immersing participants in interactive stories. Virtual reality is used to improve learning (e.g. to teach emotional intelligence or in healthcare).
- The EU states cooperate in regulating the **qualifications** and programmes on offer so the recognition of competences and qualifications is not an issue. Public and private learning providers offer a large variety of courses and modules for all learning levels, supported by latest technological innovations. This ensures the necessary skills and availability of professionals for the booming biotech and advanced technologies sectors, as well the public services.
- **Transparency** of government and business data is high, due to citizens' demand. Governments actively enforce fact checking and fight disinformation. Citizens have access to diverse **sources of information;** however, some of the major media outlets are managed by the state. Social media networks respect a clear regulatory framework. The states' objective of preserving social peace and stability results in some government propaganda, as well as monitoring of social data and of potential dissent.
- Governments use trauma-informed approaches to identify possible impacts of trauma and stress on mental health, cognition or decision-making. This improves healthcare, social services and education environments to prevent social conflicts.

Technological factors

- **Digital tools** are widespread and allow detailed monitoring of the sustainability standards and procedures, as well as the state of nature and its resources. These monitoring systems are centralised and supervised by the governments.
- **Digital finance** is well regulated. The use of a central bank digital currency replaces the use of cash thus strengthening the international role of the euro. Digital finance benefits from increased data sharing, with well-regulated processing of personal data related to consumers. Open finance ensures that customer data in the financial sector becomes available for automated processing, transforming the way consumers and businesses access financial services.
- Citizens participate in policymaking through **digital public services** to make their ideas heard. The government engages with civil society via digital tools to involve people in decision-making. Governments also use artificial intelligence to scan for societal problems and provide targeted programmes for marginalised citizens, including monetary support, employment or education.
- Virtual worlds are highly developed and popular with citizens. Governments use them efficiently to promote and test their policies and collaborative lifestyles.
- **Telecommunications** (including satellite) and other social media infrastructure is directly managed by the EU, allowing service providers to use it to the benefit of society and the economy, within a clear regulatory framework. This, however, limits radical innovation and technology development at a larger scale.
- There is considerable public funding available for technological **innovation for sustainability** and its general diffusion. High-tech innovations find numerous applications across the industries and

society. Public funding for innovation is focused on EU and national priorities, such as sustainable product lifecycles, efficiency of public services and security and disaster management. Governments invest extensively in comprehensive climate adaptation programmes, as citizens call for more protection from the effects of climate change.

Economic factors

- On the basis of long-term visions for environmental, social and economic sustainability, the EU has been empowered by the Member States to introduce comprehensive changes in the tax systems. New **environmental taxes** on companies have been complemented by a shift in the tax base from labour towards consumption, corporate income taxes and some new taxes, including on wealth. National governments are held responsible for the implementation of the new fiscal frameworks while the EU coordinates the tax rates and eliminates tax havens.
- EU regulation has enabled the **financial sector** to play a key role in the transition towards climate neutrality, avoiding large shocks or abrupt changes in the financial system stemming from climate-related risks. Financial flows are oriented towards sustainable activities and environmental considerations are integrated in the financial investment processes. Green bonds are extensively used.
- Businesses have adapted to the **highly regulated environment** in the best interest of society and respond to the citizens' demands for transparent green product lifecycles. **Sustainable social market economy** is the new economic paradigm. Member States are responsible for monitoring the new environmental standards throughout the economy and for collecting and publishing detailed information on the sustainability of products and services.
- Governments support service-based business models, as well as circular economy, in search for the most economic and sustainable approaches. **Consumption** in Europe is reduced in order to respect planetary boundaries.
- The governments see high **employment** as a priority to preserve the much sought-after social security. Low labour taxes have enabled more jobs to open and unemployment is very low, even though the jobs are of varying intensity. High degree of flexibility results in life-phase oriented work, where people can choose the intensity and hours of their work according to their personal and family situation, without penalties to their social security.
- **Labour markets** are regulated, stable, with a large public sector and guaranteed minimum wages. Many people work in digitalised public services, managing and supervising AI-led processes. There is little incentive for people to engage in self-employment or cooperative enterprises, with public jobs widely available.
- Large companies provide regular in-house **training** and up-skilling, while the widely accessible training offer and recognition of online micro-learning programmes ensures that everybody can access basic re-skilling opportunities.
- People change jobs and homes when necessary, but the intra-EU **migration** is not high. The EU and national governments therefore cooperate to facilitate regulated immigration of professionals from outside of the EU for specific sectors facing labour shortages. The EU remains attractive for economic migrants, and immigration flows are more stable due to the selective immigration policies.
- Competition for scarcer natural resources and the disruptive impacts of climate change have driven the transformation of **supply chains:** after the focus on efficiency, cost cutting and just-in-time manufacturing, the

buzzwords are now diversification of sources and resilience. Critical goods are based on short and locally based value chains, and 'friendshoring' increases the EU's security of supply and self-sufficiency. Value chains are well mapped and monitored to decrease risks of disruptions.

- The **energy** markets are highly centralised, with prices regulated by the EU. Large amounts of public R&D are invested in renewables and energy storage. The security of energy supply is ensured through a diversification of energy production, relying on renewables (solar, wind, hydropower, geothermal), nuclear, and fusion power plants.
- **Bioeconomy** is thriving, backed by public investment in innovation in biomass production, biotechnology and circular business models. Mass production of biofuels and green hydrogen has accelerated the phasing out of fossil fuels and public mobility infrastructure has been transformed to enable citizens' sustainable lifestyles.

Environmental factors

- **Nature** is valued as a limited resource and for its capacity to sustain human livelihoods. Urban greening and set-aside land to support biodiversity are widespread and well managed. The EU uses the latest technologies for monitoring natural resources and raw materials, as well as ecosystem health in real time. This allows governments to anticipate possible disruptions or scarcities and prepare necessary interventions.
- A fully integrated **monitoring** and verification system for Earth Observation is operating with a global coverage in near-real time, exploiting synergies between a large number of different observation platforms and also navigation signals. One of its applications is ensuring compliance with environmental regulations for air quality, greenhouse gas emissions, agricultural practices, forestry and other areas, but it is also relevant for security applications like the monitoring of ship traffic. This system enables highly accurate observations and detection of point source emitters as well as changes on small patches of land. User-friendly tools enable non-expert end-users to use data products from this system on a daily basis.
- Technology also helps restore and maintain healthy soil, including by securing storage of hazardous waste, radioactive waste but also ignitable, corrosive and toxic by-products from industry. **Agriculture** is managed in an environmentally sustainable way by using organic fertilizers and low-impact pesticides. Food security and water scarcity is one of the main concerns. Risk management is very developed, including alternative food, seed and fertilizers suppliers.
- The EU and national governments promote **healthy lifestyles** and diets through nudging and social network campaigns. At the same time, they support the production of alternative food, such as insect farming, artificial foodstuffs (meat and dairy replacements) and GMO food. These alternatives can ensure autonomy of EU food supply and sufficient nutrition levels, while enabling a substantial reduction in impacts from livestock farming and respecting environmental standards.
- Consumers can access more sustainable products in the market as sustainable production is the norm. This is a result of strong EU policy promoting eco-design products and sustainable information for consumers considering the entire supply chain of products. Such measures have a positive effect also on third countries, where raw materials are extracted or manufacturing takes place.

Political factors

- Decision-making is mostly **top-down**. Citizens and civil society are regularly engaged in the preparation of policies, but policymaking processes are steered through strong policy leadership for sustainability.

- National governments and traditional political parties are still going strong, managing considerable public budgets and investments. National **democratic mechanisms** are in place, and people follow closely the actions of their elected representatives.
- The **EU** has been empowered by the Member States to lead in selected key policies important for sustainability and security. This has entailed Treaty changes in the field of environmental, energy and tax policies, transferring competences from the national to the EU level. The competences for foreign and defence policies, however, remain shared between the two levels, with the EU coordinating the interests of its Member States and representing them at the global level. **Subsidiarity** has been weakened by the strong central governments and local and regional authorities have more of a consultative role.
- **Crisis and disaster management** is coordinated by the EU, with the national authorities responsible for implementation of crisis management systems. EU interventions in cases of global climate disasters are limited to urgent humanitarian aid.

Geopolitical factors

- The world order has not changed much. International organisations and military alliances, such as NATO, are still coordinating the peace, climate, trade and security talks among the key players on the global scene. The EU has an important role in brokering global cooperation, while the balance between the USA and China remains delicate.
- With a track record in achieving environmental sustainability and resilience, the **EU** is among the leaders of the **global climate mitigation** and adaptation efforts. The USA followed the EU's regulatory path to a greener economy. China has achieved similar levels of climate neutrality as the EU thanks to its green technologies.
- The EU has reduced its supply chains to minimize environmental impacts in the EU, but is still exerting influence through the World Trade Organisation on the sustainability, fairness and ecological standards around the world.
- Supply of **raw materials** and rare earths is difficult due to competition, but the EU invests heavily in tech innovation to boost efficiency of production and recycling. It cooperates with selected African and Latin American countries rich in minerals to secure its necessary supplies. At the same time, the EU welcomes skilled workers from those countries, hampering their long-term sustainable development strategies.
- EU remains an attractive destination for economic migrants from Africa and Asia, and in agreement with the Member States, applies **selective immigration** policies to address shortages in specific professions and sectors.
- The **internet** still connects the world. The global digital infrastructure and the satellite systems are interoperable. The EU leads on setting the digital standards, not only focused on the rights of citizens and consumers, but now much more on sustainability concerns.
- The **USA** is still one of EU's key partners, but it has turned inwards, dealing with a highly polarised society due to internal fragmentation and effects of climate change. Its key sphere of influence is Latin America.
- **Russia** has lost much of its sphere of influence due to decreased energy exports and diminished economy, forcing it to reintegrate in multilateral institutions and renounce its expansion strategies.
- **China** is an important trading partner for the EU, even though it is facing increased competition from India' strong low-cost digital technology industry. China's ageing society and high levels of debt have retained its economic growth and resulted in decentralisation of power to the regions.

- **Latin America** is dependent on support from other regions to deal with green transition, welcoming EU, Chinese and US investors. Through large investments in renewable energy, the EU also has a substantial influence over the region, which it uses to negotiate the trade with rare earths and missing raw materials.
- **Africa** is still struggling with high levels of corruption and government debt. The EU is investing in extraction of raw materials and in energy infrastructure in a number of African countries, causing friction with other countries more influenced by China.

Scenario 2: Greening through crisis. Crisis-response-driven sustainability

Abstract

A series of crises have driven the agenda for society and politics in the last decades. These crises have been both geopolitical, including territorial disputes, and stemming from the consequences of global environmental and social issues (e.g., climate change, biodiversity loss, pandemics). Society has adapted as best as possible. Environmental sustainability became a priority by force as climate disasters and shortages became more common. With growing geopolitical instability, security and sufficiency became the main objectives of European policymaking. The 2027 conflict in the South China Sea and the isolation of Taiwan caused global shortages in semiconductors, which sparked a renewed focus on supply chain resilience and stockpiling. The increasing distrust between China and the EU caused a decoupling of technology in the 2030s, driven both by high EU standards which largely blocked Chinese products, and an increase in cyber-attacks. Witnessing the impact of climate change and breakdown of the rules-based international order, EU citizens and Member State governments began to favour the centralisation of power at the EU level to respond to external shocks. This shift accelerated after Russian territorial intrusions in the Arctic and in the Baltic EU Member States, which motivated the creation of an EU defence pact. Democratic processes have also shifted towards the EU as citizens turn to the European level to lead the decision-making on stability and security, bringing the EU closer to federalism. The move towards strategic autonomy of the EU through investment in green technology, diversified supply chains, more local and circular production took time to bear fruit. Economically, high prices and resource limitations are pushing businesses towards higher efficiency and optimisation. As the EU moved away from highly interconnected globalisation, resource consumption also declined.

Social factors

- The predominant **social values** are security and self-sufficiency. People have become disillusioned from witnessing the failure of the global community to meet the challenge of climate change. Many people no longer believe in 'progress narratives'. As a result, they are highly self-reliant and trust their own networks, with low degree of **trust** in community or society. Some have gone off-grid. Break-off groups also exist through online communities.
- As the EU is the main provider of their livelihoods and security (e.g. food security, defence), people have a stronger **European-level identity** than in previous decades, and focus on the security and stability within Europe. There is a degree of solidarity within Europe, which promotes sustainability and a sharing of resources between generations.
- **Education** is public, but quality varies significantly both at local level and in different parts of Europe, limited by the finances and teaching staff available locally. There has been a re-emergence of crafts and skills related to manufacturing and local production supported by a wider availability of vocational training options. Knowledge is often shared outside of formal education, in personal networks or online via EU-based platforms. A smaller share of the population pursue higher education or specialisation, in part due to limited access.
- **Social protection systems** are limited and often with poor quality, in part due to low economic growth and increased public spending on defence, disaster relief, and more, which has broadly reduced state finances. Public services are maintained, but quality varies.
- **Social inequalities** exist, but the influence of the small rich community has declined. The wealthy focus on their own security and are affected by general economic decline, limited growth and the disruption to value chains and business models. There are still differences between population groups, for example in education and healthcare outcomes, but in many areas, the gap between rich and poor has decreased.
- **Healthcare systems** are fragmented as local governments in some regions are able to offer much better care than other regions. In general, healthcare is available to all but with varying quality and speed. The spread of new technology in the healthcare sector is slow, limited by resources (e.g. infrastructure, skills) and finances. High quality private healthcare exists in major cities but is only available to the wealthiest citizens. It can be difficult to obtain advanced healthcare treatments (e.g. for cancer).
- Global networks and connectivity are no longer common, as collaboration between global regions is difficult. Instead, European-level alternatives have emerged, supported by the EU and national governments. As a result, most people rely on a few main European **media** providers and platforms. The EU controls and monitors disinformation heavily, and can effectively defend against external interference, enabled by a high influence on these European platforms. Alternative sources of information exist, but struggle to break through in a media environment with large, established providers.
- **Transparency,** enabled by European-based digital technologies, is strong on specific issues of public interest**,** for example on 'climate accounts' of businesses. Areas concerning security, defence, and innovation are protected from cyberattacks and cybercrimes, limiting transparency in these areas.
- **Migration** flows from outside the EU are highly regulated, although pressure on EU's borders persist. Flows are more unpredictable, often driven by crises, but the migration rates are not higher than in past decades, in part because emigration is difficult in many parts

of the world. There is competition to attract talent through partnerships with partner countries. The EU monitors skills needed to remain in the lead in prioritised areas, such as security, defence, space, technologies for climate mitigations and adaptation, R&D, and more. Intra-EU migration flows are high for the highest skilled talent, in particular towards the cities. Some intra-EU migration is also driven by natural disasters, such as flooding and drought.

Technological factors

- **Technology has advanced** but progress and speed is limited by costly and scare resources. The EU is investing a lot in defence and security technology, both physical and cybersecurity.
- **Digital finance** has a limited role, with little potential to improve services and products, but helping reduce the digital divide among social groups and between SMEs and larger companies. The lack of transparency and control over data sharing dampen consumer confidence and trust in sharing information for financial purposes. Financial service providers thus struggle accessing financial information in a real time and timely manner.
- **Digitalisation** has progressed unevenly due to the disruption of the highly globalised digital market, with many parts of economy and society embracing digitalisation at varying speed. Governments and public services are slower to adopt digital tools, putting a high focus on **cybersecurity** and **data protection.**
- **Digital platforms** have become more diverse, and different platforms dominate in different regions. There is high connectivity within the EU, but less global interconnection online as lack of trust between world regions limits cooperation. EU-wide platforms ensure the use of digital tools by citizens and businesses, for example EU-based internet. The fracture (i.e. 'splinternet') means a few parts of the world are not connected, as they do not have own digital capacity.
- **Innovation and R&I** receives public funding mainly targeting security, defence, space, cybersecurity and climate change mitigation and adaptation. Private R&I funding is focused on reducing costs through innovations such as shorter supply chains or alternative material. SMEs enable bottom-up innovation, including frugal innovation. Public-private funding has in particular helped enhance R&I to manufacture synthetic substitutes for rare earths and other raw materials, in an effort to strengthen European autonomy.
- EU protects and maintains **critical infrastructure** and its energy supply through moderate upgrading and limited increase in capacity.

Economic factors

- **Private sector remains dominant and operates within strong EU regulations**. The economic paradigm has not transformed since the 2020s, but growth and consumption have decreased, due to limited resources, climate change and fragmented geopolitical relationships. Production is now primarily EU-based, after successful re-location of economic activities.
- The **financial sector** is highly affected by shocks linked to climate change. Carbon intensive assets have depreciated, supply shocks affect macro-economy, and the ever more frequent catastrophic events make valuations of assets and activities impossible. Materialization of losses in the financial sector and market turmoil lead to sharp slowdowns in trade and economy growth.
- **Circularity and service-based business models** have been continuously but slowly growing to overcome resource limitations, enabled by strong EU-wide companies. Small idea-based businesses (SMEs) emerge in cities, and to a lesser degree in rural areas as part of a moderate market reshaping and re-location of value chains. Many of them focus

on social innovation and the service economy.

- **The labour market** has a stable structure, but there is some EU-internal mobility. The major cities attract the highest skilled workers, and the service sector has been growing in the past decades. Most citizens pursue education, but there is a growing segment with lower skill levels, in part driven by the reshoring of manufacturing. There are few opportunities for re- or upskilling and high unemployment in some regions. Cities and regions with production and manufacturing have lower unemployment levels. Employment contracts tend to be stable or fixed in the EU-wide companies that cover many key sectors, in particular manufacturing. The service sector and SMEs have more flexible contracts. Multiple jobs are common, especially as some jobs are online.
- EU **energy market** favours centralised power generation, such as from nuclear energy and off-shore wind, complemented by other renewable sources, such as solar farms. There are however insufficient resources to maintain and upgrade energy infrastructure to ensure affordable access for all the citizens. Some citizens turn to do-it-yourself solar or wind power generation. This leads to a vicious cycle of increasing rates for customers remaining on an increasingly decrepit grid.
- **Supply and value chains** are highly diversified to limit dependencies. Some production has moved back to the EU, while other sectors turn to 'friendshoring' (i.e. sourcing components and raw materials from countries with shared values). The EU firms collaborate to establish more robust relationships with businesses in partner countries.

Environmental factors

- Despite limited finances, there is public investment in nature, for example to restore ecosystems. Nature is valued for its capacity to serve human interests and ensure sufficiency. People volunteer to help rebuild local nature park and areas for biodiversity as this is considered to be essential for food security and health.
- The EU conducts close **monitoring of nature** to manage resources well, using economic and political levers available to enforce standards and limits for activities that burden the environment, such as taxes, fines, etc.
- Agriculture is seeing a shift towards permaculture and regenerative agriculture, driven by strict regulations for land resources. **Food security** is a priority; it is supported by alternative food sources, such as from insects, algae, and fungi. Local produce is favoured and determines what is available at a given time. People consume only what is strictly necessary and food waste has been reduced drastically.

Political factors

- **The EU's role in policymaking has grown to be akin to a federal government**, with a few policy areas out of this scope. The EU regulates the economy and influences market dynamics. The EU plays a larger role in procurement and supply chain management, aiming to act as a safeguard against disruptions and shortages.
- There is a strong shift towards **protectionism**, while the EU has expanded relationships with neighbouring countries as well as partner-countries in other regions.
- The EU and Member States collaborate with significant spending on **defence, security** and resilience against hybrid threats, given the geopolitical instability. Significant funds are allocated to ensuring Europe's critical infrastructure, ensuring close cross border and cross-sectoral coordination.
- The EU promotes the **sharing of best practices between EU regions**, in particular for social innovation. There are collaborations between the major cities, which helps improve living standards through innovation and optimisation.

- The **crisis management** capabilities within the EU are very high, and there is an emphasis on preparedness in political decision-making. When international crises or disasters strike, the EU still responds with humanitarian action.

Geopolitical factors

- The world order has changed dramatically since the 2020s, and **multilateralism** has nearly **collapsed**. Many countries now prefer to align along regional or ideological lines. There are several 'centres of power' at the global level – South-East Asia, Africa, South America and North America. Lack of trust among these centres of power drives uncertainty and concerns about international security.
- The **EU** has expanded into the Western Balkans, as well as into the Eastern neighbourhood with Ukraine and Georgia, Moldova, Armenia, and Azerbaijan. The European political community has also grown to include parts of northern Africa, including Tunisia and Algeria. The European sphere of influence has expanded through the need to form stronger alliances at the regional level to ensure security and resources within the global order. For example, the EU uses access to green and nuclear technology as incentive to convince others to join its sphere of influence. A strong European Defence and Security Pact was created in the 2030s, after years of stalemate in NATO, which eventually led to its dissolution.
- **China** asserts dominance over the South East Asian region, and acts as the main provider, for example of technology, food and security. China's path to this dominance included violent conflict in the past decades.
- **United States** leads its own sphere of influence, which includes Canada and most of Central America. In the 2030s, the US stepped up its presence in South East Asia to try to contain China's growing influence, and provided support to countries pushing back on China's expansionary approach. While full proxy war was avoided, the conflict accelerated the global fragmentation and gradual break down of the global order. During the past decades the US experienced severe internal conflict, as the polarisation of society led to the emergence of several break-off groups and violent clashes. In 2050, the US is inwardly-focused and dedicated to recovering from the social fractures of the 2030s and 2040s.
- **Russia** has expanded into Belarus, and continues to put military pressure on neighbouring countries to increase sphere of influence, and recently a new Russia-centred union has emerged. The Russian economy has been weakened but self-sustaining, although some parts of the country face shortages. Russia maintained a strong alliance with China up to the 2030s, where China's growth led to an unequal relationship that eventually fizzled out. Russia is trying to profit from some aspects of climate change in the Arctic region, e.g. by shipping along the Northern Sea Route, the exploitation of raw materials and fishing, and the expansion of agriculture. It also keeps building up its military capacity in the region. At the same time, it is increasingly struggling with negative impacts of climate change, such as thawing permafrost and wildfires.
- **India** is also expanding its own sphere of influence in Asia, and competing closely with China on providing technology and infrastructure in the region. At the same time, India's finances are strained by dealing with climate-related disasters and a high number of internally displaced people.
- Some countries in **Central and South America** have developed significantly. In Central America the influence of the US is strong, including through investment and trade. The US provides the digital and technological infrastructure in many countries in the region. The EU also exerts influence in the region, mostly through trade and cultural

relations. China used to be a big player in the region but relations stalled after the conflict in the South China Sea.

- **Africa** has split into various spheres. Some like-minded Northern and Western African States join the EU sphere of influence, in part attracted by support for green technologies, such as an extended solar hub around the Mediterranean, and investment in water sustainability projects. Many African countries also benefit somewhat from the EU dependency on its raw materials, however, the EU is working to overcome this dependency by investing in innovation to design alternative materials. Other African countries join the Chinese sphere of influence, often due to relationships established through the Belt and Road Initiative. In Southern and Eastern Africa, a new union emerges as the African Union fails to create cohesion across the continent. The South East African Union has moved forward with regional integration.

Scenario 3: Green business boom. Business-driven sustainability

Abstract

Worsening climate change, shortages of raw materials, frequent disruptions of supply and value chains, and unpredictable price increases led to economic challenges for the EU. Business leaders realised that a shift towards circularity and optimised resource use was needed to make the economy more stable and resilient to external shocks. Reducing environmental impacts of production and consumption such as emissions and waste was also understood as important for social and economic stability. Policymakers encouraged the market push towards sustainability by placing taxes on environmentally unsustainable practices, enforcing transparency and stimulating innovation. The evolution of digital tools enabled transparency, for example by facilitating advanced tracking and simulation to monitor environmental impacts of production, products and services. Seeing that the private sector was better able to establish circular business models, integrate new technologies and manage supply chains, the economy was deregulated in the EU. Most regions of the world similarly trusted the ability of markets and technology to adapt and mitigate the impact of climate change. This began a trend of privatisation and a larger role for the private sector. The social paradigm favours sustainable lifestyles to some extent: citizens live sustainably in different ways depending in large part on their personal means. People still favour high consumption levels but many are held back by the high prices, in part because energy and raw materials have been taxed in line with the planetary boundaries.

Social factors

- The most predominant **social values** are individualistic, mostly focused on personal achievement, inventiveness, wealth, power and status. Most people believe there is opportunity around the corner and a high degree of social mobility, and there is the sense that 'anyone can make it'. When they can, people spend money on status symbols that create an image of wealth, eco-consciousness and a healthy, environmentally-friendly lifestyle, such as green luxury housing, sustainable diets or buying 'natural capital' in conservation or restoration areas.
- **Trust** in society, peers, and politics is generally low but there is a lot of faith in technological innovation to solve social and environmental challenges. Society is fragmented and people have split into rather isolated groups, where they share similar values or traits. People spend a lot of time online and in virtual reality settings, interacting in filter-bubbles/ echo-chambers, which gives them a sense of belonging. Some groups protest, for example against inequality or corruption, including though hacking, cyberattacks or protests in the virtual environments.
- Like many sectors, **education** has undergone a process of privatisation and digitalisation.

Education in 2050 is diversified and accessible, but with stark differences in price and quality depending on household income. Education is highly focused on skills, and there is close collaboration with industry through widely implemented dual-education model, making vocational training and apprenticeships attractive. Access to the highest levels of education is often determined by personal means, connections to benefactors or corporately financed scholarships in fields of interest for the economy. This contributes to the rapid pace of technological development and innovation as fee-paying students from around the world, especially in science and technology subjects, are recruited through heavy marketing.

- **Social protection systems** are less organised, with private providers taking up many of the roles that belonged to the public sector in the 2020s. As a result, accessibility, price and quality vary substantially. At the same time, sweeping digitalisation and advancements in AI, automation, and robotics have enabled the public sector to maintain a level of service similar to the 2020s available to the vulnerable citizens. Private charities complement this access to social services for the poorest.
- **Social inequalities** persist and it has been difficult to achieve a just transition, as interventions and innovations have focused on the business goals. This has led to a fragmented landscape with gaps in access and substantial differences in living standards. Society is effective at mobilising both locally and internationally for specific issues that spark a strong response, such as humanitarian or environmental action both within and beyond the EU.
- **Healthcare systems** also involve many private providers, with many customisation options and use of digital and automated services to shoulder care for elderly population. Biomedical research has delivered revolutionary cures for cancer and many non-communicable diseases. This has improved quality of life and life expectancy for the rich. Advanced technologies for health and care, customised outreach and monitoring has also made lifestyles healthier overall.
- Citizens have access to diverse **sources of information** and digital platforms, which are intuitive and easy to use**.** Broad digitalisation makes information and media widely accessible, even in remote locations. The media landscape is fragmented and dominated by private media companies. A wealth of new digital platforms and media outlets have sprung up as the business of keeping people informed and entertained has continued to grow.
- A combination of the high penetration of digital tools, tracking and regulation ensures that **transparency** on environmental sustainability of products, businesses and governments is high. The tracking of materials facilitates recycling. Citizens are interested in monitoring how the sustainability boundaries are respected, as that has proven to be critical for future prosperity. Other areas of society and the economy are not subject to the same transparency.
- **Migration** flows to the EU are less regulated than in the 2020s. Many countries, especially in Africa and Asia, are reaching comparable levels of development to Europe and generate less migration, mostly less qualified workforce pushed by climate disasters. Businesses recruit global talent aggressively, while migration for low-skill jobs continues, often on a short-term basis. In most EU countries, there is fast recognition of skills of migrants (e.g. of diplomas and certificates), but no standardised, streamlined approach at EU level. There are also high levels of intra-EU migration, drawn by differences in jobs and living standards between EU regions.

Technological factors

- Technology operates in a competitive,

integrated and privatised global system, with high interconnectivity and interoperability.

- **Digitalisation** has taken off in all aspects of society, led by large global platforms and large multinationals. Big business is behind the most advanced technological breakthroughs, including the necessary energy-optimisation of digital tools. AI and automation have advanced significantly.
- Regulated crypto assets are the main means of payment. Different types of virtual currencies are available, following a range of requirements. The **digital finance** ecosystem became fragmented, with several actors developing their own digital currency based on different technologies and standards.
- **Health and biotech research** are well-funded as they hold great promise for the well-off parts of population, especially for the development of renewable biological resources. Synthetic biology is now mainstream. Innovation in efficient land use and agriculture is advancing quickly, including through digital tools, to help the agri-food sector adapt to environmental changes.
- Vast amounts of **data** are available, giving insights into human behaviour, the environment, supply chain and much more. Data is primarily owned by businesses, which limits data sharing. Data related to sustainability and circularity is shared due to regulation. Some good practices facilitate data sharing in other areas driven by business interest, such as healthcare.
- **Quantum related technologies** have advanced significantly in areas where profit-driven applications were easily reachable such as sensing, imaging and navigation applied in the automobile, defence and aerospace industry. Furthermore, quantum communications and cryptography have proven to be of critical importance to guarantee secure and private communications especially at governmental level and are providing some countries leverage over others. Quantum computing applied in scientific research for medicine development, bioengineering (for both health and agriculture) and simulation (e.g. ecosystems digital twin) supports the development of innovative solutions to health, food, climate change and security challenges. Quantum sensors enable high-precision measurements of environmental parameters such as underground water or ocean currents, but are also used to detect underground facilities, with potential military application.
- **The Metaverse** is widespread and popular. It was the first in a range of virtual reality and augmented reality environments, which now exists at a range of quality and price levels. These environments were first used professionally to replace meetings and travel. Then they were adopted by the affluent, private education institutions, later spreading through education and training sector. The public embraced metaverses, in particular for gaming and as a substitute for traveling and tourism, as it contributes to a reduction of the carbon footprint.
- **Innovation and R&D** thrives enabled by strong backing of the private sector and by taking advantage of new technologies and digital tools and networks across Europe. Innovation is fast-paced and often disruptive.
- **Business interests** drive green development and the R&D investments in search of solutions to constraints set by sustainability and resources. There is a focus on energy and resource efficiency, durability, recyclability and circularity. There is investment in search for alternative materials.

Economic factors

- The path towards sustainability is entrusted to liberal markets, as sustainable practices are recognised as a sound **economic strategy.** The planetary boundaries are recognised by business as hard limits, in large part due to recurrent shortages (energy, water, raw materials), disrupted or unreliable global

supply chains. As a result, high taxes have been set on environmentally unsustainable practices. These factors condition economic growth and push markets towards sustainability.

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- The economy is less regulated than in the 2020s. National governments and the EU play a small role in **economic governance**, primarily to push for environmental sustainability, for example by switching to economic indicators that account for stocks of natural resources and the quality of the environment.
- The highly dynamic and technology-oriented economy has led to a two-tier **labour market**, which is highly dynamic. Skilled elites, especially in STEM, and creatives compete globally for demanding but well-paid jobs; they can work from anywhere, with governments either turning a blind eye or coming to mutual agreements on income tax and corporate presence. Many people work in service jobs and the 'care economy' has grown since the 2020s. Some have multiple jobs, or 'gigs', often with flexible, short-term contracts. Governments have regulated the labour market to make contracts and recruitment easier and more flexible for business, intended to promote innovation and entrepreneurship. Changing careers, re- and upskilling is common, achieved by a combination of public and privately sponsored offers.
- **SMEs** play a significant role in a lively EU economy, mostly supported by private interests or large multinationals. New and disruptive business models frequently emerge, enabled by less regulation and oversight from governments. Products and services are increasingly customised to individual users based on increased insight into behaviour and needs. There is only limited privacy protection in place. Most consumers appreciate the customisation features and are not concerned with privacy, but some push for businesses to ensure the data protection (e.g. preventing data breaches).
- There has been a large shift towards "**as service" business models** because it helps businesses ensure **circularity** and optimised resource use. This shift is supported by the wide uptake of digital tools both in EU and globally.
- Markets, manufacturing and **supply chains** are still globalised, but attention is given to resilience and efficiency, also through the growth of industrial ecosystems and circularity clusters (sites where the waste of one industry is input to another industry). Supply chains have also diversified to avoid overdependence on single supplier or regions. Industry closely monitors supply chains and focuses on preparedness and frequent risk assessments due to frequent disruptions from natural disasters or economic instability.
- The **financial sector** is redirecting financial flows towards sustainable activities and integrating environmental consideration into their investment process. Green bonds are extensively used. Large multinationals play a central role in international finance through private investment in infrastructure and joint ventures in strategic sectors such as energy, transport and for circularity. Blended finance and new models of combining public and private financing have become common.
- The **energy market** is highly competitive, with incumbents taking more and more market share. Energy systems include mixed sources and some household and regions manage to use renewable sources directly.
- **Investments in infrastructure** are limited to what makes economic sense. Local initiatives do succeed but are often governed by private interests. The same goes for urban planning.

Environmental factors

- **Nature** is acknowledged as a limited resource

and for its power to determine future economic gains. 'Natural capital' is accounted for in economic indicators. Ecosystem protection and restoration is promoted by governments through a payment for ecosystem services mechanism, meaning that the stakeholders pay for using the ecosystem or environmental good (e.g. land).

- There is inequality in relation to **climate adaptation for the individual citizen**. Multiple businesses offer customised solutions for adaptation (microclimate control, private gardens, urban greening, water reuse, recycling, etc.) However, not everyone can afford these solutions, and there is only a weak social safety net in terms of exposure to climate and environmental degradation.
- Both business and governments **monitor nature** to ensure maximum sustainable yields and prevent further degradation. Agriculture and soil management focus on optimisation to stay within environmental limits. Some farmers are struggling with the transition due to lack of digital skills and investment capacity.
- Many satellites are launched and operated by private companies for profit, specifically in the case of nanosats. There is close collaboration between government agencies and the private sector. Some Earth observation datasets are not available for free.
- **Food security in the EU** has been challenged by high prices and global shortages due to natural disasters and changes in growing conditions. As a result, and given the fear of further shortages, there has been a public push for local production in EU, incl. through vertical farming, and using technology to find alternative nutrition sources, such as lab-grown meat or proteins derived from yeast, fungi, bacteria and algae. Large EU enterprises have emerged in the agri-food-tech sector. With a deregulated landscape, unsustainable food choices are still available on the market and less well-off people use them due to low prices.

Political factors

- **National governments** are increasingly flexible and pragmatic. EU countries cooperate to advance economic interests. They have followed similar socioeconomic models, for example lowering taxes on labour. The EU maintains necessary competences related to the single market, while other policy areas are decided at national level, with flexible and voluntary coordination between some EU countries.
- The **EU** and European institutions play a role in a limited number of areas, in particular in standard setting and common fiscal rules to foster economic and green growth and to engage with large multinational corporations.
- There is corruption in most levels of government and **corporate interests**, especially of large corporations, have significant influence in political decisions. When cases of corruption become public, people perceive it as further evidence to mistrust politics. The mistrust and lack of transparency fuels a growing political polarisation, both in terms of parties and in the public, which in turn makes it harder to achieve consensus and political agreements.

Geopolitical factors

- There are **many key players internationally**, which makes setting the agenda internationally more complex. Multilateralism and global fora are still a part of the geopolitical landscape, but are largely 'talk shops'.
- Economic might continues to be a significant determinant of global influence, and global competition has increased. Developing and emerging countries are growing faster than developed regions, with the result that the level of inequality between countries is declining. Some developing countries have leapfrogged technologically through foreign investment and technology spill-over from trade.

- The **EU** has large multinational companies that can give it clout, especially regarding ethical bio-technology, alternative food sources and health technologies. The pragmatic attitude of most governments in EU countries has led to a loose structure within the Union, where some countries are highly integrated, while others cooperate more on an ad-hoc basis. Countries in the Western Balkans and Eastern neighbourhood frequently form part of the ad-hoc cooperation.
- **China** has been leading on green technology for the past decades, driven by significant public investment. Through the Belt and Road Initiative, many of these technologies spread across the world, effectively setting the standard. This has made China a strong soft power that drives the international agenda in many areas. Having people work until very late in life has, combined with technological breakthroughs, helped offset the steady decline of the Chinese workforce. These factors allowed China's GDP to grow much faster than in North America and Europe, and China's economic output is almost three times larger than the US.
- The **United States** is catching up but has been slow to make the transition to a green economy, which resulted in economic stagnation in the late 2030s. The US remained strong in the digital domain, and developed substantial capabilities to counteract cybercrime. There are several dominant US corporations in the digital sector. The US and US corporations are highly active in the race for space, and lead the competition for lunar and asteroid mining.
- **Africa** is an emerging economic bloc, in particular due to technology and innovation spill-over from increased trade. Many African countries have a close relationship to China due to the investment and presence generated by the Belt and Road Initiative. Corporations from the US and EU are stepping up investment in the region but are struggling to catch up to their counterparts from China.
- **South America** is a developed region with many digital entrepreneurs, in part driven by its ability to attract remote workers with low costs of living. Argentina, Bolivia and Chile formed a lithium alliance towards the end of the 2020s, which boosted their economies as the demand for lithium grew, linked to digitalisation, the increase in electric vehicles, renewable energy storage and more. South America also remains a major food exporter by using GMO crops.
- **India** is the world's most populous country in 2050, but fertility rates have been steadily declining for decades. The digital sector of India's economy is thriving. Biotechnology is a growing field that sees much cooperation and investment from EU countries and companies. India has strong economic growth but society remains very unequal.
- While **Russia** still exports food to parts of the world, many wealthier economies favour local production combined with alternative food sources, which weakens this sector of the Russian economy. The global availability of alternative energy sources have also weakened the Russian economy in the past decades. Turning to mining of raw materials, Russia has been able to maintain a strong economy, and some state owned companies in this field are globally competitive. Russia continues to draw labour migration from central Asia, which has helped reduce the burden of societal ageing.
- Technological advances and economic growth are helping societies to adapt, and globally there is strong cooperation in climate change adaptation. Efforts on mitigation are uneven, and there is limited international cooperation on the reduction of emissions, pollution and other measures to remain with planetary boundaries. Frequent disasters and shortages due to climate change cause instability in many parts of the world, including in Europe.

Scenario 4: Glocal eco-world. People-driven sustainability

Abstract

Catastrophic extreme weather events and natural disasters driven by accelerating climate change since the late 2020s have affected people across all European regions. Simultaneously, access to fossil fuels and to many metals, originally deemed essential for the green transition in the early 2020s, became restricted due to geopolitical competition. This has caused profound changes in lifestyles and economy across the EU, with people struggling in increasingly hot Mediterranean regions, melting alpine ski resorts, as well as in Dutch polder regions and river basins prone to floods. National governments have had to rely on EU support to address climate disasters and propose solutions for economic adaptation, but have not been able to ensure the necessary transition towards climate neutrality. In the early days, the EU had insufficient competences to entice its Member States to engage in systemic change. Citizens – many of whom grew up with the Fridays for Future movement and the rise of cooperatives of various types - have therefore mobilised through local and regional networks to enhance local resilience and preserve ecosystems. A healthy nature is now clearly seen as essential to one's well-being and various organisations are putting effort into restoring the natural environment and biodiversity. Climate disasters and the increasing price of many raw materials have made people conscious about the consequences of consumerism and the need to cut overall consumption of energy, food and the use of wasteful technology. The resulting reduced economic output entails reduced government revenues so the states are no longer able to provide the level of social protection afforded in previous decades. People have therefore turned to their local communities to organise alternative solutions in care, mobility, education and other services.

Social factors

- Citizens are more sensitive to the intrinsic **value** of nature for wellbeing and more conscious of the interconnectedness of nature, human health and quality of life. High eco-awareness entails a deep concern for natural resources and biodiversity protection.
- Under pressure from a fast changing climate and shortages of natural resources, people have had to reduce their consumption and embraced sufficiency, if not outright frugality. Economic growth is no longer a realistic policy goal and society has shifted its focus towards ensuring the broad **wellbeing** of people, including nature in all its aspects.
- People have understood that collaboration is their best strategy for long-term wellbeing and they turn to local decision-making for the development and implementation of sustainable solutions. This naturally reinforces **identity** and solidarity at the local level. People have a high sense of personal responsibility towards communitarian outcomes, fostering a **high degree of trust** in peers and the local community.
- The collapse of the previous growth based economic model has considerably **reduced social inequalities.** There is now a strong social pressure to remain within the planetary boundaries and reduce material consumption. The sustainability transition and the need to collaborate have increased fairness; people are concerned about their close relations and their broader community, investing a lot of time in volunteering, supporting their local community and cultural activities. The importance of intergenerational justice has become self-evident, as people strive to preserve nature, think about their children and live in a sustainable way.
- **Citizens value equity** as a part of a sustainable society, so material wealth as an end in itself and as a sign of status is frowned upon by most. The collaborative economy contributes to providing similar services to most.

- Many cities and regions have introduced universal basic income schemes and exchange lessons learnt, discussing options for improvement. Others have difficulty to implement such schemes, due to weak economy and low public resources.
- **National social protection systems,** especially pensions and healthcare, have deteriorated due to a decrease in public funding. In a social context that values social equity, this has sparked social innovation at local and regional levels, complementing the reduced national public services. New forms of community and sharing services supported by technology provide new ways to organise local actions and benefits.
- People have embraced **healthier lifestyles**, given the diets based on ultra-short food supply chains with locally grown seasonal food and the high price of processed food. As cities have shifted towards zero-carbon mobility, people walk more, cycle and engage in physical activities such as community gardening in enlarged urban green and social spaces. Others choose life in the middle of nature, where frugal digital technology still ensures connectivity.
- As productivity and quantity of **work** are less important than in the past, flexible working arrangements and a more concise working week enable a better work-life balance. People have more time to volunteer in their communities and start local initiatives.
- Improved work-life balance and smart public health interventions help maintain good health outcomes at population level although **healthcare systems** are not receiving as much public investment as in the 2020s. Family, community and volunteers ensure a large proportion of care, helped by technology and the development of e-health. Serious and rare illnesses are more difficult to address due to less accessible advanced healthcare.
- **Education** has likewise been transformed. It is largely managed at regional level and involves self-learning, local learning facilities and non-profit organisations. A variety of open-source online learning resources complement the basic public education offer and enable life-long learning. Recognition of qualifications is an issue in this fragmented education landscape, where learning and employment have a high local component.
- Citizens have access to many diverse **sources of information.** Social media are still very popular, but people's primary focus is on their close community. Disinformation is still common but close social networks and the existence of trusted media sources limit its impact. While people live very much connected with their immediate surroundings, the EU invests in promoting a shared EU narrative and a sense of EU identity.
- In line with the strong sense of equity and fairness, **transparency** of public data, investments and sustainability standards is high, as citizens are active in the public and political life. They hold their representatives at local, regional, national and EU levels accountable for ensuring sustainable economy and lifestyles.

Technological factors

- **Digital tools** for collaboration are widespread. This technology enables social innovation, local start-ups and sharing economy, with citizens driving development and collaborative economy at local level. Good practices are also actively shared and discussed by stakeholders across the EU through digital media. This creates conditions favourable to crowdfunding campaigns.
- Private electronic means of payment replace the central bank money. Crypto-assets, local alternative currencies and decentralised **finance** are widely used for provision of financial services.
- High-technology multinationals and global social media platforms have lost a global role and receded from the EU market, where

the EU ensures the fundamental rule making, infrastructure and low carbon energy supply for social media and the internet.

- People use digital technology and civic tech platforms massively to engage in local participatory processes, including **direct democracy**. The most used technologies are distributed so central control or censorship is very difficult.
- The collaborative ethos of society and the importance given to social distributive justice facilitate the development of open-source technology. This allows entrepreneurial citizens to drive **bottom-up innovation**. There is not much public investment so most innovation and R&D is financed through crowdfunding or private sources.
- European society is cautious about **high-tech** advances that raise ethical and regulatory issues, such as bioengineering. On the other hand, innovation to solve practical problems and respond to local sustainability needs is thriving. Citizens also use a new generation of **frugal digital technologies** to optimize the performances in everyday tasks, consumption, the shared mobility solutions and other services, and to reduce the use of natural resources.
- Driven by sustainability concerns, businesses are developing no-emissions building **materials** and locally sourced materials are the basis for new housing projects. Limited urban areas are transformed through combining multi-generational housing with multi-purpose spaces for economic activity and social interactions.

Economic factors

- The economy has had to increase its resilience while adjusting to operate within the planetary boundaries. It is oriented towards strengthening **local markets** with short supply chains: production and consumption occur as close to each other as feasible. The drive for strategic autonomy in food production, energy and raw materials use also leads to the rise of **protectionism**.
- Overall, the economy has become **collaborative**. Management structures in private companies have evolved. Many businesses are managed by a range of stakeholders, including employees and customers. Cooperatives flourish, including in the energy sector. A variety of product-sharing business models provide many essential services. Start-ups or social enterprises often rely on funding from cooperative banks or alternative financing focused on investments of public interest.
- Companies regularly report on the sustainability of their services and operations. They are expected to be active in the community life. Factories gather in industrial ecosystems where circularity is promoted, e.g. a production activity uses the wastes of other activities, and energy infrastructure and other resources are shared to minimise use and cost.
- The consumption of material and energy has been scaled down due to scarcity, increased cost and concerns over natural resources. This has **reduced economic output,** with a negative impact on **fiscal revenues** available to governments, reducing public financing and investments. With unchanged tax systems and high levels of public debt since the 2020s there are no new sources of financing for social protection, pensions or infrastructure. In response, people build resilient solidarity and mutual support systems within their local communities.
- With shorter supply chains and more community-based activities, **transport** and other infrastructure are required at a smaller scale than in the 2020s, and usually the old infrastructure caters for the needs with no or minor new developments. The trend of 15-minute cities transformed urban areas across the EU into greener and cleaner living spaces. People use clean and shared

transport solutions to travel longer distances when needed, but tourism is oriented towards closer, sustainable experiences.

- **Labour markets** have changed. The social economy has developed and more people are self-employed. There is more cooperative, as well as flexible forms of work. As pensions and other social protection services are insufficient, many people invest their savings in cooperative banks and funds, contributing to local support systems.
- The boundaries between **work and private life** are more fluid, as people share their time between professional tasks, growing food, community volunteering, learning and the like. Community help and barter allow reducing dependence on salaries for everyday life. A dynamic world of work provides for continuous up- and re-skilling and peer exchange, allowing people to reach high level of skill. Better work-life balance and community life foster the creativity of workers.
- People move freely within the EU in search of work and new initiatives. The impacts of climate change, like desertification, coastal erosion and flooding, etc. also cause migration within Europe. There is less pressure from international **migration**, as Europe no longer shines internationally as a 'land of riches'. Attracting talent and specialised professionals from abroad has become difficult. However, a certain stability and the preservation of democratic and social values means that the EU remains a haven for people seeking asylum or fleeing disasters and war in other parts of the world: large cities still experience immigration, especially from neighbouring regions and Africa.
- The 2022 energy crisis in Europe triggered large investments in energy savings and renewable energy. By 2050, many people have joined local energy cooperatives and **energy** markets have been decentralised to some extent. Some people have gone off-grid due to the availability of mature renewable sources. With a de-growth approach embraced by many people, the overall energy demand has decreased. Thanks to technological improvements and bottom-up innovation, renewable energy share has increased significantly through diverse means (wind, photovoltaic, waves, biogas, etc.). People use sensors and wearables generating energy from ambient environment, either solar, thermal, wind or mechanical, to "harvest" energy for personal use.
- The EU has refocused its international **trade** on a limited number of trusted partners and has made efforts towards re-shoring as much of its industry as possible. This has had various consequences: on the one hand a somewhat lower economic efficiency and less choice for imports, but on the other hand more strategic autonomy and resilience with respect to potentially rogue geopolitical actors. However, the economy remains vulnerable to natural disasters and shocks, as the effects of climate change are still worsening.
- This also has important consequences on **food security and water supply**. As European food supply has become much more local, people can rely on high-quality trusted food in most areas but with higher prices, less variety and more in tune with the seasons. The regions most affected by climate change, on the other hand, are having a harder time ensuring reliable food supplies.

Environmental factors

- People now **value nature** in its own right and not just for "ecosystem services". This has led to the adoption of a rights-based approach to nature protection that has changed radically natural resources management and pollution control. Sustainability and the protection of the commons are now considered as a core issue in any permitting procedure that would lead to affecting a natural space.
- Land is often cultivated according to agro-ecological principles, with multiple

crops grown together, sometimes reviving traditional models abandoned during the 20th century or following the rules of permaculture. Cities have introduced urban gardens wherever possible and many people own home aquaponics systems. Vegetarian and vegan options are widely available and popular.

- Due to dependency on local markets, food production is very vulnerable to climate shocks and the EU steps in with (humanitarian) aid in cases of severe disasters. The EU aims to secure collective supplies of basic food commodities that cannot be produced domestically through its global networks.

Political factors

- The rise of participatory democracy has led to innovation in governance and a new political culture. Decision-making has become a lot more inclusive and **EU subsidiarity looks different** from what it was thirty years earlier. Many decisions are taken at local and regional levels after extensive deliberations.
- Independent **citizens' assemblies** are organised to deliberate and provide recommendations on important issues. There is a lot more participatory democracy than in previous decades, also relying on distributed digital platforms. Citizens are now a lot more engaged politically, not only at local, but also at the EU and international levels. The EU institutions also organise citizens' assemblies when preparing actions on the international scene.
- With more power at the local and regional level and key policy issues such as geopolitics and climate change being global in nature, the **national** level has slowly become less prominent. As public financial resources have been on a general decreasing trend, national governments have become hollowed out**.**
- At the **regional and local level**, cities and regions are leading the way in implementing sustainable solutions. They cooperate across borders to exchange experience and tools.
- With the devolution of many responsibilities to the lower levels of governance and following some Treaty changes, the **EU** is responsible for **global issues.** This includes efforts to combat and adapt to climate change and promote a global sustainability agenda. The EU has also been empowered with the common security and defence policy.
- In this decentralised constellation of powers, local and regional authorities are expected to prepare for crises and have significant **disaster management** capacities that can be pooled at EU level. Thanks to an advanced EU level response capability, the EU intervenes in case of major disasters, dispatching available resources to where they are needed when local capacities are not sufficient.
- Geopolitical factors
- The **EU** has lost clout on the international scene due to its reduced economy and small share of the world population, but it showcases good examples of sustainable food production, social innovation and deliberative democracy. It tries to act as a global broker in climate talks, partnering with strong citizens' organisations and networks of cities and regions. There are green innovation pockets in the EU that are globally competitive.
- European **cities** are sharing globally their knowledge and experience of sustainability transition, and managing ultra-short supply chains sustainable technologies being developed to ensure food production, social innovation. They have built close networks with Asian, American and African megacities that have risen as actors on the global stage. For example, Los Angeles, Lagos and Shanghai are among the leaders of the global sustainability solutions.
- Global partnerships between major cities

have become the driving force of the sustainability transitions, putting pressure on states and their coalitions to promote and implement climate agreements.

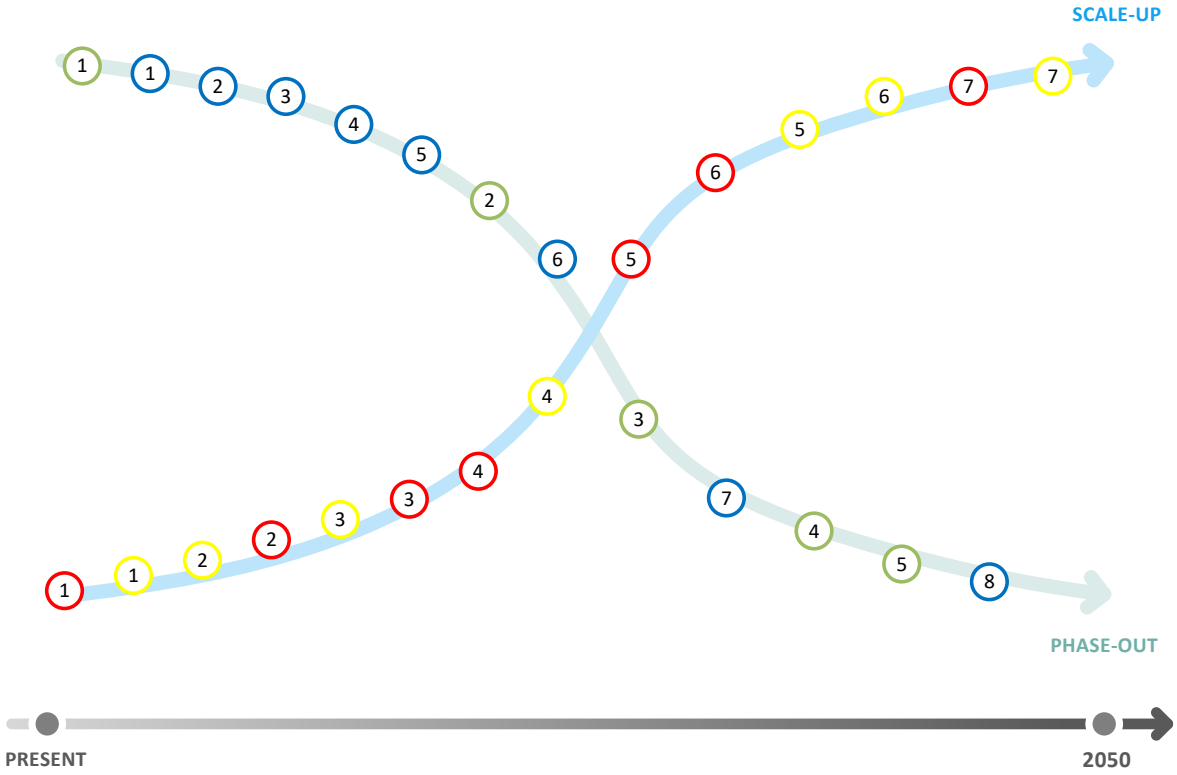
- The EU engages in close **cooperation** with a limited number of partner countries and unions around the world to secure its access to critical raw materials and resources and to promote democracy. At the same time, some innovative approaches in the EU allow replacing some critical raw materials with locally sourced materials, reducing dependencies.
- The EU remains active in humanitarian help and disasters response at the global level, receiving support from partner countries when climate disasters strike in Europe. It has no sufficient budget, however, to transfer significant funds to the global South to support their climate mitigation and adaptation efforts.
- The **USA and China** are now the key global adversaries, gathering like-minded or dominated countries in their spheres of influence. The EU's partnership with the USA has a critical role in ensuring EU citizens' security in a polarised world, where NATO is expected to preserve peace and stability in Europe. The EU is seen by the US as a buffer towards Russia and China worth investing into, given the fragile global order.
- The EU spends a relatively large share of its budget on defence and security (including cyber security and space), actively working within NATO to preserve stability, counter hybrid threats and protect its partnerships with like-minded states and city networks.
- **Internet** has broken down into global digital islands led on the one hand by the US and on the other by China. Such a system is more vulnerable to cyber-attacks so a loose multilateral digital alliance at the global level has been created to improve cybersecurity.
- **China's** economy was thriving until 2035, but then its influence started to decline due to an ageing society and climate change impacts. China however still attracts talent and exerts influence on the Belt & Road countries.
- **Russia** has lost clout at the global level and has cut economic ties with the EU. It has instead fallen under the Chinese umbrella and is still the largest energy exporter within China's sphere of influence. It makes efforts to maintain its own links with Brazil and India.
- **Africa** is heavily affected by climate change, environmental degradation and water scarcity. African communities and cities try to adopt EU's low-tech and small-scale solutions for their green transition. However, the number of climate refugees keeps increasing, with the highly qualified workforce heading towards China as their main destination.

Annex 3 - Four transition pathways toward EU 2050 – The X-Curves

This annex contains a curated version of the X-curves illustrating the four transition pathways to EU 2050. They are based on the findings from the two workshops implemented through the foresight process and further analysis, assessment and interpretation. They contain several narratives of patterns of change which are marked with different colours. A simplified version of the X-curves is presented in chapter 2.

Note that the numbering is intended to facilitate reading, without the order of the proposed changes having any particular meaning.

Figure 12 Eco-states transition pathway towards EU 2050 - Complete X-Curve representation

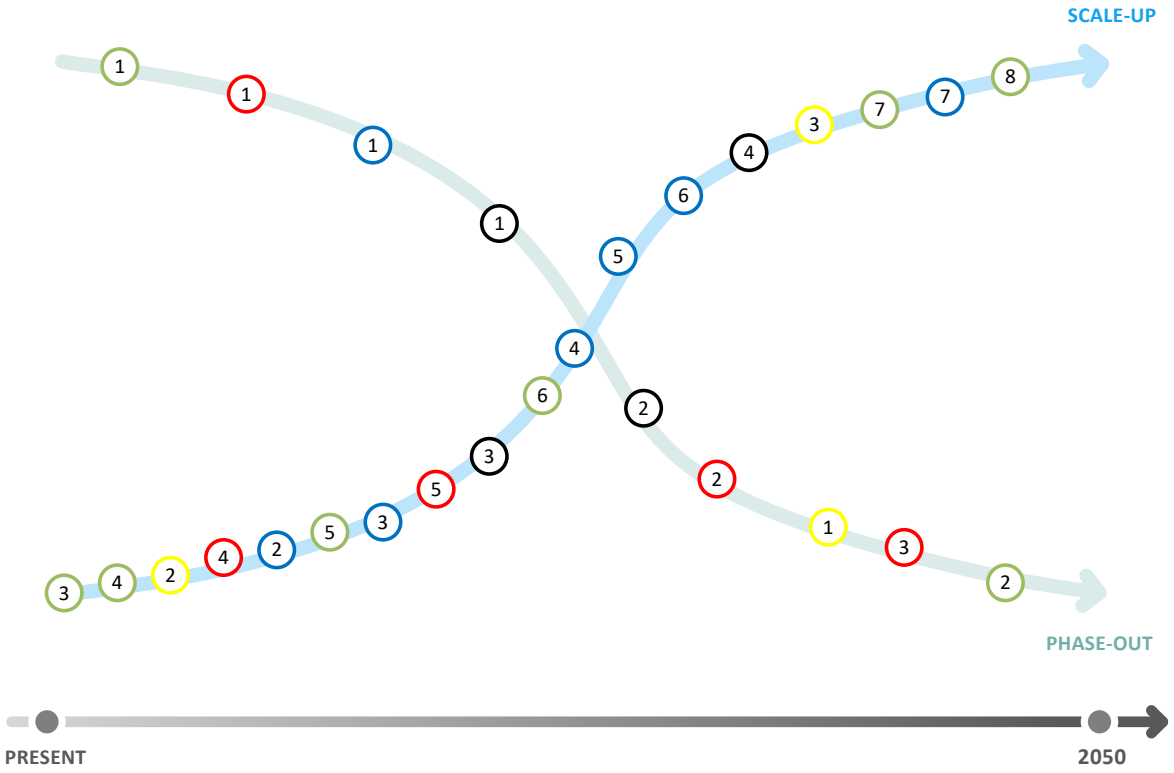


Eco-states transition pathway

Personal freedoms (green)	1. Substantial personal freedoms 2. Personal choices restricted by social pressure 3. States use digital deliberative democracy tools to engage citizens 4. Compulsory voting and partial replacement of governments 5. Collectivistic culture
Shift from consumers to eco-citizens (blue)	1. Consumerism as a way of life 2. legislation aiming at rolling back consumerism 3. circularity by design; banning ads on unsustainable products 4. learning curricula mainstream sustainability and sufficiency 5. States use AI and social networks to reorient people's behaviour 6. personal carbon footprint quotas 7. social status based on eco-consciousness and sufficiency 8. SUFFICIENCY AS A WAY OF LIFE
Fiscal systems (red)	1. Member states tax systems 2. Boosting environmental and health taxes 3. Tax burden shifts from labour to vat and corporate income 4. Eu invests in eliminating tax evasion and tax havens 5. Increasing taxes on capital, property, inheritance, high income 6. Tax competences shift to the eu 7. Eu tax system with a new tax base
State-led tech development (yellow)	1. Bottom-up tech development 2. Eu digital decade: heavy investments in it infrastructure and digital skills 3. Mainstreaming digitalisation and innovation in public services 4. Eu mission approach in all sectors: pooling funds & regulation; private & public actors 5. It tools for wide participation in democratic processes 6. Highly skilled youth attracted to the innovative public sector 7. State-led advanced technologies

1.1.1

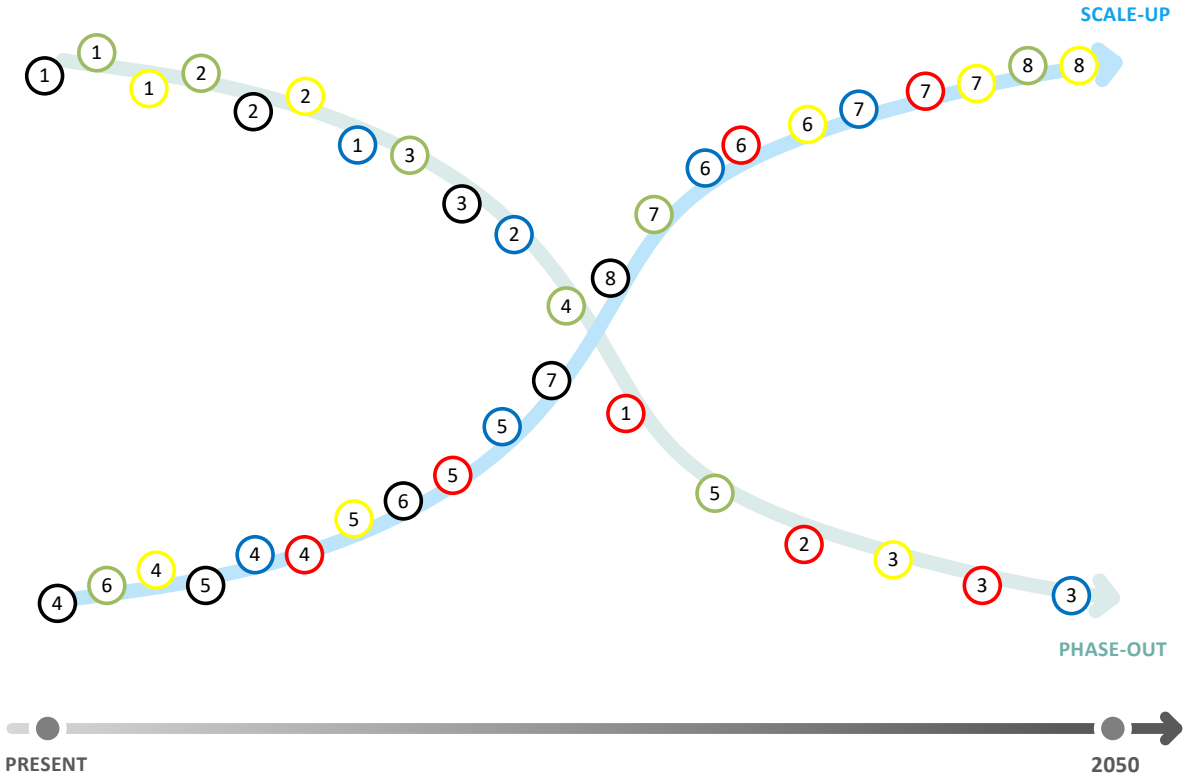
Figure 13 Greening through crisis transition pathway towards EU 2050 - Complete X-Curve representation



Greening through crisis transition pathway

An emerging consensus on Green Strategic Autonomy (green)	1. Optimised procurement coordination between Member States in strategic areas 2. Siloed approach to strategic priorities 3. "Green Strategic Autonomy" becomes a headline target for EU policymaking 4. Member States and EU invest in R&I in strategic areas, esp. green tech 5. EU joint procurement is made green and expands to more areas 6. Gradual delegation of powers to EU level in strategic areas begins, starting with energy 7. Institutionalisation of EU level procurement in strategic areas 8. 'Europeanisation' of strategic industries
Digital technologies as a key battleground for strategic autonomy (Black)	1. The global digital infrastructure and flow of technology is disrupted by spyware, cyberattacks, mistrust, and diverging standards 2. The internet is in chaos as countries and regions seize control of 'their' internet and create 'splinternets' 3. A new model of private and public partnership in the EU digital sector emerges 4. A strong European digital sector
Subsidiarity re-defined: Power shifts between levels of governance (blue)	1. EU decision-making is destabilised as Member States increasingly use the 'enhanced cooperation' procedure to overcome stalemates 2. EU media grows - more available and more relevant as EU mandate expands 3. EU becomes more democratic via EU wide voting lists 4. More powers delegated to EU level 5. Local governance level expands role in social policy and healthcare 6. Some decisionmaking is localised: Cities move towards more direct, local democracy, for example with more referenda 7. Federal EU becomes reality
A profound econfiguration of global supply and value chains (red)	1. EU Member States compete for opportunities, for example for companies reshoring 2. Off-shoring is discouraged 3. Supply chain vulnerabilities/single supplies phased out 4. demand for new skills for industry 5.0 emerges in EU 5. EU initiatives and subsidies for reshoring industries
The EU becomes a hard power as well	1. NATO loses relevance as stalemate prevails 2. EU central command of in Ukraine begins closer integration of MS militaries 3. EU army is official and institutionalized in new EU treaties

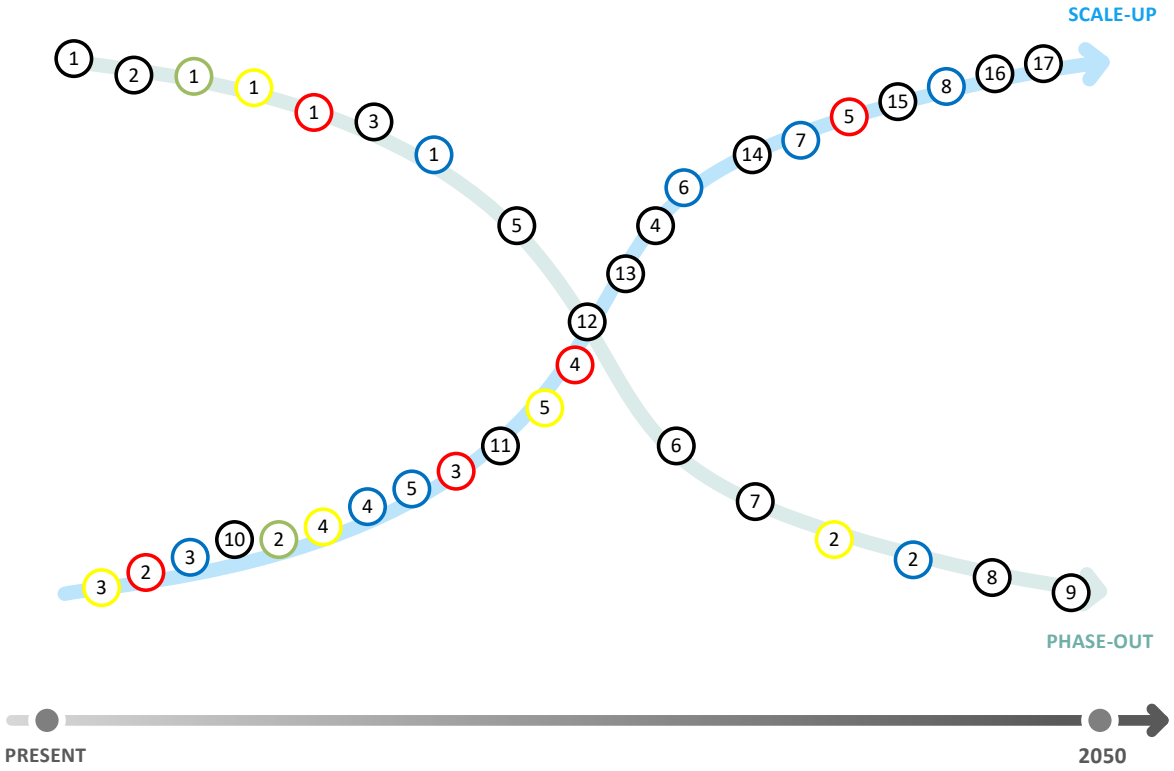
Figure 14 Green business boom transition pathway towards EU 2050 - Complete X-Curve representation



Green business boom transition pathway

Green systemic reconfiguration (green)	1.	Resource scarcity push Global value chain reconfiguration
	2.	Accelerated exit from fossil fuels
	3.	New Innovative indicators on environmental impacts
	4.	Critical Tech sectors (Transport, steel and construction) became GGH Neutral
	5.	Large corporation abandons resource intensive sectors
	6.	Adoption of regenerative and remedial practices on environmental services
	7.	New practices for 1,5 degrees lifestyle & eco-consciousness
	8.	Upscaling circular solutions across value chains
Strong public-Private cooperation for a sustainable transition (Blue)	1.	New future accountability tax, pricing in all measurable environmental externalities
	2.	Shift in the role of states on public services and use of public funds
	3.	Government fully shift to monitoring/ controlling role for publics services
	4.	Multi actor collaboration supporting new business model
	5.	Tech Neutral regulation + Private R&D investment
	6.	Public-Private Partnerships + Infrastructure + Green entrepreneurship
	7.	Finance and corporates - Blended finance instruments
New models for enabling social mobility (red)	1.	Labour force transitions from traditional to dynamic sectors
	2.	Unskilled non-EU migration is discourage
	3.	Elimination of unskilled and repetitive jobs
	4.	Emergence of private providers of public services
	5.	Emergence of Philanthropy and Civil Society Organizations
	6.	Educational model shift & Upscaling technologies
	7.	↑ Employees as corporate shareholders
Bioeconomy takes centre stage (yellow)	1.	Elimination of subsidies for non- sustainable agriculture
	2.	Food challenge addressed through agriculture optimization
	3.	Material and energy efficiency replaced by circular solutions
	4.	Emergence of agroecology, biotechnologies and urban farming
	5.	Diffusion of High tech solutions for bioeconomy sectors
	6.	Shared vision Corporates & SMES - R&D and Food security
	7.	Waste is a critical resource
	8.	Bioeconomy is the core of the economy
New Business models for reshaping markets (Black)	T1.	Technological paradigm shift and economies of scale
	2.	Strong shift to Green taxation, Standards and market incentives
	3.	Increased market segmentation, diversification
	4.	Increasing adoption of high-tech solutions for service sector
	5.	New business models: high-tech, service and circular economy
	6.	Consolidation of digital tools and global platforms + Service sector
	7.	Emergence of customer made solutions
	8.	Consolidation of B2B economy

Figure 15 Glocal eco-world transition pathway towards EU 2050 - Complete X-Curve representation



Glocal eco-world transition pathway

Democratic Shifts (Black)	1.	Strong member state
	2.	Strong communities, well-being
	3.	Coalition of green and conservative political parties under pressure of events
	4.	Wisdom emerges from misery
	5.	New EU Treaty, new EU competences (e.g. energy, defense). EU regions represented in EU Senate
	6.	New EU identity Nation states keep some important functions in policing, & enforcement of some rule
	7.	National infrastructure degrades and collapses
	8.	Weakened Member States
	9.	LOW IMMIGRATION, BRAIN DRAIN
	10.	Policing is an issue that remains at MS level
	11.	New rules, structures & competition to govern the commons
	12.	Education becomes more decentralised and community based
	13.	Some states fail, functions delegated to communities
	14.	New collective understanding of what is good: new virtues, empathy
	15.	Strong and complex regional institutional systems
	16.	TRUST IN THE COLLECTIVE
	17.	STRONG MEMBER STATES
Economic shifts (Yellow)	1.	Fiscal resources shrink as the economy reduces output
	2.	Global trade, meat consumption reach low points
	3.	Sharing and repair economy slowly emerges
	4.	As MS tax income shrinks, the EU gets more own resources
	5.	The grey economy (legal but unofficial) develops
Community develop (Blue)	1.	Ageing, reduced national public services linked to lower tax receipts
	2.	Immigration in the EU decreases, brain drain increases
	3.	Growth of volunteering for communities
	4.	Food supply becomes increasingly local, people get a higher feeling for sufficiency
	5.	People get a higher sense of purpose, care jobs are better valued
	6.	EU civil service for all young people
	7.	COMMUNITIES are central (energy, education, cooperatives, management of the commons, social services...)
	8.	"Polder model", culture of compromise
Climate shock (Green)	1.	Shocks from megatrends become overwhelming (ageing, supply disruptions, climate chaos...)
	2.	More extreme weather events
Frugal technologies emerge (red)	1.	Loss of EU tech leadership. The EU depends on others for its high technology
	2.	Development of DIY technology/low tech
	3.	New skills and markets needed to serve the needs of local communities, scale up of cooperatives
	4.	Nature-based solutions are mainstreamed, GM crops
	5.	Alternative proteins for food (e.g. insects, lab grown)

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