

A SYSTEM CHANGE COMPASS

IMPLEMENTING THE EUROPEAN GREEN DEAL IN A TIME OF RECOVERY

OCTOBER 2020

Co-authored by

SYSTEMIQ



Funded by

SUN Institute
Environment & Sustainability
Initiated by Deutsche Post Foundation

In collaboration with



“ Climate neutrality by 2050 is our binding commitment to the European people. It is our promise for a fair, resilient and green economy – a promise we must uphold through the successful implementation of the European Green Deal. I am inspired by A System Change Compass and feel confident its unique and practical approach will enable us to deliver the EGD – now. ”

Pascal Canfin, MEP, Chair of the Environment, Public Health and Food Safety committee

“ The European Trade Union Confederation supports the idea of having a System Change Compass to implement the European Green deal in a time of recovery. A green and social recovery has the potential to create new quality jobs while ensuring that we reduce our GHG emissions and remain within the limited resource boundaries of our planet. To achieve a just transition that is fair for all and protect most vulnerable, it will be essential to have strong social foundations as well as an inclusive governance where trade unions, workers and civil society are at the table. ”

Luca Visentini, General Secretary, European Trade Union Confederation

“ This report clearly reaffirms the powerful guidance that the European Green Deal can and is giving to EU policy making and specifically to the economic recovery efforts. It documents a huge range of initiatives and actions that can bring the Green Deal to life and charts a way forward to build on this direction. By bringing together the latest insights and discussions The Club of Rome and SYSTEMIQ have provided a powerful new framework for business and policymakers to consider. ”

Harry Verhaar, Chair, Corporate Leaders Group Europe

“ As we recover from Covid-19, we must build back better and continue to act with ambition and urgency on addressing climate and environmental pressures. This inspiring report recognises the important role the financial sector has to deliver the European Green Deal. Public financial institutions like the European Investment Bank can make a significant contribution to the transition to carbon neutrality and to making our economies greener, climate resilient and more inclusive. Guided by its Climate Bank Roadmap 2021-25, the EIB Group will align its financing activities with the principles and goals of the Paris Agreement by the end of 2020. It will also further develop its financing and advisory offer in order to address green investment gaps – in the EU as well as outside – and to mobilise private capital in support of the objectives of the European Green Deal. ”

Werner Hoyer, President of the European Investment Bank

FOREWORD BY URSULA VON DER LEYEN, PRESIDENT OF THE EUROPEAN COMMISSION

The European Union is undertaking an unprecedented effort: a green and digital transformation. The European Green Deal and the NextGenerationEU recovery and resilience facility will shape the social, economic, and ecological architecture of the continent for decades to come. To use their potential to the fullest and to build the Europe we all want to live in, we must adopt a systemic approach.

We introduced the European Green Deal as Europe's new growth strategy – one that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy that emits zero net emissions of greenhouse gases in 2050 and achieves economic growth decoupled from resource use. Recent extreme weather events and the coronavirus pandemic have exposed the greatest challenges of our time: to keep ourselves and our planet, but also our economy, healthy.

This report provides guidance for a systemic realisation of the European Green Deal by addressing the real drivers of resource use and environmental pressures. It examines what our future industrial landscape could look like and how we may rebuild our economy through future-fit industries. It takes societal needs as a reference point for all economic activities, embraces resource productivity as a source of future competitiveness, and provides a framework for progress on the European Green Deal.

Implementation of the European Green Deal and the coronavirus recovery are two sides of the same coin. Europe has the potential to emerge from the current crisis to become a fairer, more prosperous, more sustainable and more resilient society.

People in Europe are rightly calling for progress on the European Green Deal. The need to act on this challenge is overwhelming and urgent. This report will give us welcome counsel on how best to act.



A handwritten signature in black ink, which appears to read 'Ursula v. d. L.' followed by a stylized flourish.

PREFACE

With the European Green Deal (EGD), the European Commission showed unprecedented leadership for necessary change at a European level. The EGD also sets the ambition for the rest of the world. While that ambition is clear, its implementation remains uncertain.

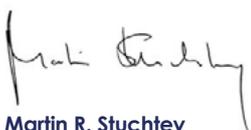
The effects of climate change and the overexploitation of natural capital are well known, and well addressed by the EGD: this report touches on them only briefly. Instead, we focus on the drivers and pressures that lead to these environmental challenges, and on solutions and required changes to the current economic operating model. We examine the system change that the authors see as necessary to deliver the ambitious EGD vision, together with a convincing and consistent answer to the current health-related crisis.

This report does not claim to address all questions related to multiple system changes, such as those arising from global commitments to the Sustainable Development Goals or the Paris climate agreement, yet it still contributes to their implementation. According to the International Resource Panel, trade-offs among various SDGs are unavoidable; the most efficient strategy to mitigate them and resolve the environmental and developmental challenges is through sustainable consumption and production. This report is thus based on a natural resource perspective. The way we treat resources largely determines economic results, as well as environmental and health outcomes. They link the economy and competitiveness on the one hand, and climate change, biodiversity loss, pollution and health impacts on the other. We also acknowledge that the EGD's success depends on other systemic challenges – around essential social, cultural or political changes.

The report is centred on a **System Change Compass**: this describes the transformations required to change the drivers of our socio-economic system. It focuses on economic development as the main driver of increasing natural resource extraction and consumption. Linked to the Compass are 30 necessary policy orientations at the system level. These orientations are not prescriptively detailed; they offer guidance, indicating the direction to follow.

Additionally, we introduce a new system-based logic founded on societal needs – unlike the sectors conventionally used to describe the economy. We outline **8 economic ecosystems**, following the example of ecological ecosystems and functioning within the safe operating space of our planetary boundaries. The economic ecosystems are designed to deliver specific resource-intensive societal needs (healthy food, built environment, intermodal mobility and consumer goods) or to support that delivery (nature-based, energy, circular materials, and information and processing). Each has subsystems: a non-exhaustive list of economic opportunities consistent with the Compass orientations and based on an economy founded on societal needs.

Our actions now will define the future of our society. We must decide whether we accept a future of inequality, exploitation and environmental degradation, or choose a future that ensures human survival and creates well-being and dignity for all. The EGD is a brave call to action, but it is no longer enough to simply act. We must do so quickly, systemically and together. This report aims to achieve exactly that. We hope you will find it inspiring and useful.



Martin R. Stuchtey

Co-Founder and Managing Partner of SYSTEMIQ and Professor for Resource Strategy and Management at Innsbruck University



Sandrine Dixson-Declève

Co-President of The Club of Rome, Chair of Economic and Societal Impact of Research and Innovation (ESIR) expert group, Ambassador of the Energy Transition Commission for Europe



Janez Potočnik

Co-Chair of the International Resource Panel, Member of The Club of Rome, SYSTEMIQ Partner, and former European Commissioner for Science & Research and for the Environment

AUTHORS, CONTRIBUTORS AND ACKNOWLEDGMENTS

This report is co-authored by SYSTEMIQ and The Club of Rome. It has been funded by the SUN Institute Environment & Sustainability and was drafted in collaboration with the MAVA Foundation.

The team that developed this report comprised:

Matthias Ballweg, Christina Bukow, Faustine Delasalle, Sandrine Dixon-Declève, Bertram Kloss, Isabel Lewren, Julia Metzner, Julia Okatz, Milan Petit, Katharina Pollich, Janez Poščnik, Anna Schwarzmann, Martin R. Stuchtey, Adrien Vincent

The authors have benefited from the insight and contributions of the following individuals and institutions. We are thankful for their support, critical feedback and helpful discussions that have improved the report.

From The Club of Rome

- **Maja Göpel** (Author, Director of Research of THE NEW INSTITUTE)
- **Connie Hedegaard** (former European Commissioner for Climate Action, Chair of the KR Foundation)
- **Hunter Lovins** (Author, President of Natural Capitalism Solutions, Co-Founder of the Rocky Mountain Institute)
- **Carlos Álvarez Pereira** (President of the Innaxis Research Institute, Fellow of the World Academy of Art and Science)
- **Ernst Ulrich von Weizsäcker** (Author, founding President of the Wuppertal Institute, former Member of the German Bundestag)
- **Anders Wijkman** (Author, former MEP, Chair of the Governing Board of Climate-KIC)

Further contributors

- **Stephane Arditi** (European Environmental Bureau)
- **Flemming Besenbacher** (Carlsberg Foundation)
- **Patrick Ten Brink** (European Environmental Bureau)
- **Joss Bleriot** (Ellen MacArthur Foundation)
- **Arne Cartridge** (Imagine)
- **Majda Dabaghi** (International Chamber of Commerce)
- **Maria Damanaki** (The Nature Conservancy)
- **John Denton** (International Chamber of Commerce)
- **Kirsten Dunlop** (Climate-KIC)
- **Per-Anders Enkvist** (Material Economics)
- **Per Klevnäs** (Material Economics)
- **Alexandra Kuldorff** (Material Economics)
- **Armin Falk** (briq Institute)
- **Heather Grabbe** (Open Society Foundations)
- **Matthias Kopp** (World Wildlife Fund Deutschland)
- **David McGinty** (PACE)
- **Niklas Niemann** (Volkswagen)
- **Kirstine Rasmussen** (Carlsberg Foundation)
- **Holger Schmid** (MAVA Foundation)
- **Tom Vöge** (International Chamber of Commerce)
- **Jeremy Wates** (European Environmental Bureau)
- **Kate Wolfenden** (Climate-KIC)
- **Klaus Zumwinkel** (SUN Institute)
- **Sacha Goddeke** (Nederlandse Spoorwegen)

Contributors and their respective organisations do not necessarily endorse all findings or recommendations of this report. The authors would also like to thank Zoë Wildsmith from The Content Creation Company for her editorial support and Regency Creative for designing and producing the report. All remaining errors and omissions are the responsibility of the authors.

TABLE OF CONTENTS

Executive summary	1
I. From political programmes towards systems transformation – opportunities from the European Green Deal	15
1) A need for system change	16
2) The European Green Deal and COVID-19 recovery: two sides of the same coin	18
3) Providing a compass to guide the recovery	20
II. European Green Deal: ensuring ambition through system change	22
1) Consistency – adding up the parts	25
2) Effectiveness – matching the challenge	27
a) The drivers of climate change and biodiversity loss	27
b) Social fairness and the just transition	28
3) Acceptability – winning support of citizens and Member States	29
4) Conclusions on the EGD	30
III. A new compass – turning the European Green Deal into an economic and social systems transition	31
1) Redefining prosperity: embracing social fairness for real prosperity	36
2) Redefining natural resource use: prosperity decoupled from natural resource use	37
3) Redefining progress: meeting societal needs as the purpose of a model based on economic ecosystems	40
4) Redefining metrics: performance measurement updated	44
5) Redefining competitiveness: digitalisation and smart prosperity at the heart of European competitiveness	46
6) Redefining incentives: introducing the real value of social and natural capital	48
7) Redefining consumption: from owning to using	51
8) Redefining finance: the facilitator of the transition	53
9) Redefining governance: sharing sovereignty and working together	55
10) Redefining leadership: intergenerational agreement by system change leaders	58
IV. Putting the System Change Compass into action – recovery and beyond	60
1) A framework for optimising the system and applying the System Change Compass	62
2) Activating the European Green Deal: an applied case of the System Change Compass	68
a) System-level orientations	69
b) Discussion of the 8 economic ecosystems	72
V. From ideas to implementation: catalysing action	108
References	112

EXECUTIVE SUMMARY

Earlier than expected, we are confronted with a choice: whether to only treat the symptoms of the existing pandemic or to take this opportunity and also create the paradigm shift necessary to recover and prepare against future shocks.

The European Green Deal provides a timely North Star for a prosperous and sustainable Europe. However, as a political programme that bridges old and new theories of change, it is vulnerable. This report lays out an integrated systems perspective, based on a System Change Compass. It is applied to the European economic system as a whole and to its individual economic building blocks, which deliver societal needs. For this generational project to succeed, and to achieve the desired system change, we must apply the System Change Compass.

Never since the formation of the European Union has there been a better moment for Europe to transform itself on the inside and to lead on the outside. The European Green Deal (EGD) and a European COVID-19 response can – if handled well – address Europe’s climate, biodiversity, pollution, economic, political and health crises, and at the same time strengthen its institutions and reignite popular support for the European project. Efforts that, in their own way, support the EU’s delivery of the UN Sustainable Development Goals (SDGs). However, Europe’s Green Deal and its recovery strategy could equally split into antagonistic, competing strategies – which both fail. Clearly, the first avenue is far more promising. But it is onerous, requiring reconciliation of long-term systemic changes with short-term demands. What will it take for both to succeed? This report aims to provide the answers.

Europe’s history is rich and full of turning points. The ongoing COVID-19 crisis may well be such a turning point. We cannot yet gauge its true impact on societies and economies, but the pandemic leaves us with three inescapable realisations:

First, our global and tightly coupled human-ecological system is failing. After decades of economic growth evaluated against GDP indicators, societal needs are still unmet, economic gains are shared unequally and the social contract is eroding. In parallel, humanity’s impact on the Earth’s natural systems now poses an existential risk to human survival. The double crises of climate change and biodiversity collapse – as predicted by the 1972 report to The Club of Rome “The Limits to Growth” and generations of scientists since – have finally arrived. These crises are compounded by the COVID-19 pandemic, which has further increased the pressure on our public institutions to meet the societal needs of Europe’s citizens and prevent economic collapse. We had singular attempts at changing elements of the system in the past. But these efforts failed to take sufficient account of the relationships between our economic activities, the environmental impacts of human activities and the societal needs of our citizens. Underestimating these relationships threatens the adequacy of our response in the present.

Second, deep transformational change is needed, and we now know that when faced with an emergency, people and societies can make change work. Through the COVID-19 pandemic, we have learned that we can and must work more closely across boundaries for human survival: we can transform our work practices, value chains and community engagement. Transformational change has occurred through a crisis of massive proportions. Now it must be designed for future resilience. Today’s challenges defy conventional policies. A fresh approach is needed.

The European Commission’s EGD and Next Generation EU recovery packages reflect such an approach, at least in their objectives and principles. It is an approach that rebalances resilience and efficiency, addresses the need for green and social foundations across all policy domains,

and suggests new governance structures. Importantly, this approach considers sustainability and the COVID-19 crisis recovery as two sides of the same coin. The EGD sets out a strong and clear ambition of how to transform Europe into a more sustainable, equitable and inclusive economy. It also taps into an important element in the popular mood: opinion polls show how many people realise that the “old normal” was far from perfect and want the experiences of the past months to yield something better.

Third, we recognise that we struggle to bring this transformational vision to life. Business-as-usual proponents criticise the EGD as unaffordable or untimely. And even supporters cannot agree on how to begin such a transformational economic and social change. We can describe the target parameters – net-zero emissions, decoupling economic growth from resource use, leaving no person and no place behind – but we cannot agree on the road to take us there. And, in the meantime, urgency increases and political pressure mounts.

Europe's determination for a green and social recovery through a robust EGD sets the direction for a more sustainable, low-carbon, equitable and inclusive economy. **By treating the EGD and COVID-19 crisis recovery as two sides of the same coin, the European Commission is demonstrating genuine leadership. This report is written at a critical juncture for the EGD's success and, ultimately, for its implementation across European Member States.** Its authors – SYSTEMIQ and The Club of Rome – strive to identify the underlying, system-level changes required for the EGD to succeed in a post-COVID-19 world. At the same time, we offer a holistic plan to enhance the EGD with a systems perspective that multiplies and optimises solutions for change and translates into on-the-ground impact, so that European and global citizens truly understand the benefits of a joined-up social and green economy.



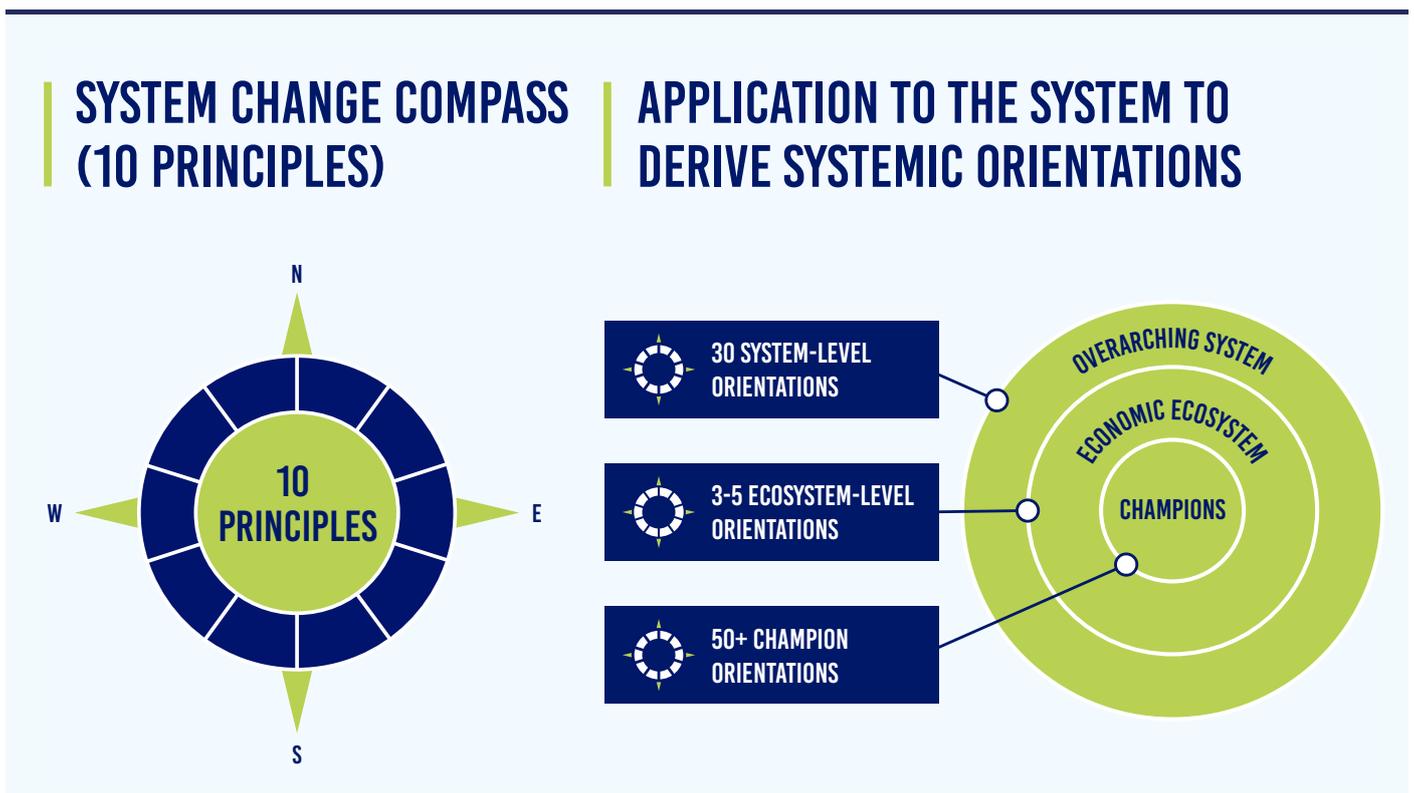
This report:

- adopts a simple and coherent perspective: the excessive use of natural resources is one of the root causes of climate change, biodiversity losses, pollution and negative human health effects. Radical resource decoupling and sustainability provide the answer to many of our environmental, social and health challenges
- offers a systems perspective, from a diverse set of authors working on systems change
- starts from the human drivers for change and the pressure on the Earth's systems, as a way of better understanding core systems breakdown, symptoms and adequate responses
- offers a set of principles that will support the EU in delivering the SDGs and ensure a just transition
- takes natural systems as the starting point for the design of the new wealth-creating economic systems we need. It demonstrates that these should be integrated, interdependent, efficient, resilient and adaptive. Europe's next industrial backbone should mirror naturally regenerative ecological systems, rather than resource-depleting systems. Much like these ecological systems, what we call new economic ecosystems will meet the societal needs of their respective constituents, while being regenerative and not exploitative

To achieve this system-level change, this report puts forward a System Change Compass. This addresses three fundamental barriers to a rapid rollout of the EGD. These barriers are the lack of:

1. shared policy orientations at the overall system level
2. systemic orientations for each individual economic ecosystem that delivers societal needs
3. a shared target picture and roadmap for Europe's next industrial backbone and Champions

TRANSLATING THE SYSTEM CHANGE COMPASS TO SYSTEMIC ORIENTATIONS



““ Applying the System Change Compass will address the drivers and pressures of our economic system and ensure that the EGD’s vision is not derailed. ””

The System Change Compass: the EGD is built on explicit and implicit assumptions. We identify 10 principles that need to be debated and eventually agreed among the actors. Some of the principles – such as political target metrics, producer obligations or resource market design – depart fundamentally from the way our economic system currently works. Applying the System Change Compass will address the drivers and pressures of our economic system and ensure that the EGD’s vision is not derailed.

The 10 principles are not ranked – they are intended to be of equal weight and importance. All mutually reinforce each other. Together, they will support the vision of the EGD and help in the realisation of the SDGs.

Applying the System Change Compass to the system gives us:

- **30 system-level political orientations for the overarching system.** The reset of foundational premises can be translated into policy orientations and instruments. We identify 30 such policy orientations in the overarching system. These orientations serve as a checklist for policymakers in charge of activating the EGD and as a guide on how to tackle challenges that have so far gone unaddressed.
- **8 ecosystems and 3–5 ecosystem-level orientations for Europe’s future industrial backbone.** We identify 8 pivotal “economic ecosystems” that will provide Europe’s productive core and be the long-term successors to today’s industrial base. For each of the economic ecosystems, we identify a set of 3–5 ecosystem-level orientations to guide policymaking and prioritisation of COVID-19 recovery funds.
- **50+ champion orientations that form a view of industrial priorities:** Europe’s future will not be dominated by today’s corporations and industries but by tomorrow’s economic systems and their respective emerging “champions”. The 50+ champion orientations are a first attempt at sketching Europe’s exciting future industrial landscape. They represent specific, investable opportunities to create jobs and build a more sustainable future through COVID-19 recovery funds.

Orientations are so-called because they set the direction that needs to be taken. They are not prescriptive, nor do they suggest a “central planner” approach. At the Champion level, orientations guide the way economic development should proceed to build the industrial backbone of a sustainable and resilient European economy in the 21st century.



A NEW SYSTEM CHANGE COMPASS

As the global and European context shifts rapidly, long-held beliefs require review. The EGD is a bridge into a new world and offers a new theory of change, though admittedly with pillars still resting in the old world. To make the EGD successful and to deliver the SDGs, 10 system conditions need to be addressed and redefined. These equally important principles for a System Change Compass provide intellectual guidance on how to transition towards a more sustainable, resilient and equitable model fostering a greater balance between people–planet–prosperity while underpinning a new type of value-driven growth.



SYSTEM CHANGE COMPASS



FROM...	...TO
01 REDEFINING PROSPERITY: Prosperity defined by aggregate economic growth	Prosperity defined by fair and social economic development
02 REDEFINING NATURAL RESOURCE USE: Prosperity based on natural resource consumption	Prosperity decoupled from resource consumption through efficiency, sufficiency and a shift to responsible use of natural resources
03 REDEFINING PROGRESS: Growing economic activities and sectors	Focusing on societal needs that need to be fulfilled without transgressing planetary boundaries
04 REDEFINING METRICS: Decisions driven by optimising for GDP growth	Decisions driven by holistic metrics including natural capital and social indicators
05 REDEFINING COMPETITIVENESS: Massive dependency of Europe on imports of natural resources	A resilient Europe based on low-carbon products, services and digital optimisation
06 REDEFINING INCENTIVES: Incentives supporting the status quo	Incentives aligned with Green Deal ambitions and economic ecosystems
07 REDEFINING CONSUMPTION: Owning products as part of individual identity	Experiencing and using products and services as part of individual, shared and collective identity
08 REDEFINING FINANCE: Subsidising and investing in "old" industries	Supporting and facilitating economic ecosystems
09 REDEFINING GOVERNANCE: Top-down, static, slow normative policy processes	Transparent, flexible, inclusive, participatory models of governance influenced by science
10 REDEFINING LEADERSHIP: Traditional leadership roles and expectations	System leadership based on an intergenerational agreement

30 SYSTEM-LEVEL POLICY ORIENTATIONS FOR THE OVERARCHING SYSTEM

When applied to the overarching system, the 10 principles of the System Change Compass translate into 30 system-level policy orientations for rule-makers. These orientations are guidelines to enable policymakers to shape economic activities in a way that ensures they stay within our planetary boundaries.

COMPASS PRINCIPLES	SYSTEM-LEVEL ORIENTATIONS
<p>01 REDEFINING PROSPERITY: EMBRACING SOCIAL FAIRNESS FOR REAL PROSPERITY</p>	<ul style="list-style-type: none"> ① Balance policy attention from income and wealth creation to income and wealth distribution, and ensure that economic transition contributes to equality and social fairness by guaranteeing universal basic services and minimum levels of income ② Create conditions for social acceptance of the transition by: enhancing reskilling and educational programmes; introducing a funding mechanism to support transition; supporting lower- and middle-income groups to help absorb the costs introduced by all economic ecosystems ③ Replace part of the income-based taxes with resource-based taxes to address resource as well as social policy targets
<p>02 REDEFINING NATURAL RESOURCE USE: PROSPERITY DECOUPLED FROM NATURAL RESOURCE USE</p>	<ul style="list-style-type: none"> ① Complement energy and GHG-related targets by introducing science-based resource use (absolute) decoupling targets following sufficiency principles ② Assess all policy proposals by dematerialisation and energy-efficient decarbonisation impacts ③ Align current legal and financial systems with circular and carbon-free principles; support the necessary infrastructure and research to contribute to achieving a carbon-free circular transition
<p>03 REDEFINING PROGRESS: MEETING SOCIETAL NEEDS AS THE PURPOSE OF A MODEL BASED ON ECONOMIC ECOSYSTEMS</p>	<ul style="list-style-type: none"> ① Ensure that societal needs are met inside a safe operating space and respecting planetary boundaries; set this as a primary goal for all European institutions and national governments ② Replace short-term-based governance – driving public, private and financial policy decisions – with a longer-term strategic approach and incentives ③ Reorganise European institutions, governments and other governing bodies and promote industrial dialogue to address societal needs, economic ecosystems logic, and other complex challenges; avoid an approach based on individual silos
<p>04 REDEFINING METRICS: PERFORMANCE MEASUREMENT UPDATED</p>	<ul style="list-style-type: none"> ① Replace GDP with a new, comprehensive well-being measure that also integrates social and environmental needs, accompanied by a set of additional indicators ② Introduce natural capital accounting ③ Standardise company and investor reporting with a decoupling lens against indicators of societal needs, pollution and emissions related to production
<p>05 REDEFINING COMPETITIVENESS: DIGITALISATION AND SMART PROSPERITY AT THE HEART OF EUROPEAN COMPETITIVENESS</p>	<ul style="list-style-type: none"> ① Build EU competitiveness based on resource, including energy and productivity; use digitalisation and spatial planning to optimise competitiveness ② Support the development and deployment of new digital services-based or other resource- and energy-reducing models ③ Support solutions that will strengthen resilience and strategic autonomy of the European economy, provide new local jobs and enhance education and job (re-training) programmes

COMPASS PRINCIPLES

SYSTEM-LEVEL ORIENTATIONS

06 REDEFINING INCENTIVES: INTRODUCING THE REAL VALUE OF SOCIAL AND NATURAL CAPITAL

- ① Follow the policy principles in all economic ecosystems, which would reflect and include all costs, like carbon pricing or resource taxes, related to environmental and health impacts (so-called "externalities")
- ② Reduce, without further delay, all harmful and unsustainable subsidies supporting extraction, consumption and disposal of natural resources; strengthen producer liability and use freed-up funding to support activities reducing natural resource use, especially in hard-to-abate sectors
- ③ Prioritise investments in "rebooting" nature and update environmental standards to take into consideration systemic interactions between climate–biodiversity–health, to ensure greater resilience to future shocks

07 REDEFINING CONSUMPTION: FROM OWNING TO USING

- ① Educate consumers and provide them with information, such as product passports, to empower them for informed choices
- ② Explore the opportunities offered by a less ownership-biased younger generation and provide consumers with alternative options to meet their needs
- ③ Support transition of governance, legal and financial systems to enable producer ownership business models

08 REDEFINING FINANCE: THE FACILITATOR OF THE TRANSITION

- ① Ensure financial accounting and risk assessment fully disclose climate, nature and diversity impact indicators of investment portfolios
- ② Orientate all public investments to catalyse system change, along the lines of compass orientations and economic ecosystems while considering immediate "symptomatic" action needs
- ③ Support and de-risk private investment and expand blended financing in emerging economic ecosystems and their respective champions

09 REDEFINING GOVERNANCE: SHARING SOVEREIGNTY AND WORKING TOGETHER

- ① Support inclusive, informed, fair and participatory governance systems, ensuring that all relevant stakeholders have voice, agree and share the ownership of necessary system change
- ② Explore the establishment of an international resource management convention and ensure better inclusion of resource management in all existing international agreements
- ③ Lead the implementation of more innovative, deliberative formats for policymaking, especially at supranational level; provide development funds to promote decoupling globally through co-creating or fostering new projects and programmes that are "bottom-up", and enhance governance models to support those implementing them

10 REDEFINING LEADERSHIP: INTERGENERATIONAL AGREEMENT BY SYSTEM CHANGE LEADERS

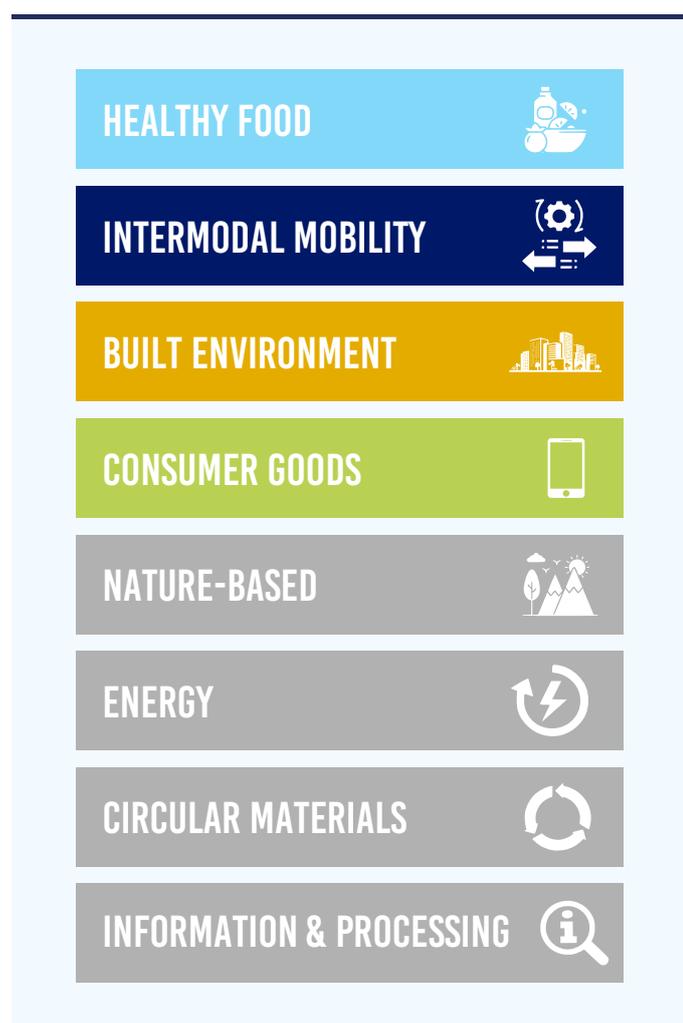
- ① Build trust through stronger commitment to – and rules on – science-informed policymaking, based on credible knowledge from diverse knowledge systems at all governance levels, and better define how the precautionary principle should be used in practice to strengthen resilience and build preparedness
- ② Empower and support system change leaders at all levels to drive the change: from private to public, local to global, ensuring equality and diversity of leadership
- ③ Ensure that the rights of future generations are considered in policymaking and their voices are better heard and included in decision-making debates

8 ECONOMIC ECOSYSTEMS TO MEET SOCIETAL NEEDS

To achieve the objectives of the EGD, the economy needs to fulfil societal needs, while not transgressing planetary boundaries. **This report focuses on four societal needs: nutrition, housing, mobility and daily functional needs met through consumer goods (such as hygiene, clothing or communication equipment).** We focus on these societal needs because they have the biggest impact on our resource consumption in Europe and are closest to the areas addressed through the EGD. We recognise that there are many other societal needs, including education, health, political voice and quality. We invite further efforts to systematically address these areas both in the context of the EGD and outside the European Union.

Meeting societal needs while not overstepping our planetary boundaries is the key system challenge that the EGD needs to address. To do this, the current organisational model must move from being focused on economic activities to being organised around economic ecosystems that are holistic in scope and demonstrate a direct link to natural capital and our respect for the planetary boundaries. The core idea is simple: **people don't need products and services; they need their societal needs to be met. So, for example, they don't need cars, but mobility; they don't need refrigerators, but fresh and healthy food; they don't need house ownership, but high-quality, affordable and safe living space.**

8 ECONOMIC ECOSYSTEMS



To meet these societal needs, we identify 8 economic ecosystems. Four of these directly meet a specific societal need (the healthy food, built environment, intermodal mobility, and consumer goods ecosystems). Four additional economic ecosystems support the first four ecosystems in their delivery of societal needs. These supporting economic ecosystems are the energy, nature-based, circular materials, and information and processing ecosystems.

Just as natural ecosystems are intertwined, so are economic ecosystems. They overlap and interact through various feedback loops; they are interdependent. **Structuring an economy along the lines of these economic ecosystems allows policymakers a clearer view of the connection between these systems.** This in turn enables policymakers to identify the trade-offs required to meet both societal needs and planetary boundaries, in order to enact the necessary policy and financial interventions.

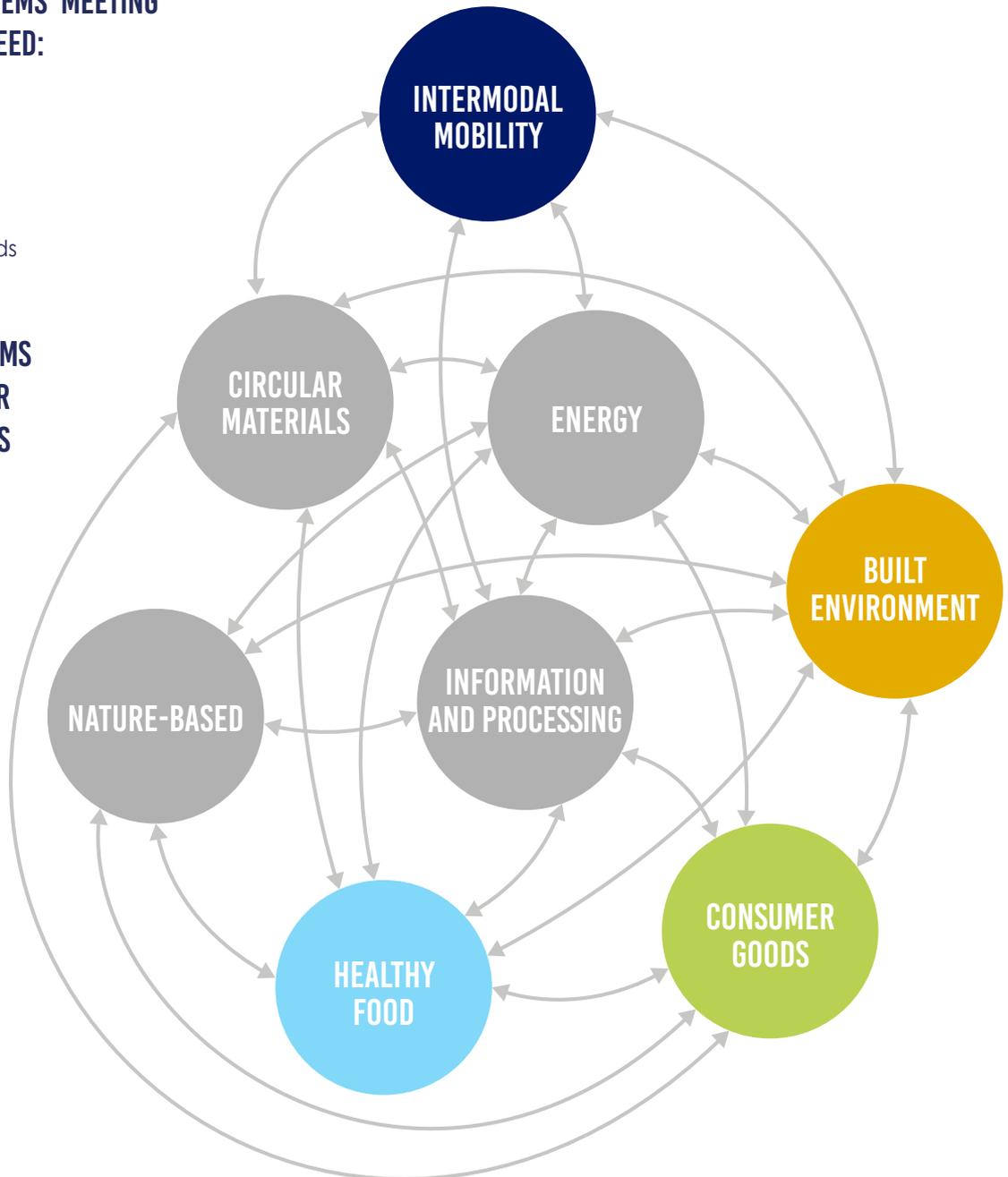
HELPING THE EGD MEET SOCIETAL NEEDS THROUGH 8 ECONOMIC ECOSYSTEMS

4 ECONOMIC ECOSYSTEMS MEETING A SPECIFIC SOCIETAL NEED:

- Nutrition
- Mobility
- Housing
- Daily functional needs

4 ECONOMIC ECOSYSTEMS SUPPORTING THE OTHER ECONOMIC ECOSYSTEMS IN THEIR DELIVERY OF SOCIETAL NEEDS:

- Nature-based
- Energy
- Circular materials
- Information and processing



“ Just as natural ecosystems are intertwined, so are economic ecosystems. They overlap and interact through various feedback loops; they are interdependent. ”

50+ CHAMPION ORIENTATIONS

Within each economic ecosystem, we identified a first map of Champion orientations. They form a view of industrial priorities and – if developed – can transform into interconnected Champion industries or simply “Champions”. They would become the **growth engines of the 21st-century economy that also enable the green, resilient and fair post-COVID-19 economy that Europe wants to build**. These Champions can contribute to fulfilling essential societal needs, have significant economic size and/or growth potential, contribute to the ambitious climate change agenda of the EGD, and have the capacity to support decent and lasting job creation that contributes to the reduction of inequalities. They also offer discrete investable opportunities to direct COVID-19 recovery funds at a European or national level.

This list of Champion orientations should not be regarded as a prescriptive group of economic winners. The actual economic activity – the businesses and entrepreneurs that make up those Champions – might develop differently,

depending on the particular challenges and needs that will develop over time. What unites the Champion orientations is their organising principle around the 8 economic ecosystems and the Champions’ ability to future-proof the EU’s economic development in line with environmental limitations.

Champion orientations do not advocate for the systematic merger and consolidation of players into national or supranational monopolies. Rather, they are **teconomic sub-ecosystems for which Europe should aim to build a cutting-edge know-how, a sizeable market and infrastructure, and an international competitive advantage to enable new business models and to scale solutions**. Post-COVID-19 stimulus money and future research and innovation funding at a national and European level should be invested into these Champions to create the future economic and resilience backbone of the European economy, in harmony with planetary boundaries.



HEALTHY FOOD



- Organic food and beverages
- Regenerative agriculture
- Sustainable aquaculture and fishing
- Reduce and valorise food waste
- Urban agriculture
- Product reformulation for nutritious food
- Alternative proteins

CONSUMER GOODS



- Product-as-a-Service models
- Maintenance and value retention in products
- Peer-to-peer product sharing platforms

CIRCULAR MATERIALS



- Localised and distributed value chain systems
- Asset recovery systems and reverse logistics
- Markets for secondary materials
- High-value material recycling
- Materials-as-a-Service models
- New materials and high-performing substitutes
- Additive manufacturing

BUILT ENVIRONMENT



- Smart urban planning
- Rethink built environment ownership
- Repurpose underused buildings
- Retrofit existing buildings
- Fluid and sufficiency-oriented space management
- Circular and net-zero housing

NATURE-BASED



- Restoration of degraded land and coasts
- Urban greening
- Systems for paid ecosystem services
- Seaweed
- Marine and land-based environmental protection areas
- Ecotourism
- Smart forest management

INFORMATION & PROCESSING



- Distributed manufacturing
- High-speed digital infrastructure
- Digital material information and tracking systems
- Data generation, processing and protection
- Artificial intelligence for societal challenges

INTERMODAL MOBILITY



- Fast charging infrastructure
- High-speed railway infrastructure
- Modern and adapted transit infrastructure
- Car- and ride-sharing models
- End-of-life management for vehicles
- Electric and autonomous vehicles
- Infrastructure to improve traffic flow and AV adoption
- Green aviation
- Green shipping
- Walking/cycling infrastructure

ENERGY



- Renewable power generation
- Energy storage
- Hydrogen economy
- Smart metering and (point-of use) energy management
- Grid integration and technologies
- Production of low-carbon gaseous and liquid fuels (*transition technology only*)
- Carbon capture infrastructure (*transition technology only*)

LEVERAGING GREEN RECOVERY TO ACCELERATE THE TRANSITIONS: TWO SIDES OF THE SAME COIN

Implementing the EGD and its related implementation documents – while addressing the most urgent economy recovery needs – is the best way to deliver Europe's future prosperity. To provide an effective recovery process it is crucial to strategically strengthen Europe's preparedness and resilience – and to position the global and European economy alongside true societal needs while respecting the safe operating space of planetary boundaries.

This report offers a comprehensive System Change Compass and sets of orientations for each level of the system required to deliver the ambition presented to our generation by the EGD.

The need to act on this challenge is overwhelming and urgent. This report maps out how it can be done.



I. FROM POLITICAL PROGRAMMES TOWARDS SYSTEMS TRANSFORMATION OPPORTUNITIES FROM THE EUROPEAN GREEN DEAL



1) A NEED FOR SYSTEM CHANGE

“ As the global recovery picks up, global warming will not slow down. First-mover advantage will count double and finding the right projects to invest in will be key. A more modern and circular economy will make us less dependent and boost our resilience. This is the lesson we need to learn from this crisis. ”

President of the European Commission Ursula von der Leyen¹

Never since the formation of the European Union has there been a better moment for Europe to transform itself on the inside and to lead on the outside. The European Green Deal (EGD) and a European COVID-19 response can – if handled well – address Europe’s climate, biodiversity, pollution, economic, political and health crises, and at the same time strengthen its institutions and reignite popular support for the European project. Efforts that, in their own way, support the EU’s delivery on the UN’s Sustainable Development Goals (SDGs). However, Europe’s Green Deal and its recovery strategy could equally split into antagonistic, competing strategies – which both fail. Clearly, the first avenue is far more promising. But it is onerous, requiring reconciliation of long-term systemic changes with short-term demands. This report aims to identify the prerequisites that need to be created for both the EGD and recovery efforts to succeed. It takes our model of wealth creation as a starting point to describe the challenge and the unique opportunity if success is achieved.

“ The current socio-economic system is the underlying driver of both existing social and ecological challenges. ”

European prosperity has been based on extraction of scarce natural resources and has significantly lifted the living standards of many. But due to the known, predominantly environmental, side effects, this resource intensive growth cannot continue. The failure to equitably distribute economic benefits of these natural resources has furthermore led to widespread social unrest.² Despite Europe’s generally

progressive taxation systems, private wealth is at its highest absolute level ever and poverty is growing.³ Similarly even though the continent has almost blanket universal health coverage, large inequalities exist, with almost a third of the lowest income quintile’s medical needs unmet in some countries, compared to 1% for the highest earners.⁴ COVID-19 and climate change have made painfully clear how vulnerable our current economic system is to external shocks.⁵ And just as with healthcare and extreme weather events overall, it is the most vulnerable that bear the brunt.⁶

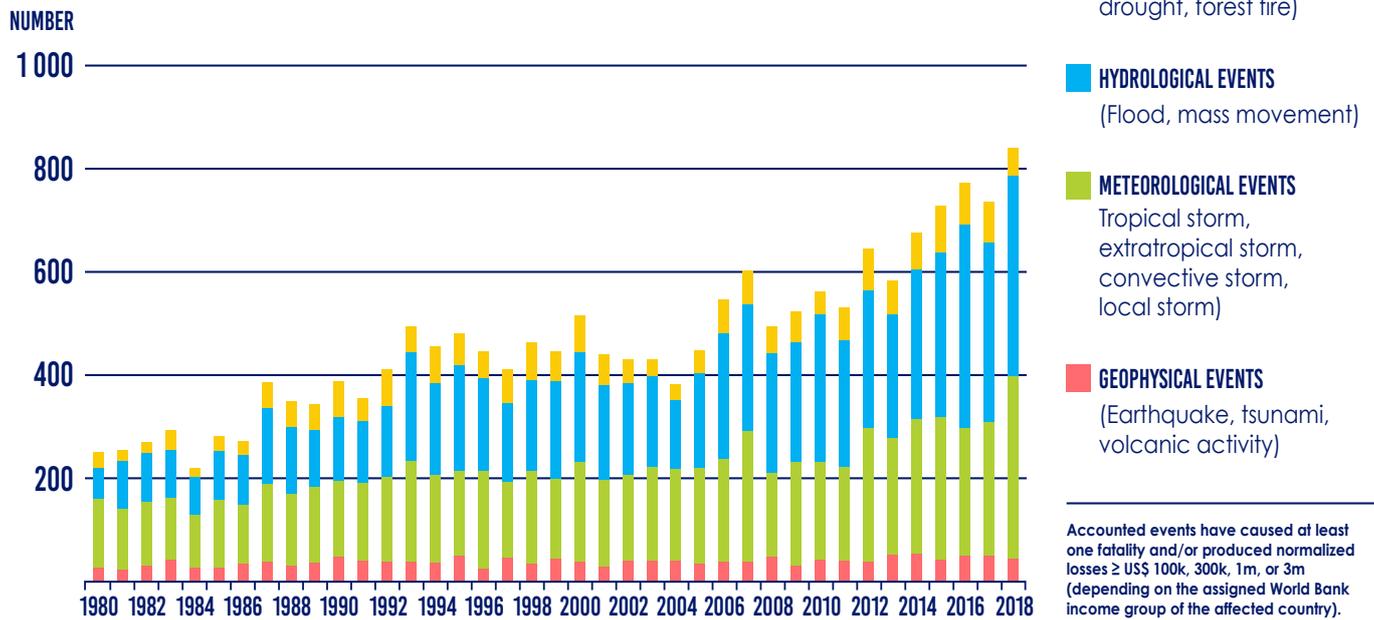
But COVID-19 is only the tip of the iceberg, providing a glimpse of much deeper underlying problems.⁷ As a result of the overexploitation of natural resources, the frequency and intensity of external shocks to our economic system is constantly increasing. As illustrated in Figure I.1, the number of global natural catastrophes (geophysical events such as volcanic activity, meteorological events such as storms,

hydrological events such as floods, and climatological events such as droughts and extreme temperatures) has been increasing steadily over the past 40 years. While the number of global natural catastrophes was at about 250 events in the 1980’s, this number has risen to around 800

annual events in 2018, excluding geophysical events. Many of these catastrophes take place in developing regions, which are poorly equipped to shoulder the economic costs associated with natural catastrophes and are unable to rebuild their communities effectively. The loss of livelihoods exacerbates migratory patterns and creates tensions with receiving countries.

Figure 1.1

NUMBER OF WORLD NATURAL CATASTROPHES, 1980-2018



Source: Munich Re (2019), *Geo Risks Research*⁸

The current socio-economic system is the underlying driver of both existing social and ecological challenges. The Club of Rome and the International Resource Panel (IRP) have shown that the world has moved from being fairly empty, with labour and infrastructure being the main limiting factors to human well-being, to a full world, where assaults on natural systems are compounding the limits to well-being.⁹

The biggest challenge is that the current systems do not account for the negative effects that extraction, use, and disposal of natural resources have on human well-being. Economic growth is prioritised at the expense of all else; other indicators of well-being, such as health, education and a clean environment, are undervalued or not valued at all.

To build an economic model that can sustainably increase well-being it is essential to decouple economic activity from the negative effects of resource use and recouple humanity's existence with natural ecosystems. Only those resources should be used that are needed to fulfil our most important societal needs while respecting the planetary boundaries. The aim is to bring economic systems into line with natural systems and to integrate them closely.

Doing this requires nothing less than a transformation of the fundamentals of our current socio-economic system. By taking a systems-based approach that identifies the drivers and pressures of our current system – instead of merely remedying the symptoms – intervention points can be derived that will set up the European economy to focus again on well-being and delivering societal needs within planetary boundaries. It enables the decoupling of economic activity from negative environmental effects and recouples human activity with the natural environment.¹⁰

The potential benefits of such an approach could equal the challenges society currently faces. Not only will it be able to avoid or mitigate the worst impacts of climate change and biodiversity loss, it will also be able to positively contribute to many of social problems that Europe faces. By tackling both the ecological, social and health crises together, the EU, its Member States and its local governments can turn the European Green Deal into an economic and social systems transformation, renew intergenerational social contracts, and demonstrate international leadership on how to build a sustainable economic model that works for its citizens.

2) THE EUROPEAN GREEN DEAL AND COVID-19 RECOVERY: TWO SIDES OF THE SAME COIN

The European Commission has clearly identified the need to tie together recovery funding with the European Green Deal and has shown true leadership in this regard. The success of this courageous plan will be fundamental for changing global trends, while also assuring Europe's resource-efficient, low-carbon and social prosperity. Europe needs to build a more resilient economic system anchored in strong social and environmental ecosystems. The EGD and the post-COVID-19 crisis recovery are two sides of the same coin for the following five reasons:

1. The EGD documents offers the most effective policy to reinvigorate the EU's competitiveness, improves its resilience and creates quality jobs by focussing on increasing well-being

By committing to no net GHGs emissions by mid-century and to decoupling natural resource use from growth the EU has embarked on a promising path to reduce its import-dependency of critical raw materials and energy sources. This does not only improve competitiveness but there are also other economic and social benefits to decarbonisation and to better protection of biodiversity and natural capital. Meeting the energy needs of the world with renewable energy is cleaner and creates more jobs than the current fossil-based system.¹¹ Feeding the world with regenerative agriculture also creates more jobs, increases rural prosperity and optimises land use for carbon storage.¹² Finally, implementing a circular economy, which focuses on retaining the value and utility of manufactured goods for as long as possible, also creates more jobs than the status quo, cuts emissions and reduces the need for material extraction.¹³ Coupling this with a reduction in consumption and a concerted policy of ensuring healthy lives and livelihoods, made more urgent by the current pandemic, would enable a more resilient Europe and greater well-being for all Europeans.

2. The European COVID-19 response and EGD have provided important impetus to rebalance global supply chains towards more resilient and climate-friendly constellations

President Macron, for example, pointed out that COVID-19 "will change the nature of globalisation, with which we have lived for the past 40 years" and Internal Market Commissioner Thierry Breton added that we "need to save all companies, so a radical paradigm shift in our approach will be necessary."¹⁴ The EGD proposal for low-carbon, circular industrial production will add to this development and strengthen domestic activities in remanufacturing, recycling or product-service systems. While global trade will continue to play a critical role, value chain rebalancing is on the way.

“ The EGD is needed to ensure that the depletion of natural capital does not further indebt future generations. ”

3. Both the EGD and post-COVID-19 recovery call for inter-generational solidarity and agreement.

The EGD is needed to ensure that the depletion of natural capital does not further indebt future generations. Solving the economic effects of the pandemic will require public money and additional indebtedness, which will also fall on the shoulders of the younger generation. Profits are privatised, while costs are socialised.

Through the climate youth strikes the youth have rightly called for a response to the climate emergency and a radical shift in decision-making that takes into consideration future generations. In meeting the COVID-19 crisis, the younger generation has shown solidarity with the older generation. Now, they cannot be left with all the debts – financial and environmental – without providing them with a promise of and a solution for a better world. A new intergenerational agreement is needed, with a clear promise of a more sustainable and resilient world. This agreement can only be built on the UN SDGs as a minimum and the promise of an ambitious EGD.

4. Both COVID-19 and climate-related challenges require a new approach to governance, particularly at the global level.

COVID-19 has affected all societies. It has demonstrated that a better approach is needed globally and within the EU to address global challenges. To address such challenges efficiently, it is necessary to join forces and cooperate. This calls for more sharing of sovereignty and more meaningful partnerships, some of which is already visible in the Paris Climate Agreement. Due to the increased complexity in international relationships and the predicted growth in converging economic shocks from health pandemics, climate change and biodiversity loss, increased cooperation and better coordination needs to become the norm and not an exception.

The EGD can be enhanced to guide Europe into a positive and accelerating spiral with Marshall Plan-like benefits. It will enable a stronger internal market, social innovation, climate neutrality and cohesion; and it will strengthen the EU's unified leadership vision.

5. COVID-19 could provide the missing political urgency for the EGD and climate-related financial efforts

COVID-19 and the financial consequences of the economic lockdown have been dire, and yet have made it even more apparent how the global political response to global warming has been inadequate. The amount of financial support deployed or promised to the COVID-19 recovery is vast compared with any efforts related to the greening of the economy, tackling global warming, or stopping ecosystem decline. If this financial support is used in an EGD-consistent way, it could provide an important element of urgency that has been missing in fighting global warming and its related environmental and health challenges.

While the ship is sailing through turbulent waters amidst the COVID-19 crisis, the main priority must be to ensure that the EU and its global neighbours do not sink. The first important step to avert a collision course was the EUR 1.8 trillion of EU funding offered to tackle the effects of this crisis.¹⁵ But this is not enough. Without a clear compass steering the continent in the direction of a strong EGD, the ship will not be prepared nor resilient to the expected turbulence from social, ecological and health shocks.

“ Without a clear compass steering the continent in the direction of a strong EGD, the ship will not be prepared nor resilient to the expected turbulence from social, ecological and health shocks. ”

3) PROVIDING A COMPASS TO GUIDE THE RECOVERY

This report offers a System Change Compass that aims to support the EGD's implementation in the context of the COVID-19 crisis by charting the course to recovery. When stress-testing the current EGD documents against the strong overall EGD ambitions, the EGD still falls short of the adequate impact levels. In its current form (and acknowledging that much still needs to be fully translated into specific directives and other policy measures), it does not sufficiently catalyse transformative change towards a society that decouples prosperity from the use of natural resources and carbon intensive practices.

The DPSIR system-based approach from the UNEP IRP (see "Key concept: Drivers-Pressures-State-Impact-Response (DPSIR) framework")¹⁶ is used in this report to sketch out a compass that can assist policymakers in how to implement the EGD together with the COVID-19 recovery measures. By focusing on the drivers and pressures of current social and ecological challenges, the System Change Compass provides a set of 10 overarching principles. Applying the compass at the full system level, we derive 30 policy orientations to guide decision-making in line with planetary boundaries. We also presents a new economic model that is based on meeting societal needs and consisting of 8 economic ecosystems. Applying the compass to these economic ecosystem yields 3-5 ecosystem-specific orientations. Finally, and to accelerate the recovery to a Europe that is both prosperous and socially fair, the report identifies 50+ Champion orientations that represent distinct investment opportunities and are the potential seedlings of the future European industrial backbone in line with sustainable development. This report is therefore structured as follows:

Chapter II stress-tests the EGD documents released so far, based on testing consistency, effectiveness and acceptability to identify the points for improvement and ways of implementation to meet the social and ecological challenges of the EU.

Chapter III looks at drivers and pressures of the social and ecological challenges, sketching a compass of the necessary system-change transformations that can transform the current socio-economic system. While the report does not specifically address the point of demographics, the authors recognise its importance to economic development and in particular the tensions posed by a growing ageing population in Europe. This report will, however, concentrate on economic development, as it is the major driver of the growth of European (and global) natural resource extraction and consumption – and disposal.¹⁷

Chapter IV applies the 10 principles of the System Change Compass to each level of the system to derive a set of orientations and responses.

Together, these chapters put forward a system-level perspective that identifies the required interventions necessary for the EGD to succeed in a COVID-19 world. They offer an overview of our current political, social and physical context in 2020 and stress-test this against the EGD.

“ When stress-testing the current EGD documents against the strong overall EGD ambitions, the EGD still falls short of the adequate impact levels. ”

KEY CONCEPT: DRIVERS-PRESSURES-STATE-IMPACT-RESPONSE (DPSIR) FRAMEWORK

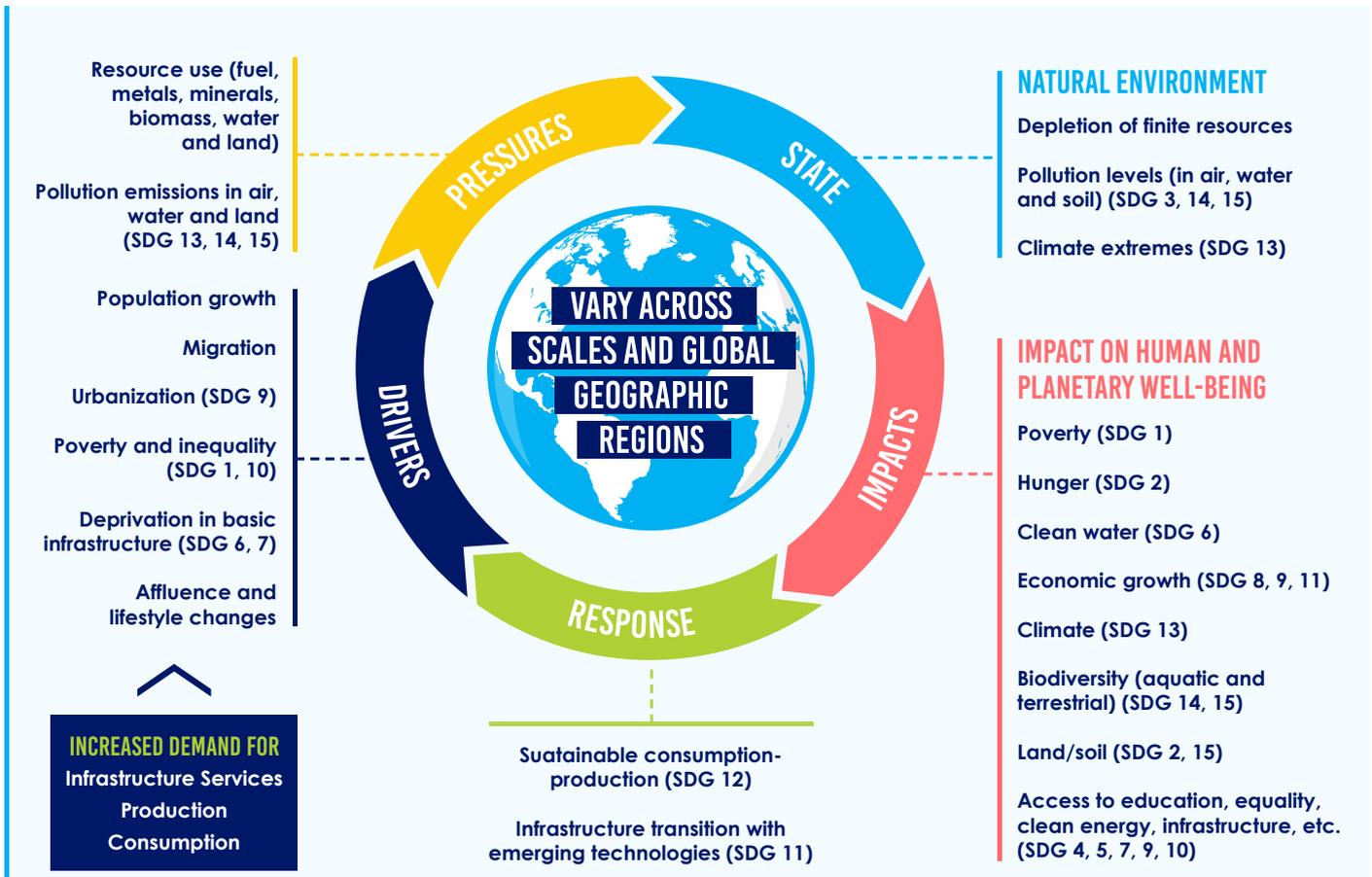
The DPSIR framework describes the interactions between society and the environment. It proposes causal links and feedback loops between the interdependent components. **Drivers**, or driving forces, are areas of public life whose processes exert **pressure** on the environment (e.g. industry or private consumption) resulting in pressures with environmental impact (e.g. emissions to air, water or soil). The **state** describes the condition of an environmental space exposed to the pressures (e.g. air, water or soil quality) while **impacts** refer to the specific effect of the pressures (e.g. greenhouse effect or soil acidification). These impacts trigger societal **responses** (e.g. specific target settings or an improvement in production processes).

Thus, the DPSIR framework can be applied to analyse how natural resources extraction, use, and disposal are the root cause of the ecological and social crises described above. It also shows how the socio-economic system is the driver of natural resource extraction, use and disposal, as well as that the right societal, political and economic responses can tackle these crises when applied systematically.

Figure 1.2

DPSIR FRAMEWORK AND THE SDGS

Socioeconomic **drivers** from human activities are the first factors in the chain of causal links. These drivers cause **pressures** on the environment, which in turn affect the **state** of the environment. The changing state of the environment can be seen through environmental and human **impacts**. A **response** is needed that can influence the key drivers and enable positive changes throughout the entire system through a continuous process.



Source: International Resource Panel (2019), *Global Resources Outlook*¹⁸

II. EUROPEAN GREEN DEAL: ENSURING AMBITION THROUGH SYSTEM CHANGE



The EGD is even more relevant today in a COVID recovery world than when it was initially proposed. It is a strategy that builds social and environmental resilience. It is a package of political intent underpinning the necessary deep transformation of the transformation of Europe's "economy and society so as to put it on a more sustainable path".¹⁹ It is also an "integral part of this Commission's strategy to implement the UN's 2030 Agenda and the sustainable development goals".²⁰ In short, the ambition of the EGD is nothing less than system change.

“ The EGD Communication marked an important strategic shift, away from the widely accepted narrative that all that counts is economic growth and jobs. ”

In order to support this goal, this chapter stress-tests the existing EGD documents to assess their system change potential. Based on these tests it becomes clear that while the EGD is a great leap in the right direction, a system approach is lacking. Chapters III and IV address this gap by providing a System Change Compass for the implementation of the EGD.

To support the goals of net-carbon zero and relative decoupling, the EGD Communication proposes a reductions target for 2030 of at least 50% moving towards 55% compared with 1990 levels.²¹ It describes a sectoral approach and expected decarbonisation pathways for key economic activities such as hard-to-abate sectors.²² It aims to trigger a wave of renovation for public and private

buildings to tackle the twin challenges of energy efficiency and affordability.²³ It identifies a substantial reduction in transport emissions.²⁴ It promises to use the food system to protect biodiversity, increase healthy diets, tackle global warming, and preserve and restore ecosystems. And it aims to create a pollution-free environment.²⁵ Green finance, innovation and education are complemented by an environmental pledge to "do no harm" in supporting this transition.²⁶

With these targets the European Commission is showing unprecedented leadership and intent for system change on a European level. . When defined in more detail, the policy directives will also set the ambition for the wider world. The EGD Communication marked an important strategic shift, away from the widely

accepted narrative that all that counts is economic growth and jobs. In its place, it presents a "growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use".²⁷ This ambitious political contract intends to put strong social and environmental policy at the centre of a thriving Europe. If properly implemented, it offers the necessary response to Europe's crises and challenges and creates the transformational systems change needed for resilience to future shocks.

While many of the detailed roadmaps, action plans and legislation still to come will determine the success of the implementation, an initial assessment can already be made based on the existing documents. Stress-testing will identify areas of improvement. This consists of three tests:

1. A consistency test, evaluating if and how the various strategies are interlinked – providing a systems view on the working level.
2. An effectiveness test, reviewing how the documents address three core objectives: climate neutrality, circularity and social progress (including quality jobs and improving equality and cohesion).
3. An acceptability test, focusing on the support to transition employment out of critical industries, and the impact of the suggested measures in terms of stranded assets, social balance and short-term (un) employment.

This process was applied to the following EGD documents:

- European Green Deal Communication
- Sustainable Europe Investment Plan & European Green Deal Investment Plan
- A New Industrial Strategy for Europe
- Annual Sustainable Growth Strategy 2020
- European Climate Law
- Circular Economy Action Plan (CEAP)
- Shaping Europe's Digital Future
- Farm to Fork Strategy (F2F)
- EU Biodiversity Strategy for 2030
- Multiannual Financial Framework (MFF) and Next Generation EU (NGEU)

Figure II.1

THE 11 ELEMENTS OF THE EGD



Source: European Commission (2019), *The European Green Deal | Communication*²⁸

1) CONSISTENCY – ADDING UP THE PARTS

The EGD can only be successfully implemented if all its recommendations are consistent and linked up. This means that the various implementation documents clearly refer to each other, not only by identifying the areas where they can mutually support each other, but also address the potential trade-offs that need to be made. The European Commission clearly realises this. However, based on our analysis, it has so far not managed to fully break down the silos: to be truly effective, the EGD documents still need more consistency and coherence.

The Commission itself understands this need: the narrative and key policy packages and recommendations should be “strongly interlinked and mutually reinforcing”.²⁹ Specifically, it advises that each strategy should state its intended impacts. Consequently, other strategies from other Directorate Generals (DGs) or working groups must be identified and aligned to ensure an integrated and systemic approach to the stated aim.

“ Nevertheless, most documents seem to operate within the relative silos in which they were written. ”

Nevertheless, most documents seem to operate within the relative silos in which they were written. Take land use: many strategies in the EGD documents explicitly or implicitly require land. The climate strategy requires carbon sinks such as forests; the biodiversity strategy aims to increase areas of protected land; the energy strategy needs land for crop-for-fuel production; and the mobility strategy will likely imply land use for new infrastructure. And while the Commission adopted its “not net land take” principle back in 2011, this is not mentioned in, for example, the Farm to Fork Strategy, even though agriculture accounts for 41% of total land use in Europe.³⁰ Across all strategies, it is not even clear whether there is enough land available in Europe to meet all these different demands.

This is exacerbated by the distribution of funding under the Common Agricultural Policy. Instead of subsidising the transformation of land to reflect the goals set out in the EGD, the largest share is still spent on maintaining the

status quo.³¹ Aligning the funding with the EGD goals and identifying the areas where competition exists for land use would already significantly improve consistency.

Another example of a lack of consistency is seen in the materials system. The CEAP comprehensively covers the relevant topics, but it stops short of stating the causes of the existing wasteful linear system, or the economic incentives behind it. Structured into product- and sector-oriented chapters, it misses the greater potential of a wider shift: to decoupling through dematerialisation of products and services, combined with overall demand reduction. Furthermore, the distinction between material stocks and flows must be made and indicators put in place that can incentivise actors to keep materials in use for longer.

When it comes to the mobility system, scientists are clear that changing private vehicle use is the key to cutting GHG emissions and reducing its other environmental impacts.³² But the EGD and the CEAP address mobility only from the perspective of batteries and vehicles. The CEAP focuses on its new regulatory framework for batteries and the revised rules on end-of-life vehicles, while no wider

strategy document yet exists, though a comprehensive European Strategy for a Sustainable and Smart Mobility is planned for the future.³³ A systems approach is needed to reduce the impact of air, sea and land transport, and to reduce their growing emissions. The new mobility strategy should consider intermodal mobility solutions for both passenger and freight transport, rather than treating transport modes separately.

In the EGD documents, questions about the built environment system are addressed only in terms of construction and buildings, rather than the wider perspective of space and city management. The central question of better utilisation of space, connected to the question of land use, is not addressed. Further efforts could also be made to detail the priority areas for investment. Large-scale infrastructure investments are required if the built environment is to meet the mobility, land use and material targets mentioned above.

Lastly, the connection between the digital and the ecological transition is made explicitly but could benefit from more detail. The Commission's overall ambition to connect them is clear from its Industrial Strategy and documents such as the CEAP and the Farm to Fork Strategy raise specific questions about how to do so.³⁴ However, the reference to the EGD implementation in the Commission's Strategy on Shaping Europe's Digital Future is limited to general statements, with only the reduction of the ICT sector's environmental footprint receiving a detailed plan.³⁵ The twin ambitions – for sustainability and for digitalisation – need to be more consistent: the various strategies considering the twin transition should not only refer to each other, but also ensure that the proposed implementation matches the scope of the targets set.

How can we improve consistency across these documents? Chapter IV of this report suggests an approach that thinks beyond silos or thematic departments. It focuses on the target state of so-called economic ecosystems as defined in Chapter III. Working towards a clear objective with systemic outcomes can guide policymakers and economic stakeholders to form strategic taskforces across various DGs, ministries and economic areas, which connect the relevant expertise for a joint goal and ensure integrated strategies. This approach would guarantee not only consistency, but also synergies and greater impact among thematic areas.



2) EFFECTIVENESS – MATCHING THE CHALLENGE

To be effective, the strategic package guiding EGD implementation needs to contribute to the EGD's overarching targets: climate neutrality, decoupling of growth and resource use, and a just transition leaving no one behind, including the creation of quality jobs across systems.

To achieve this, two aspects are key. First, setting targets that effectively meet the objectives of climate neutrality and decoupling by 2050. Second, putting in place solutions that have the intended impact. To be effective, this needs to hold for both the drivers of climate change and biodiversity loss as well as social fairness and a just transition. Based on these themes it is clear that large challenges remain in the Commission's implementation documents, in terms of the way the overall targets are put into effect for maximum impact.

“ Achieving real change will require clarity on the key barriers to action and on the possible solutions. ”

a) The drivers of climate change and biodiversity loss

The EGD Communication makes clear that to achieve the environmental ambition of the EGD, the drivers of climate change and biodiversity loss need to be addressed.³⁶ But instead of setting targets that address these, the EGD focuses on specific initiatives, such as reducing emissions

for hard to abate sectors.³⁷ The root causes – the drivers and pressures – are either unclear or missing altogether. Achieving real change will require clarity on the key barriers to action and on the possible solutions.

Based on research by the IRP, high-income countries and regions such as the EU cannot truly achieve climate neutrality unless they decouple their resource use from economic growth and environmental impacts in absolute terms.³⁸ In other words, any future economic growth needs to be achieved by reducing the resources used, with lower impact on environment and health. EGD strategic documents refer generically to “decoupling” of resource use from economic growth, but do not specify the need for absolute decoupling.³⁹ Nor do they address how to re-couple human economic development – how to find a safe operating space within planetary boundaries.

Overall, the EGD needs to acknowledge the need for absolute decoupling: not doing so will reduce its credibility with European stakeholders, as well as in discussions with emerging economies. Nowhere is the ambition

clearly presented: neither the CEAP nor any other document states the starting point, acknowledges the magnitude of the challenge, or identifies any indicators or targets to achieve it. Decoupling should be at the heart of the new industrial strategy and the different measures that will put it in place.



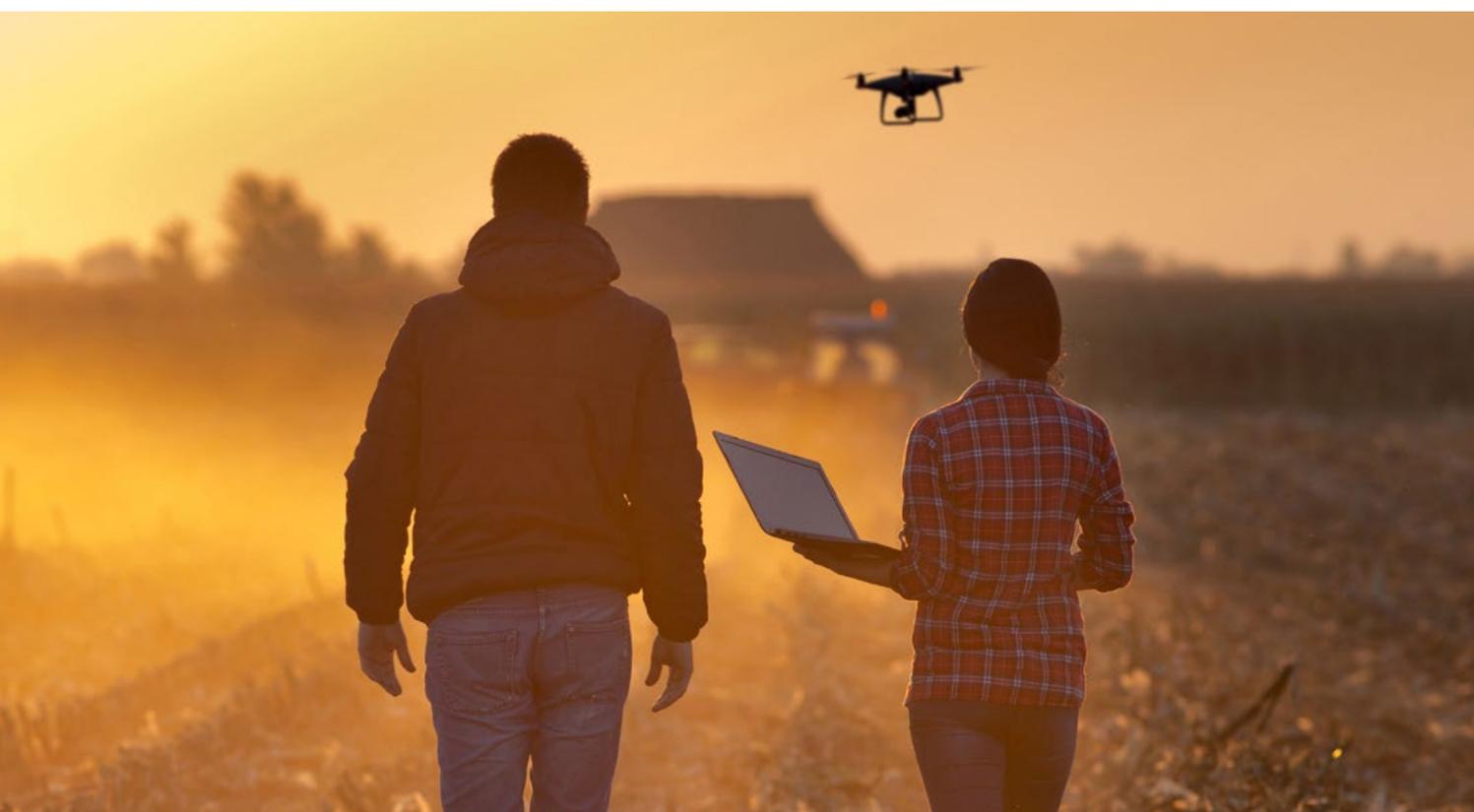
b) Social fairness and the just transition

The importance of social fairness and the just transition is recognised extensively in all strategic documents. There are direct references to a just transition or fairness in the European Commission's Industrial Strategy, the CEAP and European Climate Law.⁴⁰ The Just Transition Mechanism recognises the need to support and protect those who are most at risk, as well as to raise the living standard for all.⁴¹

However, one worrying aspect in achieving real social fairness is being largely overlooked: the growing inequity of wealth distribution and purchasing power across and between Member States. The Annual Sustainable Growth Strategy 2020 acknowledges that "since 2010, [the poorest regions'] economic gap with richer regions has widened".⁴² This is clearly pointing to wealth distribution issues and continued inequality, even before we consider the greater stress-points caused by COVID-19. Although the issue of purchasing power and unequal wealth distribution across Europe is broadly recognised, there is no clear commitment to improving the situation. The proposed mechanisms are limited: either direct compensation payments (Just Transition Fund) or job creation.⁴³

In contrast, there is almost no mention of a broader conversation around universal income or the shift in taxation from labour to products and production. In the implementation phase, it will be important to define clear goals of fairness within the EGD and policy proposals – covering minimum income rules, access to essential services such as healthcare, education, skill development, employment – and include these as leading macroeconomic indicators. This would allow for the design of a fairer economy across Europe.

In sum, the EGD cannot be fully effective unless the drivers of climate change and biodiversity loss are clearly recognised and addressed. Doing so will also enable an understanding of where gaps exist in the solutions that are offered. To support the EGD, Chapter III offers a framework to analyse the underlying drivers of the current challenges to the delivery of societal needs, and to identify the right systemic responses. Chapter IV in turn offers a set of feasible solutions that would allow the EGD to meet its goals.



3) ACCEPTABILITY – WINNING SUPPORT OF CITIZENS AND MEMBER STATES

Especially in times of acute health and economic crisis, acceptability is a crucial success factor for any political strategy – on an individual and a collective level as well as in social and political terms. Acceptability is determined by a strategy's capability to offer an immediate short-term remedy to the effects of the COVID-19 crisis, to address the most pressing socio-economic concerns, and whether or not it increases the resilience of society. Acceptability also depends on the ability to effectively communicate the strategy and its benefits to the wider public as well as specific stakeholders. While the EGD documents, combined with the recently agreed European stimulus measures, go a long way to ensure the acceptability of the strategy, there is still significant room for improvement. Specifically, the link between COVID-19 relief and the EGD can be strengthened through shifting more of the stimulus money to targets aligned with the EGD, and by strengthening communication.

Based on European Parliament opinion polls, the five topics that EU citizens want the EU to focus on at this moment are, in order of importance: health, economic recovery, jobs and social affairs, climate change, and research and innovation.⁴⁴ Except for health, the EGD Investment Plan

“ Especially in times of acute health and economic crisis, acceptability is a crucial success factor for any political strategy – on an individual and a collective level as well as in social and political terms. ”

already covers all topics to a large degree through the allocation of over EUR 1 trillion over the next ten years to support the sustainable transition.⁴⁵ The combined budget of EUR 1,824 billion, made up of EUR 1,074 billion from the EU Multiannual Financial Framework (MFF) and EUR 750 billion from the EU COVID-19 recovery package Next Generation EU (NGEU), is the largest EU budget on record and will be further enhanced by recovery packages from Member States and the European Central Bank (ECB).⁴⁶ 30% of the EU's budget is earmarked for climate action, which makes the EU's budget and recovery package

the greenest and most ambitious in the world. The importance of a just transition, stable and secure quality jobs, the number of job opportunities and economic growth are furthermore generally addressed by all the EGD documents, especially for left-behind regions.⁴⁷ Taken together, the existing measures go a long way to offering immediate relief from the impact of COVID-19.

The MFF and the NGEU chiefly address the short-term economic recovery concerns. However, the long-term socio-economic issues, as mentioned in the EGD, could still benefit from more funding. The Just Transition Fund has been scaled back by more than half, to EUR 17.5 billion (of which EUR 10 billion comes from NGEU and EUR 7.5 billion from the MFF), the InvestEU budget for green growth projects has been cut significantly and is now at EUR 5.6 billion. Moreover, the Horizon Europe research budget has been cut from close to EUR 100 billion down to EUR 81 billion.⁴⁸ Also, while 30% of the MFF and NGEU needs to be allocated to climate spending, the risk remains that most of the rest will be spent supporting fossil-fuel-based industries. This issue is compounded by the fact that the methodology to determine what is considered “climate” is not as robust as it could be. Furthermore, the rule-of-law mechanism is still to be determined, and long-term trends of inequality are mentioned but not addressed.⁴⁹

Resilience has become the highest political priority as the experience of the COVID-19 pandemic has demonstrated the fragility of our economic system.⁵⁰ One of the most effective measures to increase resilience is to reduce strategic dependencies, for example being reliant on a single supplier for an important resource.⁵¹ The EGD is generally strong on this point: the CEAP in particular details how a transition to a circular economy could reduce dependencies on certain suppliers of raw materials.⁵² The Biodiversity Strategy and Farm to Fork Strategy also indicate how they aim to contribute to increasing the resilience of Europe's food supply and health overall.⁵³ Whether this actually materialises, however, depends on their implementation.

The vision of the EGD is clear, but much more can be done to communicate that it is not only the most effective approach to increase resilience, but also the best option for a successful economic recovery. Clear arguments, proof points and especially storytelling are needed to convince

“ Clear arguments, proof points and especially storytelling are needed to convince citizens that more solidarity and greater resilience really will benefit everyone. ”

citizens that more solidarity and greater resilience really will benefit everyone. Special attention should be given to deprived regions and industrial areas most hit by this essential transition. It will be necessary to show the benefits of the green recovery locally, regionally and nationally, providing a compelling story for Europe and the rest of the world.

The EGD strategy is thus well advanced in terms of short-term political acceptability, where the proposed instruments are based on solidarity and support for Member States and their citizens. What is still needed is clear communication, the inclusion of lessons learnt from past experiences, and sufficient mobilisation of large sums that cannot be “spent twice”. This approach should be complemented by identifying key economic ecosystems and their “Champions” that could be the drivers of the sustainable transition, as well as providing quality jobs as detailed in Chapter IV. The EGD could further enhance its acceptability with a focus on prevention and resilience in the field of health, such as strengthening the elements of the Biodiversity and Farm to Fork strategies that deal with healthy diets and zoonotic diseases.

4) CONCLUSIONS ON THE EGD

The EGD paints a grand vision – which is an impressive achievement in its own right. But it is not yet truly systemic in its approach and its implementation pathway. In particular, greater effort on the development of truly transformational and ambitious policy will be needed. A consultative approach should be put in place, ensuring all voices are heard and broad ownership is created. To improve the consistency, effectiveness and acceptability of the EGD, Chapters III and IV detail a compass and a set of orientations on all system levels that, if adopted, will help implement the EGD in line with its stated vision and ambition.

III. A NEW COMPASS

TURNING THE EUROPEAN GREEN DEAL INTO AN ECONOMIC AND SOCIAL SYSTEMS TRANSITION



To achieve the ambitious targets set out in the EGD and the recovery from the COVID-19 crisis, a full-scale reform of the current socio-economic system is needed. The way natural resources for economic activities are used is the cause of many of the world's most pressing issues.

Instead of maximising quantity, adopting a more holistic view of what prosperity means is necessary. As seen in Chapter II, the current EGD documents are a crucial step in the right direction, addressing some but not all the drivers of climate change and biodiversity loss.



Transitioning away from the current economic model, and towards a more sustainable, fair and successful one, requires a rethinking of the fundamentals. The greatest challenge is the need for simultaneous emergency management that is both green and social in scope, and which can provide Europe with much needed economic stimulus and initiate the required paradigm shift.

This chapter aims to enhance the EGD by providing guidance on how to address these fundamentals to comprehensively reform the socio-economic system. It combines some of the most exceptional existing thought-leadership on the various topics to provide a compass that can guide the EU and sail the ship properly through uncertain times and towards the goals of the EGD.⁵⁴

KEY CONCEPT: A SYSTEM CHANGE COMPASS WITH 10 PRINCIPLES

The System Change Compass brings together 10 principles that combine the thought leadership of the various authors referenced with the contributors to this report. Notably, the principles are not ranked. They are intended to be of equal weight and importance and mutually supportive of each other.

The compass describes the principles in a way that can be directly applied in the EGD context for policymakers at a European, national and local level, and tackles the following three fundamental barriers to a rapid rollout of the EGD. A lack of:

1. Shared policy orientations at the overall system level
2. Systemic orientations for each individual economic ecosystem that delivers societal needs
3. A shared target picture and roadmap for Europe's next industrial backbone and Champions

Specifically, the compass is designed to provide intellectual guidance on how to transition the current socio-economic system towards a more sustainable, resilient and equitable model. It addresses the drivers and pressures of our current economic system and its application will foster a greater balance between people and planet while underpinning a new type of value-driven growth (see Figure III.1).

In a simplified view, transitioning the system will require the implementation of three complementary actions, simultaneously – and as soon as possible:

1. Showing what a new economic system, at the service of people and planet, looks like: “mapping and envisioning”
2. Identifying and deploying impactful interventions to tip the system towards the desired state: “designing and implementing interventions”
3. Empowering stakeholders to implement change: “mobilising and enabling actors”

Doing so will improve the EGD's consistency by breaking down the barriers between the various documents and

identifying the common causes of the challenges that need to be tackled. This approach also strengthens the effectiveness as it provides a feasible pathway to meet the bars of climate neutrality by 2050, and to achieve decoupling. It also enhances acceptability through a focus on the social dimension and offers a compelling overarching narrative. For a successful implementation it is essential to adopt this approach at a national and local level as well as at the European level. All levels must cooperate closely to this effect.

The 10 principles are elaborated further and described in more detail in the following sections.

“ Transitioning away from the current economic model, and towards a more sustainable, fair and successful one, requires a rethinking of the fundamentals. ”

Figure III.1

SYSTEM CHANGE COMPASS



FROM...

...TO

01 REDEFINING PROSPERITY:

Prosperity defined by aggregate economic growth



Prosperity defined by fair and social economic development

02 REDEFINING NATURAL RESOURCE USE:

Prosperity based on natural resource consumption



Prosperity decoupled from resource consumption through efficiency, sufficiency and a shift to responsible use of natural resources

03 REDEFINING PROGRESS:

Growing economic activities and sectors



Focusing on societal needs that need to be fulfilled without transgressing planetary boundaries

04 REDEFINING METRICS:

Decisions driven by optimising for GDP growth



Decisions driven by holistic metrics including natural capital and social indicators

05 REDEFINING COMPETITIVENESS:

Massive dependency of Europe on imports of natural resources



A resilient Europe based on low-carbon products, services and digital optimisation

06 REDEFINING INCENTIVES:

Incentives supporting the status quo



Incentives aligned with Green Deal ambitions and economic ecosystems

07 REDEFINING CONSUMPTION:

Owning products as part of individual identity



Experiencing and using products and services as part of individual, shared and collective identity

08 REDEFINING FINANCE:

Subsidising and investing in "old" industries



Supporting and facilitating economic ecosystems

09 REDEFINING GOVERNANCE:

Top-down, static, slow normative policy processes



Transparent, flexible, inclusive, participatory models of governance influenced by science

10 REDEFINING LEADERSHIP:

Traditional leadership roles and expectations



System leadership based on an intergenerational agreement

1) REDEFINING PROSPERITY: EMBRACING SOCIAL FAIRNESS FOR REAL PROSPERITY

“ The Union’s aim is to promote peace, its values and the well-being of its peoples. ”

The Treaty of the European Union⁵⁵

To achieve a socially fair and prosperous Europe, the EU needs to revise its economic system to put the well-being of its citizens at its heart. So far, the prevailing wisdom of the past century still broadly holds: growing the economy in production terms, through supply and demand dynamics, will enhance society’s ability to satisfy its needs and increase well-being. However, the view that growth itself is the goal, rather than a means to satisfy the ends, has led to the optimisation of economic activity above all else. As a result, global GDP per capita is at its highest level ever⁵⁶ but with many unintended consequences.⁵⁷ Minimising these unintended consequences and developing sustainably to a society of real prosperity requires embracing social fairness.

Rising incomes have enabled many to meet their needs, but the gains have been unevenly spread. COVID-19 has again shown that many in this world are one setback away from falling back into poverty.⁵⁸ Moreover, it is debatable whether Europe has truly ever recovered from the financial and euro crises with the economic gap between richer and poorer regions widening.⁵⁹ Rising inequality has been shown to decrease the economic well-being of all, not just the lower incomes of the divide. The opposite is also true, with some of the most equal societies also being the wealthiest, such as in north-western Europe.⁶⁰ As a result, the view has spread over the past two decades that the existing focus on increasing incomes should be complemented with a fairer distribution of wealth.⁶¹

At the same time, inequality goes beyond income. The richest parts of Europe produce the largest share of emissions and consume most of the resources, but the effects are strongly felt in less affluent regions already impacted by the effects of climate change, including severe weather events, droughts and flooding.⁶² Higher inequality is also linked to strong vested interests in the status quo (for example those making financial returns from fossil fuels), and impeded information flow across income “classes” – making a society-wide project for change more difficult.⁶³

This report therefore suggests a change in how the economic system is envisioned and mapped in line with “an economy

that works for people”: embracing social fairness for real prosperity.⁶⁴ This means that any recovery strategy should be planned with the objective of leaving no one behind and should have Europe’s social pillar as its centrepiece.

Considering that the twin digital and ecological transitions are expected to lead to a major realignment of the European job market, especially with regard to manufacturing, it is crucial that the following is taken into account to build a real prosperous society.⁶⁵ When supporting economic development, the focus should be on the quality of jobs, improving working conditions and on minimising associated resource usage, to avoid a further lock-in of unequal consumption patterns. This is not possible without fostering innovation, both through investment in research and development, and encouraging entrepreneurship. During a transition, the focus should be on short-term reskilling and long-term education. Equality will have to be clearly defined, not only in terms of income, but in terms of wealth, stability, resilience, and access to educational and other opportunities. These challenges can be addressed directly by increased investments and tackling disparities in taxation, which are essentials for the social acceptability of an economic system. This should include a reduced use of income-based taxes and a shift towards taxes based on resource use and consumption. Furthermore, job creation policies will crucially rely on ensuring that everyone has an equal opportunity across both rural and urban communities, and on breaking down the structural disadvantages faced by women and minority groups.

This crisis has clearly shown the benefits of cohesive and resilient societies, as they required less intrusive lockdown policies to have the same result as less cohesive societies; they rebounded earlier and shared the burden more equally.⁶⁶ Redefining progress to include fairness and equal opportunities would not only be a boost to economic growth, it would also benefit public health and societal well-being overall. A refocused economic system that embraces social fairness can enable the European Union to strive for real prosperity and thus fulfil its founding promise.

2) REDEFINING NATURAL RESOURCE USE: PROSPERITY DECOUPLED FROM NATURAL RESOURCE USE

“ Our home, planet Earth, is finite; all life shares its resources and the energy from the sun, and therefore it has limits to growth. For the first time, we have touched those limits. ”

David Takayoshi Suzuki⁶⁷

Sustainable development by definition cannot be based on the depletion of finite natural resources. At the same time, there is no bigger threat to prosperity than the dramatic climate and environmental impacts that result from this depletion. Current efforts that have mainly focused on efficiency and optimisation to reduce the negative impact of society's use of natural resources have been shown to be insufficient. In order to remain within the planetary boundaries, a more fundamental shift is needed: to an economy where prosperity is no longer based on natural resource consumption. This is possible if efficiency through a circular economy is complemented by the principles of sufficiency and a shift to renewable resources.

The exploitation of natural resources brings with it a range of different challenges. Most notably, many economies that possess a wealth of these resources – that include fossil fuels, metals, non-metallic minerals and biomass – are marred by inequality, poverty and corruption.⁶⁸ Already the extraction and processing of natural resources have disastrous consequences for local and global well-being by transgressing almost all our planetary boundaries. This practice is responsible for widespread pollution, 90% of biodiversity loss and water stress, 50% of global GHG emissions and 30% of

health impacts from particulate matter.⁶⁹ If the consumption and disposal of these natural resources are added into the mix – for example, the burning of fossil fuels – the root cause of the vast majority of global and local environmental damage and related health conditions is identified.⁷⁰

Traditionally, tackling the overuse of resources has been addressed via measures on the production or supply side. And yet, despite production optimisation and technology-enabled efficiency, material productivity – the GDP gained through resource use – slowly declined from 2000 to 2015 and has stabilised since. In the same period, absolute material usage has risen more than threefold since 1970, in line with GDP.⁷¹ This was because the efficiency gains were cancelled out, by the outsourcing of industrial activities to economies with lower material productivity.⁷² As these are often lower-income countries, their economic development would be expected to increase their wealth, and improve overall material productivity. However, rising income levels are also strongly linked to increased material consumption.⁷³ The per capita material footprint in high-income countries is 13 times as high as in low-income countries.⁷⁴ That this disparity does not have to be this high is shown by the large between-country differences of high-income countries.⁷⁵

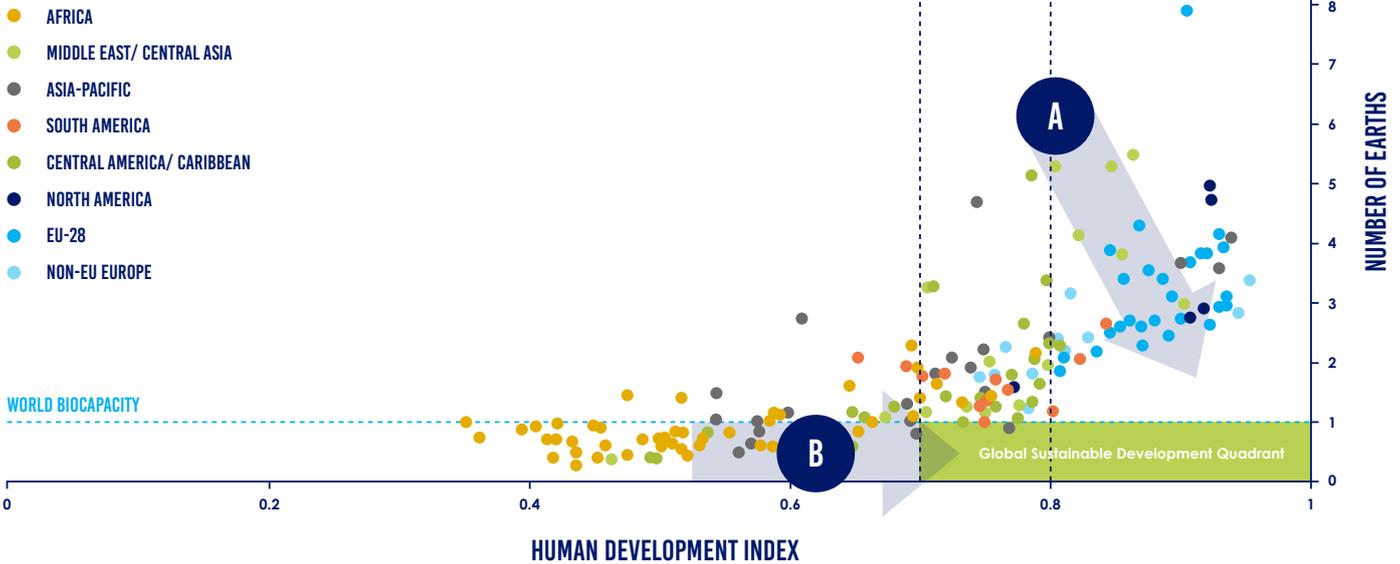
What is therefore needed is a more fundamental realignment of the relationship between income levels and resource consumption, where increasing the former is decoupled from the latter. While it is indeed the case that existing measures have shown to be effective at increasing material productivity, for example by minimising the rebound effect, real decoupling is only possible by changing the current economic system.⁷⁶ Based on the “towards sustainability” scenario from the IRP that models such a future by combining principles of efficiency, sufficiency and a shift to renewable resources, this would see a reduction of GHG emissions by at least 90% from 2015 levels, prevent the loss of at least 1.3 billion hectares of pristine nature, and restore a further 450 million hectares while stimulating economic development.⁷⁷

Resource decoupling has different implications for developed and developing countries. Developed countries, which are consuming far above sustainable levels, potentially need to more than halve their material footprint. Many less

developed countries still have some room to expand their footprint, noting that this concerns consumption rather than production metrics. Absolute targets of sustainable resource use are not yet established by consolidated science, but the first tentative estimates indicate that sustainable levels of resource consumption would lie far below of what high-income countries consume today.⁷⁸ This means that for more developed countries currently consuming resources at an unsustainable level economic development needs to be accompanied by pursuing absolute decoupling. That is, absolute resource consumption needs to fall while well-being is maintained or increased (Figure III.2; arrow A). Less developed countries that are consuming at levels under the world's biocapacity should pursue strong relative decoupling, meaning that absolute resource consumption should increase at a lower rate than well-being (Figure III.2; arrow B). Determining these goals, however, is difficult due to complicated science-policy processes to agree on targets related to sustainable resource use.

Figure III.2

ECOLOGICAL FOOTPRINT AND HUMAN DEVELOPMENT INDEX OF COUNTRIES (2016)



Source: Wackernagel, Hanscom, & Lin (2017), *Making the Sustainable Development Goals Consistent with Sustainability*⁷⁹

Globally, a circular economy, combined with rapid developments in digitalisation and smart technologies, can further increase efficiency and massively reduce the need for resource extraction. The current economic system is highly wasteful because it is linear: most production is based

on virgin resources and over 90% of material and energy value is lost after one use cycle.⁸⁰ A circular economy is closely integrated with nature, where the waste for one is a resource for another, leading to a closed loop system with a constant cycling of valuable resources.

Shifting to a circular economy on the supply side needs to be matched by adopting the principle of sufficiency. This is the change in mindset that is related to decoupling, where the organising of the economy is to improve the well-being

and protected – most importantly, through a massive push for the decarbonisation of current energy sources by the phasing out of fossil fuels. Electrification combined with clean electricity should be pursued where possible as long as all material extraction and full value chain impacts are properly taken into consideration.⁸² In fact, nature-based solutions furthermore have been shown to be the most effective and renewable method to capture existing carbon.⁸³

“ The savings associated with combining efficiency, sufficiency and a shift to renewable resources are expected to increase economic development for almost all countries. ”

of people instead of consumption per capita. This does not imply that no further economic development or innovation is necessary, merely that it needs consumption patterns that respect the planetary boundaries.⁸¹

The savings associated with combining efficiency, sufficiency and a shift to renewable resources are expected to increase economic development for almost all countries compared to business as usual and decrease inequality in countries and between them. Only by combining the above described interventions it will be possible to achieve prosperity that is decoupled from the depletion of natural resources and all its related problems.

Achieving those goals will also require a shift to renewable resources while natural eco-systems need to be nurtured



3) REDEFINING PROGRESS: MEETING SOCIETAL NEEDS AS THE PURPOSE OF A MODEL BASED ON ECONOMIC ECOSYSTEMS

“ Economic growth is not an end in itself. An economy must work for the people and the planet. ”

EU Annual Sustainable Growth Strategy 2020⁸⁴

To move to an economic system that puts the well-being of its citizens at its heart and stays within the planetary boundaries requires a rethinking of what this system is for. While the current economic system optimises consumption, revenue and shareholder value, with little regard to social and environmental impacts, this report argues that the function of our economy should be to satisfy human and societal needs while respecting planetary boundaries. To do so, the four societal needs that require natural resources to be fulfilled are identified, as well as the planetary boundaries that should not be transgressed. This allows the envisaging of a new kind of economic model, one that can drive the development of certain economic activities over others and stimulate investment in sectors offering value to society within the constraints of our planetary boundaries and natural resources, and achieve the targets set out in the SDGs and the EGD.

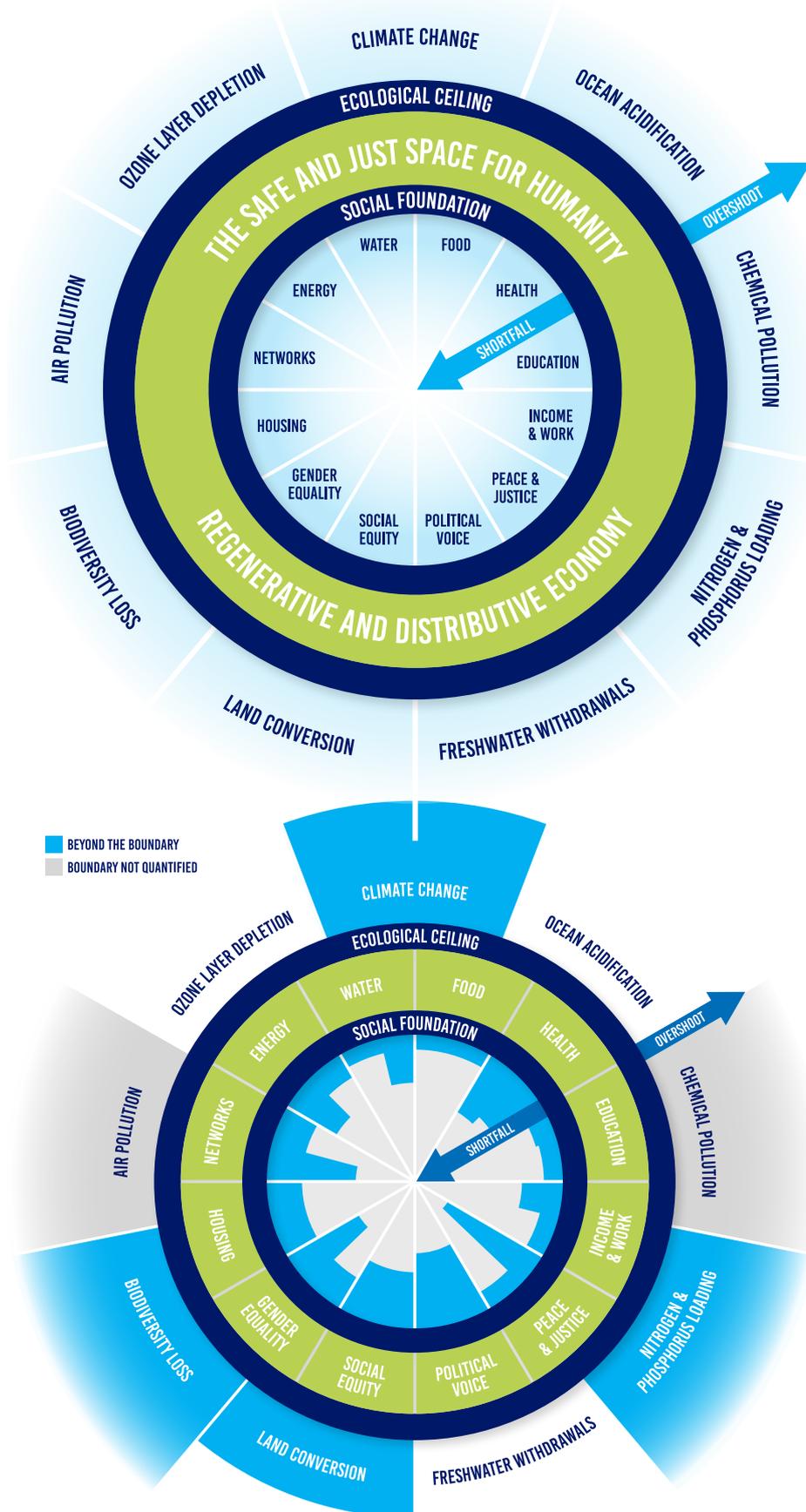
Looking at the economy through the lens of societal needs is a necessary first step to embracing a new socio-economic framework that fosters an integrated systems

approach.⁸⁵ The foundation for this was laid by the seminal “Limits of Growth” report by The Club of Rome and has been expanded by many members of The Club of Rome and other economic thinkers over the last 50 years, notably through the “doughnut” framework by Kate Raworth.⁸⁶ It highlights the link between the fulfilment of societal needs and the impact of our economic system on the environment using the well-known Stockholm Resilience Centre Planetary Boundaries framework (see upper half of Figure III.3). As illustrated on the lower half of the figure, this framework shows that our current economic system, based only on economic growth, is failing to provide universal social foundations and overshoots the ecological ceilings of our planet. Following this, it becomes clear that the targets of the EGD with respect to planetary boundaries can only be achieved if societal needs are fulfilled as well. Already, from Amsterdam to New Zealand, existing efforts are underway that use this insight to aim to create a safe space within the planetary boundaries and value-based economics and financial systems.⁸⁸



Figure III.3

THE DOUGHNUT OF SOCIAL AND PLANETARY BOUNDARIES



Source: Raworth (2017), *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*⁸⁷

To enhance the EGD, this report therefore builds on the doughnut framework to focus on four societal needs that together account for more than 80% of energy use in Europe, as well as the majority of its material footprint.⁸⁹ We left out societal needs that – while equally important for people – do not directly require natural resources to be fulfilled, such as education, gender equality or political voice. As a result, our list of societal needs is not a comprehensive list of what makes life worthwhile. It does, however, provide a framework to focus policy interventions on the drivers of some of the most pressing social and environmental shortcomings in today's system: the unsustainable use of natural resources.

The four prioritised societal needs⁹⁰ are:

1. Nutrition: access to drinkable water and healthy, nutritious food
2. Housing: access to a safe, sanitised, heated, or cooled shelter
3. Mobility: access to safe transport from one place to another, to work, to access education, or interact socially; this also includes safe transport for goods along their value chains
4. Daily functional needs: access to day-to-day consumer goods and services (e.g., clothes, household and personal hygiene, communication).

Meeting these needs for all EU citizens would go a long way in achieving a fair and prosperous society but this is only possible if the nine planetary boundaries are not transgressed. These are⁹¹:

1. Climate change: the effect of carbon and methane emissions on increasing global warming
2. Ocean acidification: the effect of carbon emissions on increasing acidification of the ocean
3. Chemical pollution: the effect of toxic material released into natural environments

4. Nitrogen and phosphorus loading: the effect of fertiliser in natural environments
5. Freshwater withdrawals: the effect of depleting freshwater sources
6. Land conversion: the effect of converting natural environments into land for economic activity
7. Biodiversity loss: the effect of economic activity on reduction or extinction of species
8. Air pollution: the effect of aerosol emission on the health of species and precipitations
9. Ozone layer depletion: the effect of chemicals on the ozone layer

Taken together, these needs and boundaries point to a new kind of economic model: one that allows for a more prosperous, sustainable and resilient society. This requires a reordering of structure of the current model. Instead of being based on economic activities, where growth in one activity has the same effect on GDP as growth in any other, regardless of its impact of societal needs or planetary boundaries, the new model will be based on economic ecosystems that are built around meeting these needs without transgressing those boundaries.

In total, we identified 8 economic ecosystems that can be divided into two categories: four that deliver a specific need, such as the healthy Food ecosystem, and four that support the first four to deliver societal needs, such as the nature-based ecosystem. As our planetary ecosystems are intertwined, so are our economic ecosystems. They overlap and interact through various feedback loops, and should therefore not be viewed as independent, but rather interdependent. As a result, the most effective way to build healthy economic ecosystems is to support them holistically, as described in Chapter IV.

Shifting to an economic model built around economic ecosystems will allow for an economy that works for people and planet. It enhances the ability to distinguish between what is essential and non-essential and provides a better basis for the possible trade-offs of economic development for increased well-being. But it is only possible by changing the fundamentals of our economic model.

This principle (redefining progress), together with the preceding two (redefining prosperity and redefining

natural resource use), lays the foundation for the transition away from the current economic model, and towards a more sustainable, fair and successful model. The three principles set forth how this new economic model can look. This part of our System Change Compass (see Figure III.1) is defined as the action of "mapping and envisioning". The following principles will identify and discuss impactful interventions to tip the system towards the desired state and are summarised under the action of "designing and implementing interventions".



4) REDEFINING METRICS: PERFORMANCE MEASUREMENT UPDATED

“ [GDP] measures everything, except that which makes life worthwhile. ”

Robert Kennedy⁹²

Gross Domestic Product (GDP) has been the bedrock of policymaking since the Second World War and resulted in significantly raising living standards for many – but not all – global citizens. However, it has come at immense costs. By counting only what can be expressed in monetary value, GDP and its associated economic model simultaneously overvalues and over-rewards production (financial) capital while undervaluing and under-rewarding human capital. It rarely values, let alone rewards, natural capital.⁹³ Redefining this metric to become more holistic would therefore be a powerful lever to achieve a fair and prosperous society.

GDP is often used as the single metric for the success of a country's and government's performance and therefore has a significant effect on electoral outcomes in democracies.⁹⁴ This is despite the fact that various economists, including the pioneer of measuring aggregate national incomes Simon Kuznets, have laid bare its limits since its creation, emphasising that these metrics are a measure of economic activity, not of economic or social well-being.⁹⁵

“ We need a broader set of metrics that go beyond measuring flows and include natural capital and human development as well as accounting for the resilience, efficiency, and adaptability of each economic ecosystem. ”

The effect of this optimisation of a single variable at the cost of others is clearly borne out by the Inclusive Wealth Index timeline (see Figure III.4). It shows that while per capita GDP and the closely related physical (or financial) capital (PC), have almost doubled between 1992 and 2014, human capital (HC) has increased only by around 25% and natural

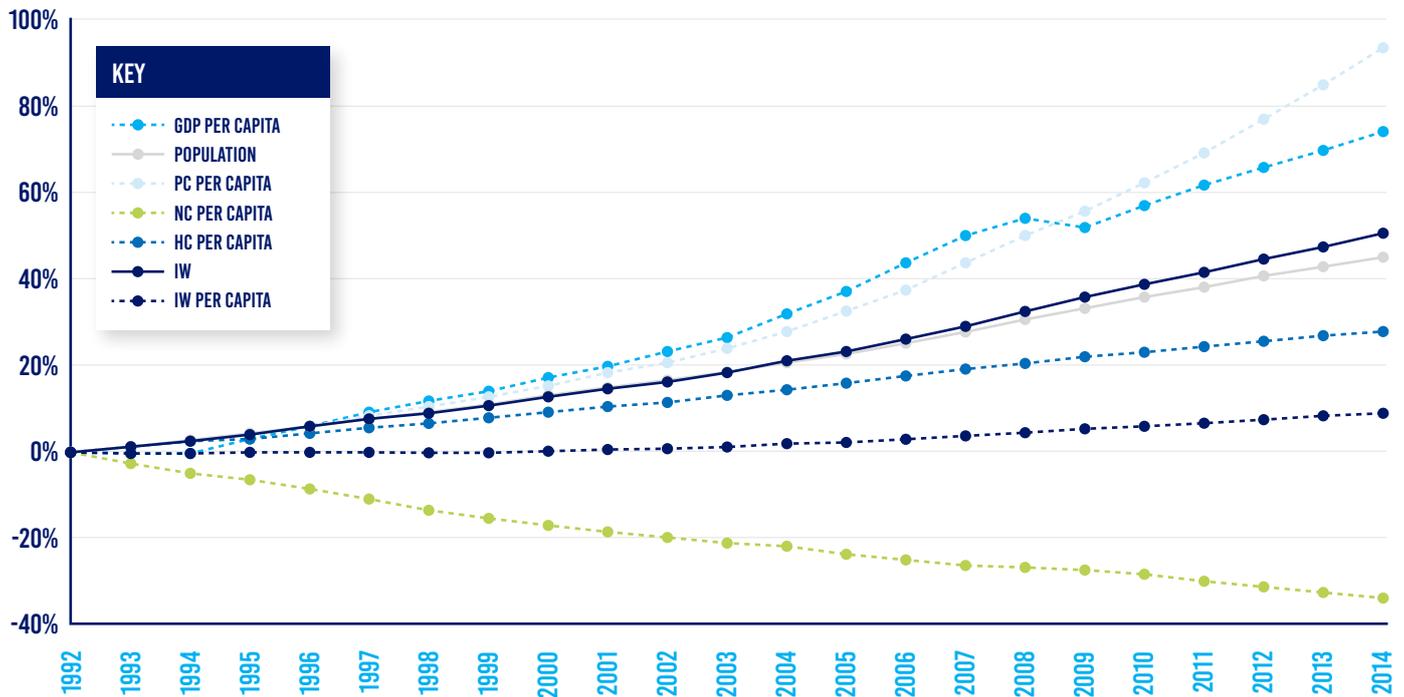
capital (NC) has dropped by almost 40%. As a result, the inclusive wealth per capita has only increased by around 10%. It is evident that GDP is not fit for purpose as a measure of well-being.

Instead of one metric that pertains to include all, the transition towards an economic model based on meeting societal needs without transgressing boundaries needs to be based on a broader set of measures reflecting these various goals. This should go beyond measuring flows and include natural capital (including greenhouse gas emissions) and human development as well as accounting for the resilience, efficiency and adaptability of each economic ecosystem. Doing so will enable us to measure the health of each of the respective ecosystems, and shine light on some of the inevitable trade-offs that will need to be made.

Many initiatives have been proposed, but none has caught on decisively on a global scale. However, progress is being made, most notably in the EU with the 2009 “GDP & Beyond” report, written by some of the world's leading economists, as well as Tim Jackson's “Prosperity Without Growth”.⁹⁷ Inspiration can also be found outside the EU. The Chinese government has decided not to set a GDP growth target for 2020 and acknowledges that it is now more important to “give priority to stabilising employment and ensuring people's livelihood”.⁹⁸ More holistically, New Zealand bases its budget not only on GDP but also on its “Living Standards Framework”, which aims to achieving higher living standards and intergenerational well-being.⁹⁹ At the international level, partnerships such as WAVES (World Bank), BIOFIN (UNDP) and Green Growth (OECD) are striving to update the global System of National Accounts towards more holistic accounting.¹⁰⁰

Figure III.4

INCLUSIVE WEALTH (IW) INDEX (AND ITS COMPONENTS) EVOLUTION - 1992 TO 2014



Source: UN Environment Programme (2018), *Inclusive Wealth Report*⁹⁶

The private sector has also seen efforts to introduce new metrics. Here, holistic accounting serves as the overarching methodology for companies that use a set of indicators including natural and human capital. The Natural Capital Coalition is an example for bringing together businesses. It provides tools and guidance to allow companies to track their performance beyond economic indicators.¹⁰¹ Many of these indicators are linked to the SDGs but no emerging standard exists that allows for comparison between companies.

An economy consistent with the SDGs and the ambitions set in the EGD needs to be guided by this more holistic dashboard of indicators. It should enable the tracking of performance against the fulfilment of societal needs, and tracking of progress in decoupling from natural resources as well as monitoring social and environmental impact. This monitoring should leverage the possibilities of big data and digital visualisation tools to develop a useful, versatile and up-to-date set of measures for the successful development of economic ecosystems and real implementation of the EGD and SDGs.

5) REDEFINING COMPETITIVENESS: DIGITALISATION AND SMART PROSPERITY AT THE HEART OF EUROPEAN COMPETITIVENESS

“ When digital transformation is done right, it’s like a caterpillar turning into a butterfly, but when done wrong, all you have is a really fast caterpillar. ”

George Westerman – research scientist at the MIT Center for Digital Business¹⁰²

In 2018, more than half of the EU’s energy needs were met by net imports, while with raw materials such as metals this share is between 75-100%, both hampering competitiveness and increasing exposure to strategic rivals.¹⁰³ While the material costs as share of total input costs continue to rise, the digital revolution has massively shifted value from tangible to intangible goods, either in the form of data or ideas.¹⁰⁴ To improve European competitiveness the focus should therefore be on natural resource use optimisation through the application of new technological developments and digitisation. The digital transition especially could be an accelerator that makes an existing system more efficient but comes at a high risk to social and environmental capital. To get to the metaphorical butterfly instead of a fast caterpillar, the system as such must therefore be oriented towards social and environmental sustainability.¹⁰⁵

The European Commission has come to the same conclusion, stating that the twin ecological and digital transitions, if managed well, could provide the basis for European competitiveness for the years to come.¹⁰⁶ Digitalisation, defined as “the use of digital technologies to change a business model and provide new revenue and value-producing opportunities”, has already shown its disruptive potential to important European industries such as hospitality and automotive.¹⁰⁷ But more than just competitiveness, President von der Leyen stated that these twin transitions are about Europe’s sovereignty, and that the “need for Europe to affirm its voice, uphold its values and fight for a level playing field is more important than ever.”¹⁰⁸ If it wants to do so “it must now become the accelerator and enabler of change and innovation.”¹⁰⁹

Broadly speaking, digitalisation can improve competitiveness and contribute to a fair and prosperous society in three distinct ways.

The first is to significantly reduce the need for natural resources as it has the potential to improve quality and endurance, as well as increase production efficiency, for example through customisable and additive processes.¹¹⁰ The deployment of artificial intelligence (AI) solutions holds a lot of potential for improving the remaining supply chains and production processes with predictive maintenance. It can also improve quality management through, for example, image-based defect recognition.¹¹¹

Second, increased digitisation, improved broadband access and ubiquitous smartphones have proved a boon to especially low- and middle-income countries in empowering citizens to access knowledge and manage their money and resources. For example by enabling new, sustainable, business models such as those based on the sharing economy.¹¹² These new or improved products have shown to be better at meeting societal needs due to their personal nature, and may come at a lower environmental costs. It is a precondition, however, that their large and growing energy consumption is met with sustainable energy sources.

Finally, new digital technologies can also help societies deal with the negative effects of climate change and biodiversity loss by improving the performance of early warning and emergency systems and of power infrastructure, to increase food and water security, and to minimise the impact of climate hazards.¹¹³

A large-scale transition like this must be taken with caution. It inevitably comes with risks of a similar scale. These risks include a huge drain on rare earths and materials, cyber security or personal data theft, polarisation and large upheaval in the labour market, with many traditional skills and experience rendered useless.¹¹⁴ New business models such as those of the sharing economy have also shown to be very similar to more traditional business models, enabling underpaid and unsafe working environments if not regulated properly.¹¹⁵ These and others reasons have led to the situation where digital technologies, particularly artificial

to regain the ground lost to those countries and regions that have already placed Industry 4.0 at the centre of their economic development. To do this, it needs to build on its strong public research institutes and programmes, access to large amounts of data, easy access to financing and a low regulatory burden through the single market.¹¹⁸ Europe's outstanding educational institutions and the educated labour force furthermore provide the ideal conditions for the change in jobs and the competence development required for the digital transition.¹¹⁹ This should be further enhanced with investments in digital infrastructure, digital

“ To act in the service of sustainable development, digital technologies need to be guided and controlled by clear political rules and boundaries with a particular anchor in social fairness, income distribution and environmental protection. ”

business models and enterprises that focus on reducing use of natural resources, and specific education and reskilling programmes.

If the risks of the digital transition can be managed, it could play an important part in achieving the goals of the EGD, reduce Europe's import dependency, and improve its competitiveness. Doing so requires not only a strong set

intelligence (AI), can be beneficial to the achievement of the SDGs, but may also inhibit some of them.¹¹⁶ To act in the service of sustainable development, digital technologies need to be guided and controlled by clear political rules and boundaries with a particular anchor in social fairness, income distribution and environmental protection.

of policy measures grounded in social fairness and creating prosperity but raising awareness about the potential pitfalls of such a transition. Without Europe affirming its voice and upholding its values, its competitiveness will suffer. . If Europe is, however, able to build on its existing strengths and act decisively, it could harness the power of the digital transition to support navigating the ecological transition and reduce its natural resource dependency. Thus, the EU could reposition itself as a current and future global leader and a driving force for a long-term sustainable and successful economy.

Where the EU has been leading on some of the landmark cases of digital policymaking, its businesses have lagged behind in capturing the commercial value.¹¹⁷ Nevertheless, the EU is well equipped to drive the digital transition and

6) REDEFINING INCENTIVES: INTRODUCING THE REAL VALUE OF SOCIAL AND NATURAL CAPITAL

“ We can't save the world by playing by the rules, because the rules have to be changed. Everything needs to change - and it has to start today. ”

Greta Thunberg¹²⁰

The shift to an economy that supports societal needs without transgressing planetary boundaries can only be achieved if all the rules governing that economy are changed. Rewriting those rules would not only remove support for polluting activities but would also offer the opportunity to support those activities whose benefits are currently undervalued. This holds especially true with regard to social and natural capital as outlined in the fourth principle. To introduce their real value, policymakers have two broad types of instruments at their disposal: market-based instruments and regulatory approaches.¹²¹ Carbon pricing and producer ownership schemes should take precedence as they hold significant potential to speed and scale up the transition to an economy that meets the targets of the EGD. If enacted successfully

“ Supporting the leading businesses and industries should at least come with conditionalities and clear transition commitments. ”

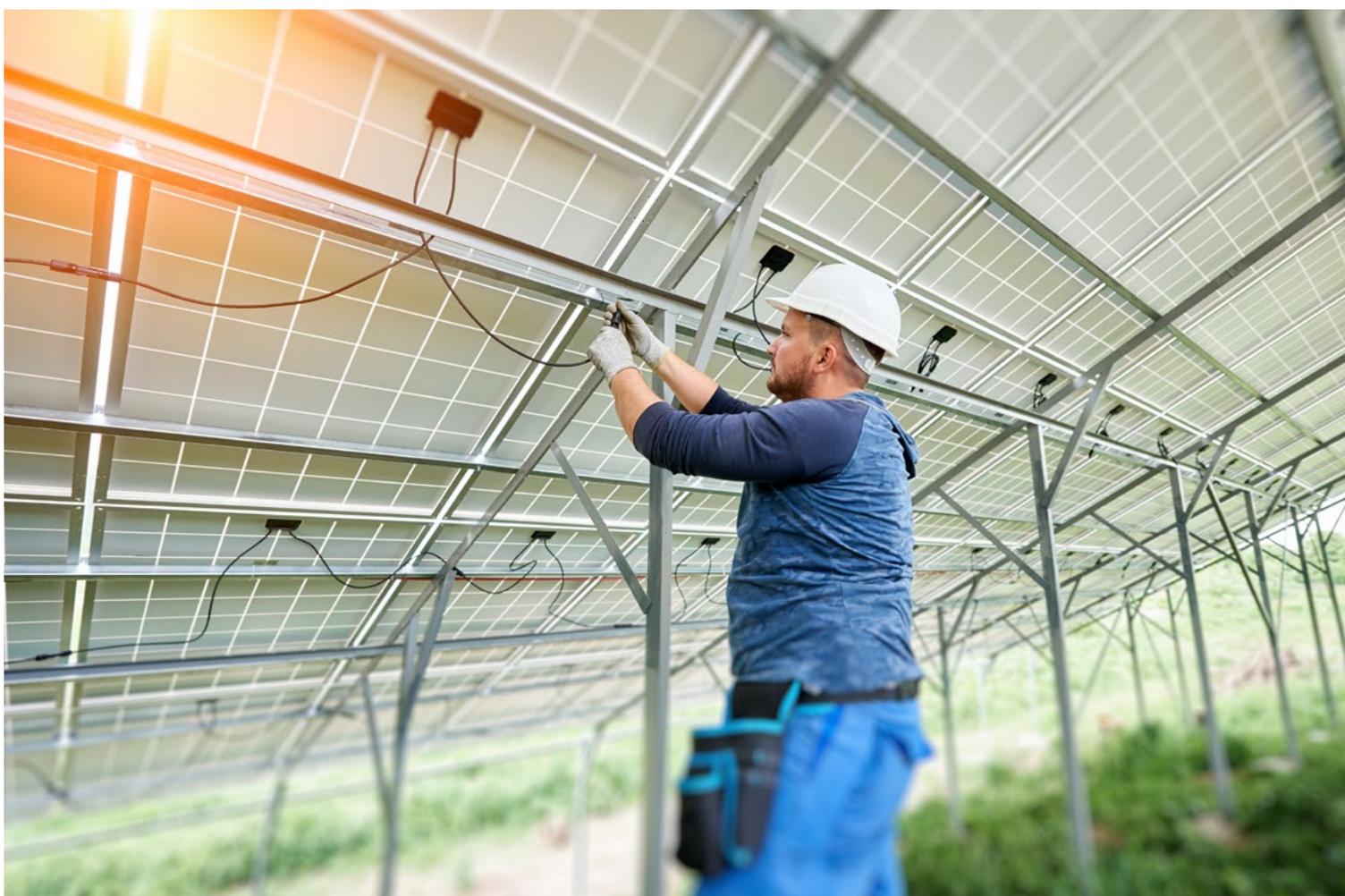
these measures are also very effective economic stimuli, according to a survey of global experts, especially in the provision of quality jobs.¹²²

The COVID-19 crisis has proved again the importance of government intervention to correct market failures. And while recovery measures must bring immediate social relief, supporting the leading businesses and industries should at least come with conditionalities and clear transition commitments. For example, those introduced by Austria and France made clear demands on their aviation sectors.¹²³

The need for a longer term re-distribution of economic incentives is shown by the number of subsidies provided to different sectors. In recent years, the European Union and its Member States accounted for around USD 90 billion in estimated renewable subsidies, while between around USD 130 billion per year were provided towards the production and consumption of fossil fuels by only 11 Member States and the EU itself.¹²⁴ Similarly, only 40% of the proposed EUR 344 billion of the Common Agricultural Policy will need to be spent on measures aligned with the EGD.¹²⁵

Providing subsidies is one measure, but governments can intervene in a much broader scope to support the desired economic activity. Market-based instruments, such as subsidies, aim to use the market to find the most efficient solution to a broad issue, such as the decarbonisation of the economy. Putting a price on carbon, either through a cap and trade system, or through a carbon tax, is one such market-based instrument that holds the potential to use market signals to move towards a net carbon-zero economy.¹²⁶ Other measures include procurement rules and providing the necessary physical, digital and social infrastructures that can create markets for certain goods, which could for example increase recycling and collection of packaging materials.¹²⁷

If, on the other hand, it is clear what the technological solution is, or where there are split incentives for producers and consumers, regulatory approaches are better suited. These include implementing regulations and setting targets, for example with regard to the minimum share of electricity from renewable sources or the banning of specific harmful substances such as chlorofluorocarbons (CFCs).¹²⁸



Two specific measures that governments could enact – and which are especially promising – are carbon pricing and producer ownership schemes. While the potential positive impact of carbon pricing has already been detailed extensively by others, the latter is a relatively unknown concept, and will therefore be explored in more depth in the following paragraphs.

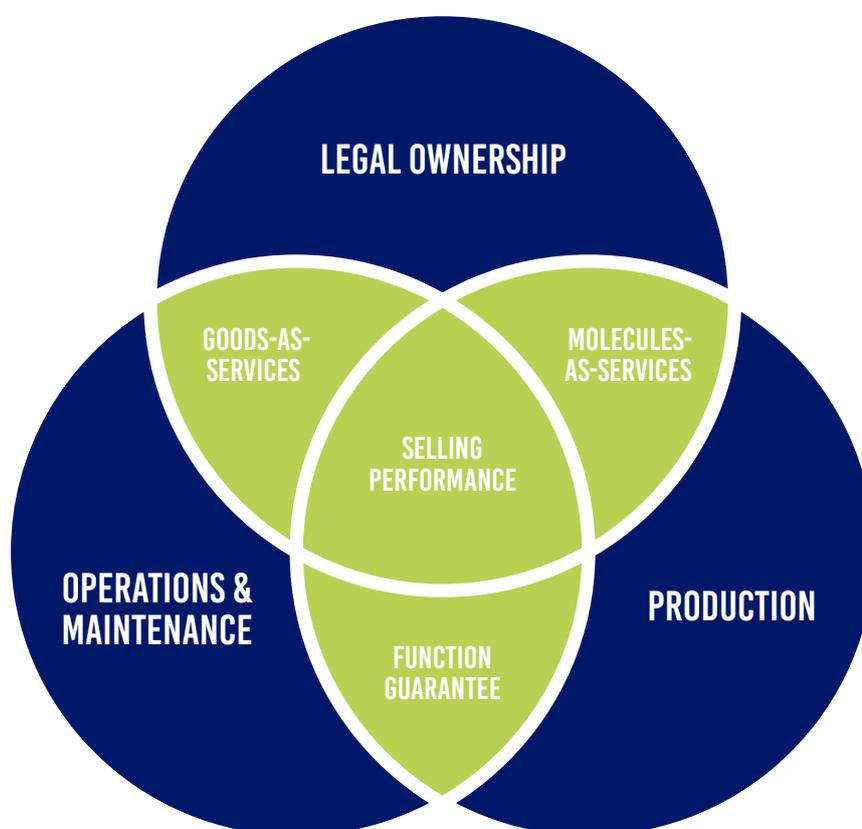
Within current ownership structures, most producers take responsibility only as far as the point of sale; they have little or no connection to the use phase, and take no responsibility for disposal. While the benefits of the sale of resources and manufactured goods are private and thus accrue to those directly involved, the costs are mutualised by society at large in the form of public waste management services.¹²⁹ This is the major cause of pollution globally, especially as

most governments do not have the means to take care of all waste.¹³⁰

With the concept of “producer ownership”, producers act as or are owners of their products during and after the use phase.¹³¹ This concept is referred to in the EU CEAP and fits into an economy of ecosystems, where it is in the interest of everyone who participates that individual and collective responsibility is taken for goods produced, used and disposed of.¹³² Several producer ownership business models exist (see Figure III.5); none should be seen as the definitive model, but as examples of models that have shown to be fully circular while meeting the needs of their users. These models can be complemented by other successful circular business cases such as upcycling, repair services and bartering.

Figure III.5

FOUR MODELS OF PRODUCER OWNERSHIP



Source: UCL & SYSTEMIQ (2019), *Making Materials Work for Life – introducing Producer Ownership, based on Stahel (2019), The Circular Economy – a user's guide*¹³³

Under so-called 'function guarantees', such as those provided by the brand Craftsman for most of their tools, the user is the owner of the product, while the manufacturer will replace or repair it at no extra cost when required.¹³⁴ Products-as-a-service, such as Share Now and other car rental services, allow the user to rent or lease products based on the time and intensity of use.¹³⁵ Molecules-as-a-service, such as those provided by SAFECHEM, are solvents provided for industrial processes to function: they allow the user to pay only for what they need while the producer takes care of any waste material. Payment is based on a combination of variables such as the amount supplied, the service required and the costs of waste disposal.¹³⁶ Finally, performance as a service, such as TotalCare by Rolls Royce, is where users pay only for the performance of a product, in this case flying hours of jet engines.¹³⁷

Combined with the other proposed changes in this report, shifting from current ownership structures to producer ownership would be a massive opportunity for businesses, which would be able to fully benefit from the quality of design, durability and value of their products. This would also reduce public waste management costs, increase the resilience of supply chains of critical materials, and reduce natural resource use.¹³⁸ However, to ensure that these measures do not only avoid transgressing planetary boundaries but also promote social fairness, utmost care should be taken to design them in line with the other principles, especially redefining prosperity and redefining competitiveness.

7) REDEFINING CONSUMPTION: FROM OWNING TO USING

“ People don't need enormous cars; they need respect. They don't need closetsful of clothes; they need to feel attractive and they need excitement, variety, and beauty. ”

Donella Meadows¹³⁹

Apart from the explicit rules that govern the market, the natural resource use of a society is based on norms and certain patterns of behaviour. To change the full socio-economic system, it is therefore necessary to not only rewrite the rules, but also to change beliefs and shift behaviour towards a lifestyle that is based on sufficiency. Doing so requires an integrated set of measures that have both short- and long-term impacts, and that touch on the demand as well as supply side of the economy. Only in this way can the interventions of the System Change Compass lead to true system change.

Research has shown that people often stick to habitual and default behaviour even when economic circumstances change, due to decision-making based on social norms, the

“ A systemic change can only be achieved through a redefinition of the culture of consumption and the associated shift in mindset. ”

expression of certain values, or familiarity.¹⁴⁰ “Nudging” has therefore proved to be an effective tool, leveraging these habits to nudge people to choices with a great societal benefit. This does not involve constraining any freedom of choice, but instead rearranges existing choices – for example by placing unhealthy food behind healthy food in cafeterias.¹⁴¹ Deliberately setting defaults can also promote the desired behaviour.¹⁴²

In the case of shifting consumer behaviour to more sustainable patterns and especially the move from owning to using, the concept could be applied as follows: where

possible and relevant, products should be available for rent as well as for purchase, with the rent option as the default. This could be further enhanced by making the buy-to-own option less attractive through a simple registration process. While this does not burden those that have a good reason to want to own a specific product, it will provide a welcome boost to the adoption of new ownership models.

While such short-term approaches are important tools to change behaviour, a systemic change can only be achieved through a redefinition of the culture of consumption and the associated shift in mindset. This long-term change of consumer behaviour requires a shift towards a culture and norms that enable and support sustainable consumption and once again the concept of sufficiency.

Currently, people across most of the world define themselves by what they own. This is driven by mostly Western consumer culture, where owning is often seen as a sign of prestige and has been actively promoted by consumer goods companies over the past decades.¹⁴³ Building on the insight that ownership provides a sense of

security, clarity and familiarity, they used various tactics such as planned obsolescence to inflate profit margins, often with higher natural resource use as a result.¹⁴⁴ Consumption patterns in emerging economies are following this culture and thus consumption levels rise with increasing income levels in these countries.¹⁴⁵

To successfully change the culture of consumption, the setting of new norms is required as well as a redefinition of what behaviour is acceptable or not. Several tools exist that can support this shift, the most important being information and education.¹⁴⁶ Informing the public about the role of

consumers and the impacts they can have is crucial for creating active consumer engagement. The “Good Life Goals” project translates the 17 SDGs into specific actions for individuals, including several actions for consumers.¹⁴⁷ Such information projects should be supported by governments and local institutions to reach as many people as possible. Furthermore, the subject of sustainable consumption should be included in education programmes, both in schools and universities, and in programmes for adults, such as workshops or advanced trainings.

This can be further supported by identifying and promoting existing shifts in culture. A shift in mindsets can, for example, be observed among younger generations in several Western countries, who are defining themselves less through what they own, leading to them owning less and renting more. This is most visible in the mobility sector, where individual car ownership among young people is declining, while shared mobility services are on the rise.¹⁴⁸ By identifying, calling out, and stimulating this behaviour, it can start to be seen as the new normal, thereby changing culture in the process.

Both long-term and short-term solutions are needed to complement the instruments and actions described in redefining incentives. The concept of producer ownership illustrates this important interaction. For almost all of the different producer ownership business models to work, it is important to not only use incentives to change the way producers provide their product, but also to change the way consumers demand products or services. No producer ownership concept will work if the consumers still want to be the owner of the product. At the same time, ownership

provides a powerful psychological driver for people to take care of what they consider to be theirs, thereby lengthening the product's life.¹⁴⁹ The aim should therefore not be to abolish ownership, but rather foster a sense of ownership for both the user and producer of a product.

By addressing both the demand and supply side, as well as economic and cultural incentives, enacted policies are expected to have a strong positive feedback loop. A change in mindsets, culture and norms will lead to a change in demand and thus to a change in production models that are designed to meet this. At the same time, a change in production and thus in supply, possibly accompanied by new marketing strategies, will influence consumers in their consumption choices. This needs to be coupled with policies that enhance innovation and the creation of new societal models that continue to promote business leadership and new business practices.

The four preceding principles together make up the “designing and implementing interventions” part of the System Change Compass illustrated in Figure III.1 and comprise a set of deeply transformative and impactful interventions if properly implemented. Their implementation will pave the way for the new economic system that has been mapped and envisioned in the principles 1–3 (“mapping and envisioning the system”). Following the logic of the System Change Compass, the next three principles comprise the element of “mobilising and enabling actors” and will discuss how to empower different stakeholders to implement change.



8) REDEFINING FINANCE: THE FACILITATOR OF THE TRANSITION

“ Ultimately, purpose is the engine of long-term profitability. ”

Larry Fink – CEO BlackRock¹⁵⁰

The transition to a fair and prosperous economy requires a fundamental reallocation of capital, estimated to require additional spending of between USD 1.6–3.8 trillion annually (between 2–4% of 2018 GDP) up to 2050 for the supply-side energy system alone.¹⁵¹ It is therefore crucial that from now on, all public and private investments are directed to the social and green transition. At the same time, the financial sector needs to refocus on its role as an enabler of the real economy, matching savers with investors, managing risk and facilitating payments to enhance well-being for all.¹⁵² Policymakers can support this transition by providing clear signals through de-risking sustainable investment, including a broader definition of value and reforming the role of regulators. Most importantly, policymakers must act in a consistent and stable manner. While current European policies are neither consistent nor stable, many of the right policies have already been trialled and need to be implemented more broadly to achieve the required transition.

is growing, with recent data showing that companies that included environmental or social indicators in their long-term planning have managed to perform better through the COVID-19 pandemic.¹⁵⁶

To further strengthen the case for sustainable investing, capital providers need policy stability and are waiting for the necessary regulatory signals to act.¹⁵⁷ In many cases, the barrier to financing sustainable projects and companies is the level of uncertainty and risks related to investing in new assets such as emerging clean technologies, regenerative and circular business models. Shifting capital towards emerging markets, where significant capital investment is required in the coming years, further amplifies perceived risks. Governments and public finance institutions must play a key de-risking role, for example through mechanisms such as loan guarantees. The potential benefits of these measures can already be seen in more established renewable technologies, which in some cases have already surpassed traditional energy sources in terms of risk and profitability.¹⁵⁸

“ Governments and public finance institutions must play a key de-risking role. ”

Currently, capital markets are not designed to fully support this transition. While many investors are signalling that they are willing to act, among them Larry Fink, actual sustainable investment flows continue to represent a small share of total volume, including that of Larry Fink's BlackRock.¹⁵³ In developed and emerging markets combined, green bond issuance accounted for just over 2% of total global bond issuance last year.¹⁵⁴ The most cited issue that explains this discrepancy is the confusion over what counts as sustainable and – despite a growth in the tools available – an inability to properly assess the risk and return prospects associated with sustainable investing or current portfolio exposure to climate risk.¹⁵⁵ However, the empirical case for sustainable investing

Supporting solutions that accelerate the transition will also mean that the financial system needs to shift to a broader definition of value by including social and environmental

metrics as well as natural capital accounting. This will require a proactive and collaborative approach together with clients and stakeholders. It will also require a different role for regulators, which should include a broader framework of long-term resilience-building, while balancing the need to ensure short-term financial stability.

There has been substantial progress on mainstreaming sustainable finance in Europe, but it has still not sufficiently accelerated positive change across the financial system.

On the one hand, the Commission has committed almost EUR 2 trillion over the next 10 years through the Multiannual Financial Framework and the Next Generation EU programme, of which 30% is allocated for climate-friendly expenditure.¹⁵⁹ These funds are expected to leverage significant sums of private capital and are tied to green and social conditions per the EU Taxonomy and “do no significant harm” principles.

On the other hand, intransigence in the existing EU public and private finance system abound. The COVID-19 recovery proposal still allows money to be spent on supporting fossil fuels via regional development funding under the “Coronavirus Response Investment Initiative” and the state aid rules have also not been changed accordingly. There is no guarantee that all EU Member States will commit to “greening” their fiscal stimulus or COVID-19 recovery plans.

EU financial institutions are also providing conflicting signals. While the remit of the European Investment Bank (EIB) has been changed to shift away from financing fossil fuels to focus on investments with positive social and climate-related impacts,¹⁶⁰ the ECB's mandate still reflects the old economy. Its fiscal stimulus and recovery plans are still supporting sovereign bonds and corporate bonds purely based on their respective historical size and liquidity, rather than screening on social or environmental standards.¹⁶¹ However, the ECB did recently commit to putting green objectives at the heart of the bank's EUR 2.8 trillion asset purchase programme to combat global warming, thereby boosting demand for green bonds.¹⁶²

These conflicting signals are the opposite of the policy stability and regulatory clarity that investors are looking for. Investors themselves are now calling on EU leaders to step up and ensure that economic recovery efforts are directed to where job creation can be matched with net zero emissions industrial pathways, and where sustainable and resilient infrastructure strengthen societies and maintain natural systems.¹⁶³

Efforts to align these signals have already been undertaken at both EU and Member State level. The Sustainable Finance Action Plan (most notably through the EU Taxonomy), disclosure requirements (e.g. Article 173 in France¹⁶⁴) and a push to reassess regulatory disincentives are all clear examples of this. While many financial regulations are outside the remit of the Commission, it is crucial that it uses its convening power to ensure that they are enacted on a single market level and promoted at the international level to create a broader and more equitable systems shift. In addition, apart from reforming its own institutions and internal tools, the EU should continue to take a leadership position and work with global finance ministers and international financial institutions through its international platforms and multilateral and bilateral negotiations. The European Commission's co-leadership with China of the International Platform on Sustainable Finance is an excellent example of just this.¹⁶⁵

These measures, together with a systems perspective of new economic ecosystems, can translate into a set of deep cultural norms and incentive changes (both implicit and explicit) that can and must be driven by governments and regulators. This would enable the financial sector to again become the enabler of the real economy and act as an accelerator instead of a brake on the sustainable transition.

9) REDEFINING GOVERNANCE: SHARING SOVEREIGNTY AND WORKING TOGETHER

“ The time for seeking global solutions is running out. We can find suitable solutions only if we act together and in agreement. ”

Pope Francis¹⁶⁶

A successful transition to a sustainable economy has proven to be beyond the capability of any single government to solve, as it includes major global challenges that call for global solutions. But such a transition is also inherently about national and local issues and there is as much need for local involvement and experience. To shift to an economic model based on ecosystems on a global and local level, new modes of governance are needed that rely on the involvement of public, private, and societal actors, and accordingly change the role of political leadership. Based on the experiences of the past months during the pandemic, and building on insights of the past years, the path to a systemic form of governance is clear. It is informed by science, addresses the root causes of the problems, and it is based on deliberative decisionmaking that shares sovereignty. To achieve this, governments need to adopt a mission driven approach to policymaking that is based on the System Change Compass principles.

“ The path to a systemic form of governance is clear: It is informed by science, addresses the root causes of the problems, and it is based on deliberative decision-making that shares sovereignty. ”

COVID-19 has proved that societies are able to change quickly and fundamentally. Governments enacted measures that were unthinkable only months before and that cost trillions with uncertain benefits to halt the outbreak. Based on the results so far, COVID-19 demonstrated that tackling symptoms alone is not enough. Successful strategies entailed a targeted approach on the underlying drivers – breaking the transmission link through social distancing. Countries that were able to do this effectively

were those with science-informed governance based on advice from independent research centres, such as Taiwan, Singapore, New Zealand and Germany. The guidelines issued in these countries were not only successful because they tackled the drivers of the virus, but also because they were clearly and effectively communicated to the public and were continuously updated based on the latest reliable information.¹⁶⁷

Following the latest scientific evidence discussed earlier in this report, to tackle the drivers of the existing social and ecological challenges requires redefining the current socio-economic system. While these challenges are driven by socio-economic phenomena, their direct cause is the extraction, use and disposal of natural resources.¹⁶⁸ While reducing natural resource use is one of the 17 SDGs, its broader negative effects on the other SDGs are insufficiently recognised, and no environmental convention explicitly addresses the overconsumption of natural resources.¹⁶⁹ Without doing so, efforts of governments, citizens, and businesses will risk focusing too much on the symptoms, and will not be able to reach the targets of the EGD or SDGs.

The scope and interconnectedness of the social and ecological challenges also call for a more systemic approach to governance. This implies that existing international, national, and local structures need to be updated to the needs of the 21st century. The goal is to make governance more effective, not only by tackling underlying causes, but also by strengthening their multi-level and inclusive character. In a way, it is about innovating democratic approaches to make them fit to deal with the challenges of the 21st century. Examples of this are already starting to proliferate, with citizen assemblies

on climate, broader stakeholder consultation in consensus conferences and the establishment of institutions embedding longer-term political leadership.¹⁷⁰ It is furthermore more important than ever that this systemic approach includes cross-functional collaboration in governance and also in research. To develop innovative solutions, it is necessary to break up the silo-based system and reorganise science and education along the lines further detailed in Chapter IV.

The international community recognised the need for collaboration for these challenges through the formulation of the SDGs and the Paris Agreement, but the implementation of these grand goals has so far fallen short. The EGD is arguably the most ambitious implementation strategy currently adopted. Only a determined and long-term orientated state actor – that is able to lead by example and has the authority and means to do so at a global scale – could have enacted such a plan. For example, the EGD would not be so influential without the pledged EUR 1 trillion over the next decade,¹⁷¹ the proposed law that obliges climate neutrality by 2050 and the ambition to utilise the European Semester to coordinate and enforce transition.¹⁷²

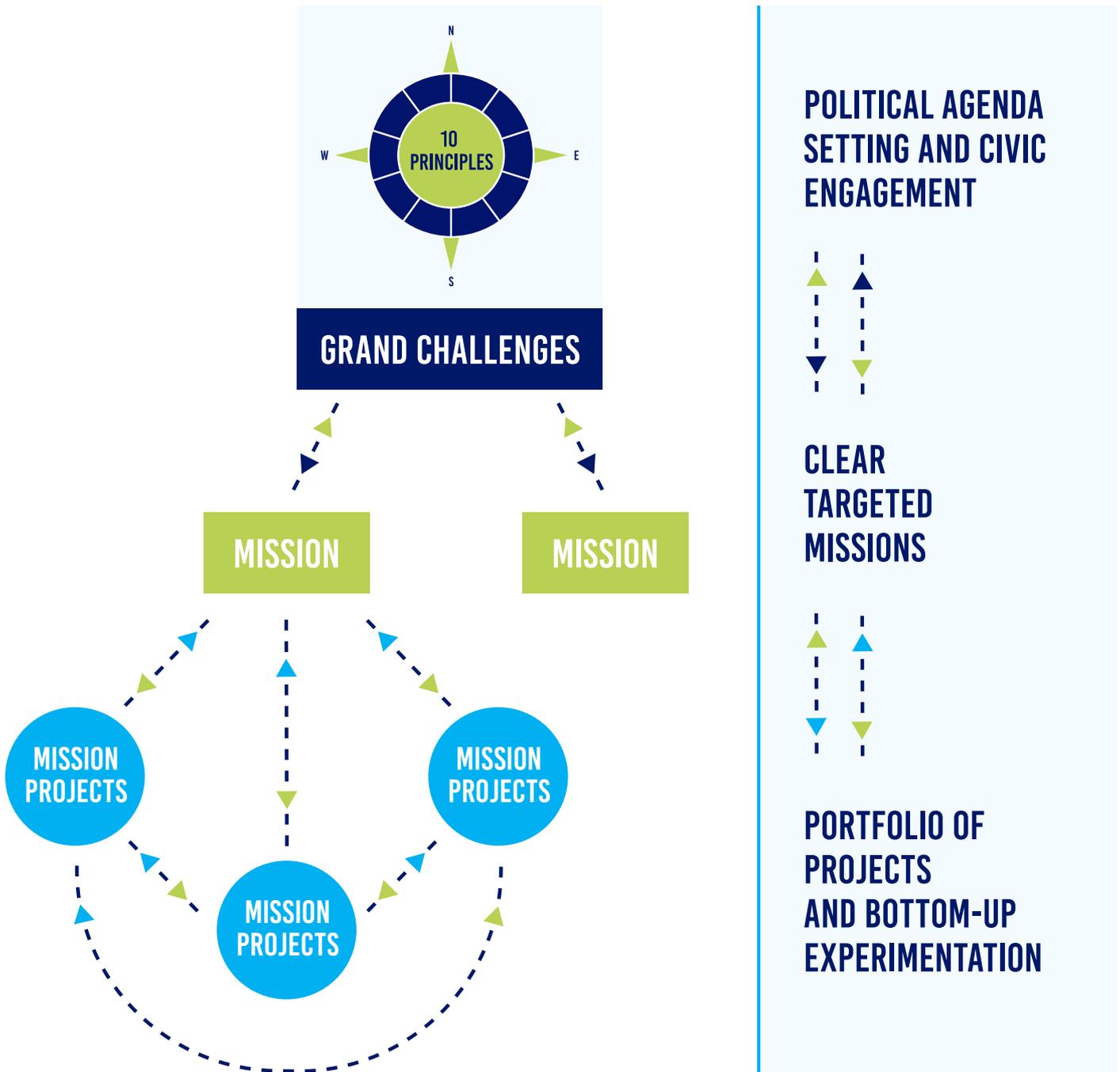
If the EU wants to remain at the international forefront as a fair and prosperous society, it needs to act on all levels. Internationally, it is important that the EU and the Commission take a leading role and live up to the EU's promise of being a geopolitical force to be reckoned with. Domestically, the EU needs to address some of its societies' growing discomfort regarding the loss of control and identity in increasingly complex and global dynamics, and needs to create the necessary conditions to achieve the targets of the EGD. Locally, the EU needs to emphasise the importance of the EGD and its core social and green factors and building blocks for a 21st-century European identity

Achieving this ambitious goal will be difficult under normal circumstances, but is almost impossible to do if dependent on unanimity for all important decisions. The requirement to make unanimous decisions is often used by individual players to block agreements and delay decisions. Within the EU, this was apparent in 2019, when Poland refused to sign up on the zero-emission target of the Green Deal, despite being offered support with transitioning its fossil-fuel dependent energy system. This was only overcome when the Commission finally decided to proceed with a legislative proposal even without unanimity.¹⁷³ Being able to move forward with international negotiations even without unanimity would therefore speed up the decision-making process for those countries that are committed to achieving the EGD goals.

To assist the realisation of these goals the System Change Compass provides a direction to policymakers to change their economic systems without adopting the role of central planners. The presented principles of the Compass aim to support the design and implementation of policies that pass the three tests of consistency, effectiveness and acceptability as discussed in Chapter II. It is important to note that the Compass principles are not meant to be prescriptive, but rather provide policymakers at various levels with orientations to guide new policies they consider most appropriate for the specific context in which they operate. In this sense the System Change Compass could form the basis of a kind of mission-driven style of governance (see Figure III.6). Similar to the SDGs, the system change principles offer a sense of direction, with missions designed to take into account the respective environment in which they take place. Various levels of orientations presented in Chapter IV paint a more detailed picture of how these missions could look.

Figure III.6

MISSION DRIVEN GOVERNMENT BASED ON GRAND CHALLENGES



Source: Mazzucato (2018), *Mission-oriented innovation policies: Challenges and opportunities*¹⁷⁴

The past decades are proof that current international, national and local institutions face great challenges to solve the most pressing issues of the 21st century. At the same time, the Paris Agreement, SDGs and EGD provide hope that these challenges can be overcome. Approaching

governance systematically and in a mission-driven form could be an important part of managing the transition at all levels. It could provide the chance for the EU to remain a global leader and achieve the goals laid out in the EGD.

10) REDEFINING LEADERSHIP: INTERGENERATIONAL AGREEMENT BY SYSTEM CHANGE LEADERS

“ We do not inherit the earth from our ancestors, we borrow it from our children. ”

Native American proverb¹⁷⁵

Not only are the challenges unprecedented, but so are the changes needed to tackle them. It is nothing less than the redefinition of the fundamentals and determinants of our society that is required to shift to a system based on economic ecosystems. To implement and legitimise these far-reaching changes, a new social contract is needed: one that is intergenerational and based on the implementation of the SDGs and EGD as a minimum requirement. The success of this contract is dependent on a new kind of leadership, specifically system change leadership based on the ten principles outlined in this report. This leadership is characterised by transparency, collaboration, preparedness and resilience.¹⁷⁶

“ System leaders can, and should, come from all strata of European society and from a diversity of backgrounds. ”

The global socio-economic, health and environmental crises all are inflicting massive costs, mostly borne in the form of debt.¹⁷⁷ This debt is not only financial but also in terms of human and environmental capital that will be needed to respond to future crises.¹⁷⁸ To reduce the likelihood of these future crises, it should be a moral obligation for current generations to accelerate the transition to a fair and prosperous society based on economic ecosystems that support a shift towards well-being across the world. At the same time, it should be recognised that the associated costs of this transition, such as losses of traditional industries, are unevenly distributed and will disproportionately affect specific regions and age groups.

The only viable solution is therefore to build an intergenerational contract that recognises this reality, takes into consideration real implementation of the EGD and

SDGs on the ground through key targets and timetables and strives to “meet the needs of the present without compromising the ability of future generations to meet their own needs”.¹⁷⁹

These crucial actors require system change leaders. System leaders can, and should, come from all strata of European society and from a diversity of backgrounds. Rather than by position or area of interest, they are defined by a mindset:

They are transparent by taking responsibility, stating a clear ambition, and laying out an action plan for the future that gives orientation, planning security to those making investments, and against which specific actions and policies can be measured. Most importantly, they will have to provide comprehensive explanations of why these changes are necessary and be honest about the trade-offs required. These explanations should be held as dialogues, providing ample space through consultations and actively seeking out contributors for the changes proposed. Furthermore, system change leaders should be able to transcend boundaries and form between groups, states or supra-national organisations.¹⁸⁰

As there is no single recipe to our issues, creativity and bottom-up participation is much needed. A multitude of possible pathways towards a fair and prosperous society based on economic ecosystems should be explored and tested in different scales and territorial contexts. Female empowerment and leadership, as well as that of minority groups, should be further developed to achieve a truly diverse perspective and decision-making. Concepts such as “regenerative communities” can play an important role.



These communities use the knowledge and potential of the local population to “provide diverse, place-sourced, and practical tests of alternative economic pathways”.¹⁸¹ Institutional players should seek to support system change leaders and multiply concepts such as these communities as they can support and enrich the development of a system based on economic ecosystems at the European level.

Hastily pushing through radical changes will cause resistance and undermine the acceptance of the plans overall. While immediate action is required, this needs to be supported with long-term thinking that can overcome the pitfalls of short termism. Only in this way can true resilience and regeneration be built, as it allows not only to prepare for what can be expected, but also to create the space to react to what will be unexpected.¹⁸²

Taken together, this forms a clear call to action for the European Commission to empower an inter-generational cohort of system change leaders and build a series of key Champions in the Member States and local governments so that, together, these leaders can build a new social contract firmly anchored within our planetary boundaries that incorporates all principles discussed in this chapter.

As displayed in Figure III.1, this principle, together with the two preceding ones, is placed in the “mobilising and enabling actors” part of the System Change Compass. The three principles demonstrate how the most relevant stakeholders to implement change can be empowered. It is important to note again that the three parts of the Compass are complementary actions to be implemented simultaneously – and as soon as possible.

IV. PUTTING THE SYSTEM CHANGE COMPASS INTO ACTION

RECOVERY AND BEYOND



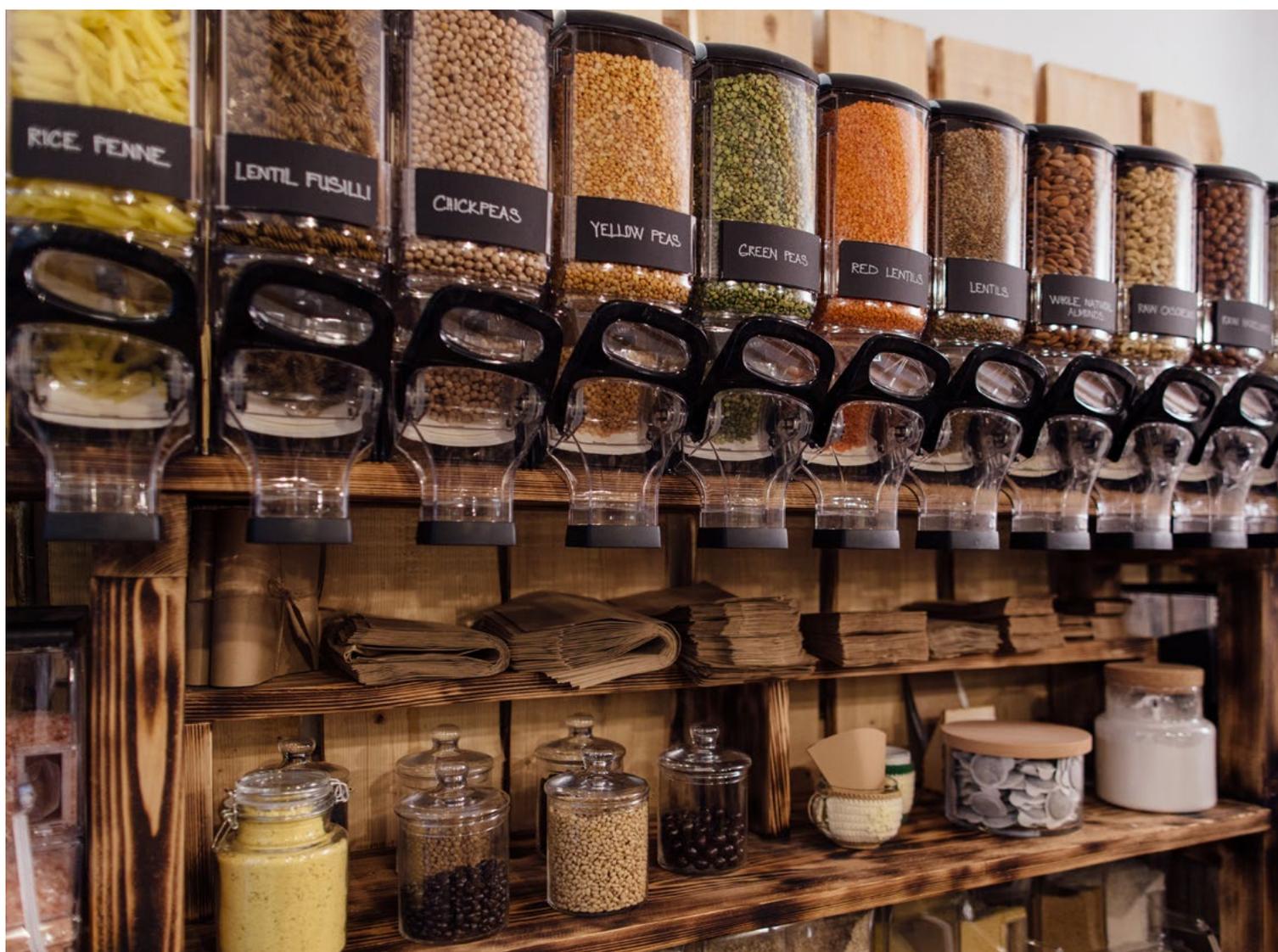
Chapter III focused on the socio-economic challenges and introduced the System Change Compass. Its ten principles are mostly of a general nature, as they aim to be universally applicable.

This chapter focuses on how to bring these ten principles to life, by applying the System Change Compass at all different levels of the system – the overarching level, the level of economic ecosystems and the level of Champions. This will ultimately lead to profound changes within the EU economy and the economies of its Member States, and to the way policy decisions are made.

Chapter IV.1 presents a framework for optimising the system and applying the System Change Compass: it introduces a new way of mapping the system. This new map reflects the call for a transitional change and requires a systemic and holistic view. It also brings out the interconnections

between the individual building blocks of the overarching system. This overarching system – which involves all possible aspects meeting societal needs – is clustered in economic ecosystems that are highly interdependent. Within each economic ecosystem, this report identifies “Champions” with the collective potential to be the new backbone of Europe’s economy. They represent specific, investable opportunities to create quality jobs and build a more sustainable future through COVID-19 recovery funds.

In Chapter IV.2 the System Change Compass is applied at each level: at the overarching system level, it yields 30 system-level policy orientations (Chapter IV.2.a). At the level of economic ecosystems, it yields 3–5 ecosystem-level orientations along with 50+ Champion orientations to build a future European economic backbone (Chapter IV.2.b).



1) A FRAMEWORK FOR OPTIMISING THE SYSTEM AND APPLYING THE SYSTEM CHANGE COMPASS

To apply the System Change Compass and translate its principles into specific policy orientations and concrete policy measures (interventions), we need to revisit how the overarching system is mapped and envisioned. This is particularly relevant in the context of the COVID-19 recovery, which presents Europe with the choice of

rebuilding the former system, or creating a new, more sustainable economic architecture. In this report, three building blocks make up the framework through which the system can be improved and, ultimately, re-envisioned in line with the ambitions of the EGD.

The three building blocks are:

- 1. A systems map:** This offers a new way to look at the economy and its subcategories (usually clustered in "sectors") on the one hand, and policy orientations and concrete policy measures (interventions) on the other. The systems map recognises the interconnected and adaptative nature of these two areas and facilitates synergies in the decision-making process. Hence the systems map should not be seen as a portfolio of independent areas, orientations or interventions, but as a "neuronal network" as shown in Figure IV.1. This way of looking at the system can identify interconnections between economic activities and synergies with relevant policymaking entities or stakeholders before advancing any policy or investment decisions.
- 2. 8 economic ecosystems and 50+ Champion subsystems:** This displays the new organisation of the European policy and its economic activities as a stepping stone to transformational change. Inspired by the Compass principles, the economy and its economic activities are categorised into one overarching system. This is comprised of 8 economic ecosystems and 50+ Champion subsystems. The overarching system consolidates the European economy in its entirety. Within this overarching system, eight major economic activities are identified as "economic ecosystems" that constitute an alternative to the economic areas and sectors conventionally used to organise the economy. Four of these 8 economic ecosystems meet a specific societal need (nutrition, housing, mobility and other daily functional needs). The other four ecosystems support these economic ecosystems in their delivery of societal needs (e.g. the energy ecosystem supports the intermodal mobility ecosystem as well as the built environment ecosystem). Within each of the 8 economic ecosystems, Champions are identified. Champions are economic subsystems that could become the new spearheads of the green, resilient and fair post-COVID-19 economy Europe wants to build.
- 3. Policy orientations at each level:** The application of the System Change Compass via policy orientations on each level. Mirroring the new organisation of the economy as an overarching system, across economic ecosystems, and through Champions, the framework finally introduces three levels of orientations that translate the Compass principles into more concrete policy orientations. System-level orientations aim to facilitate the right conditions for the economic ecosystems and Champions to thrive. Other orientations are specific to one particular ecosystem. Champion orientations represent discrete, investable opportunities for economic development in line with the vision of the EGD and with the potential to build a more sustainable future through the use of COVID-19 recovery funds.

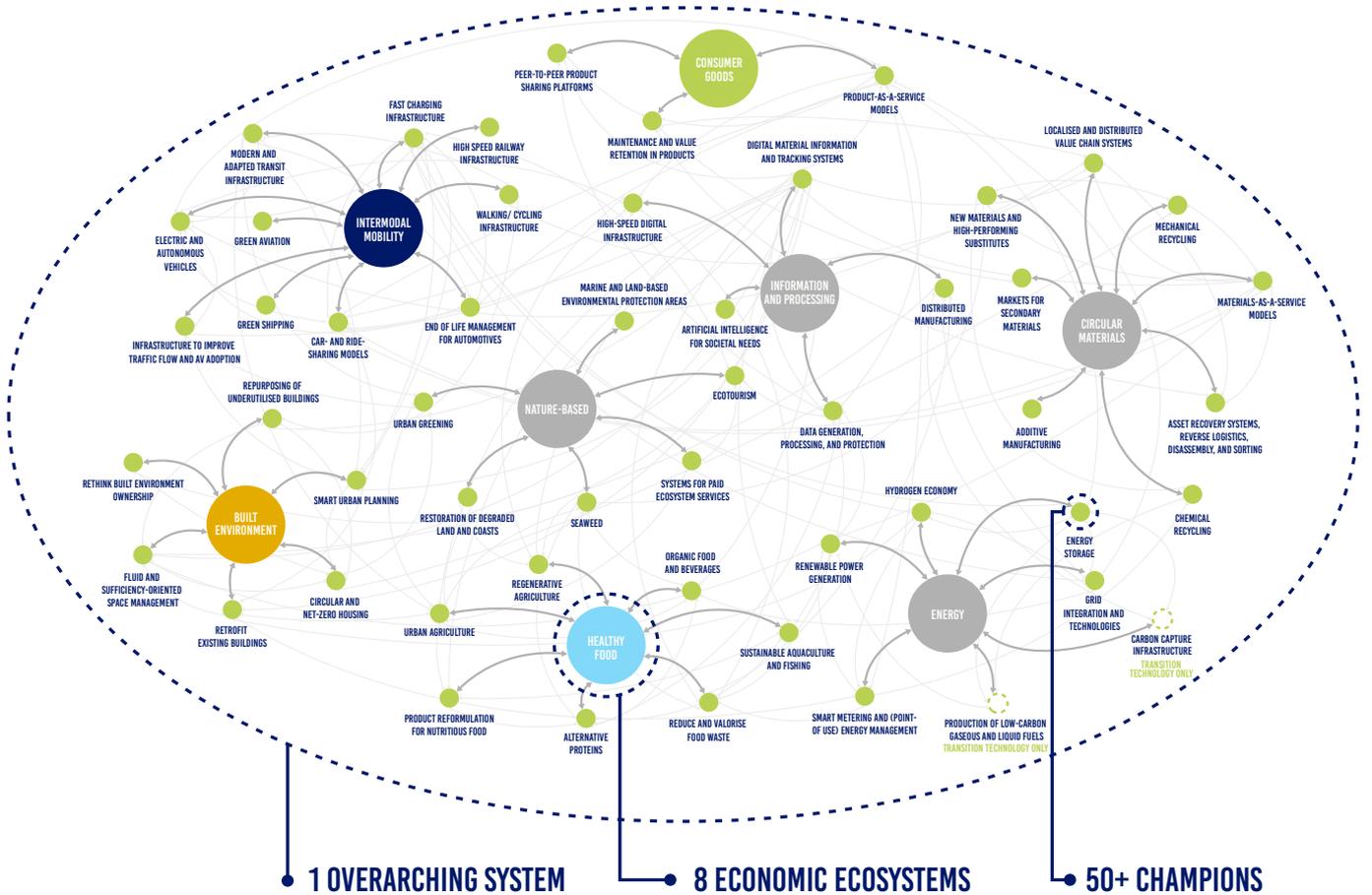
“ To apply the System Change Compass and translate its principles into specific policy orientations and concrete policy measures (interventions), we need to revisit how the overarching system is mapped and envisioned. ”

The following figure displays three building blocks - the dynamic systems map, the new organisation of the European economy and the application of the System Change Compass and how they are interconnected.

Figure IV.1

SYSTEMS MAP

A framework for optimising the system and applying the System Change Compass



<p>New organisation of economic activities</p>	<p>One overarching system that consolidates the European economy in its entirety.</p>	<p>Economic ecosystems can meet a specific societal need (e.g. Healthy food system) or support the fulfilment of multiple societal needs (e.g. Energy system).</p>	<p>"Champions" are economic sub-systems which could become the new spearheads of the green, resilient and fair post-COVID-19 economy Europe wants to build</p>
<p>Application of the Compass on each level</p>	<p>30 system-level policy orientations</p>	<p>3-5 economic ecosystem-level orientations</p>	<p>50+ champion orientations</p>

Representing the systems map in this way does not mean that the European economy is autonomous of other geographies and economies or that trade is disregarded. On the contrary, implementing the System Change Compass requires continued European engagement with its trade partners and European leadership on setting the ambition and success criteria for an economy that delivers well-being for its citizens.

The building blocks of this new economic organisation are 8 economic ecosystems and 50+ Champions orientations.

KEY CONCEPT: ECONOMIC ECOSYSTEMS

We identify 8 economic ecosystems to structure the overall system and economic activity within it. They are based on societal needs. We exclusively focus on those economic ecosystems that are resource intensive in the European context. The 8 economic ecosystems follow a "4 + 4 logic": four deliver societal needs, the other four economic ecosystems support the first four in that delivery.

The four economic ecosystems that immediately meet societal needs are:

- The **Healthy food** ecosystem, meeting the need for nutrition
- The **Built environment** ecosystem, meeting the need for housing and places of work
- The **Intermodal mobility** ecosystem, meeting the need for mobility
- The **Consumer goods** ecosystem, meeting daily functional needs such as clothing and hygiene

The four supporting economic ecosystems that support the first four economic ecosystems in their delivery of societal needs are:

- The **Nature-based** ecosystem
- The **Energy** ecosystem
- The **Circular materials** ecosystem
- The **Information and processing** ecosystem

We recognise that our focus on societal needs excludes important societal needs such as health, education, political voice, and (gender) equality. We do not intend to suggest that they are less important. Our focus is merely the result of selecting those societal needs and economic ecosystems that have the highest resource consumption in the European context.

Just like planetary ecosystems, economic ecosystems are intertwined. For this reason, the interlinked systems view is more important than a delineation of what is in one economic ecosystem or another – see Figure IV.2.



Figure IV.2

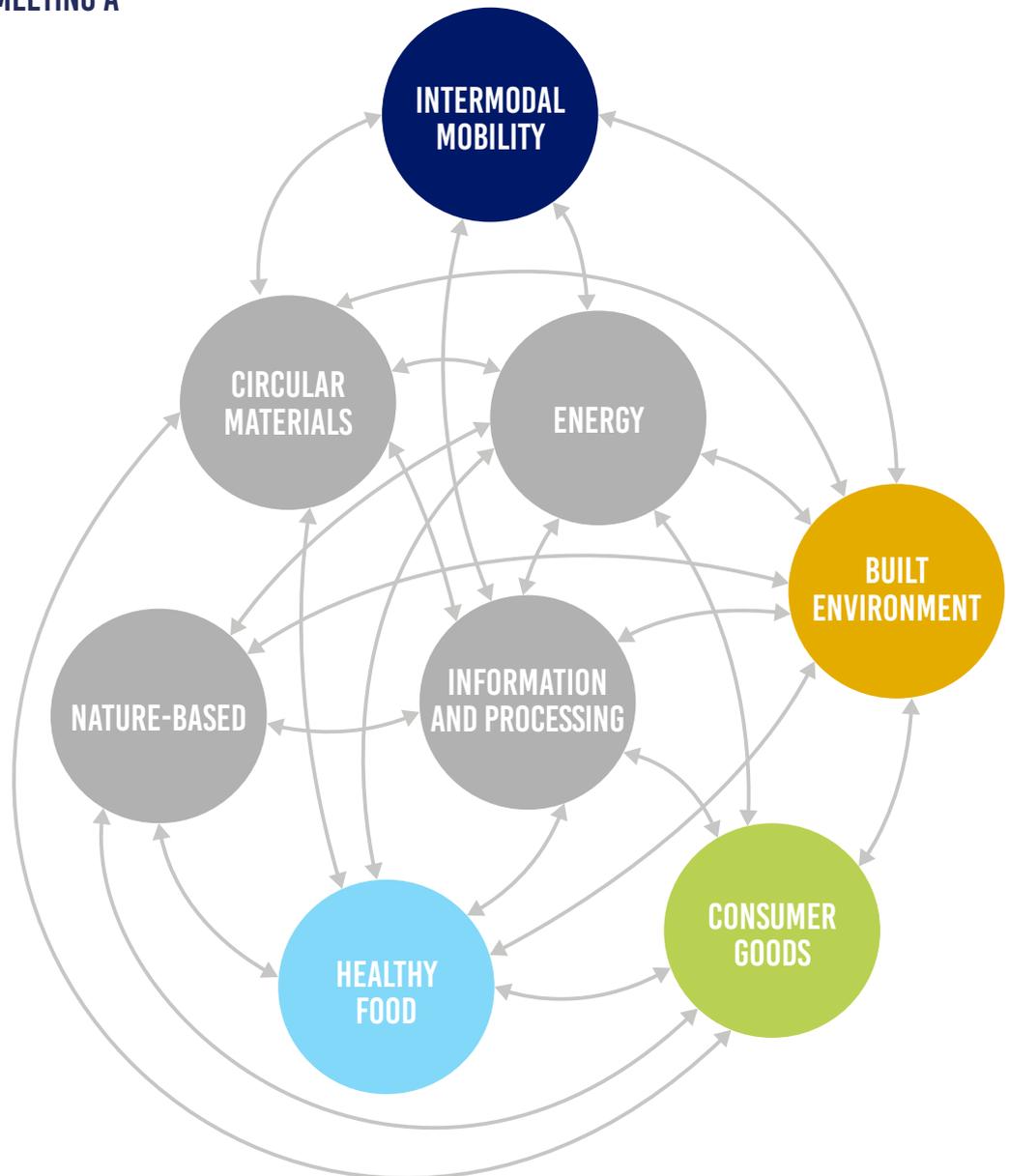
HELPING THE EGD MEET SOCIETAL NEEDS THROUGH 8 ECONOMIC ECOSYSTEMS

4 ECONOMIC ECOSYSTEMS MEETING A SPECIFIC SOCIETAL NEED:

- Nutrition
- Mobility
- Housing
- Daily functional needs

4 ECONOMIC ECOSYSTEMS SUPPORTING THE OTHER ECONOMIC ECOSYSTEMS IN THEIR DELIVERY OF SOCIETAL NEEDS:

- Nature-based
- Energy
- Circular materials
- Information and processing



The building blocks of each of these economic ecosystems are the 50+ Champion subsystems. During its history, Europe has been known for a number of industrial “Champions”,

which were industries Europe had built a leading position for in terms of technology innovation, intellectual property, skilled labour and competitiveness on global markets.

“ These are nascent industries that have the potential to succeed the industrial Champions and are best suited to compete in the green, resilient and fair post-COVID-19 economy that Europe wants to build. ”

This report identifies a new set of 50+ “Champion orientations”. These are nascent industries that have the potential to succeed the industrial Champions and are best suited to compete in the green, resilient and fair post-COVID-19 economy that Europe wants to build.

KEY CONCEPT: CHAMPIONS

Associated with the economic ecosystems, we identify 50+ champion orientations. These champion orientations are seedlings of economic subsystems. They all represent discrete, investable opportunities in areas of economic development that are in line with the vision of the European Green Deal and have the potential to build a more sustainable and resilient future through COVID-19 recovery funds.

We do not propose a “central planner” approach; nor are we suggesting that the Champion orientations will be the only winners in the economic recovery and the transition towards a sustainable future. We do believe, however, that the suggested Champions are able to future-proof EU economic development in line with planetary boundaries. We also suggest that, insofar as there is discretion in the distribution of economic recovery funds, relevant actors should direct funds towards the Champion orientations.

Innovation will play its part in identifying new ways to meet our societal needs. As such, we expect the list of Champion orientations to evolve, reflecting new technologies and business models. The list in this report is our best effort – at the time of writing – to sketch these economic subsystems.

Champion orientations do not exist in isolation. There are important considerations around sequencing, interrelationships between individual Champions and potential lock-in effects. One example is hydrogen, which today is still produced primarily from non-renewable sources. Scaling renewable energy production to produce green hydrogen must happen before widespread hydrogen expansion. We are undertaking further work to address the many questions relating to sequencing the Champions. The Champion orientations in this report do not suggest a particular sequence or order of priority.

The 50+ Champions have been identified by applying the 10 System Change Compass principles to each economic ecosystem. The idea is to identify orientations that are part of driving the desired system transition in each economic ecosystem. Within an economic ecosystem, there may be many industries that support these systemic orientations: this process has been about assessing which of them have the potential to deliver economic, social and environmental impact in line with the EGD vision. They represent discrete, investable opportunities.

The Champions listed are not exhaustive and the list does not claim to be an absolute truth: the nascent Champions will need to be monitored and re-evaluated. Interested stakeholders are invited to share their thoughts on how to refine, enrich and detail these Champions and interconnections.

The Champions identified differ in maturity: some are in the early stages, others are already relatively well developed in the EU. The list of Champion orientations might change. The criterion for current and future Champions is that they individually support the ecosystem-specific orientations derived from the Compass. They are areas where the EU economy can develop sustainably in line with planetary boundaries – and in which Europe should start seizing the competitive advantage.

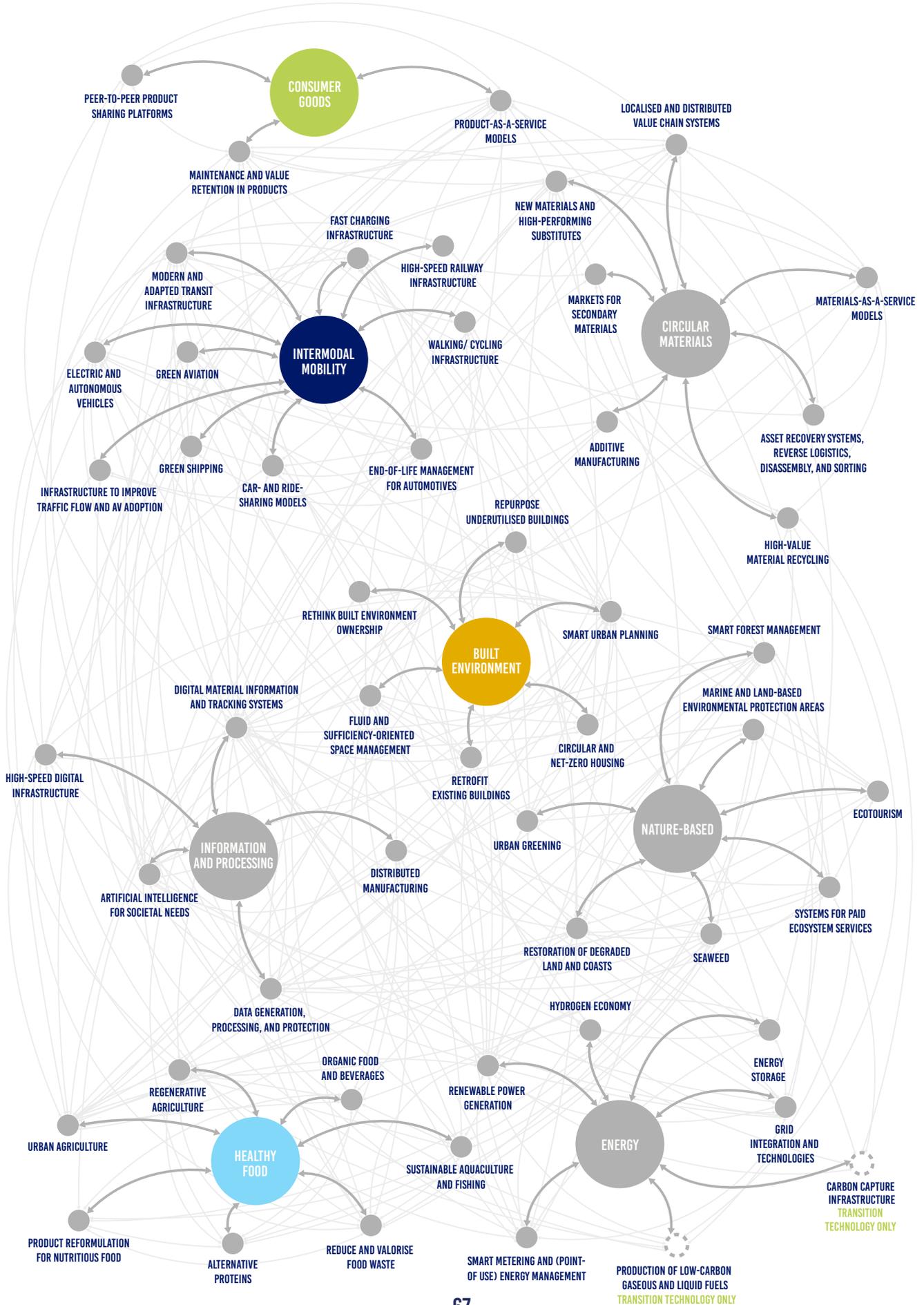
Champions, as defined in this paper, do not advocate for the systematic merger and consolidation of players into national or supranational monopolies. They are introduced as “sub-ecosystems” for which Europe should aim to build a cutting-edge know-how, a sizeable market and infrastructure, and an international competitive advantage. The focus should be on enabling new business models and the potential for scaling solutions e.g. for sustainable mobility, healthy food and resilient health systems.

Figure IV.3 presents the interconnections between the Champions; they are listed, described and complemented by case studies in Chapter IV.2.b. A couple of examples illustrate these types of links clearly: digital “material passports” are a crucial enabler of the circular material systems; smart urban planning is critical for a sustainable built environment but also for an intermodal mobility system.

Figure IV.3

50+ CHAMPIONS ORIENTATIONS TO LEAD A GREEN, RESILIENT AND FAIR POST-COVID-19 EUROPEAN ECONOMY

(non-exhaustive examples of themes interconnecting various Champions are indicated on the arrows)



2) ACTIVATING THE EUROPEAN GREEN DEAL: AN APPLIED CASE OF THE SYSTEM CHANGE COMPASS

This section describes the direct application of the System Change Compass to the framework explained above. Applying the Compass will address the drivers and pressures of our economic system and ensure that the vision of the EGD is not derailed.

“ Applying the Compass will address the drivers and pressures of our economic system and ensure that the vision of the EGD is not derailed. ”

As shown in figure IV.4, the 10 Compass Principles give rise to systemic (policy) orientations on each level of the systems map. The Compass looks to address and reset the drivers of our economy at a fundamental level. Applying the Compass to different levels of the system allows it to be translated into dedicated policy orientations.

In the overarching system there are 30 system-level policy orientations that are further analysed in Chapter IV.2.a. These orientations serve as a checklist for policymakers in charge of activating the EGD. They are a guide to tackling challenges that have so far gone unaddressed. They can

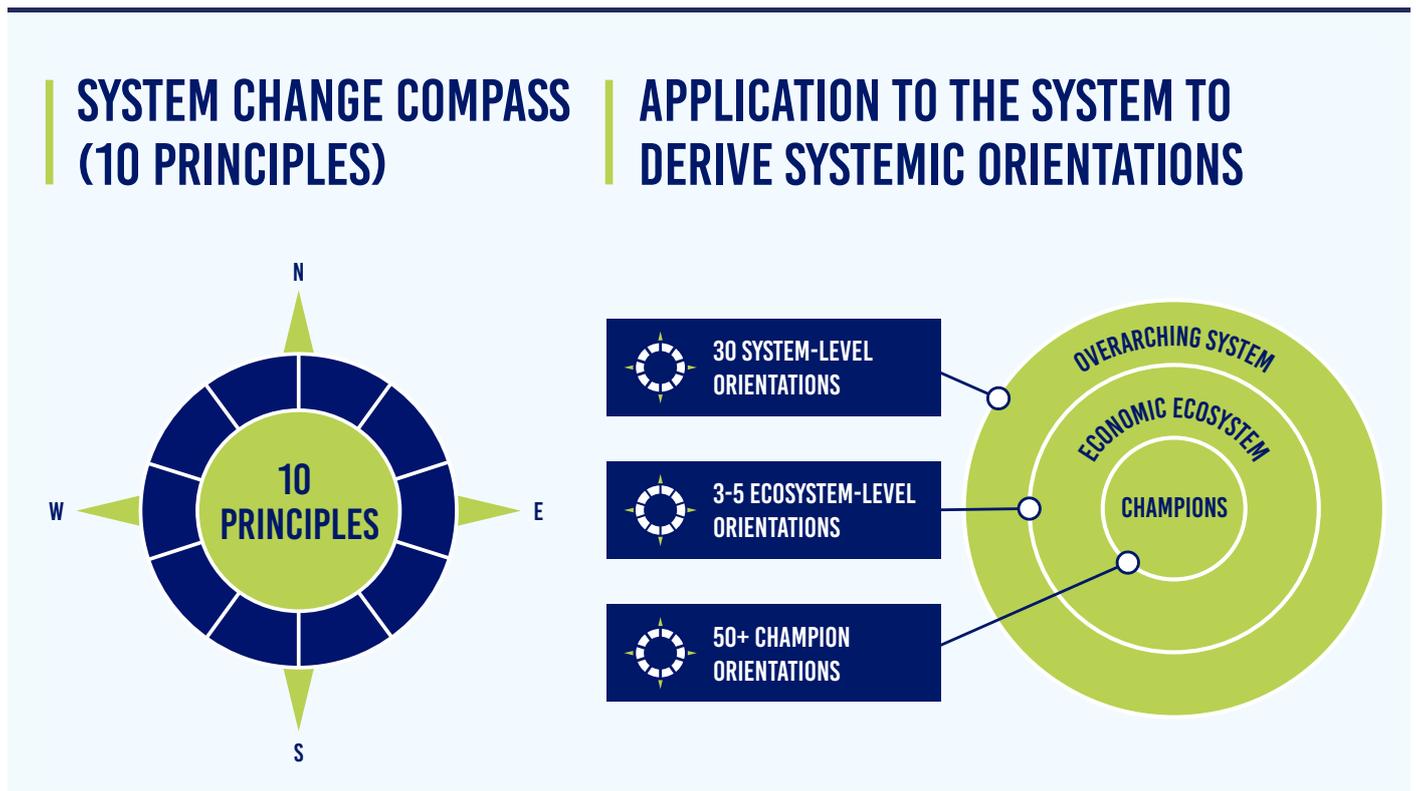
help put in place the necessary conditions for the ecosystems and Champions to thrive in a resilient, green and just way.

Chapter IV.2.b examines each of the 8 economic ecosystems in depth. It identifies sets of 3–5 ecosystem-level orientations identified to guide policymaking and prioritisation of COVID-19 recovery funds.

Within these economic ecosystems are 50+ Champion orientations that outline industrial priorities. These are a first attempt at sketching an exciting future industrial landscape for Europe. They represent specific, investable

Figure IV.4

TRANSLATING THE SYSTEM CHANGE COMPASS TO SYSTEMIC ORIENTATIONS



opportunities to create quality jobs and build a more sustainable future through COVID-19 recovery funds.

Orientations are so called because they set the direction that needs to be taken. They are not prescriptive, nor do they suggest a “central planner” approach. At the Champion level, orientations guide the way industrial development should proceed in order to build the

“ Orientations are so called because they set the direction that needs to be taken. Based on these orientations, specific and concrete policy action (intervention) is required. ”

economic backbone of a sustainable and resilient European economy in the 21st century.

The orientations for each economic ecosystem and Champion subsystem are wide ranging. For instance, public support could accelerate the research and development of nascent technical and technological solutions, through research grants, partnerships with public research centres, cities and regions, or investments in early-stage technology start-ups and accelerator programmes. The orientations are intended to offer guidance for all European policymakers: at EU level, nationally and regionally. Commitment at all political levels is required to summon up the power to adopt and implement these orientations.

Based on these orientations, specific and concrete policy action (intervention) is required. Where solutions are available but private investors are disincentivised by uncertainty and risk, or insufficient coordination and authorisation from public bodies, these interventions can take the form of direct investments. Ideally, such public capital should be deployed in a blended finance approach, so that each public euro invested is used to leverage private capital by bringing guarantees or de-risking the investments for private funders. Direct investments are often also related to infrastructure and other substantial investments.

The transitions described in Chapter III require massive – but positive – social change, whether through the acquisition of new skills and expertise, or through awareness raising and behavioural changes. Public authorities have a strong role to play in accelerating these shifts at all levels – from traditional educational frameworks and schools to new knowledge frameworks and community programmes.

a) System-level orientations

Three system-level orientations have been identified for each Compass principle to translate them into political action. These proposed orientations are listed in the table below and together are the foundation of the operating space for the 8 economic ecosystems, as can be seen in Figure IV.4.

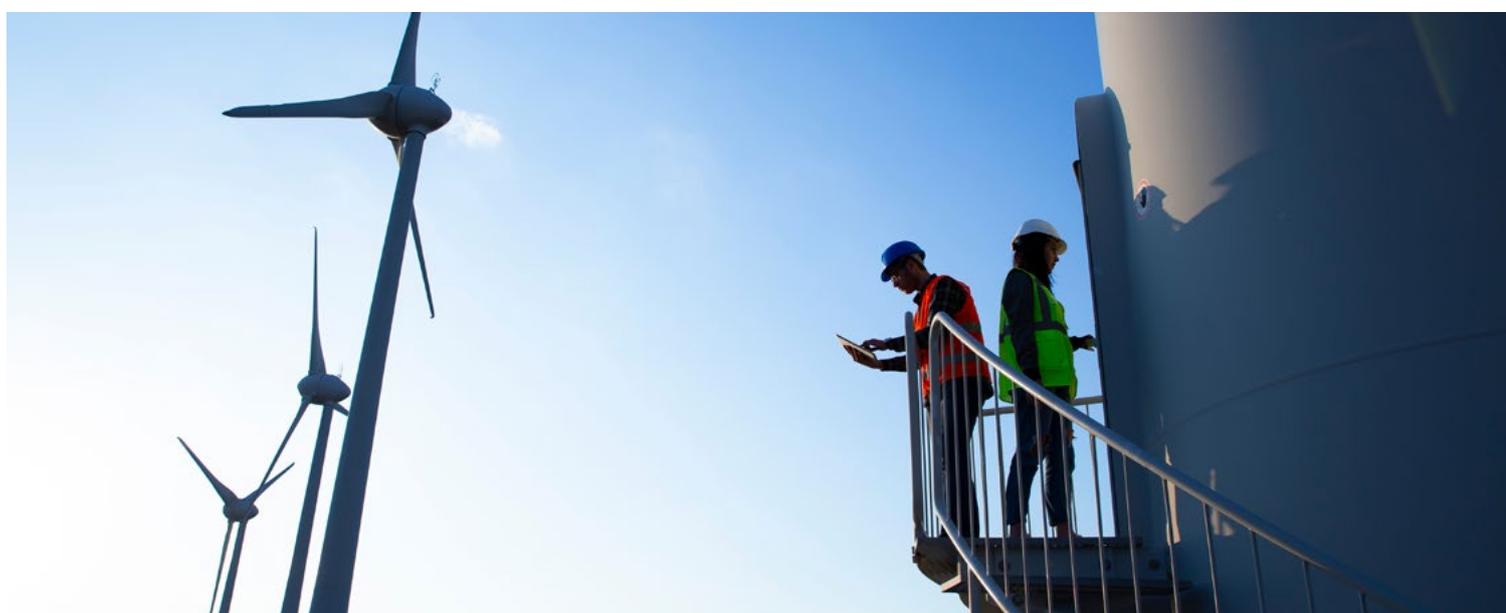


Figure IV.5

COMPASS PRINCIPLES	SYSTEM-LEVEL ORIENTATIONS
<p>01 REDEFINING PROSPERITY: EMBRACING SOCIAL FAIRNESS FOR REAL PROSPERITY</p>	<ul style="list-style-type: none"> ① Balance policy attention from income and wealth creation to income and wealth distribution, and ensure that economic transition contributes to equality and social fairness by guaranteeing universal basic services and minimum levels of income ② Create conditions for social acceptance of the transition by: enhancing reskilling and educational programmes; introducing a funding mechanism to support transition; supporting lower- and middle-income groups to help absorb the costs introduced by all economic ecosystems ③ Replace part of the income-based taxes with resource-based taxes to address resource as well as social policy targets
<p>02 REDEFINING NATURAL RESOURCE USE: PROSPERITY DECOUPLED FROM NATURAL RESOURCE USE</p>	<ul style="list-style-type: none"> ① Complement energy and GHG-related targets by introducing science-based resource use (absolute) decoupling targets following sufficiency principles ② Assess all policy proposals by dematerialisation and energy-efficient decarbonisation impacts ③ Align current legal and financial systems with circular and carbon-free principles; support the necessary infrastructure and research to contribute to achieving a carbon-free circular transition
<p>03 REDEFINING PROGRESS: MEETING SOCIETAL NEEDS AS THE PURPOSE OF A MODEL BASED ON ECONOMIC ECOSYSTEMS</p>	<ul style="list-style-type: none"> ① Ensure that societal needs are met inside a safe operating space and respecting planetary boundaries; set this as a primary goal for all European institutions and national governments ② Replace short-term-based governance – driving public, private and financial policy decisions – with a longer-term strategic approach and incentives ③ Reorganise European institutions, governments and other governing bodies and promote industrial dialogue to address societal needs, economic ecosystems logic, and other complex challenges; avoid an approach based on individual silos
<p>04 REDEFINING METRICS: PERFORMANCE MEASUREMENT UPDATED</p>	<ul style="list-style-type: none"> ① Replace GDP with a new, comprehensive well-being measure that also integrates social and environmental needs, accompanied by a set of additional indicators ② Introduce natural capital accounting ③ Standardise company and investor reporting with a decoupling lens against indicators of societal needs, pollution and emissions related to production
<p>05 REDEFINING COMPETITIVENESS: DIGITALISATION AND SMART PROSPERITY AT THE HEART OF EUROPEAN COMPETITIVENESS</p>	<ul style="list-style-type: none"> ① Build EU competitiveness based on resource, including energy and productivity; use digitalisation and spatial planning to optimise competitiveness ② Support the development and deployment of new digital services-based or other resource- and energy-reducing models ③ Support solutions that will strengthen resilience and strategic autonomy of the European economy, provide new local jobs and enhance education and job (re-training) programmes

COMPASS PRINCIPLES

SYSTEM-LEVEL ORIENTATIONS

06

REDEFINING INCENTIVES: INTRODUCING THE REAL VALUE OF SOCIAL AND NATURAL CAPITAL

- ① Follow the policy principles in all economic ecosystems, which would reflect and include all costs, like carbon pricing or resource taxes, related to environmental and health impacts (so-called "externalities")
- ② Reduce, without further delay, all harmful and unsustainable subsidies supporting extraction, consumption and disposal of natural resources; strengthen producer liability and use freed-up funding to support activities reducing natural resource use, especially in hard-to-abate sectors
- ③ Prioritise investments in "rebooting" nature and update environmental standards to take into consideration systemic interactions between climate–biodiversity–health, to ensure greater resilience to future shocks

07

REDEFINING CONSUMPTION: FROM OWNING TO USING

- ① Educate consumers and provide them with information, such as product passports, to empower them for informed choices
- ② Explore the opportunities offered by a less ownership-biased younger generation and provide consumers with alternative options to meet their needs
- ③ Support transition of governance, legal and financial systems to enable producer ownership business models

08

REDEFINING FINANCE: THE FACILITATOR OF THE TRANSITION

- ① Ensure financial accounting and risk assessment fully disclose climate, nature and diversity impact indicators of investment portfolios
- ② Orientate all public investments to catalyse system change, along the lines of compass orientations and economic ecosystems while considering immediate "symptomatic" action needs
- ③ Support and de-risk private investment and expand blended financing in emerging economic ecosystems and their respective champions

09

REDEFINING GOVERNANCE: SHARING SOVEREIGNTY AND WORKING TOGETHER

- ① Support inclusive, informed, fair and participatory governance systems, ensuring that all relevant stakeholders have voice, agree and share the ownership of necessary system change
- ② Explore the establishment of an international resource management convention and ensure better inclusion of resource management in all existing international agreements
- ③ Lead the implementation of more innovative, deliberative formats for policymaking, especially at supranational level; provide development funds to promote decoupling globally through co-creating or fostering new projects and programmes that are "bottom-up", and enhance governance models to support those implementing them

10

REDEFINING LEADERSHIP: INTERGENERATIONAL AGREEMENT BY SYSTEM CHANGE LEADERS

- ① Build trust through stronger commitment to – and rules on – science-informed policymaking, based on credible knowledge from diverse knowledge systems at all governance levels, and better define how the precautionary principle should be used in practice to strengthen resilience and build preparedness
- ② Empower and support system change leaders at all levels to drive the change: from private to public, local to global, ensuring equality and diversity of leadership
- ③ Ensure that the rights of future generations are considered in policymaking and their voices are better heard and included in decision-making debates

b) Discussion on the 8 economic ecosystems

This section details the 8 economic ecosystems. First, it analyses the four economic ecosystems that immediately meet societal needs (Healthy foods, Built environment, Intermodal mobility and Consumer goods meeting functional needs). It then looks at the four economic ecosystems that support the first four (Nature-based, Energy, Circular materials and Information and processing).

Each ecosystem is described and COVID-19's impacts on the respective ecosystem are discussed. Having outlined the value at stake, this section outlines orientations which are specific to that economic ecosystem, and which are derived from the 10 Compass principles. Implementing the EGD while using these orientations as guidance will help to strengthen it from an economic, social and environmental perspective, as well as enhancing the EU's all-round resilience.

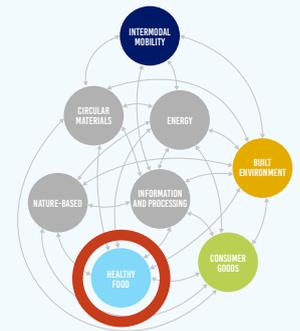
Applying these orientations will:

- help to cut (hidden) costs of current processes and methods (**economic**)
- boost economic recovery by creating quality jobs in well-established and nascent industries as well as reducing inequalities and dependencies, e.g. from fossil-fuel-producing countries (**social**)
- support protection of the environment and reduce air pollution, biodiversity loss and the leakage/emission of GHG (**environmental**)
- strengthen the EU's capacity to deal with change, and to use shocks or disturbances (like the COVID-19 pandemic) to spur renewal and innovative thinking (**resilience**)¹⁸³

Having outlined and clustered the respective economic ecosystem-level orientations, the report lists Champion orientations for each ecosystem. It needs to be reiterated that the Champions listed are not exhaustive. However, they contain industries that are ripe for investment and hence have the potential to offer direct COVID-19 relief. Within each ecosystem, one Champion orientation is presented in more detail, along with an example of a concrete policy measure (intervention) and a relevant case study.



1 HEALTHY FOOD



This ecosystem encompasses the whole lifespan of food – from its production to end-of-life. It includes how the food is cultivated (e.g. conventional vs organic), where it is farmed (e.g. urban vs countryside farming) and what kind of food is consumed (e.g. resource-intensive animal-based protein vs alternative proteins). Thus, it is directly related to nature and biodiversity, for example through the use of pesticides and excessive nutrient build-up, and their contribution to soil, water and air pollution. The Healthy food ecosystem fulfils the essential societal need for nutrition. It is deeply intertwined with the other six economic ecosystems. This is particularly evident for the connection to circular materials (the market size of global fresh food packaging in 2020 is USD 79.9 billion)¹⁸⁴ and energy (this ecosystem uses energy, but also produces commodities/resources for energy generation, such as cow dung for biogas).

“ This ecosystem encompasses the whole lifespan of food – from its production to end-of-life. ”

Impact of COVID-19. The COVID-19 pandemic is exacerbating an ongoing food security crisis, revealing underlying risks, fragility and injustices in global food systems, and affecting the most vulnerable most strongly. According to the UN World Food Programme, 820 million people were already chronically food insecure. Unless swift action is taken, COVID-19 related effects could double this number.¹⁸⁵ The pandemic has underlined the importance of a robust and resilient food system that is able to guarantee citizens access to an adequate supply of affordable and healthy Food at all times. The partial food supply shortages and empty supermarket shelves have revealed the critical links between our food supply chains, consumption patterns, social inequalities and health.

The effects of the virus are another demonstration that our food system needs to become more resilient. They demonstrate the critical influence of industrial agriculture on the emergence of diseases (intensive livestock production and wildlife intrusion) and how a lack of resources can affect a complex flow of food, production inputs and seasonal workers, leading to production difficulties or even production stops. Nevertheless, there is a risk of a delayed transition, especially for regenerative agriculture, due to high transition costs.¹⁸⁶ Globally, workers in the food system face insecurity and low wages and are among those most at risk of economic disruption.¹⁸⁷

Value at stake. The global food industry entails tremendous socio-economic, health and environmental costs: current methods of production and consumption costs are greater than the market value of the global food system measured at market prices.¹⁸⁸ Unsustainable agricultural and land-use methods are a key driver of biodiversity loss, water stress, extreme weather events linked to global warming and natural

resource depletion – as well as food insecurity and non-communicable diseases such as diabetes. The food system is also intertwined with the risk of zoonotic diseases spilling over to humans.

According to estimates by the Food and Land Use Coalition, the largest hidden cost to the global economy – totalling USD 6.6 trillion per year – relates to human health. Over two-thirds of these health costs relate to the impact of widespread malnutrition across our food systems.¹⁸⁹ However, human health also demands that the right actions are taken: converting natural ecosystems for food production increases the frequency of human-wildlife-domestic animal interactions and thus the risk of cross-

species transmission of pathogens. Meat from ruminants is the most land-intensive food (20 times more than legumes per gram of protein) and the beef industry is the leading driver of tropical forest loss. Reducing meat consumption (both wild and domesticated) and transitioning to smaller-scale, more localised meat production, away from natural ecosystems, would thus have an impact in reducing risk of zoonotic disease spillover.

A productive and regenerative agricultural system presents significant economic, social and environmental benefits: the annual economic gain from this transition is estimated at >USD 1 trillion globally by 2030.¹⁹⁰ Reducing and valorising food waste, and establishing regenerative and precision agriculture, could unlock EUR 93 billion by 2030 in Europe alone.¹⁹¹ Soil health and improving the water cycle are intrinsically linked to the general health of our food system. A food system with closed nutrient loops and a regenerative and healthy food chain can return additional value to European households by reducing food costs by 30% per person.¹⁹² With global value of food loss, waste and fertiliser leakage estimated at USD 1.3 trillion,¹⁹³ addressing this inefficiency presents a tremendous economic opportunity in the food and land use sector in Europe. Halving consumer food waste presents an annual opportunity of around USD 380 billion in 2030, given projected growth in food demand and waste.¹⁹⁴ Moreover, the Healthy food economic ecosystem together with the nature-based ecosystem have immense potential for new employment: 191 million jobs could be created by 2030.¹⁹⁵

A rapid shift away from animal-based proteins and the development of diversified sources of protein would complement the global transition to healthy diets; it also entails various environmental benefits. This diversification of human protein supply falls into four main categories: aquatic, plant-based, insect-based and laboratory-cultured. These last three sources alone could account for up to 10% of the global protein market by 2030 and are expected to scale up rapidly.¹⁹⁶ This transition would also contribute to reducing GHG emissions, most notably of methane, which has at least 56 times the global warming potential of an equivalent amount of CO₂ in a 20-year time horizon.¹⁹⁷

A pivotal component of building a resilient European food system is the restoration of land and soil and ensuring of animal welfare through regenerative agricultural practices – which also requires large-scale training and investment. Such interventions would have the additional benefits of increasing incomes for farmers and supporting livelihoods, thus contributing to a just transition.

Alternative feed and food sources from aquafarming, seaweed (algae) farming and insect farming are additional solutions to meet societal needs while reducing pressure on natural resources. Farmed fish feed used today is a mix of 30% wild fish meat and 70% plant proteins such as soybeans.¹⁹⁸ Hence it contributes to overfishing our oceans and there is an inherent risk that rainforest is being destroyed to expand farmland for soybean cultivation. A transition to insect meal in aquaculture would therefore contribute to a sustainable use of the oceans as well as prevent increased CO₂ emissions, loss of habitat and land erosion caused by deforestation. Moreover, there is an immense economic potential in insect meal in aquaculture: the global market is estimated at EUR 5 billion in revenue and could grow to EUR 30 billion by 2030.¹⁹⁹ In summary, investing in sustainable aquaculture and fishing while protecting and restoring essential habitats – such as wetlands and coral reefs – would create employment opportunities, support regional nutritional security (fish currently provides more than 3.2 billion people with almost 20% of their average intake of animal protein) and also help to shift diets away from animal-based proteins with large GHG and land-use footprints.²⁰⁰

From the Compass to the economic ecosystem-level orientations. Chapter III's 10 principles translate into four specific policy orientations for the Healthy food economic ecosystem. Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.1

HEALTHY FOOD ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Maximise nutrient productivity (nutrients per resource input; land & water) and improve health benefits by</p> <ul style="list-style-type: none"> • promoting change in dietary choices: reducing animal-based meat consumption and promoting alternative sustainable protein sources (including meat that is produced from regenerative practices, i.e. grass fed, soil building, carbon sequestering) while ensuring fairness and affordability in access to healthy food • promoting regenerative agricultural practices (including the biodiversity perspective in crop selections) and permaculture practices 	✓	✓	✓	✓
<p>Minimise food/biomass waste in supply chains and at the consumer/household stage and maximise nutrient cycling through</p> <ul style="list-style-type: none"> • shorter supply chains • better access to food supply 	✓	✓		✓
<p>Create enabling sustainable conditions through</p> <ul style="list-style-type: none"> • transition help for farmers and other actors across the value chain • resolving competing land/biomass consumption claim • matching positive sustainability potential of the land with right use, particularly for non-food crops (e.g. biofuel) to reduce their land consumption 		✓		✓
<p>Minimise and compensate remaining negative impacts through</p> <ul style="list-style-type: none"> • ensuring fair distribution of societal costs of negative impacts • implementing, for example, flower strips for biodiversity, water conservation and cycling, precision fertilisation and farming 		✓		✓

List of Champion orientations primarily associated with this ecosystem. Seven Champion orientations have been identified for the healthy food economic ecosystem and are displayed in the table below.

Table IV.2

HEALTHY FOOD – CHAMPIONS 	DESCRIPTIONS 
Organic food and beverages	Increase organic food and beverage market (e.g. through pull measures and rewards for their ecosystem services)
Regenerative agriculture	Minimise agrochemicals and soil disturbance, maintain soil cover and promote efforts to maximise biodiversity (adapted to local contexts across European geographies)
Sustainable aquaculture and fishing	Boost development of sustainable aquaculture and sustainable wild-caught fisheries
Reduce and valorise food waste	Shift to zero-waste high-quality food systems, reducing food waste through new business models and technology, and scale nutrient waste-to-fertiliser facilities, e.g. anaerobic digestion and bio-refineries
Urban agriculture	Improve the scale and efficiency of food grown in urban environments, e.g. through urban public gardens, indoor or vertical farming
Product reformulation for nutritious food	Improve nutritional content by reducing processing, substituting fat and sugar content, and increasing transparency for consumers
Alternative proteins	Scale next-wave human protein food supply sources, particularly aquatic, plant-based, insect-based and laboratory-cultured

Champion orientation example: regenerative agriculture.

For decades, food systems have focused on finding cheaper ways to feed populations. The consequence is the erosion of the soil – the very foundation of farming – and reduced resilience of natural systems. The cost of soil degradation in the EU is estimated at EUR 97 billion per year, of which two-thirds are costs to human health.²⁰¹

We need an agricultural system that is both productive and regenerative. This should entail changes in landscapes and practices to improve yields, while promoting the health of the surrounding natural ecosystem. To this end, traditional techniques should be revived and combined with new ones: crop rotation, agroforestry and advanced precision farming technologies together can support more judicious use of inputs, better yields and overall more sustainable and regenerative farming methods.

A cluster of farms in Belgium has achieved a transition to regenerative soil practices that has reduced agrochemical inputs by 30% while preserving yields.²⁰² Better regenerative land management will increase soil fertility, maximise crop yields, make food more nutritious and support the absorption of CO2 and the recovery of biodiversity. All this will yield enhanced resilience as greater agrobiodiversity and healthier soils also increase resilience to disease, pests and weather instability.²⁰³

This transition has the potential to generate large-scale employment and economic opportunities. The UN Food and Agriculture Organization estimates that regenerative agricultural practices could yield an additional 200 million full-time jobs by 2050.²⁰⁴ These jobs could also be created rapidly due to their low-tech nature and the minimal training required. Investing USD 35–40 billion in regenerative agriculture could yield an estimated USD 1.1 trillion in economic benefits by 2030.²⁰⁵

Example of intervention at Champion level. Scaling regenerative practices across Europe will require significant direct investment, large-scale training and education programmes, research and development spending and deeper structural policy changes, for example on agricultural subsidies. Effective interventions will include shifting public procurement for regeneratively produced foods to provide off-take guarantees and increase demand for nutritious and regeneratively produced foods.

Similarly, investment in innovative solutions for knowledge and data sharing between farmers and across the value chain would facilitate the scale-up of economically favourable and regenerative practices.

For example, the Carbon Action project in Finland is an innovative model that brings together researchers, corporate food buyers and farmers who adopt regenerative practices for improved yields, while sharing their knowledge with the broader Healthy food ecosystem.

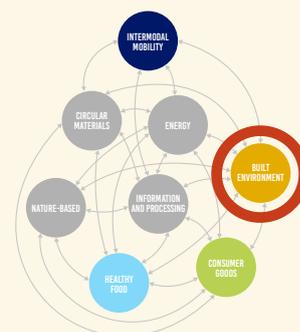
Case Study 1: Carbon Action project: research and training for carbon farming practices, Finland²⁰⁶



Carbon Action is a Finnish collaboration platform established in 2017 to drive regenerative agriculture and soil carbon sequestration through research and training of “carbon farming” (i.e. regenerative) practices. It also aims to mobilise key actors in the sphere. The programme studies and identifies practices that both increase crop yield and improve biodiversity, resilience and global warming mitigation. These are achieved through regenerative practices such as cover cropping, reduced tillage, organic fertilisation, agroforestry tools and networks. Farmers dedicate some of their fields to research to support the Carbon Action platform.²⁰⁷

Additionally, corporate food buyers are involved, including Fazer and Valio, who can benefit from the research and learn how to support their own farmers in transitioning their practices.

2 BUILT ENVIRONMENT



The built environment refers to all human-made environments that provide the setting for human activity, from buildings to cities. It is the space in which people live and work, day-to-day, thus serving their needs of accommodation, organisation and representation. This system primarily serves the need for housing. However, a modern built environment also includes access to healthy food and community gardens; it influences mental and physical health; it needs to ensure amenity for pedestrians and cyclists. As such, it has strong connections to the other economic ecosystems.

Impact of COVID-19. The built environment is of great importance for public health and well-being and for reducing the risk of infection, since we spend more than 90% of our time indoors.²⁰⁸ Cities have high population densities; people are constantly in close contact with others, which enables a rapid spread of infectious diseases. The need for office space is decreasing significantly due to more home working and operating cost reductions,²⁰⁹ requiring new usage concepts and repurposing of buildings. The pandemic challenges us to rethink building design and use, and the urban areas themselves, and possibly implement sustainable built environment solutions with win-win results.

Studies show that there are helpful measures available, ranging from incremental changes like the re-organisation of spaces, the erection of physical barriers and touch-free solutions, to measures like increasing natural ventilation. For example, simpler and cleaner minimalist design for buildings could become a growing trend. The absence of carpets can reduce the accumulation of viruses and at the same time reduces resource consumption and maintenance efforts. Minimalism also makes rooms more flexible and adaptable, which benefits flexible, modular office and living spaces.²¹⁰ These measures can help not only reduce the risk of a virus being spread, but also increase resilience, improve air quality and reduce energy or material consumption, which may increase the sustainability of the built environment.²¹¹

Value at stake. The European built environment today accounts around 40% of EU's energy consumption and is responsible for 36% of greenhouse gas emissions.²¹² 75% of European buildings are energy-inefficient.²¹³ 15% of buildings materials are wasted in the construction phase, the overuse of steel and concrete can be up to 50%.²¹⁴ "Greening" the built environment (large-scale renovation and construction programmes with a focus on energy and material efficiency, urban design solutions, better residence management models) would create widespread economic, social and environmental benefits. On its own, improving energy efficiency in buildings represents a USD 555–770 billion market opportunity by 2030.²¹⁵ "Circular" buildings, circular city infrastructure and closing construction loops have the potential to save EUR 195 billion by 2030 of which EUR 81 billion can be reached through recovery activities in the short term.²¹⁶

The European Commission estimates that 2–4 million new jobs could be created, and 6.5 million full-time positions could be retained from realising the target to increase the renovation rate threefold.²¹⁷ Additionally, standards of living would improve (e.g. through better homes and neighbourhoods), cost savings would materialise for both households and public entities (as 10–12% of the stock is in public hands), and emissions from the built environment could be reduced (e.g. emissions from the material cycle of residential could be reduced by at least 80% by 2050).²¹⁸ Reducing the material input costs (space, land and construction materials) and energy (operating) would similarly benefit the 11 million households who experience severe housing deprivation.²¹⁹ For example, 50% of construction costs could be lowered through industrial and modular processes to construction – where a total of 30% of cost per square meter could be returned value.²²⁰

From the Compass to the economic ecosystem-level orientations. Chapter III's 10 principles translate into five specific policy orientations for the Built environment economic ecosystem as shown in Table IV.3.

Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.3

BUILT ENVIRONMENT ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Reduce required floor space while keeping quality of life high, enhancing fairness and improving community enablers through</p> <ul style="list-style-type: none"> • designing cities in strategic urban hubs providing density in nodes (instead of megacity “concrete jungles”) with near access to surrounding green spaces • facilitating relocation and downsizing for residents who live in unnecessarily large spaces e.g. after children leave • renovating and increasing use in existing buildings thus avoiding the need for new buildings • ensuring fairness of access, particularly in areas of under-utilisation, e.g. by city/neighbourhood revitalisation 	✓	✓	✓	✓
<p>Increase number and size of green city spaces for</p> <ul style="list-style-type: none"> • carbon sinks and improve local biodiversity • enabling local food production • improving quality of life for all residents through fair access 		✓	✓	
<p>Create interconnected and sharing communities through</p> <ul style="list-style-type: none"> • local farming with community areas and services • building multi-party residences with smart shared spaces and direct access to shared services e.g. electric bike stations • designing interconnected hubs to provide diverse residential, cultural, community and commercial services 		✓		✓
<p>Increase material and energy efficiency of buildings by</p> <ul style="list-style-type: none"> • improving renovation and insulation for higher energy efficiency of residential and commercial buildings • using better, recyclable and renewable circular materials, such as cross-laminated timber to construct houses 	✓		✓	
<p>Switch fuels for heating and cooling through</p> <ul style="list-style-type: none"> • clean and renewable energy sources • electrifying heating and cooling with renewable energy sources once available 			✓	

List of Champion orientations primarily associated with this ecosystem. Six Champion orientations have been identified for the Built environment economic ecosystem and are displayed in the table below. They represent the various dimensions of this ecosystem: improving individual buildings (existing or new) and connecting them smartly with a system lens through smart urban planning.

Table IV.4

BUILT ENVIRONMENT – CHAMPIONS 	DESCRIPTIONS 
Smart urban planning	Plan cities to benefit both nature and humans, particularly in zoning decisions for area use (e.g. ensure city planning reduces the need for mobility, ensures limited sprawling, prepares for intermodal mobility solutions, enables micro-mobility through pedestrians and bicycles)
Rethink built environment ownership	Transfer the built environment ownership to public or private owners who take care of full space utilisation and are rewarded based on utility provided per area of built environment
Repurpose underutilised buildings	Increase the smart use of buildings through urban revitalisation, redevelopment, conversion of vacant or derelict stock
Retrofit existing buildings	Optimise the energy efficiency of built environment by retrofitting public and private buildings, e.g. electrification of heating, insulation, ground source heat pumps, electric and hydrogen boilers etc.
Fluid and sufficiency-oriented space management	Increase provision of durable and modular, space-efficient buildings with sufficiency-oriented amount of space per capita, a flexible usage concept and a common infrastructure to save costs and increase convenience, e.g. co-working and co-living; reduce barriers to relocation for households where space requirements have decreased (e.g. after children move out of parental homes)
Circular and net-zero housing	Increase construction of circular and net-zero buildings and retain maximum value of end-of-life building materials through improved design, improved material as well as circular and net-zero construction principles

Champion orientation example: retrofit existing buildings.

The world's energy systems are rapidly changing. However, the built environment is experiencing a much slower transition despite the significant share of energy budget this ecosystem represents in the EU. It is possible to optimise (reduce) total floor space through combination of smart city planning and higher utilisation. While the overall transition has reduced costs and yields, more efficient and cleaner technologies (including insulation, heat pumps and appliances like air-conditioning units), these are not yet adopted at scale.

The market for retrofitting buildings is estimated to grow to USD 151.8 billion by 2020 globally and has the potential to save up to 45% of energy even with standard refurbishments

in Europe.²²¹ The benefits of replacing high-carbon and inefficient assets with more efficient technologies include: cheaper energy from improved efficiency (e.g. electric heat pumps could satisfy around 90% of global heating needs with a lower carbon footprint than gas-fired condensing boilers²²²), cleaner air (avoiding air pollutants from boilers) and safer buildings (from improved cooling services in face of rising temperatures). Best-in-class air conditioning units are already three times better for the climate, (particularly as inefficient units leak refrigerants throughout their lifespan which are 20-20,000 times more potent than CO₂), and save 70% of costs for end-users.²²³ Additional social benefits would materialise from re-training workers install such energy-efficient solutions. McKinsey & Company estimates

that 16–21 full-time jobs could be created per EUR 1 million mobilised for energy-efficiency retrofits of houses while rapidly accelerating the just transition.²²⁴

Example of intervention at Champion level. To scale retrofitting of the built environment, however, key barriers must be overcome. Retrofit building investments are typically self-financed by end users, making it difficult to scale the market without greater access to debt or equity, as the solutions available invariably represent higher upfront costs in

exchange for longer-term benefits. A lack of understanding of how to monetise energy efficiency savings is also a key issue. Innovative models and initiatives are coming forward, including heat as a service (HaaS), cooling as a service (CaaS) and the Energy Efficiency Enabling Initiative, which allow for the investment in sale-and-leaseback models that overcome the cost burden to technology providers and consumers, as the entire required investment can be held on a bank's balance sheet.

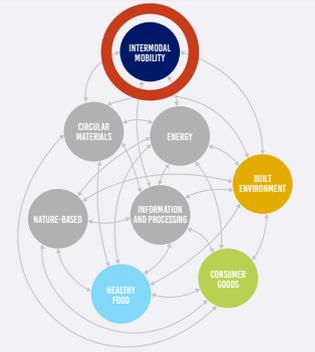
Case Study 2: Sale-and-leaseback business models and Energy Efficiency Enabling Initiative



Today's energy-efficiency investments are primarily self-financed by end users. High upfront capex costs limit the ability to scale investments. Two market solutions provide a means to scale the number of energy-efficiency solution providers, improve economics at household level and increase the number of completed energy-efficiency installations.

- i) Sale-and-leaseback models enable technology providers to provide solutions deployment at scale, with the required investment resting on the lender's balance sheet. Multiple models exist that enable customers to pay for the benefit they receive, and not the upfront capex: Heat-as-a-Service (different models exist, including selling heat in kW thermal units through district heat networks), Property Assessed Clean Energy (PACE), cooling-as-a-service (CaaS) and other on-bill financing. In all these models, the project developer installs and maintains the relevant equipment and recovers costs and returns through period payments.
- ii) The Energy Efficiency Enabling Initiative instrument provides the model for a funding mechanism where risk capital supply is increased through the involvement of new investors in an energy efficiency equity fund. The fund has the mandate to source and support efficiency initiatives, backed by clear guidelines, eligibility criteria and reporting requirements – which can be tailored to incentivise investments in sale-and-leaseback business models

3 INTERMODAL MOBILITY



This ecosystem encompasses all different forms of land, sea and air mobility and the transportation of people as well as goods. It meets the societal need for the transport of individuals and goods. Modern, clean, barrier-free and affordable mobility and transportation can be enabled through policy changes as well as digital innovations in this sector. For mobility in urban and rural areas, different concepts of public and private networks will be integrated and allow a seamless and convenient transition between different modes of transport. This Intermodal mobility economic ecosystem is underpinned by reducing the impact of the transport systems on the environment and human health through sharing models (e.g. for cars and bicycles), mobility services (e.g. expanded public transport

“ This ecosystem encompasses all different forms of land, sea and air mobility and the transportation of people as well as goods. ”

networks), digitalisation, electrification, autonomous driving and other new solutions for cargo vessels and aircraft. Such solutions are a major lever for saving energy as well as materials and thus show strong links to the energy and circular materials economic ecosystems.

Impact of COVID-19. As a result of lockdowns and physical distancing, the demand for mobility has declined sharply, while operational complexity has increased due to additional health and hygiene measures. There have been reductions in overall mobility demand of up to 90% during lockdowns, accompanied by an increasing share of private mobility (cycling, walking, car) as people try to maintain distance.²²⁵ Public transport passenger numbers have fallen by 70 to 90% in major global cities. Carpooling has also declined by up to 60 to 70%, and many micro-mobility providers have discontinued their services.²²⁶ Pauses in sharing services

risk leading to a delayed development.²²⁷ The number of passengers on commercial flights in 2020 is expected to be 35% to 65% lower than in 2019.²²⁸ Vehicle capacities have been reduced. As the pandemic progresses, the impact on mobility behaviour and preferences will continue. The general decline in GDP and reduced household budgets as well as increased home working and e-commerce will lead to a reduction in travel volume, to changes in the purpose of travel (e.g. fewer trips from home to work) and to a reorientation of travel (e.g. fewer trips at peak times). Further, the experiences from lockdowns have long-term effects: survey data from 21 cities in six European countries show that many people would like to see measures preventing a return to pre-pandemic levels of air pollution. There is strong

support for new zero-emission zones, banning cars in urban areas and maintaining more cycle and pedestrian paths.²²⁹ In the short term, the COVID-19 crisis is likely to have a negative impact on the scalability of

mobility-as-a-service (MaaS) development, as the MaaS business model is largely focused on mass transit. In the medium term, MaaS can contribute to a more sustainable mobility and greater system stability through a wider range of mobility options. Thus, the COVID-19 crisis offers a unique opportunity for governments and operators to significantly transform mobility systems.²³⁰

Value at stake. Enabling a circular, intermodal mobility system, mostly integrated mobility systems, circular car production, circular car systems, presents a great economic return opportunity for Europe, estimated at USD 247 billion by 2030, yielding significant additional environmental (including material) and social benefits.²³¹ Of these, EUR 70 billion can be saved near-term through green recovery investments, for example in fast charging infrastructure, remanufacturing and recycling facilities and an increase

uptake in electric vehicles in shared fleets.²³² The European transport sector is estimated to represent around 27% of total European GHG emissions.²³³ Usage rates of public transport are slowly increasing compared to decades ago, but mobility is still strongly based on individual car transport, accounting for 83% of all passenger-kilometres across the EU.²³⁴ This is a problem precisely because, on average in Europe, the car has a utilisation rate of only 2%, when taking into account the 92% of the time it is parked, time stuck in traffic jams or searching for parking spots, and the fact that it is used by only 1.5 passengers on average.²³⁵ The post-2008 recovery in the US showed that funding for public transit infrastructure created more than twice the job-hours compared with the same level of funding for highways.²³⁶ It is also estimated that the transition to electric vehicles will create 200,000 new quality jobs in Europe by 2030.²³⁷

In 2017, the average European household spent almost 20% of their annual gross income on car mobility.²³⁸ A significant amount thereof could be returned to consumers with the help of a more efficient mobility system and subsequently reduced operation (~30%), maintenance (~50%) and overall lifetime costs.²³⁹ The societal opportunity cost from time spent in congestion is EUR 3,500 per annum per car.²⁴⁰ Together, these costs amount to about EUR 2 trillion – equal to the GDP of Italy and Sweden combined,²⁴¹ which can be significantly reduced through a system transition towards a situation which removes the lock-in effects of particular ownership- or business-models and thus leads to a high exchange between transport modes.



Aviation is another emission-intensive mobility sub-sector. It accounts for 1Gt CO₂ per annum globally and makes up about 3% of the EU's total CO₂ emissions.²⁴² In spite of the COVID-19 pandemic, the number of flights and passengers is expected to rise in the coming years.²⁴³ Annual global emissions from international aviation are already about 70% higher in 2020 than they were in 2005, and the International Civil Aviation Organization predicts that they could increase by over 300% by 2050 if no additional measures are taken.²⁴⁴ Implementing sustainable solutions – such as improved energy efficiency and shifting to alternative engines or fuels – in aviation would reduce GHG emissions drastically²⁴⁵ while ensuring quality jobs in this sector. This should be complemented by reducing demand for short-distance air trips and diverting that mobility to fast rail networks, which would be a key transition to achieve the EGD's objectives.

Regarding the transport of goods and materials, the international shipping industry is responsible for the carriage of around 90% of world trade²⁴⁶ and consumes about 300 Mt of fuel annually. In the EU, maritime transport was responsible for 138 million tonnes of CO₂ released into the atmosphere representing over 3.7% of total EU CO₂ emissions.²⁴⁷ The transition to green shipping (including eco-vessels and green ports) would have significant environmental, social and health benefits through the reduction of GHG emissions. Ocean-based transportation even has the potential for a roughly 100% reduction in operational net GHG emissions by changing the way it stores and consumes energy on board.²⁴⁸ Moreover, green shipping would prevent marine water pollution (e.g. by ballast discharge) and noise pollution.²⁴⁹ And, it would tackle a major source of air pollutants that threaten the health of mainly coastal populations and would decrease the risk of human rights violations on shipping vessels.²⁵⁰

From the Compass to the economic ecosystem-level orientations. Chapter III's ten principles translate into four policy orientations for the Intermodal mobility economic ecosystem. Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.5

INTERMODAL MOBILITY ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Reduce the need for motorised trips through</p> <ul style="list-style-type: none"> designing cities for shorter commutes, facilitating residential relocation to shorten commutes, improving digital infrastructure and offerings to promote non-travel meetings promoting working-from-home (teleworking) policies enabling low-material, zero-fuel "active" transport e.g. extension of cycling lanes, conversion of highly frequented city zones into pedestrian areas shortening supply chains to increase freight efficiency 	✓		✓	✓
<p>Reduce energy intensity and consumption of fuel made of mineral oil by</p> <ul style="list-style-type: none"> promoting electric vehicles in all possible cases reducing energy intensity (energy consumption per tonne transported) by technical and operational interventions in aviation and shipping shifting to sustainable fuels for indispensable aviation and shipping trips 		✓	✓	
<p>Maximise the utilisation per vehicle and trip for freight and passengers through</p> <ul style="list-style-type: none"> intercity: (high-speed) rail urban: public transport, intermodal integrated mobility offerings enablers: infrastructure, exclusive lanes for shared transport and micro mobility, digital platforms ocean/air: avoiding empty/unladen/not fully booked journeys, modularity of planes for different uses that is adaptable to current need of either passenger or freight capacity 	✓		✓	
<p>Prioritise medium of transport that is easiest to electrify and maximise utilisation through</p> <ul style="list-style-type: none"> e.g. train transport over planes, particularly for regional or domestic flights 			✓	

List of Champions orientations primarily associated with this ecosystem. Ten highly interconnected Champions orientations have been identified for the Intermodal mobility economic ecosystem and are displayed in the table below.

Table IV.6

INTERMODAL MOBILITY – CHAMPIONS 	DESCRIPTIONS 
Fast charging infrastructure	Expand fast electric charging infrastructure for light and heavy-duty vehicles including harmonisation of access (e.g. regarding plugs, payment systems, electricity "roaming fees" when users are abroad)
High-speed railway infrastructure	Improve and scale high-speed railway infrastructure for (cross-border) transportation of goods and passengers
Modern and adapted transit infrastructure	Develop green public transport, particularly electric-powered buses, tramway and light rail systems as well as electrification of train network
Car- and ride-sharing models	Establish comprehensive, integrated and intermodal car- and ride-sharing platforms (including open access points and simplified payment systems across providers for commuters who use multiple mobility services)
End-of-life management for automotives	Develop an industrial system to retain value of end-of-life cars, including reverse logistics, design for refurbishment, remanufacturing and recycling
Electric and autonomous vehicles	Scale up electric and autonomous vehicles manufacturing and the necessary infrastructure changes in cities
Infrastructure to improve traffic flow and AV adoption	Increase penetration of hardware and software to improve traffic flows and prepare road infrastructure for autonomous vehicles (including lidar, radars, intelligent traffic management systems, traffic data analytics)
Green aviation	Improve aircraft fuel efficiency, increase the supply and demand of Sustainable Aviation Fuels (made either from advanced biofuels or produced using renewable energy sources), develop new technologies and systems engineering processes and methods to optimise air routes
Green shipping	Reduction of the use of resources and energy by gaining efficiency, using eco-friendly vessels and establishing green ports
Walking/cycling infrastructure	Promote an active transport infrastructure and micro-mobility solutions, e.g. more and improved pedestrian/bike lanes, bicycle "highways", better pedestrian and bicycle crossings (for roads and rivers)

Champion orientation example: modern and adapted transit infrastructure. Public transport powered with clean energy is a good way to reduce urban congestion and emissions harmful to the environment and health. In 2018, the share of buses and trains in total passenger kilometres amounted to only 17%. potentially due to a lack of access and convenience.²⁵¹ However, fast and efficient transit through a city not only improves economic vitality, but also makes it a more attractive place to live and work.

By integrating different modes of transport, the user can identify the most efficient mode or combination of modes for each journey. This requires clear information on costs (financial and carbon costs) and easy transfer between modes, facilitated by simplified payment or ticketing systems, user-centred system design and fair and transparent pricing. A more seamless transport operation between transport modes and between operator and infrastructure owner can satisfy the growing

demand with relatively less infrastructure and a better service. McKinsey & Company estimates that 77 full-time jobs could be created per EUR million mobilised for a modern and adapted transit infrastructure.²⁵² Thus, an improved transit infrastructure holds both environmental and economic potential. In combination with car- and ride-sharing models, a true intermodal and integrated mobility can be realised.

Example of intervention at Champion level. To activate the transition to a clean and intermodal mobility ecosystem, and decrease the use of private cars for individual

transport in favour of highly utilised shared vehicles and public modes of transport, interventions should be designed to both discourage individual car ownership and support public transport as well as service-based models, including rental services. The latter are inherently incentivised to maximise their efficiency, maintain value and extend lifetime of the operated vehicles. One effective illustration of how to achieve these multiple aims is the initiative of Finnish company MaaS Global. It has integrated all mobility options in Finland on a single app, supported by the Finnish government, to provide access to both car hires and public transport.

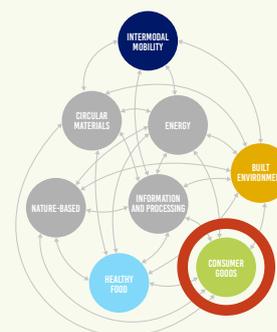
Case Study 3: MaaS Global's intermodal mobility system in Finland²⁵³



Since November 2017, MaaS Global has been providing the first all-inclusive multi-modal transport service to all of Finland – integrating public transport networks with other mobility options through a single app. Travellers are able to plan and pay for public transport through the app – with instant access to buses, trains, shared bikes, taxis or hire cars.

The service allows subscribers to use the same card across all transport modes, payable through monthly “mobility packages” or on an as-you-go basis. Packages start from less than EUR 100 for public transport access, to EUR 1,000 packages that give users unlimited access to a hire car but without the hassle of ownership. The Finnish government joined in pushing the initiative, saying that “the biggest driver has been jobs and economic growth”. Initial findings from a 2019 report analysing this MaaS system highlight the potential of the solutions. The data suggests that public transport is the main mode of transport for MaaS users, whose use patterns are characterised by multimodality.

4 CONSUMER GOODS



The economic ecosystem around consumer goods meets all the daily societal needs, other than those already met by the previous ecosystems (nutrition, housing, mobility). Thus, consumer goods encompass clothing, cosmetics and hygiene products, communication and entertainment devices, packaging, tools to express human creativity and thought, tools for learning and education, etc. In short, it encompasses all the products that surround human beings and enable them to meet their functional needs. It does not include those items and products in the previous three economic ecosystems, and it does not include artistic production.

The Consumer goods economic ecosystem is tightly linked to the circular materials ecosystem. It seeks to directly meet the societal needs as outlined above. Insofar as these needs are met through the use of consumer goods, it seeks to extract maximum utility out of these goods, retaining their value and keeping them in use for as long as possible. The circular materials ecosystem acts as supplier of sustainable materials for these consumer goods (and for the other economic ecosystems) and ensures that goods that can no longer be used are properly disassembled and the materials recovered and recycled.

This economic ecosystem is called “consumer goods” to reflect how most of the related societal needs are currently met. However, it does not imply that things must or should remain this way. In many areas, societal needs can be successfully met without the use of tangible goods or products. The way in which music or video streaming has partly replaced CDs and DVDs is just one example. Accordingly, reducing the need to employ tangible goods and meeting societal needs without or with less reliance on natural resources is a primary objective of this ecosystem.

Impact of COVID-19. The pandemic brought dramatic disruptions to value chains, retail stores and the way consumers shop for products that meet their needs. Shopping online has become ubiquitous for consumers. Since the outbreak of COVID-19, 49% of European

customers have shopped in stores less frequently, while online purchases have increased significantly in the first half of 2020, especially for everyday products such as toiletries and pharmaceuticals.²⁵⁴ As an immediate reaction, many retailers have reduced their product ranges in order to focus on top-selling items in key categories.²⁵⁵

B2B e-commerce has also grown significantly.²⁵⁶ Sharing models are likely to suffer short-term demand due to hygiene concerns.²⁵⁷ But circular economy approaches such as utility-as-a-service or access over ownership can provide a good way for consumers to retain access to necessary goods and services without incurring the full costs of ownership, in a time when household budgets are constrained due to the economic downturn. Disrupted value chains and cash-constrained household budgets have highlighted the benefit of maintaining existing products in use for as long as possible. In this context, repair cafes and local closed-loop value chains demonstrate a viable path for providing a reliable supply of local products at affordable prices.²⁵⁸

Value at stake. Increasing consumption leads to growth in the fast-moving consumer goods (FMCG) industry, which is characterised by a linear take–make–dispose model. It accounts for about 35% of the material input and 75% of municipal waste.²⁵⁹ The volume of materials used for packaging is continuously increasing. In 2017, packaging waste in Europe reached a record of 173kg per inhabitant, which represents 60% of post-consumer plastic waste.²⁶⁰ In the EU, it is estimated that 95% of the value of plastic packaging material, i.e. between EUR 70 and 105 billion per year, is lost after a short first use cycle.²⁶¹ The amount of electronics brought to market in the EU has increased rapidly in recent decades, while shortening life cycles. With 4 percent (44.7 million tons) in 2016, electronics is one of the fastest growing waste streams in the world.²⁶² In 2016, the consumer electronics industry generated 44.7 million tons of electronic waste, cell phones accounting for 435 thousand tons of which only 20% were recycled.²⁶³ Globally, the average number of times a garment is worn before it is no longer used has decreased by 36% compared to 15 years

ago. Less than 1% of the material used to make clothing is recycled into new clothing, representing a material loss of over USD 100 billion per year.²⁶⁴

The growth in demand far outstrips the improvements achieved through more environmentally friendly supply chains and products. Certain measures can facilitate rebound effects when efficiency gains lead to increased consumption. Sufficiency-based business models focus on influencing consumer behaviour: they try to moderate overall resource consumption by reducing demand through education and consumer engagement, by producing products that last longer and by avoiding built-in obsolescence.²⁶⁵ Shifting to a circular FMCG system could realise material cost savings of USD 595–706 billion per year globally. Further, the application of circular practices throughout the consumer sector would allow 30% more materials to be recovered.²⁶⁶ It would ease the strain on the

environment by reducing the need for landfill and the costs of waste treatment.²⁶⁷ For example, if any garment were worn twice the number of times, CO2 emissions could be reduced by 44%.²⁶⁸ Establishing the “refill bottle” model for all bottles used in beauty, personal care and household cleaning would mean an 80–85% reduction in GHG from packaging and transportation compared to today’s traditional disposable bottles.²⁶⁹ Also, the shift to circular business models in the consumer industry has the potential to create a large number of quality jobs.²⁷⁰

From the Compass to the economic ecosystem-level orientations. Chapter III’s 10 principles translate into three policy orientations for the consumer goods economic ecosystem. Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU’s overall resilience.

Table IV.7

CONSUMER GOODS ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Minimise the overall need for high-energy intensive and difficult-to-recycle (virgin) materials through</p> <ul style="list-style-type: none"> value chain and consumption models that make certain materials obsolete, e.g. shorter food supply chains that do not need plastic packaging policies and business models promoting fairer distribution and maximum societal function per input 	✓		✓	✓
<p>Establish policy environment and business practices that increase and retain the use-value of products with consumers through</p> <ul style="list-style-type: none"> improving product design to enable higher levels of reuse, repairability and recyclability (design for reuse, recycling, repair) policies, business models and product design for high utilisation, e.g. sharing models 	✓	✓	✓	
<p>Decrease material consumption at consumer level by</p> <ul style="list-style-type: none"> incentivising consumers towards buying waste-free products improving transparency and consumer education regarding environmental (material) footprint of individual products 	✓	✓	✓	

List of Champion orientations primarily associated with this ecosystem. Three highly interconnected Champions orientations have been identified for the Consumer goods economic ecosystem in the table below.

Table IV.8

CONSUMER GOODS – CHAMPIONS 	DESCRIPTIONS 
Product-as-a-Service models	Promote business models that provide utility of products to customers without selling ownership to them (including alternative delivery models for packaging, new forms of utility provision for clothing (textiles for rent), electronics and chemicals)
Maintenance and value retention in products	Establish high-quality maintenance and value retention systems to ensure longer use of products (e.g. through open standards in electronics, repair cafes for textiles and electronics, lifelong warranties, deposit-return schemes, etc.)
Peer-to-peer product-sharing platforms	Set up public or private peer-to-peer sharing platforms for, e.g., tools, equipment, production goods (similar to existing libraries for books)

Champion orientation example: Product-as-a-Service models. Companies are increasingly shifting their offerings from products to services, consumers from “owning” to “using”.²⁷¹ Instead of making a one-time sale, manufacturers find ways to service their products. This consists of selling solutions and need-fulfilment to customers, the value of the product instead of the product itself.²⁷² Product-as-a-service models open up many new opportunities to generate profits. Offering products as a service enables much better customisation, which is made possible by advanced analytics of customer behaviour. There is an incentive for companies to optimise the customer experience and service, as customer loyalty depends on it more than ever before.²⁷³ This also leads to the development of deeper customer relationships. Well executed service businesses can increase customer satisfaction by 10 to 20% and reduce costs by 15–25%.²⁷⁴ Also, the form of revenue changes: instead of receiving one-time revenues, manufacturers now benefit from recurring revenues generated through services over the lifetime of the product – and these services can

be up to 75% more profitable than the overall business unit.²⁷⁵ Furthermore, as manufacturers stay owners of their products, they are incentivised to provide durable, high-performance products to both satisfy the customer and save costs, resulting in a positive impact on the environment through reduced material inputs and energy savings.

In order to drive further innovations in “as-a-service” business models, technological development and the availability of customer data is very relevant. The data provides an insight into when the product is used, how and for what purpose. Manufacturers use this information to optimise and tailor their offerings. The sensor and connectivity industry has revealed many previously unexplored possibilities.²⁷⁶

Example of intervention at Champion level. There are also non-technical products that can be offered as a service with high cost savings and environmental benefits. The Munich-based company RECUP has developed simple, effective returnable deposit systems for takeaway coffee cups.

Case Study 4: RECUP: deposit system for takeaway coffee cups in Germany²⁷⁷



In 2015, 2.8 billion single-use coffee cups were consumed in Germany alone.²⁷⁸ RECUP introduced the first deposit systems for coffee cups in Germany. Instead of buying a takeaway coffee in a single-use coffee cup, consumers can pay a small deposit to get their coffee in a reusable RECUP cup. These reusable cups can be turned returned at any partner store that can also be found in the RECUP app. Having started in a small town in 2016, RECUP's 2,000+ partner stores are now spread all over Germany. They include small coffee shops and bakeries, as well as big food retail markets. Corporations such as VW also participate in the system.²⁷⁹ In 2018, RECUP was selected to be the provider of standard takeaway coffee cups in Hamburg after the city issued a proposal for a standard deposit and return system.

The RECUP cups are BPA free, made in Germany and from 100% recyclable plastic. Each cup can be used 500 times before being recycled. Currently the start-up is rolling out another product: REBOWL – reusable takeaway packaging for food.²⁸⁰

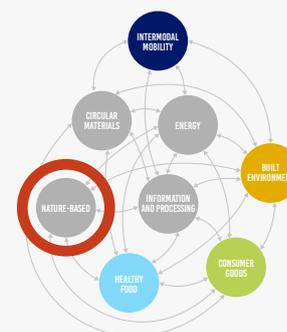
KEY CONCEPT: REDUCE LEVERS

Reducing demand for natural resources is the best way to bring our economic activities in line with planetary boundaries. Of the 8 economic ecosystems, the first four economic ecosystems directly meet societal needs; the latter four support the delivery of societal needs. The latter four therefore supply as much energy, material, land or environmental assets as is required by the first four. Reducing demand in the first four economic ecosystems will result in fewer natural resources being required overall.

Consequently, the first four economic ecosystems all include ecosystem orientations and Champion orientations that are designed to reduce demand. Those are, for example, more energy-efficient houses, smart urban planning to reduce the need for more land use, and car- and ride-sharing models that reduce the need for individual car ownership (and reduce resulting material demand).

The latter four economic ecosystems focus on meeting the remaining (reduced) demand as efficiently and sustainably as possible. They do not include reduce levers, because the demand reduction already takes place on the demand side in the first four economic ecosystems.

5 NATURE BASED



The Nature-based economic ecosystem refers to the entirety of all animals, plants, materials, forces, events and processes that happen or exist independently from humans. Protecting and restoring nature, including commons such as forests, glaciers and mountainous areas, is essential for meeting fundamental societal needs - the provision of food and water (through the pollination of plants, provision of habitats for migratory species, water purification, retention and storage, soil formation processes, nutrient cycling), the reduction of health risks (through a halt to the deforestation that creates conditions for disease outbreaks) and the release of vital oxygen. It is further relevant to safeguard development by reducing carbon emissions, regulating the climate and protecting against extreme weather events. Thus, the nature-based economic ecosystem is not only intertwined with the other six economic ecosystems, but the core foundation of all societal needs.

Impact of COVID-19. The global decline in human activities, such as the significant reduction in travel and the stagnation of economic activities, has led to a sharp decrease in air and water pollution and environmental noise in many regions.²⁸¹ Daily global carbon emissions fell by 17% during the lockdown in early April and could lead to a reduction in carbon emissions of up to 8% in 2020.²⁸² The pandemic also affected wildlife: due to the sharp decline in fishing, some fish were able to double their biomass.²⁸³ However, many rural areas in the tropics face increased pressure from land grabbing and illegal mining. The outbreak also took focus away from increasing illegal activities such as the deforestation of the Amazon and the poaching of wild animals in Africa.²⁸⁴ This is particularly alarming given that human-wildlife intrusion of this kind is causally linked to the emergence of the COVID-19 virus and several other pandemics.²⁸⁵ In addition, the pandemic hampered efforts of environmental diplomacy and caused economic impacts that could slow down investment in green technologies.²⁸⁶ Thus, COVID-19 will have both positive and negative indirect environmental impacts. But reducing emissions over a short period is not sustainable.²⁸⁷ The pandemic crisis raises other environmental issues that must remain a top priority despite the economic challenges in the EU.

Value at stake. The protection and restoration of natural ecosystems, in particular forests, peatlands and coastal regions, can promote the uptake of CO₂ from the atmosphere and help protect the climate and biodiversity. For example, the estimated global potential for CO₂ uptake from forest restoration is 400 billion tonnes in the 21st century.²⁸⁸ Nature restoration has also been identified as the third-largest global economic opportunity in the food and land use sector in a report from the Food and Land Use Coalition.²⁸⁹ Overall, recent research indicates that extending protected and preserved areas to at least 30% of our planet will result in financial and economic benefits that exceed the cost by at least 5:1. Moreover, it will increase the economic output by an average of USD 250 billion per year.²⁹⁰ Restoration programmes are also a significant employment generation lever, with net benefits worth hundreds of billions of dollars (e.g., from watershed protection and forest products).²⁹¹

Marine protection and coastal restoration are further crucial interventions – especially in the face of rising sea levels where insurance claims for coastal storm damages have exceeded USD 300 billion in the past ten years, and where a further USD 24 trillion in assets are at risk of flooding.²⁹² Marine habitat restoration projects in the US have, on average, created 17 jobs per USD 1 million spent – similar to land conservation, and much higher than equivalent investments in traditional industries such as oil and gas.²⁹³ Further economic benefits are realised through tourism, greater fishing stocks (biomass of fish assemblages are on average 670% greater than in unprotected areas) and other services.²⁹⁴ The rates of return from more resilient infrastructure, including natural solutions to flooding and coastal protection, also typically exceed traditional investments. The Global Commission on Adaptation found the cost-benefit ratios to yield returns of between 1:2 and 1:10.²⁹⁵ Nature protection and restoration also have a critical role in public health by retaining the pharmaceutical potential of tropical forests²⁹⁶ and reducing the health costs of air pollution driven by forest and peatland fires. The current crisis also reaffirms the link between ecosystem degradation and the risk of increased human exposure to zoonotic disease.²⁹⁷

From the Compass to the economic ecosystem-level orientations. Chapter III's 10 principles translate into five policy orientations for the nature-based economic ecosystem, as shown in Table IV.9. Each of these ecosystem

orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.9

NATURE-BASED ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Establish Europe as a marketplace for nature-based products and project European consumers' understanding of this to global markets by</p> <ul style="list-style-type: none"> • leveraging Europe's market size to attract carbon-positive companies across the globe to scale their businesses 	✓	✓	✓	✓
<p>Valorise and compensate economic actors and communities that contribute to and improve ecosystem services with their economic activity by</p> <ul style="list-style-type: none"> • introducing "payment for ecosystem services" for services such as improved pollination, extreme weather prevention, protection of commons, greater biodiversity, wastewater recycling, freshwater conservation and soil carbon fixation that occurs adjacent to ongoing farming activity 	✓	✓	✓	✓
<p>Establish integrated resource management, special planning strategies and responsibilities for natural capital assets across national borders by</p> <ul style="list-style-type: none"> • e.g. joint governance of water streams among all countries in the catchment area of a given river system or by improving joint governance of Alpine natural capital among Alpine countries • ensuring strategies are in line with the respective catchment area or area footprint of the respective natural capital asset 		✓	✓	✓
<p>Establish "natural capital accounting" for transparency on natural capital by</p> <ul style="list-style-type: none"> • tracking the stock of any region's natural capital and its change over time • accounting for impacts on natural capital in economic activities • establishing stewardship guidelines for the maintenance of natural capital ("natural capital accounting"), including the global commons 	✓		✓	
<p>Account for the green footprint required to produce food abroad that is consumed within the EU by</p> <ul style="list-style-type: none"> • including Europe's footprint abroad in resource management strategies and EU's natural capital accounting principles 			✓	

List of Champion orientations primarily associated with this ecosystem. Seven Champions orientations have been identified for the nature-based economic ecosystem and are displayed in the table below.

Table IV.10

NATURE-BASED – CHAMPIONS 	DESCRIPTIONS 
Restoration of degraded land and coasts	Launch large-scale forest, wetland and salt marsh restoration programmes
Urban greening	Green the urban infrastructure through green roofs and walls, more planting of trees, the creation of urban forests and "green spots" throughout the city
Systems for paid ecosystem services	Create and implement systems for natural ecosystem economies that reward activities that benefit the overall natural ecosystem. This could include payment for forest management models, payment for soil carbon fixation, improved groundwater retention, natural habitat conservation areas, etc.
Seaweed	Scale sustainable farming and processing of seaweed for multiple uses, e.g. cosmetics, food, feed, bioplastics, etc.
Marine and land-based environmental protection areas	Identify, set up, enforce and monitor land-based and marine-protected areas
Ecotourism	Harmonise guidelines and enforcement of sustainability practices for tourism-related activities, e.g. waste, energy sources, respect of local culture, access rights, etc.
Smart forest management	Introduce cross-regional forest management systems that take account of the multifunctional importance of a forest (for wildlife, biodiversity, carbon capture, social and health benefits, employment, building and heating materials, etc.)

Champion orientation example: marine and land-based environmental protection areas. Protecting and restoring essential marine and coastal habitats – including estuaries, wetlands, mangrove forests and coral reefs – is essential for the future sustainable supply of critical ocean ecosystem services. In fully protected marine protected areas (MPAs), fish species richness has been found to be 21% higher and biomass up to six times greater than in adjacent, unprotected areas.²⁹⁸ There is significant literature showing the additional benefits of MPAs beyond safeguarding biodiversity, such as creation of quality jobs (through ecotourism, reserve management, fisheries), spill-over effects benefiting the yields and productivity of surrounding fisheries, better carbon sequestration in the sea floor, and so on.

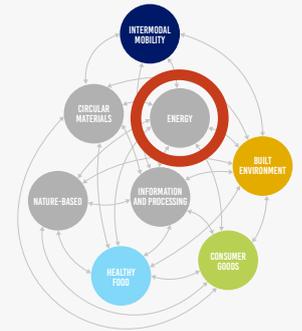
Example of intervention at Champion level. A growing number of countries are committing to an objective of "30 by 30", meaning 30% of the ocean turned into MPAs by 2030. Committing to this target is a strong signal by political leaders, but the implementation is lagging behind: as of today, less than 3% of the ocean is fully protected.²⁹⁹ Policy makers need to work with scientists to identify much faster the areas that could be turned into MPAs and provide the required funding to monitor and enforce these MPAs. Governments should also work with pioneering ventures and investors to develop innovative business models to finance the management of such MPAs in a sustainable and long-lasting way (e.g., through eco-tourism fees, or payment for ecosystem services and nature-based carbon sequestration in the MPA).

Case Study 4: Medes Island, Spain: the triple benefits of Marine Protected Areas (MPAs)³⁰⁰



The Medes Island Marine Protected Area was created in 1983 with a division of the area into zones. It includes a fully protected no-take zone, a partially protected area where seven local artisanal fishing vessels have exclusive access and a zone with open access. This allows for a combination of fishing and touristic activities. Today, the restored biodiversity and biomass have transformed the Medes Islands into a paradise for scuba divers, supporting a thriving eco-tourism industry in the area. 200 full-time jobs are supported and EUR 10 million of revenues are generated, compared with just EUR 0.5 million before the creation of the reserve.

6 ENERGY



The Energy economic ecosystem is designed to provide energy services to consumers and industries and thus comprises all components related to the production, conversion, supply and use of energy. The envisioned system is much more decentralised in energy production and storage. Energy-intensive industries use renewable resources as their primary source of energy instead of fossil fuels. The energy economic ecosystem fulfils multiple societal needs and is strongly interlinked with all other economic ecosystems. For example, the transport sector accounts for 28% of total energy consumption in the EU and buildings in the EU are responsible for approximately 40% of GHG emissions.³⁰¹

Impact of COVID-19. The pandemic has a significant impact on energy systems around the world, slowing down

“ The energy ecosystem is designed to provide energy services to consumers and industries and thus comprises all components related to the production, conversion, supply and use of energy. ”

investment and threatening to delay the spread of clean energy technologies. Demand for electricity has fallen rapidly as travel, trade and economic activity have been severely disrupted leading to a reduction in CO2 emissions. The demand recovered steadily as the measures were relaxed. In June, demand in EU countries was still 10% below the 2019 level.³⁰² So far, renewable energy sources have proven to be largely crisis resistant. According to the Finnish energy technology group Wartsila, almost half of EU demand in 2020 came from renewable energy sources.³⁰³ Renewable energies were the only energy source that grew in Europe during the pandemic. However, the current crisis

poses a particular risk for emission reductions in hard-to-abate sectors: Given the long investment cycles in heavy industry, there is a substantial risk of establishing the use of emission-intensive production facilities if investments during the recovery phase do not primarily focus on low-emission technologies.³⁰⁴ Governments have the opportunity to accelerate the transition to clean energy by making investment in renewable energy a central part of the stimulus packages. Investment in renewable energy can stimulate job creation and economic development while reducing emissions and encouraging further innovation.

Value at stake. Energy is an essential enabler that underpins all economic ecosystems that meet societal needs – including the mobility, housing, consumer goods and food ecosystems. At the same time, reduction of energy consumption is crucial to achieve the decarbonisation objectives of the EGD. The necessary demand reduction therefore needs to take place in the four economic ecosystems that fulfil individual societal needs and that consume energy in the fulfilment of those needs. The energy ecosystem will need to provide that required energy as efficiently and in as clean a fashion as possible. In addition to enabling the other economic ecosystems, the energy ecosystem is also a driver of investment, growth and job creation.

In 2018, Europe's energy system (fuel combustion and fugitive emissions from fuels) was responsible for 53% of the EU GHG emissions.³⁰⁵ Accelerating the transition to a clean energy system through investment and policy interventions would achieve multiple benefits: creating jobs, reaching climate goals and increasing EU future resilience through energy safety. The fundamental pillar of this transition is the clean electrification of the energy system, which implies:



- electrifying many end uses across buildings, transport and industry to grow the share of green electricity in the energy system from 25% of final energy demand today to 70% or more by mid-century, and
- expanding massively the size of the electricity system while fully decarbonising the production of electricity, through a massive investment in renewable power generation and complementary forms of low-carbon power and grid flexibility provision

Within this expanded power system, the focus should not only be on expanding renewable power capacity, but also on deploying the necessary transmission and distribution infrastructure, making the grid smarter, and providing increased flexibility through energy storage, low-carbon peak power provision and demand management. There is a strong link to the mobility systems, as a pan-European grid of charging stations could leverage underutilised vehicles (trains, buses, lorries, passenger cars) to act as smart energy storage. Similar flexibility mechanisms can be found in the buildings sector (through smart buildings and appliances) and in the industry sector (which could play a key role in seasonal balancing).

A system that is up to 90% based on renewable energy could be cheaper than fossil alternatives, even considering storage requirements, in nearly every geography today, and a fully decarbonised power system is likely to be cost-competitive with a coal- or gas-based system by the 2030s. At a global level, a transition to renewable energy would lead to relative improvements in GDP of 2.5% and improve employment rates by 0.2%. Cumulated GDP gains from 2019–2050 may add up to USD 99 trillion.³⁰⁶

In sectors that cannot be electrified – in particular in some heavy industry and long-distance transport applications, other forms of clean energy should be deployed, in particular clean hydrogen, biomass (although supply of truly sustainable low-carbon bio-resources is likely to be constrained) and the use of carbon capture and sequestration or use on remaining fossil fuels applications.

Extensive studies by the Energy Transition Commission confirm that a shift to net-zero GHG emissions is technically and economically possible by around mid-century.³⁰⁷ The technologies and business solutions are either already available or close to being brought to market. The International Renewable Energy Agency (IRENA) also outlines options to reduce energy-related and industrial process CO₂ emissions. In their recent outlook possibilities are analysed for accelerated action in specific areas to reduce energy and process-related CO₂ emissions to zero in 2050-2060.³⁰⁸

There is also a major role for “nature-based solutions” — preventing deforestation and sequestering carbon in soils by changing the way we use land. Countries and companies should therefore commit to making big reductions by 2030, using purchased offsets to achieve faster progress than internal action can achieve.

From the Compass to the economic ecosystem-level orientations. Applying the Chapter III 10 principles to this ecosystem leads to four specific policy orientations for the energy economic ecosystem, as shown in Table IV.11. Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU’s overall resilience.

Table IV.11

ENERGY ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Ensure fair energy access for the whole population through</p> <ul style="list-style-type: none"> adequate supply of clean energy made available throughout Europe expanding energy distribution grids and establishing sustainable energy sources across the board 	✓	✓	✓	✓
<p>Maximise energy efficiency and simultaneously minimise the need for energy across all products and operations (for example circular materials or built environment) – while maintaining or increasing the quality of life by</p> <ul style="list-style-type: none"> promoting a key lever, the highest energy efficiency in industrial production and private use, e.g. through housing insulation, smart metering, grid integration and energy-efficiency-based paybacks improving systemic services such as better city design, mobility systems, digital connections to reduce travel, shared appliances to set up the energy system for this reduction in volume and shift to revenue-per-functionality 	✓	✓	✓	✓
<p>Shift to a renewable, clean energy mix that</p> <ul style="list-style-type: none"> is comprised of a combination of solar and wind power generation (on- and offshore) as primary sources, complemented by other ocean energy technologies such as wave, tidal and current-based sources and completed by further low-carbon electricity capacity from dispatchable hydro or thermal plants ensures resilience of the energy grid by storage options like batteries for short-term storage and hydrogen for long-term storage provides alternative solutions (e.g. low-carbon hydrogen) for the 30% of total global CO2 emissions from hard-to-abate sectors for which electrification solutions are not currently available³⁰⁹ 			✓	✓
<p>Compensate negative externalities during the transition period through</p> <ul style="list-style-type: none"> zero-carbon solutions and high-pace deployment compensation of remaining emissions by investment in nature-based solutions, especially regenerative agriculture, contributing to the financing of natural ecosystems alongside development of true "within-sector" decarbonisation options, as the compensations' potential will naturally plateau over the next 30 years and cannot replace the need for drastic reductions in emissions from fossil fuels 			✓	

List of Champion orientations primarily associated with this ecosystem. Seven Champion orientations have been identified for the Energy economic ecosystem and are displayed in the table below. Given the cross-cutting nature of energy-related Champions, they are highly connected to many other Champions.

Table IV.12

ENERGY – CHAMPIONS 	DESCRIPTIONS 
Renewable power generation	Install renewable land, offshore and ocean-based power generation capacity, i.e. wind and solar but also waves, tidal changes and currents power generation, while following the cascading approach regarding forests and wood
Energy storage	Scale battery and other electricity storage solutions for grid balancing and flexibility
Hydrogen economy	Scale up the production, distribution and infrastructure for green hydrogen
Smart metering and (point-of-use) energy management	Increase use of smart metering and "point-of-use" energy management technology
Grid integration and technologies	Strengthen, upgrade and increase coverage of transmission and distribution grids, including potential microgrids, and create the ability for distributed feed-ins from small-scale renewable sources (e.g. from solar-equipped households)
Production of low-carbon gaseous and liquid fuels (transition technology only)	Increase provision of bio-based and synthetic fuel alternatives, including Power-to-X (while transitioning to mass electrification)
Carbon capture infrastructure (transition technology only)	Scale up the carbon capture infrastructure for hard-to-abate industries (e.g. cement and steel)

Champion orientation example: hydrogen economy. Scaling hydrogen production, distribution and use infrastructure to create a clean hydrogen economy is a key component to achieving carbon neutrality in Europe by 2050.

“ Scaling hydrogen production, distribution and use infrastructure to create a clean hydrogen economy is a key component to achieving carbon neutrality in Europe by 2050. ”

Hydrogen could represent 18% of Europe's final energy demand by mid-century.³¹⁰ The scale of the hydrogen economy would need to be multiplied by a factor of ten

globally to meet new demands. Similarly, according to the Hydrogen Council, the international hydrogen market could reach a value of up to USD 2.5 trillion by 2050, creating 30 million jobs around the world and reducing CO₂ emissions by 6 gigatons per year.³¹¹ As the majority of hydrogen (95%³¹²)

is still produced from fossil fuels in 2020, public support is essential to enable scaling the production of hydrogen from renewable sources through water electrolysis and to make green hydrogen cost-competitive.³¹² This involves supporting supply – the scale-up of the European manufacturing of electrolysers and access to cheap green electricity – as well as demand,

with the development of the use of hydrogen especially in industry applications at pace with the possible growth in supply.

Example of intervention at Champion level. To make hydrogen competitive, governments need to support direct investments into research and development and technological innovation in combination with financial and regulatory support for the scale-up of manufacturing, which will drive economies of scale and learning. Until now, the production of hydrogen from renewable energy has only been possible in small quantities in so-called “real laboratories”, which determine how the electrolysis can be scaled. For hydrogen to become a central component

of a decarbonisation strategy, the entire value chain from production and storage to infrastructure and use cases, including logistics and important aspects of quality infrastructure, must be addressed.

Germany is a perfect example of such an intervention, with the recent announcement of a dedicated EUR 7 billion budget of the EUR 130 billion promised in the economic stimulus to promote hydrogen to create a demand-driven market.

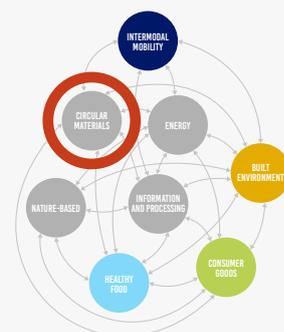
*Case Study 5: Green hydrogen ambition in Germany: CO₂-free gas for industry and transport use, and millions invested in research.*³¹³



On 10 June 2020, the German government adopted a national hydrogen strategy. This involves increasing production capacity to 5 GW by 2030 and 10 GW by 2040, with EUR 7 billion to be invested in new companies and research. A further EUR 2 billion is to flow into international partnerships.

Germany aims to have generators with a total capacity of up to 5 GW by 2030, which corresponds to hydrogen production of about 14 TWh. The capacity is to be increased to 10 GW by 2040. The strategy contains an action plan with 38 measures to be taken by 2023. Hydrogen will initially be used where processes cannot be electrified – for example, in heavy goods transport, steel production, the chemical industry and aviation. Companies in these sectors will receive financial support if they invest in electrolysis plants to convert their production processes. Germany has declared the development of a European hydrogen infrastructure as one of its top priorities during its EU Council Presidency 2020.

7 CIRCULAR MATERIALS



The Circular materials economic ecosystem refers to all the materials from which products, equipment, infrastructure and indeed all goods are made. Therefore, the Circular materials economic ecosystem is deeply interwoven with all economic ecosystems that directly meet societal needs.

This economic ecosystem provides the required materials needed in the first four economic ecosystems as sustainably as possible; when the materials are no longer fulfilling a useful purpose, it seeks to recover, disassemble and recycle them at the highest possible value. It thus covers the raw material extraction and production process on the one hand, and the end-of-life management of end-of-life products and goods on the other. It is founded on the development of innovative circular and regenerative technologies but also reverse logistics chains, asset recovery and improved recycling. A circular, closed-loop system is enabled through circular design, better materials and an infrastructure of collection, disassembly, sorting, recycling and remanufacturing facilities to eliminate waste out of the system.

Impact of COVID-19. The COVID-19 pandemic has led to an immediate increase in waste streams of single-use, disposable plastic products, due to greater use of disposable hygiene and packaging products, falling oil prices, resulting in lower prices for virgin plastics and a decline in recycling programs.³¹⁴ The spread of the virus triggered an estimated consumption of 129 billion face masks and 65 billion gloves per month worldwide, disposable hygiene products ending up in our city streets, but also in the seas and in other natural environments.³¹⁵ Some European governments have pushed back the ban on several disposable plastic products.³¹⁶ As the economic crisis makes consumers more price-sensitive, affordable goods are preferred over environmentally friendly products. Falling raw material prices and overcapacity threaten to weaken the business case for recycled materials.³¹⁷ One consequence is that there will be 30% more waste in 2020 than in 2019.³¹⁸ There is also a risk that critical innovations and the introduction of new technologies will be slowed down, especially in the field of chemical and textile recycling.³¹⁹ Furthermore, the virus significantly

affects the frontlines of waste management workers, who are already mostly among the vulnerable groups of waste collectors in the informal sector.³²⁰

Finally, the effects of the virus have revealed the vulnerability of European companies and their supply chains. Disruptions to value chains have resulted in delivery delays or in suppliers being unable to deliver individual products at all. In this context, shorter supply chains and a shift to local production can make supply chains more resilient against external shocks like the COVID-19 pandemic. The disruptions underlined the importance of diversifying value chains, localising production and eliminating foreign dependencies in order to increase Europe's strategic autonomy.³²¹ There is a growing agreement that the circular economy can support recovery plans and transparent supply chains are the first step.³²² Some businesses have already started applying innovative circular-economy principles to address supply shortages and reduce waste. For example, Nike redirected recycled material that was intended for new shoe soles into the production of protective equipment.³²³ In this context, better material stewardship through the circular materials ecosystem can increase value chain resilience and reduce Europe's dependency on raw material imports.

Value at stake. Today, linear material systems are still the norm: a take–make–dispose model, powered by fossil fuels and reliant on large quantities of easily accessible resources.³²⁴ In Europe, this current model sees 50% of materials end up in landfills, where 95% of the value of material and energy inputs are lost after the first product life cycle.³²⁵

The economic potential in Europe from implementing circular materials in Europe is enormous, at an estimated EUR 1 trillion – of which EUR 600 billion is expected to materialise as cost savings for EU businesses.³²⁶ The expansion of a circular economy in Europe also has the potential to create 1.2–3 million jobs by 2030.³²⁷ As material management is estimated to account for two-thirds of global CO₂ emissions,³²⁸ using materials in a more productive way is crucial to reduce absolute CO₂ emissions. Indeed, the

Ellen MacArthur Foundation found that applying circular economy strategies to key industrial materials (cement, steel, plastic and aluminium) could mitigate 40% of GHG emissions by 2050, closing the gap between existing intended nationally determined contributions and policies towards achieving a 2-degree pathway.³²⁹ Transitioning to the use of circular materials in three dimensions (materials recirculation, material efficiency and substitution) can cut emissions from heavy industry in the EU by 44% by 2050.³³⁰ Equally, a circular model will reduce the EU's dependence on imports for critical raw materials, relieve companies from the pressure of volatile raw material prices, have a

positive effect on resource scarcity and supply chain risks, and thereby strengthen the European economy's resilience and competitiveness.³³¹ The concept of waste would be designed out of the system.

From the Compass to the economic ecosystem-level orientations. Chapter III's 10 principles translate into three policy orientations for the circular materials economic ecosystem, as shown in Table IV.13. Each of these ecosystem orientations addresses at least one of the aspects that will help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.13

CIRCULAR MATERIALS ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Adopt a material stewardship approach for materials in use and control their life cycles, particularly for scarce and high-value materials through</p> <ul style="list-style-type: none"> tracking and tracing materials throughout their use phase reverse logistics, disassembly, sorting and high-value recycling of materials without contamination stock management of all materials and their current application (use) in products, equipment or infrastructure 	✓	✓	✓	✓
<p>Use better materials by</p> <ul style="list-style-type: none"> exchanging towards renewable, durable, recyclable and less energy-intense material whenever possible 	✓		✓	
<p>Account for the material footprint and GHG emissions resulting from production of goods for the EU abroad by</p> <ul style="list-style-type: none"> including Europe's footprint abroad in resource-management strategies and EU's natural capital accounting principles 			✓	✓

List of Champion orientations primarily associated with this ecosystem. Eight Champion orientations have been identified for the Circular materials economic ecosystem and are displayed in the table below, representing opportunities to significantly improve currently wasteful industries in Europe.

Table IV.14

CIRCULAR MATERIALS – CHAMPIONS 	DESCRIPTIONS 
Localised and distributed value chain systems	Proliferate local, distributed value creation systems, bringing producers and users of products geographically closer together. Re-evaluate need for packaging and reduce material leakage from value chain
Asset recovery systems and reverse logistics	Create digitally enabled asset tracking, recovery, disassembly and sorting systems, thus reducing leakage of material out of value streams across all production processes and enabling the return of materials into industrial production
Markets for secondary materials	Create the necessary infrastructure, logistics and regulatory environment to increase liquidity in secondary material markets
High-value material recycling	Scale high-value recycling capacity (for all materials) through better technology, better feedstock supply, improved sorting, design-for-recycling principles that avoid harmful substances, access to financing, use of recyclable materials and “pull” factors such as minimum recycled content quotas
Materials-as-a-Service models	Set up material banks and similar solutions that provide users with utility of materials instead of selling ownership to them
New materials and high-performing substitutes	Develop and scale renewable, zero-emissions material solutions and substitutes for all material needs (e.g. timber and bamboo construction material or bio-based alternatives for current fossil-based solutions)
Additive manufacturing	Develop and implement additive manufacturing technologies that reduce waste, such as 3D printing

Champion orientation example: asset recovery systems and reverse logistics. Recovering assets in electronics to create a circular electronics system is one of the greatest untapped market opportunities today. In 2016, e-waste in Europe corresponded to an average of 16.6kg/inhabitant, accounting for 27.5% of the global e-waste and tending to rise.³³²

The value of electronic waste – refrigerators, freezers, television or computer screens, mobile phones, lamps, server infrastructure and other electronic equipment – is largely left uncaptured, with collection rates of only 40% in the EU.³³³ Consequently, the market opportunity is an estimated USD 97 billion by 2030 in Europe alone, and including machinery and equipment is an added USD 110–130 billion from the labour-intensive refurbishment and recycling of these products.³³⁴ Such economic value largely derives from

cost savings from material inputs for plastics, copper, gold, steel, silver and other metals. For example, there is 100 times more gold in a tonne of mobile phones than in a tonne of iron ore.³³⁵ However, the majority of this electronic waste and value ends up on landfills, is incinerated or exported to developing countries, where it is manually dismantled on dump sites, causing great environmental pollution and hazards to human health as well as to groundwater, air and soil.

Example of intervention at Champion level. To activate an asset recovery system and reverse logistics for electronics, better electronic waste management strategies are required. Electronic waste is a highly fragmented and materially heterogenous market, with a wide range of participants including de-manufacturers, collectors, material processors, recyclers and refurbishers.

While market trends, advances in technology and business model innovations (e.g. service-based models) are likely to propel this market further, interventions are required to allow volume processing.

By way of example, the City of Austin, Texas, has successfully adopted an innovative solution allowing the exchange of materials between businesses via an online materials marketplace platform to leverage industry synergies.

Case Study 6: Austin's Materials Marketplace: addressing waste disposal needs by converting to revenue stream in Austin, Texas³³⁶



In 2005, the City of Austin, Texas, committed to reaching zero waste by 2040 by signing the Urban Environmental Accords. The primary strategy was not to expand the city's municipal services, but to build on existing private sector services and facilitate their development.

Thus, the Austin Materials Marketplace, an online exchange platform, was created to facilitate the business-to-business trading of secondary materials. Not only does this allow for businesses to create new revenue streams, through trading of recovered resources like metals, aluminium and silicone, it also provides a solution to waste disposal. While initially funded by the City of Austin, the platform's success has enabled the introduction of a new revenue system, thanks to which the Materials Marketplace can increasingly stand on its own feet without public investment. By mid-2019 Marketplace trades had avoided more than 950 million tonnes of CO₂ emissions and prevented 400 tonnes of material from ending up in landfills.

8 INFORMATION AND PROCESSING



This ecosystem refers to information and processing in all its possible applications. Information technology and digitalisation have brought tremendous changes to people's everyday life and the way science, business and governance is conducted. The Information and processing economic ecosystem facilitates the other ecosystems, particularly the first four, in their delivery of societal needs. Its function, therefore, is not to merely improve productivity or processing capabilities. Rather, it should be guided to apply information and processing capabilities to solve societal challenges. For instance, while AI applications like machine learning and predictive maintenance can help manage the increasing complexity of production systems, increase transparency and keep products in use longer (thus reducing material consumption), AI can now also be employed to resolve (apparent) trade-offs in the transition from the status quo to a sustainable future. It is this enabling and catalysing function that lies at the heart of the information and processing ecosystem.

Impact of COVID-19. With the sudden imposition of home isolation and quarantine rules across the world, demand for digital services has skyrocketed.³³⁷ In the EU, between 18.4–59% of Member State populations have started working from home as a result of the pandemic.³³⁸ Governments of 193 countries were forced to close schools at some point in the past months, moving lessons online where possible.³³⁹ In addition, much of people's private lives has been taking place in the virtual world, from webcam weddings to online streaming services.

However, it is apparent that even in high-income countries there is a clear lack of suitable infrastructure, evidenced by the fact that streaming services like Netflix or YouTube had to temporarily suspend HD streaming to relieve networks. Moreover, according to estimations by the ITU, 46.4% of the world's population remain without access to the internet and thus potentially cut off from essential services.³⁴⁰

At the time of writing, 46 countries had adopted digital tracing apps for smartphones or "movement permit" apps, including Saudi Arabia and China³⁴². This has again brought

concerns of privacy invasion and data exploitation by authorities or third parties. It is imperative that these concerns are addressed and risk of data misuse and -appropriation are mitigated and accounted for.

Value at stake. As a potent multiplier, improving digital infrastructure is already a high priority in most countries to raise economic productivity. For example, digital technology is an important enabler for advancement in mobility through integrated mobility systems, in healthcare services through telehealth (a USD 45 billion European market opportunity on its own) and for remote patient monitoring (USD 65 billion).³⁴³

Digital technology can also enable the reduction of food waste through sensing technologies (able to reduce an estimated 5-7% of food waste by 2030)³⁴⁴, smart energy systems balancing, and the protection of natural systems through greater transparency across economic ecosystems. Additionally, multiple other benefits may result, including social (e.g., job creation from accelerated roll-out of digital infrastructure and digital education and training)³⁴⁵, and environmental benefits (e.g., achieving industry decarbonisation goals by optimising processes and value chains).

To become a global role model for the digital economy, Europe's investments in digitalisation must be multifaceted. Investments into the physical digital infrastructure are needed to enable broadband access for everybody as well as investments into education for the development of digital and AI competences, while ensuring data protection, safeguarding against cyber-attacks and complying with ethical guidelines, especially when applying AI solutions. Europe must take measures to increase its super-computing capacity to enable the development of innovative solutions, e.g. for medicine, materials, transport and the environment as well as invest in a community of innovative start-ups. All of these investments should be guided by the objective to enable other economic ecosystems to meet societal needs.

From the Compass to the economic ecosystem-level orientations. Chapter III's 10 principles translate into six policy

orientations for the information and processing economic ecosystem, as shown in Table IV.15. Each of these ecosystem orientations addresses at least one of the aspects that will

help the EGD in economic, social and environmental terms and/or will enhance the EU's overall resilience.

Table IV.15

INFORMATION AND PROCESSING ECONOMIC ECOSYSTEM				
Ecosystem-level policy orientations	Impact			
	Economic	Social	Environmental	Resilience
<p>Enable energy efficiency and production efficiency by</p> <ul style="list-style-type: none"> • using machine-learning applications to forecast and optimise energy supply and demand • improving energy efficiency of IT systems • minimising transportation needs for goods through, for example, distributed (re-)manufacturing • achieving high energy gain, to compensate for the increased energy consumption of servers³⁴¹ 	✓		✓	✓
<p>Enable community engagement by</p> <ul style="list-style-type: none"> • leveraging virtual education to foster skills in rural/poor areas • reducing the need for standardisation and decentralised development by leveraging AI for customised and local production, complementing human resources not replacing them 	✓	✓		✓
<p>Enable maximum utilisation of existing products, materials and minimising need for new production by</p> <ul style="list-style-type: none"> • using IT and processing capabilities to enable new business models that maximise utilisation by ensuring interconnectedness and shared utilisation of existing assets through digital platforms • leveraging material passports to enable a circular economy by promoting refurbishment and closed-loop recovery of existing assets through material passports 	✓		✓	✓
<p>Enable new societal interactions by</p> <ul style="list-style-type: none"> • promoting the use of information systems to enhance innovative forms of knowledge exchange, deliberative democracy and inclusion 		✓		✓
<p>Boost data processing and accessibility by</p> <ul style="list-style-type: none"> • establishing common standards • using smart data applications to monitor the impact of IT systems and ensure appropriate cyber security measures 		✓		

List of Champions orientation primarily associated with this ecosystem. Five Champions orientations have been identified for the information and processing economic ecosystem and are displayed in the table below.

Table IV.16

INFORMATION AND PROCESSING – CHAMPIONS 	DESCRIPTIONS 
Distributed manufacturing	Decentralise manufacturing enabled through information technology that coordinates the production in geographically dispersed facilities
High-speed digital infrastructure	Accelerate and strengthen the roll-out of high-speed digital infrastructure
Digital material information and tracking systems	Establish material databases and material passports to enable the sharing of data across value chains, the creation of public monitoring facilities for end-to-end material tracking, and material stewardship accounting principles
Data generation, processing and protection	Improve data collection for increased temporal and spatial scales to monitor ecologically relevant indicators such as biodiversity, methane emissions, air quality, etc. (potentially through satellite or high-altitude drone monitoring)
Artificial intelligence for societal challenges	Develop artificial intelligence capabilities to solve (perceived) trade offs in the meeting of societal needs and in the transition from status quo to a sustainable future economic ecosystem

Champion orientation example: Artificial intelligence (AI)/ machine learning (ML) to inform policy decisions. AI/ML can support more impactful policy decision-making by providing data, analysing data more efficiently and evaluating outcomes. AI/ML is particularly effective in assessing trade-offs in highly complex and large systems and can simulate future scenarios and pathways, for example by reducing the computational complexity of integrated assessment models (IAMs), which combine models from social, natural and political sciences.³⁴⁶ This is essential to determine reliable decarbonisation and decouple pathways on a global, European, national or ecosystem level. ML can also support assessment of which data should flow into these models or dis-/aggregate data into meaningful insights. For example, by identifying emission sources, collecting data from social media profiles and posts to assess public opinion and social acceptability, or approximating behavioural patterns.³⁴⁷

Providing more reliable data and multi-objective optimization tools will be essential to designing and prioritizing policy interventions that address highly complex,

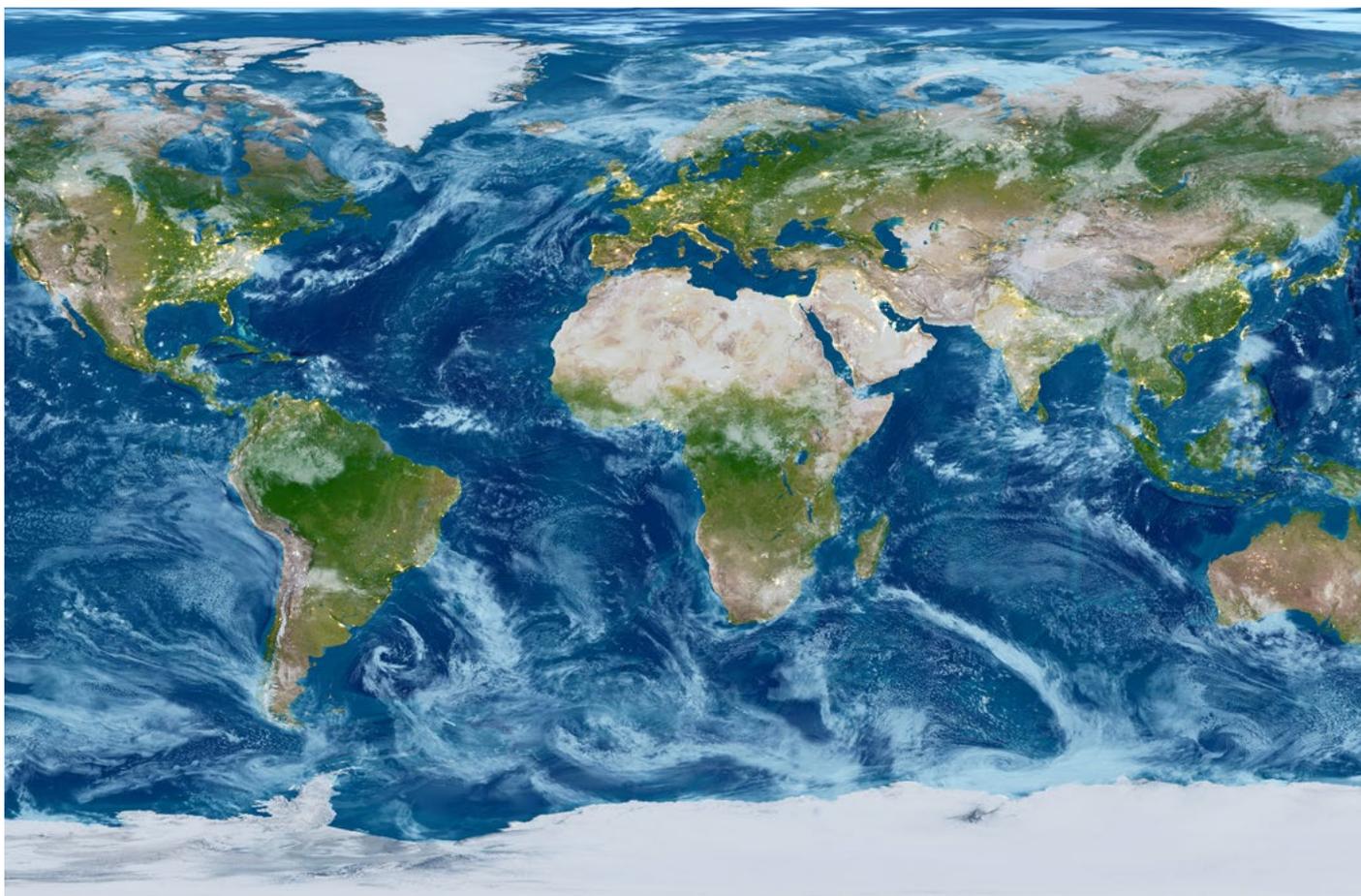
systemic challenges and aim at higher order effects. Moreover, AI can support in making the risks of climate change and global warming above 1.5°C or 2°C more tangible to the public.³⁴⁸

As these examples make evident, the results and positive impact potential of AI depend entirely on the defined objectives and the data made available to the algorithm. It is in this context that the development of IT technology in the European sphere needs to be guided by clear principles and orientations that aim to meet existing societal needs.

Example of intervention at Champion level. The possibilities in which AI/ML can support decision-making and monitoring in the context of system transformation have only begun to be explored. The Global Fishing Watch platform, for example, collects vast amounts of data from its satellites to monitor global fishing activity in real time, support marine protection, tackle overfishing and improve the way fishing is managed.

“ The results and positive impact potential of AI depend entirely on the defined objectives and the data made available to the algorithm. It is in this context that the development of IT technology in the European sphere needs to be guided by clear principles and orientations that aim to meet existing societal needs. ”

Case Study 7: Case study – Global Fishing Watch: satellite technology against illegal, unreported, unregulated fishing (IUU)³⁴⁹



Global Fishing Watch is a platform, initially built on a collaboration between SkyTruth, experts using satellite technology to protect the environment, and Google, which provided the tools for processing the data. The platform provides near-real-time tracking of global commercial fishing activity and data to enable transparent and effective governance of marine resources, supporting biodiversity and enabling a healthy, productive and resilient ocean. The vast amounts of data collected through several satellites and tracking systems are analysed by two neural networks and fed through machine-learning classifiers to determine the type of ship, its size, fishing gear used, as well as when and where it is fishing³⁵⁰. The algorithms can also automatically identify fishing vessels that are transmitting a false identity number or that of another vessel to elude authorities. Besides the decision-making capacity of policymakers and markets, such transparency supports scientific research and innovation and advocates for sustainable fisheries and ocean management.

V. FROM IDEAS TO IMPLEMENTATION: CATALYSING ACTION



The intervening decades since the publication of the "Limits to Growth" report have laid bare once more that humanity is more vulnerable, fragile and interdependent than one would like to believe – particularly when human activities are inconsistent with Earth's planetary boundaries. The frequency and severity of health-related outbreaks, climate-related extreme weather events and economic crises will very likely increase. Humanity needs to rethink the way it is managing the risks, individually and collectively, in the private and public sectors, locally and globally. Humanity needs to be better prepared and it needs to do everything to limit these likely but unwanted events. Humanity needs to create more resilient economies and societies.

“ Humanity needs to create more resilient economies and societies. ”

The European Commission has demonstrated true leadership by stepping up to the challenge and upholding the ambition of the EGD in the face of competing demands on attention and budgets in a post-COVID-19 recovery. It recognises that a post-COVID-19 recovery cannot come at the expense of transgressing planetary boundaries. Nonetheless, to be truly effective, such a fundamental transformation must be consistent, effective and acceptable. Systems thinking needs to be applied to ultimately drive absolute decoupling of economic growth from natural resources, while convincing the public and other stakeholders of the necessity for a green recovery and solidarity.

The System Change Compass put forward in this report provides a direction for policymakers in order to transition the system towards a sustainable and prosperous future. The System Change Compass, along with the consequent policy orientations, applies not just at the European level, but should be adopted and adapted to the national and local context to ensure overall success.

It is imperative that a favourable policy and investment environment in line with and in promotion of the EGD is created and maintained across all levels of European, domestic and local society. Too much valuable time has been lost, so collective and coordinated interventions should be implemented as quickly as possible. Moreover, the envisioned changes cannot be driven by the EU alone and must be fostered by Member States and local policymakers alike.

Many of the ecosystems and Champion orientations profit from existing research into their benefits and impacts. Respective interventions should be enacted immediately. Actions that are less well understood should be trialled at smaller scale. In addition, these interventions can be enhanced with further insights from analysis. For direct research, as well as innovation and development funding, the following questions should be answered with more precision at each heading of the System Change Compass:

- How can we institutionalise system change thinking at all levels of organisations and communities?



- What key metrics should we select per ecosystem to identify when a given societal need is fulfilled?
- What new forms of cooperation do we need to establish, and how can governments support this?
- How can we effectively mobilise public support for the changes necessary?
- Which geographic level of public funding is most appropriate for each investment category (EU, country, region, city)?
- How can we make sure the transition towards these new business and societal models contributes to a fairer redistribution of benefits and leaves no one behind?

For each Champion subsystem, the following questions need to be addressed through further research and stakeholder engagement – some of which is already ongoing:

How to find and select the right pipeline of projects and companies that will deliver on the promises of these opportunities?

- How can we find and select the right pipeline of projects and companies that will deliver on the promises of these opportunities?
- How can we assess (and later measure) more precisely the expected economic, social and environmental returns of these investments?
- How can we maximise the leverage of catalytic public funding to attract more private capital into these investment areas?

Just like many generations before, this one claims to be at the crossroads of humanity and yet, for the first time, it appears humanity has indeed reached this pivotal point. We are hurtling towards a future beyond our planetary boundaries, our chances of containing global warming to 1.5°C are increasingly remote and we must deal with a global health crisis of a scale that has not been seen in generations. Our actions now will define the future not only of our society, but of human civilisation itself. We must decide now whether to embrace a future of inequality, exploitation and discord or one that can ensure not only human survival but creates well-being and dignity for all. The need to act on this challenge is overwhelming and urgent. But it is no longer enough to just act, we must now do so quickly, systemically and together. The principles and orientations contained in this report chart the way to how it can be done.

“ Our actions now will define the future not only of our society, but of human civilization itself. ”





REFERENCES

1. von der Leyen, U. (2020). *Speech by President von der Leyen at the European Parliament Plenary on the EU coordinated action to combat the coronavirus pandemic and its consequences*. https://ec.europa.eu/commission/presscorner/detail/en/speech_20_675, accessed 20 July, 2020.
2. Institute for Economics & Peace. (2020). *Global Peace Index 2020: Measuring Peace in a Complex World*.
3. For public debt, see: https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?most_recent_year_desc=true&view=chart, accessed May 21, 2020; For economic growth, see: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?view=chart>, accessed May 21, 2020.
4. European Commission. (2018). *Inequalities in access to healthcare - A study of national policies*.
5. UN Department of Economic and Social Affairs. (2020). *World Economic Situation and Prospects as of mid-2020*.
6. Laborde, D., Martin, W., & Vos, R. (2020). *Poverty and food insecurity could grow dramatically as COVID-19 spreads*. International Food Policy Research Institute Blog. <https://www.ifpri.org/blog/poverty-and-food-insecurity-could-grow-dramatically-covid-19-spreads>.
7. Harvey, F. (2020). *Covid-19 pandemic is "fire drill" for effects of climate crisis, says UN official*. The Guardian. <https://www.theguardian.com/environment/2020/jun/15/covid-19-pandemic-is-fire-drill-for-effects-of-climate-crisis-says-un-official>.
8. Graph from Munich Re, Geo Risks Research, NatCatSERVICE (2019), <https://www.iii.org/graph-archive/96424>, accessed July 23, 2020.
9. International Resource Panel (IRP). (2019). *Global Resources Outlook*. (short title: Global Resources Outlook); von Weizsäcker, E. U., & Wijkman, A. (2018). *Come On! Capitalism, Short-termism, Population and the Destruction of the Planet*.
10. Farmer, J. D., Hepburn, C., Ives, M. C., Hale, T., Wetzler, T., Medly, P., Rafaty, R., Srivastav, S., & Way, R. (2019). Sensitive intervention points in the post-carbon transition. In *Science* (Vol. 364, Issue 6436, pp. 132–134). American Association for the Advancement of Science. <https://doi.org/10.1126/science.aaw7287>.
11. For more information, see Seba, T. (2018). *Clean Disruption of Energy and Transportation*. <https://www.youtube.com/watch?v=duWFnukFJhQ>, accessed May 21, 2020; or see »The Solutions Project«, <https://thesolutionsproject.org/>, accessed May 21, 2020.
12. Food and Agriculture Organization of the United Nations (FAO). (2014). *FAO calls for "paradigm shift" towards sustainable agriculture and family farming*. FAO News. <http://www.fao.org/news/story/en/item/250148/icode/>; see also Lovins, H. L., Wallis, S., Wijkman, A., & Fullerton, J. (2018). *A Finer Future: Creating an Economy in Service to Life*, pp 155 – 182.
13. Ellen MacArthur Foundation, SUN, & SYSTEMIQ. (2017). *Achieving Growth Within: A €320-billion Circular Economy Investment Opportunity Available to Europe up to 2025*. (short title: Achieving Growth Within)
14. For Macron: Financial Times. (2020). *FT Interview: Emmanuel Macron says it is time to think the unthinkable*. <https://www.ft.com/content/3ea8d790-7fd1-11ea-8fdb-7ec06edeef84>, accessed May 21, 2020 For Breton: The Parliament Magazine. (2020). *Coronavirus crisis offers chance to 'transform' society, says EU Commissioner*. <https://www.theparliamentmagazine.eu/news/article/coronavirus-crisis-offers-chance-to-transform-society-says-eu-commissioner>, accessed May 21, 2020.
15. European Council. (2020). *Special meeting of the European Council (17, 18, 19, 20 and 21 July 2020) – Conclusions*. (short title: Special meeting of the European Council - Conclusions)
16. *Global Resources Outlook*.
17. *Global Resources Outlook*.
18. *Global Resources Outlook*.
19. European Commission. (2019). *The European Green Deal | Communication*, p. 2. (short title: The European Green Deal | Communication)
20. *Ibid*, p. 3.
21. *Ibid*, p. 4.
22. *Ibid*, pp. 6-9.
23. *Ibid*, p. 9.
24. *Ibid*, p. 10.
25. *Ibid*, pp. 11-15.
26. *Ibid*, pp. 15-19.
27. *Ibid*, p. 2.
28. *Ibid*, p. 3.
29. *Ibid*, p. 4.
30. For no net take: European Commission. (2011). *Roadmap to a Resource Efficient Europe | Communication*, p. 15. For land use: Eurostat. (2017). *Land use statistics*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Land_use_statistics, accessed May 21, 2020.
31. European Court of Auditors. (2020). *Special Report | Biodiversity on farmland: CAP contribution has not halted the decline*.
32. International Resource Panel (IRP). (2020). *Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future*; Material Economics. (2018). *The Circular Economy - a Powerful Force for Climate Mitigation*. (short title: The Circular Economy - a Powerful Force for Climate Mitigation)
33. European Commission. (2020). *Circular Economy Action Plan*, p. 11. (short title: CEAP)
34. For Industrial Strategy: European Commission. (2020). *A New Industrial Strategy for Europe*, p. 3. (short title: A New Industrial Strategy for Europe) For CEAP: CEAP, pp. 7-9. For F2F: European Commission. (2020). *A Farm to Fork Strategy – for a fair, healthy and environmentally-friendly food system*, p. 6. (short title: Farm to Fork Strategy)
35. European Commission. (2020). *Shaping Europe's Digital Future | Communication*, p. 12.
36. *The European Green Deal | Communication*, p. 2.
37. *Ibid*, pp. 6-9.
38. *Global Resources Outlook*.

39. See e.g. *The European Green Deal | Communication*, p. 2; CEAP, p. 4.
40. For Industrial Strategy: *A New Industrial Strategy for Europe*, p. 1. For CEAP: CEAP, p. 24. For Climate Law: European Commission. (2020). *European Climate Law | Proposal.*, p.12.
41. For detailed information, see: European Commission. (2020). *Sustainable Europe Investment Plan & European Green Deal Investment Plan*. pp. 17 - 23. (short title: Sustainable Europe Investment Plan & European Green Deal Investment Plan)
42. European Commission. (2019). *2020 European Semester: Annual Sustainable Growth Strategy.*, p. 10. (short title: Annual Sustainable Growth Strategy 2020)
43. See e.g. *Sustainable Europe Investment Plan & European Green Deal Investment Plan.*, pp. 17-20.
44. Kantar. (2020). *Uncertainty, EU, Hope: Public opinion in times of covid-19.*
45. European Commission. (2020). *The European Green Deal Investment Plan and JTM explained.* (short title: The EGD Investment Plan and JTM explained)
46. See respective recovery plans:
For the MFF and NGEU: *Special meeting of the European Council – Conclusions.*
For the European Central Bank: European Central Bank. (2020). *Speech: The ECB's response to the COVID-19 pandemic.* <https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200416~4d6bd9b9c0.en.html>, accessed June 25, 2020.
For national measures by Member States: Bruegel. (2020). *The fiscal response to the economic fallout from the coronavirus .* <https://www.bruegel.org/publications/datasets/covid-national-dataset/>, accessed June 25, 2020.
47. See e.g. *Sustainable Europe Investment Plan & European Green Deal Investment Plan.*, p. 17.
48. *Special meeting of the European Council – Conclusions.*
49. *Ibid.*
50. European Commission. (2020). *2020 Strategic Foresight Report - Charting the course towards a more resilient Europe.*
51. Simonsen, S. H., Biggs, R. (Oonsie), Schlüter, M., Schoon, M., Bohensky, E., Cundill, G., Dakos, V., Daw, T., Kotschy, K., Leitch, A., Quinlan, A., Peterson, G., & Moberg, F. (2015). *Applying resilience thinking: Seven principles for building resilience in social-ecological system.*
52. CEAP, p. 2.
53. *Farm to Fork Strategy*, p. 4.
54. Language of compass based, amongst others, on: Corsi, P., & de Gerlache, J. (2020). *A Systemic Interpretation of The European Union Green Deal.*
55. European Union. (2007). *Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community*, 13 December 2007, 2007/C 306/01. <https://eur-lex.europa.eu/eli/treaty/lis/sign>.
56. For more information on GDP per capita worldwide and per country, see <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>, accessed June 25, 2020.
57. *Global Resources Outlook.*
58. United Nations University UNU-WIDER. (2020). *Press Release: COVID-19 fallout could push half a billion people into poverty in developing countries.* <https://www.wider.unu.edu/news/press-release-covid-19-fallout-could-push-half-billion-people-poverty-developing-countries>, accessed June 25, 2020.
59. *Annual Sustainable Growth Strategy 2020*, p. 10.
60. United Nations Development Programme (UNDP). (2019). *Human Development Report 2019.*, p.300-311.
61. *Ibid*, p. 2.
62. Mooney, C. (2018). *The people who'll be most hurt by climate swings did the least to cause them, study says.* The Washington Post. <https://www.washingtonpost.com/news/energy-environment/wp/2018/05/02/scientists-just-showed-why-climate-change-is-enormously-unfair/>, accessed June 25, 2020.
63. Thorwaldsson, K.-P. (2019). *Why income inequality is bad for the climate.* World Economic Forum. <https://www.weforum.org/agenda/2019/01/income-inequality-is-bad-climate-change-action/>, accessed June 25, 2020.
64. von der Leyen, U. (2019). *A Union that strives for more | My agenda for Europe.*
65. Eurofund. (2019). *The future of manufacturing in Europe.*
66. Olagnier, D., & Mogensen, T. H. (2020). *The Covid-19 pandemic in Denmark: Big lessons from a small country.* *Cytokine and Growth Factor Reviews*, 53, 10. <https://doi.org/10.1016/j.cytogfr.2020.05.005>.
67. David Suzuki. (2014). *The David Suzuki Reader: A Lifetime of Ideas from a Leading Activist and Thinker* (2nd ed.). Greystone Books Ltd.
68. O'Neil, P. H. (2004). *Essentials of comparative politics.*
69. *Global Resources Outlook.*
70. Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., De Wit, C. A., Hughes, T., Van Der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., ... Foley, J. A. (2009). *A safe operating space for humanity.* *Nature*, 461 (7263), 472–475. <https://doi.org/10.1038/461472a>.
71. *Global Resources Outlook.*
72. *Global Resources Outlook.*
73. Wiedmann, T., Lenzen, M., Keyßer, L. T., & Steinberger, J. K. (2020). *Scientists' warning on affluence.* *Nature Communications*, 11 (1), 1–10. <https://doi.org/10.1038/s41467-020-16941-y>.
74. *Global Resources Outlook.*
75. Wackernagel, M., Hanscom, L., & Lin, D. (2017). *Making the Sustainable Development Goals Consistent with Sustainability.* *Frontiers in Energy Research*, 5(JUL), 1. <https://doi.org/10.3389/fenrg.2017.00018>. (short title: Making the Sustainable Development Goals Consistent with Sustainability)
76. *Global Resources Outlook.*
77. *Global Resources Outlook.*
78. International Resource Panel (IRP). (2018). *The Weight of Cities: Resource Requirements of future urbanization.*
79. *Making the Sustainable Development Goals Consistent with Sustainability.*
80. Ellen MacArthur Foundation, SUN, & McKinsey Center for Business and Environment. (2015). *Growth Within: A circular economy vision for a competitive Europe.* (short title: Growth Within)
81. Potočnik, J., Spangenberg, J., Alcott, B., Kiss, V., Coote, A., Reichel, A., Lorek, S., & Mathai, M. V. (2018). *Sufficiency - Moving beyond the gospel of eco-efficiency.*
82. Energy Transitions Commission. (2018). *Mission Possible: reaching net-zero carbon emissions from harder-to-abate sectors by mid-century.* (short title: Mission Possible)
83. The Food and Land Use Coalition (FOLU). (2019). *Growing Better - Ten Critical Transitions to Transform Food and Land Use.*
84. *Annual Sustainable Growth Strategy 2020*, p. 1.
85. Doyal, L., & Gough, I. (1991). *A Theory of Human Need.*; Gough, I. (2020). *In times of climate breakdown, how do we value what matters?* OpenDemocracy. <https://www.opendemocracy.net/en/oureconomy/times-climate-breakdown-how-do-we-value-what-matters/>, accessed June 25, 2020.

86. Meadows, D. M., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *The Limits to Growth*. (short title: *The Limits to Growth*); Raworth, K. (2017). *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*. (short title: *Seven Ways to Think Like a 21st-Century Economist*)
87. *Seven Ways to Think Like a 21st-Century Economist*.
88. For Amsterdam, see Raworth, K. (2020). *Introducing the Amsterdam City Doughnut*. <https://www.kateraworth.com/2020/04/08/amsterdam-city-doughnut/>, accessed June 25, 2020.;
For New Zealand, see Roy, E. A. (2019). *New Zealand "wellbeing" budget promises billions to care for most vulnerable*. *The Guardian*. <https://www.theguardian.com/world/2019/may/30/new-zealand-wellbeing-budget-jacinda-ardern-unveils-billions-to-care-for-most-vulnerable>, accessed June 25, 2020.
See also: The Club of Rome, in partnership with Potsdam Institute for Climate Impact Research (2020), *Planetary Emergency 2.0 - Securing a New Deal for People, Nature and Climate* and Dixon-Declève, S., McLeod, A., (2020), *21st Century Wellbeing Economics: The Road To Recovery, Renewal & Resilience*, The Club of Rome economic recovery, renewal & resilience series.
89. Hertwich, E., van der Voet, E., Suh, S., Tukker, A., Huijbregts, M., Kazmierczyk, P., Lenzen, M., McNeely, J., & Moriguchi, Y. (2010). *Assessing the Environmental Impacts of Consumption and Production: Priority Products and Materials, A Report of the Working Group on the Environmental Impacts of Products and Materials to the International Panel for Sustainable Resource Management.*, p. 49
90. Based on: de Wit, M., Hoogzaad, J., Ramkumar, S., Friedl, H., & Douma, A. (2018). *The Circularity Gap report*.
91. Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sorlin, S. (2015). *Planetary boundaries: Guiding human development on a changing planet*. *Science*, 347(6223), 1259855–1259855. <https://doi.org/10.1126/science.1259855>
92. Kennedy, R. F. (1968). *Remarks at the University of Kansas, March 18, 1968*. <https://www.jfklibrary.org/learn/about-jfk/the-kennedy-family/robert-f-kennedy/robert-f-kennedy-speeches/remarks-at-the-university-of-kansas-march-18-1968>
93. Potočník, J. (2011). *Measuring green growth and natural capital - the importance of statistics in environment policy*. Speech at the Plenary Session of the Eurostat Conference. https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_11_164, accessed June 25, 2020.
94. Burdekin, R. C. K. (1988). *Economic Performance and the Determination of Presidential Elections in the U.S.* *The American Economist*, 32(2), 71–75. <https://doi.org/10.1177/056943458803200212>
95. Costanza, R., Hart, M., Posner, S., & Talberth, J. (2009). *Beyond GDP: The Need for New Measures of Progress.*, p. 4.
96. UN Environment Programme (UNEP). (2018). *Inclusive Wealth Report 2018*.
97. Commission of the European Communities. (2009). *GDP and beyond | Measuring progress in a changing world.*; Jackson, T. (2009). *Prosperity without growth? The transition to a sustainable economy*.
98. Statement by Premier Li Keqiang cited from <https://www.dw.com/en/coronavirus-china-drops-gdp-goal-boosts-spending/a-53530087>, accessed June 25, 2020.
99. The Treasury of New Zealand. (2019). *Our living standards framework*. <https://www.treasury.govt.nz/information-and-services/nz-economy/higher-living-standards/our-living-standards-framework>, accessed July 9, 2020.
100. For WAVES (World Bank), see: *Wealth Accounting and the Valuation of Ecosystem Services. About Us*. <https://www.wavespartnership.org/about-us>; For BIOFIN (UNDP), see: <https://biodiversityfinance.net/about-biofin/what-biodiversity-finance>, accessed August 15, 2020; For Green Growth (OECD), see: *OECD. Green growth and sustainable development*. <http://www.oecd.org/greengrowth/>, accessed August 15, 2020.
101. Natural Capital Coalition. *The Coalition*. <https://naturalcapitalcoalition.org/the-coalition/>, accessed August 15, 2020.
102. MIT Sloan Executive Education Blog. (2014). *The digital business transformation imperative*. <https://executive.mit.edu/blog/the-digital-business-transformation-imperative>, accessed July 9, 2020.
103. For energy, see: Eurostat. (2020). *Shedding light on energy in the EU - A guided tour of energy statistics.*; For materials, see: European Commission. (2020). *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability*.
104. VDI Zentrum Ressourceneffizienz. (2016). *Competitive Advantage: Resource Efficiency.*; Wink, B. (2020). *The US tech sector is now worth more than the entire European stock market, Bank of America says*. <https://markets.businessinsider.com/news/stocks/us-tech-stocks-worth-more-european-stock-market-apple-microsoft-2020-8-1029545001#>, accessed July 9, 2020.
105. Messner, D., Nakicenovic, N., Zimm, C., Clarke, G., Rockström, J., Aguiar, A. P., Boza-Kiss, B., Campagnolo, L., Chabay, I., & Collste, D. (2019). *The Digital Revolution and Sustainable Development: Opportunities and Challenges-Report prepared by The World in 2050 initiative.*, p. 33.
106. *A New Industrial Strategy for Europe*, p. 1.
107. For definition of digitalisation: Gartner. (2020). *Information Technology Glossary*. <https://www.gartner.com/en/information-technology/glossary/digitization>, accessed July 9, 2020.
For the automotive sector, see: BBC News. (2020). *Tesla overtakes Toyota to become world's most valuable carmaker*. <https://www.bbc.com/news/business-53257933>, accessed July 9, 2020.;
For the hospitality sector, see: Hartmans, A. (2017). *Airbnb's total worldwide listings is more than the top 5 hotel brands combined*. <https://www.businessinsider.com/airbnb-total-worldwide-listings-2017-8?r=DE&IR=T>, accessed July 9, 2020.
108. *A New Industrial Strategy for Europe*, p. 1.
109. *Ibid*, p. 1.
110. Ford, S., & Despeisse, M. (2016). *Additive manufacturing and sustainability: an exploratory study of the advantages and challenges*. *Journal of Cleaner Production*, 137, 1573–1587.
111. McKinsey & Company. (2016). *Supply Chain 4.0 – the next-generation digital supply chain*. <https://www.mckinsey.com/business-functions/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain>
112. Mi, Z., & Coffman, D. M. (2019). *The sharing economy promotes sustainable societies*. *Nature Communications*, 10(1), 1–3. <https://doi.org/10.1038/s41467-019-09260-4>
113. Balogun, A. L., Marks, D., Sharma, R., Shekhar, H., Balmes, C., Maheng, D., Arshad, A., & Salehi, P. (2020). *Assessing the Potentials of Digitalization as a Tool for Climate Change Adaptation and Sustainable Development in Urban Centres*. *Sustainable Cities and Society*, 53. <https://doi.org/10.1016/j.scs.2019.101888>
114. Deloitte. (2018). *Managing Risk in Digital Transformation.*; OECD. (2018). *Automation, skills use and training. OECD Social, Employment, and Migration Working Papers, 202*, 1–125. <https://doi.org/10.1787/2e2f4eea-en>
115. Pawlicz, A. (2019). *Pros and cons of sharing economy regulation. Implications for sustainable city logistics*. *Transportation Research Procedia*, 39, 398–404. <https://doi.org/10.1016/j.trpro.2019.06.042>

116. Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S. D., Tegmark, M., & Fuso Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications*, 11(1), 1–10. <https://doi.org/10.1038/s41467-019-14108-y>
117. Candelon, F., Bürkner, H.-P., Grebe, M., Carlo, R. C. di, & Bondt, M. De. (2020). *As the COVID-19 Crisis Reveals, Europe Urgently Needs to Digitize Its Industry*. <https://www.bcg.com/de-de/publications/2020/covid-crisis-reveals-europe-urgently-needs-industry-digitization>
118. World Economic Forum. *Global Competitiveness Index 2017-2018*. <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/>, accessed May 28, 2020.
119. Novak, J., Purta, M., Marciniak, T., Ignatowicz, K., Rozenbaum, K., & Yearwood, K. (2018). *The rise of Digital Challengers: How digitization can become the next growth engine for Central and Eastern Europe*.
120. TEDxStockholm. (2018). *Greta Thunberg: The disarming case to act right now on climate change | TED Talk*. https://www.ted.com/talks/greta_thunberg_the_disarming_case_to_act_right_now_on_climate_change
121. Environmental Protection Agency. (2020). *Economic Incentives | Environmental Economics*. <https://www.epa.gov/environmental-economics/economic-incentives> (short title: Economic Incentives | Environmental Economics)
122. Hepburn, C., O'callaghan, B., Stern, N., Stiglitz, J., & Zenghelis, D. (2020). Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? *Forthcoming in the Oxford Review of Economic Policy*, 36(S1).
123. For France, see: Flight Global. (2020). *French government sets green conditions for Air France bailout*. <https://www.flightglobal.com/strategy/french-government-sets-green-conditions-for-air-france-bailout/138160.article>, accessed July 9, 2020.; For Austria, see: Morgan, S. (2020). *Austrian Airlines bailout to be linked to climate targets*. EURACTIV. <https://www.euractiv.com/section/aviation/news/austrian-airlines-bailout-to-be-linked-to-climate-targets/>, accessed July 9, 2020.
124. For renewable subsidies: Taylor, M. (2020). *Energy Subsidies: Evolution in the Global Energy Transformation to 2050*, p. 8. (short title: Global Energy Transformation)
For fossil fuel subsidies: Gençsü, I., Mclynn, M., Runkel, M., Trilling, M., Van Der Burg, L., Worrall, L., Whitley, S., & Zerzawy, F. (2017). *Phase-out 2020 Monitoring Europe's fossil fuel subsidies*, p. 22
125. *Special meeting of the European Council – Conclusions*.
126. Carbon Pricing Leadership Coalition. (2019). *Report of the High-Level Commission on Carbon Pricing and Competitiveness*.
127. The PEW Charitable Trusts, & SYSTEMIQ. (2020). *Breaking the Plastic Wave | A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution*. (short title: Breaking the Plastic Wave)
128. *Economic Incentives | Environmental Economics*.
129. Domenech, T., Ekins, P., van Ewijk, S., Spano Klein, C., Kloss, B., Miedzinski, M., Petit, M., Stuchtay, M., & Tomei, J. (2019). *Making Materials Work for Life - Introducing Producer Ownership*. (short title: Making Materials Work for Life)
130. *Breaking the Plastic Wave*.
131. *Making Materials Work for Life*, p.7
132. CEAP., p.4
133. *Making Materials Work for Life*.; Stahel, W. (2019). *The Circular Economy - a user's guide*.
134. CRAFTSMAN®. *Warranty Information*. <https://www.craftsman.com/customer-care/warranty-information>, accessed September 5, 2020.
135. SHARE NOW. *Über SHARE NOW*. from <https://www.share-now.com/de/de/faq/about-share-now/#what-is-car-sharing>, accessed September 5, 2020.
136. SAFECHEM. *About Us*. 2020, from <https://safechem.com/en/about-us>, accessed September 5, 2020.
137. Rolls-Royce. (2017). *Our stories - TotalCare®*. <https://www.rolls-royce.com/media/our-stories/discover/2017/totalcare.aspx>, accessed July 23, 2020.
138. European Environment Agency. (2015). *Resource efficiency and the low-carbon economy*. The European Environment - State and Outlook 2015 - Synthesis Report. <https://www.eea.europa.eu/soer/2015/synthesis/report/4-resourceefficiency; Making Materials Work for Life>.
139. Meadows, D. H. (1992). *Beyond the Limits | Executive Summary*. <https://natcapsolutions.org/beyond-the-limits-executive-summary/>
140. Sunstein, C. R., & Reisch, L. A. (2014). Automatically green: Behavioral economics and environmental protection. *Harvard Environmental Law Review*, 38(1), 127–158. <https://doi.org/10.2139/ssrn.2245657> (short title: Automatically green)
141. Thaler, R., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth and happiness*.
142. *Automatically green*.
143. Czarnecka, B., & Schivinski, B. (2019). Do Consumers Acculturated to Global Consumer Culture Buy More Impulsively? The Moderating Role of Attitudes towards and Beliefs about Advertising. *Journal of Global Marketing*, 32(4), 219–238. <https://doi.org/10.1080/08911762.2019.1600094>
144. Rau, T., & Oberhuber, S. (2019). *Material matters: het alternatief voor onze roofofbouwmaatschappij*.; Cherry, C. E., & Pidgeon, N. F. (2018). Why is ownership an issue? Exploring factors that determine public acceptance of product-service systems. *Sustainability*, 10(7). <https://doi.org/10.3390/su10072289>
145. Credit Suisse Research Institute. (2017). *Emerging Consumer Survey 2017*, p. 7-9.
146. Szejnwald Brown, H., & Vergragt, P. J. (2015). From consumerism to wellbeing: toward a cultural transition? *Journal of Cleaner Production*, 1–10. <https://doi.org/10.1016/j.jclepro.2015.04.107> (short title: From consumerism to wellbeing)
147. World Business Council for Sustainable Development. *SDG Business Hub - What are the Good Life Goals*. <https://sdghub.com/goodlifegoals/>, accessed June 18, 2020.
148. *From consumerism to wellbeing*.
149. Peck, J., & Shu, S. (2018). Psychological Ownership and Consumer Behavior. In *Psychological Ownership and Consumer Behavior*. <https://doi.org/10.1007/978-3-319-77158-8>
150. Larry Fink. (2019). *Larry Fink's Letter to CEOs | BlackRock*. <https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter>, accessed July 23, 2020. (short title: Larry Fink's Letter to CEOs)
151. Intergovernmental Panel on Climate Change. (2018). *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change*, p. 3.
152. Kay, J. (2015). *Other People's Money: Masters of the Universe or Servants of the People?*

153. For investor signalling: CDP, IIGCC, & PRI. (2020). *Open letter to EU leaders from investors on a sustainable recovery from COVID-19*. (short title: *Open letter to EU leaders from investors on a sustainable recovery from COVID-19*); *Larry Fink's Letter to CEOs For share of total volume: Global Assets under management 2018: US\$74.3 trillion*, see: BCG. (2019). *Global Asset Management 2019: Will These '20s Roar?* <https://www.bcg.com/publications/2019/global-asset-management-will-these-20s-roar> accessed July 23, 2020.; *Global size of impact investments 2020: US\$715 billion*, see: Hand, D., Dithrich, H., Sunderji, S., & Nova, N. (2020). *Annual Impact Investor Survey 2020*. <http://www.thegiin.org/>.
154. Amundi Asset Management, & International Finance Corporation. (2020). *Emerging Market Green Bonds Report 2019: Momentum Builds as Nascent Markets Grow*.
155. Global Impact Investing Network (GIIN). (2020). *Annual Impact Investor Survey 2020*.
156. Mooney, A. (2020). *ESG passes the Covid challenge*. Financial Times. <https://www.ft.com/content/50eb893d-98ae-4a8f-8fec-75aa1bb98a48>, accessed July 23, 2020.
157. Wehrmann, B. (2019). *New EU green investment rules to make conservative German savers bite*. EnergyPost.Eu. <https://energypost.eu/new-eu-green-investment-rules-to-make-conservative-german-savers-bite/>, accessed July 23, 2020.
158. Kretschmer, H. (2020). *Chart of the day: Renewables are increasingly cheaper than coal*. World Economic Forum. <https://www.weforum.org/agenda/2020/06/renewable-energy-cheaper-coal/>, accessed July 23, 2020.
159. Simon, F. (2020). *Green budget rules won't be the hottest potato at EU summit talks*. EURACTIV. <https://www.euractiv.com/section/energy-environment/news/green-budget-rules-wont-be-the-hottest-potato-at-eu-summit-talks/>, accessed July 23, 2020.
160. European Investment Bank. (2019). *EU Bank launches ambitious new climate strategy and Energy Lending Policy*. European Investment Bank. <https://www.eib.org/en/press/all/2019-313-eu-bank-launches-ambitious-new-climate-strategy-and-energy-lending-policy>, accessed July 23, 2020.
161. Matikainen, S., Campiglio, E., Zenghelis, D., Barkawi, A., Bowen, A., Fankhauser, S., Monnin, P., Morgan, J., & Tanaka, M. (2017). *The climate impact of quantitative easing*.
162. Fedorova, A. (2020). *ECB's "vanguard of efforts" to boost demand for green bonds*. Esgclarity. <https://esgclarity.com/ecbs-vanguard-of-efforts-to-boost-demand-for-green-bonds/>, accessed July 23, 2020.
163. *Open letter to EU leaders from investors on a sustainable recovery from COVID-19*.
164. Evain, J., Cardona, M., & Nicol. Morgane. (2018). *Article 173: Overview of climate-related financial disclosure after two years of implementation.*; For the original legislative text (in French), see: https://www.legifrance.gouv.fr/eli/loi/2015/8/17/DEVX1413992L/jo/article_173
165. European Commission. *International platform on sustainable finance*. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/international-platform-sustainable-finance_en, accessed July 23, 2020.
166. Roewe, B. (2014). *Francis reminds UN climate summit of "unpostponable ethical imperative to act"*. <https://www.ncronline.org/blogs/earthbeat/eco-catholic/francis-reminds-un-climate-summit-unpostponable-ethical-imperative-act>, accessed July 23, 2020.
167. DW Online. (2020). *Coronavirus: 5 things New Zealand got right*. <https://www.dw.com/en/jacinda-ardern-leadership-in-coronavirus-response/a-53733397>; Farr, C. (2020). *Germany's coronavirus response: masterful science communication*. CNBC. <https://www.cnbc.com/2020/07/21/germanys-coronavirus-response-masterful-science-communication.html>, accessed July 23, 2020.
168. *Global Resources Outlook; The Limits to Growth*.
169. *Global Resources Outlook*.
170. For the French climate assembly, see: Democracy International e.V. (2020). *Unique Citizens' Convention initiates referendum on climate change in France*. <https://www.democracy-international.org/unique-citizens-convention-initiates-referendum-climate-change-france>, accessed July 23, 2020; For broader stakeholder consultation see: Club of Rome (2020). *Open Letter to Global Leaders – A Healthy Planet for Healthy People*. <https://clubofrome.org/impact-hubs/climate-emergency/open-letter-to-global-leaders-a-healthy-planet-for-healthy-people>, accessed July 23, 2020; For institutions establishing long term political goals, see: Committee on Climate Change. (2010). *Committee on Climate Change Framework Document*.
171. *The EGD Investment Plan and JTM explained*.
172. *Special meeting of the European Council – Conclusions*.
173. Keating, D. (2019). *EU Leaders Agree 2050 Climate Target - Without Poland*. Forbes. <https://www.forbes.com/sites/davekeating/2019/12/13/eu-leaders-agree-2050-climate-target-without-poland/>, accessed July 23, 2020.
174. Mazzucato, M. (2018). *Mission-oriented innovation policies: Challenges and opportunities*. *Industrial and Corporate Change*, 27(5), 803–815. <https://doi.org/10.1093/icc/dty034>
175. *Inherit the Earth, or Borrow it from our Children? | Open Space | National Recreation and Park Association*. (2015). <https://www.nrpa.org/blog/inherit-the-earth-or-borrow-it-from-our-children/>, accessed July 23, 2020.
176. Dreier, L., Nabarro, D., & Nelson, J. (2019). *Systems leadership can change the world - but what exactly is it?* World Economic Forum. <https://www.weforum.org/agenda/2019/09/systems-leadership-can-change-the-world-but-what-exactly-is-it-mean/>, accessed July 23, 2020. (short title: *Systems leadership can change the world – but what exactly is it?*)
177. Gramlich, J. (2020). *Coronavirus pandemic likely to increase government debt around world*. Pew Research Center. <https://www.pewresearch.org/fact-tank/2020/04/29/coronavirus-downturn-likely-to-add-to-high-government-debt-in-some-countries/>, accessed July 23, 2020.
178. Parker, L. (2020). *For young people, two defining events: COVID-19 and climate change*. National Geographic. <https://www.nationalgeographic.com/science/2020/04/gen-z-pandemic-will-define-formative-years-coronavirus-climate-change/>, accessed July 23, 2020.
179. World Commission on Environment and Development. (1987). *Our Common Future*.
180. *Systems leadership can change the world – but what exactly is it?*
181. Capital Institute. *Regenerative Communities Network*. <https://regencommunities.net/>, accessed August 20, 2020.
182. Krznaric, R. (2020). *The Good Ancestor: How to Think Long Term in a Short-Term World*.
183. Stockholm Resilience Centre. (2015). *Explaining core concepts: What is resilience?* <https://www.stockholmresilience.org/research/research-news/2015-02-19-what-is-resilience.html>, accessed July 23, 2020.
184. Marketsandmarkets. (2020). *Fresh Food Packaging Market by Material (Polyethylene, Polypropylene, Aluminum, Paper, BOPET, PVC), Pack Type (Converted Roll Stock, Gusseted Bags, Flexible Paper, Corrugated Box, Boxboard, Cans), Application and Region - Forecast to 2025*.
185. *Policy Brief: The Impact of COVID-19 on Food Security and Nutrition*.
186. Material Economics. (2020). *The circular economy as economic opportunity in the COVID-19 recovery*. (short title: *The circular economy as economic opportunity in the COVID-19 recovery*)

187. International Panel of Experts on Sustainable Food Systems. (2020). *COVID-19 and the crisis in food systems: Symptoms, causes, and potential solutions*. The International Panel of Experts on Sustainable Food Systems.
188. The Food and Land Use Coalition (FOLU). (2019). *Growing Better - Ten Critical Transitions to Transform Food and Land Use*. (short title: Growing Better)
189. Ibid.
190. Ibid, p. 79.
191. *The circular economy as economic opportunity in the COVID-19 recovery*.
192. *Growth Within*, p. 27.
193. *Growing Better*, Exhibit 2, p. 13.
194. World Economic Forum. (2020). *New Nature Economy Report II - The Future Of Nature And Business.*, p. 42
195. Ibid, p. 9.
196. *Growing Better*, p. 11.
197. Intergovernmental Panel on Climate Change. (1996). *Second Assessment Report - Global Warming Potentials*. <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>, accessed July 23, 2020.
198. *Achieving Growth Within*, p. 112.
199. Ibid, p. 112.
200. For share of animal protein: Department, A. O. of the U. N. F. (2000). *The State of World Fisheries and Aquaculture, 2000* (Vol. 3). Food & Agriculture Org., p. 2
For dietary shift: *Growing Better*, p. 112 ff.
201. SYSTEMIQ, & Soil Capital. (2019). *Regenerating Europe's soils - Making the economics work.*, p. 2 (short title: Regenerating Europe's soils)
202. Soil Capital. (2020). *Advising Belgian farmers on regenerative agriculture*. <https://www.soilcapital.com/projects/advising-belgian-farmers-on-regenerative-agriculture>, accessed July 23, 2020: *Growing Better*, p. 85.
203. Lechenet, M., Dessaint, F., Py, G., Makowski, D., & Munier-Jolain, N. (2017). Reducing pesticide use while preserving crop productivity and profitability on arable farms. *Nature Plants*, 3(3), 1–6.
204. Heren, H. R., Bassi, A. M., Tan, Z., & Binns, W. P. (2012). Green jobs for a revitalized food and agriculture sector. *Nature Resources Management and Environment Department, Food and Agriculture Organization of the United Nations, Rome.*, p. 31
205. Ibid.
206. Baltic Sea Action Group. (2019). *Carbon Action*. <https://carbonaction.org/carbon-action/>, accessed August 6, 2020.
207. *Regenerating Europe's soils*, p. 10.
208. European Commission. (2003). *Indoor air pollution: new EU research reveals higher risks than previously thought*. https://ec.europa.eu/commission/presscorner/detail/en/IP_03_1278, accessed July 20, 2020.
209. WSP. (2020). *How will COVID change demand for office space?* <https://www.wsp.com/en-GL/insights/how-will-covid-19-change-demand-for-office-space>, accessed August 20, 2020.
210. Pinheiro, M. D., & Luís, N. C. (2020). COVID-19 Could Leverage a Sustainable Built Environment. *Sustainability*, 12(14), 5863.
211. Ibid.
212. European Commission. (2019). *Energy performance of buildings directive*. https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en (short title: Energy performance of buildings directive)
213. European Commission. (2020). *Energy efficiency in buildings*.
214. *The Circular Economy - a Powerful Force for Climate Mitigation*.
215. Business and Sustainable Development Commission. (2017). *Better business, better world.*, p. 31 (short title : Better business, better world)
216. *The circular economy as economic opportunity in the COVID-19 recovery*.
217. Lamy, P., Pons, G., Borchers-Gasnier, A., Leturcq, P., Delair, M., Magdalinski, E., & Pellerin-Carlin, T. (2020). *Greener After - A Green Recovery Stimulus for a post-COVID-19 Europe.*, p. 5
218. For share of buildings in public hands: EUROSAI Working Group on Environmental Auditing. (2018). *Energy Efficiency of Public Sector Buildings.*, p. 5
For emission reduction: International Resource Panel (IRP). (2020). *Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.*, p. 2.
219. *Growth Within*, p. 20.
220. Stuchtey, M., Enkvist, P.-A., & Zumwinkel, K. (2017). *A good disruption: Redefining growth in the twenty-first century*. Bloomsbury Publishing.
221. For market size: Nock, L., & Wheelock, C. (2009). Energy efficiency retrofits for commercial and public buildings. *Pike Research*.
For energy saving potential: Becchio, C., Corgnati, S. P., Ballarini, I., & Corrado, V. (2012). Energy saving potential by retrofitting residential buildings in Europe. *REHVA J*, 6, 34–38.
222. IEA. (2020). *Tracking report: Heat Pumps*. <https://www.iea.org/reports/heat-pumps>, accessed July 20, 2020.
223. Blumberg, K., Isenstadt, A., Taddonio, K. N., Andersen, S. O., & Sherman, N. J. (2019). *Mobile Air Conditioning: the Life-cycle Costs and Greenhouse-gas Benefits of Switching to Alternative Refrigerants and Improving System Efficiencies*.
224. McKinsey & Company. (2020). *How a post-pandemic stimulus can both create jobs and help the climate*.
225. van Audenhove, F.-J., Rominger, G., Eagar, R., Pourbaix, J., Dommergues, E., & Carlier, J. (2020). *The Future of Mobility post-COVID: Turning the crisis into an opportunity to accelerate towards more sustainable, resilient and human-centric urban mobility systems*. (short title: The Future of Mobility)
226. McKinsey Center for Future Mobility. (2020). *The impact of COVID-19 on future mobility solutions*.
227. *The circular economy as economic opportunity in the COVID-19 recovery*.
228. IEA. (2020). *The impact of the Covid-19 crisis on clean energy progress*. <https://www.iea.org/articles/the-impact-of-the-covid-19-crisis-on-clean-energy-progress>, accessed August 6, 2020.
229. Posaner, J., Cokelaere, H., & Hernandez-Morales, A. (2020). *Life after COVID: Europeans want to keep their cities car-free*. <https://www.politico.eu/article/life-after-covid-europeans-want-to-keep-their-cities-car-free/>, accessed August 6, 2020.
230. *The Future of Mobility*.
231. *Better business, better world*, p. 29; *The circular economy as economic opportunity in the COVID-19 recovery*.
232. Ibid.
233. European Environment Agency. (2019). *Greenhouse gas emissions from transport in Europe*. <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-12>, accessed August 6, 2020. (short title: Greenhouse gas emissions from transport in Europe)
234. Eurostat. (2019). *Car travel dominates EU inland journeys*. <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/EDN-20190916-1>, accessed August 20, 2020.
235. Stuchtey, M., Enkvist, P.-A., & Zumwinkel, K. (2017). *A good disruption: Redefining growth in the twenty-first century*. Bloomsbury Publishing.
236. Smart Growth America. (2011). *Recent lessons from the stimulus: Transportation funding and job creation*.

237. Harrison, P. (2018). Fuelling Europe's Future. How the Transition from Oil Strengthens the Economy. *Cambridge Econometrics, Informe Técnico.*, p. 5
238. Growth Within, p. 54; including annualised purchasing cost of vehicle, capital cost, fuel, maintenance, insurance, and parking fees as well as taxes
239. Ibid, p. 54.
240. Ibid, p. 56.
241. Ibid, p. 54.
242. For global: Lee, D. S., Fahey, D. W., Skowron, A., Allen, M. R., Burkhardt, U., Chen, Q., Doherty, S. J., Freeman, S., Forster, P. M., & Fuglestedt, J. (2020). The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. *Atmospheric Environment*, 117834
For Europe: Morgan, S. (2020). *Greener aviation set for end-of-year lift*. <https://www.euractiv.com/section/aviation/news/greener-aviation-set-for-end-of-year-lift/>, accessed July 20, 2020.
243. Ibid.
244. European Commission. (2020). *Reducing emissions from aviation*. https://ec.europa.eu/clima/policies/transport/aviation_en, accessed July 20, 2020. (short title: Reducing emissions from aviation)
245. *Mission Possible*, p. 10 ff.
246. International Chamber of Shipping. (2020). *Shipping and World Trade*. <https://www.ics-shipping.org/shipping-facts/shipping-and-world-trade>, accessed July 20, 2020. (short title: Shipping and World Trade)
247. European Commission. (2020). *2019 Annual Report on CO2 Emissions from Maritime Transport*. (short title: 2019 Annual Report)
248. Hoegh-Guldberg, O., Caldeira, K., Chopin, T., Gaines, S., Haugan, P., Hemer, M., Howard, J., Konar, M., Krause-Jensen, D., & Lindstad, E. (2019). *The Ocean as a Solution to Climate Change: Five Opportunities for Action*.
249. International Maritime Organisation. (2020). *Air Pollution, Energy Efficiency and Greenhouse Gas Emissions. Our Work*. <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Default.aspx>, accessed August 6, 2020.
250. For pollution: Ramacher, M. O. P., Tang, L., Moldanová, J., Matthias, V., Karl, M., Fridell, E., & Johansson, L. (2020). The impact of ship emissions on air quality and human health in the Gothenburg area—Part II: Scenarios for 2040. *Atmospheric Chemistry and Physics*, 20(17), 10667–10686.
For human rights: Human Rights at Sea. (2019). *Human Rights Abuse & Amputations in Fijian Crewed Fisheries*. <https://www.humanrightsatsea.org/2019/05/21/human-rights-abuse-amputations-in-fijian-crewed-fisheries/>, accessed August 6, 2020.
251. For share of public transport: Eurostat. (2020). *Share of busses and trains in total passenger transport*. https://ec.europa.eu/eurostat/databrowser/view/sdg_09_50/default/table?lang=en, accessed August 6, 2020
For reason: Poelman, H., & Dijkstra, L. (2015). Measuring access to public transport in European cities. *Regional and Urban Policy*.
252. *How a post-pandemic stimulus can both create jobs and help the climate*.
253. MaaS Global. (2020). *MaaS Global - The company behind the Whim app*. <https://whimapp.com/about-us/>, accessed August 20, 2020.
254. Wulff, C., & Rumpff, S. *Lockdown, Shake Up: The New Normal for Shopping in Europe*. <https://www.pwc.de/en/retail-and-consumer/european-consumer-insights-series-2020-new-normal.html>, accessed August 20, 2020.
255. Colle, T. *Getting ready for stability after COVID-19*. <https://www.nielsen.com/ua/en/insights/article/2020/getting-ready-for-stability-after-covid-19/>, accessed August 6, 2020.
256. World Trade Organization. (2020). *E-Commerce, trade and the Covid-19 pandemic | Information Note*.
257. Gordon, E. (2020). *COVID-19 Implications for the sharing economy companies*. <https://news.umich.edu/covid-19-implications-for-the-sharing-economy-companies/>, accessed August 6, 2020.
258. Wijayasundara, M. (2020). *Opportunities for a circular economy post COVID-19*. World Economic Forum. <https://www.weforum.org/agenda/2020/06/opportunities-circular-economy-post-covid-19/>, accessed July 20, 2020.
259. Ellen MacArthur Foundation. (2013). Towards the circular economy. *Journal of Industrial Ecology*, 2, 23–44., p. 5 (short title: Towards the circular economy)
260. For kg per capita: CEAP, p. 11.
For share of total: European Commission. (2018). *A European strategy for plastics in a circular economy*, p. 11.
261. Ibid.
262. European Environment Agency. (2020). *Europe's consumption in a circular economy: the benefits of longer-lasting electronics*. <https://www.eea.europa.eu/themes/waste/resource-efficiency/benefits-of-longer-lasting-electronics>, accessed July 20, 2020.
263. Rizos, V., Bryhn, J., Alessi, M., Campmas, A., & Zarra, A. (2019). *Identifying the impact of the circular economy on the Fast-Moving Consumer Goods Industry Opportunities and challenges for businesses, workers and consumers—mobile phones as an example STUDY*.
264. Morlet, A., Opsomer, R., Herrmann, S., Balmond, L., Gillet, C., & Fuchs, L. (2017). A new textiles economy: redesigning fashion's future. In *Ellen MacArthur Foundation*. (short title: A new textiles economy)
265. Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, 18, 41–61.
266. *Towards the circular economy*.
267. Ibid.
268. *A new textiles economy*.
269. Ellen MacArthur Foundation, & Material Economics. (2019). *Completing the Picture: How the Circular Economy Tackles Climate Change.*, p. 22.
270. *Towards the circular economy*.
271. McFarlane, D. (2020). *Why 'as-a-service' models will reign in a post-pandemic world*. <https://venturebeat.com/2020/05/16/why-as-a-service-models-will-reign-in-a-post-pandemic-world/>, accessed June 25, 2020.
272. Aubertin, C. (2020). *From Product to Product-as-a-Service*. <https://medium.com/swlh/from-product-to-product-as-a-service-37baed471cd6cole>, accessed July 20, 2020.
273. Ibid.
274. Benjamin, G., Lavandier, H., & Muthiah, S. *Introduction: The services solution for unlocking industry's next growth opportunity*. <https://www.mckinsey.com/business-functions/operations/our-insights/the-services-solution-for-unlocking-industrys-next-growth-opportunity>, accessed July 20, 2020.
275. Glueck, J., Koudal, P., & Vaessen, W. (2007). The service revolution: Manufacturing's missing crown jewel. *Deloitte Review*, 8, 26–33., p. 24
276. Ibid.
277. RECUP. *So einfach geht's*. Retrieved October 5, 2020, from <https://recup.de/sogehts>, accessed July 27, 2020/
278. Deutsche Umwelthilfe. (2015). *Coffee to go—Einwegbecher – Umweltauswirkungen und Alternativen.*, p. 4 (short title: Coffee to go—Einwegbecher)
279. Kühling, S. (2019). *Recup: Bei VW in Baunatal gibt es nur noch Mehrwegbecher*. <https://www.hna.de/lokales/kreis-kassel/vw-setzt-auf-mehrwegbecher-kaffee-aus-pappe-ist-in-baunatal-geschichte-11755421.html>
280. REBOWL. *Pfandschale*. <https://rebowl.de/pfandschale/>, accessed July 27, 2020.

281. Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). Indirect effects of COVID-19 on the environment. *Science of the Total Environment*, 138813. (short title: Indirect effects of COVID-19 on the environment)
282. For reduction in April: Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J. P., Abernethy, S., Andrew, R. M., De-Gol, A. J., Willis, D. R., Shan, Y., & Canadell, J. G. (2020). Temporary reduction in daily global CO₂ emissions during the COVID-19 forced confinement. *Nature Climate Change*, 1–7
For reduction at end of 2020: IEA. (2020). *The impact of the Covid-19 crisis on clean energy progress*. (short title: The impact of the Covid-19 crisis)
283. Korten, T. (2020). *With Boats Stuck in Harbor Because of COVID-19, Will Fish Bounce Back?* <https://www.smithsonianmag.com/science-nature/fish-stop-covid-19-180974623/>, accessed August 20, 2020.
284. Conservation International. (2020). *Impact of Coronavirus on nature*. <https://www.conservation.org/stories/impact-of-covid-19-on-nature>, accessed August 20, 2020.
285. Bloomfield, L. S. P., McIntosh, T. L., & Lambin, E. F. (2020). Habitat fragmentation, livelihood behaviors, and contact between people and nonhuman primates in Africa. *Landscape Ecology*, 35(4), 985–1000.
286. For diplomacy: Farand, C., & Doyle, A. (2020). *Cop26 climate talks postponed to 2021 amid coronavirus pandemic*. Climate Home News. <https://www.climatechangenews.com/2020/04/01/cop26-climate-talks-postponed-2021-amid-coronavirus-pandemic/>, accessed August 6, 2020.
For investment: Newburger, E. *Coronavirus could weaken climate change action and hit clean energy investment, researchers warn*. CNBC. <https://www.cnbc.com/2020/03/13/coronavirus-could-weaken-climate-change-action-hit-clean-energy.html>, accessed August 6, 2020.
287. *Indirect effects of COVID-19 on the environment*.
288. Thies, C. (2018). Re-Greening the Earth - Protecting the Climate through Ecosystem Restoration. *Heinrich Böll Foundation Publication Series Ecology*, 44.7.
289. *Growing Better*, p. 11.
290. National Geographic, & WYSS Campaign for Nature. (2020). *Economic Benefits of Protecting 30% of Planet's Land and Ocean Outweigh the Costs at Least 5-to-1*. <https://www.campaignfornature.org/protecting-30-of-the-planet-for-nature-economic-analysis>, accessed August 6, 2020.
291. *Growing Better*, p. 89.
292. Dietz, S., Bowen, A., Dixon, C., & Gradwell, P. (2016). 'Climate value at risk' of global financial assets. *Nature Climate Change*, 6(7), 676–679.
293. Edwards, P. E. T., Sutton-Grier, A. E., & Coyle, G. E. (2013). Investing in nature: restoring coastal habitat blue infrastructure and green job creation. *Marine Policy*, 38, 65–71.
294. For fish assemblages: Sala, E., & Giakoumi, S. (2018). No-take marine reserves are the most effective protected areas in the ocean. *ICES Journal of Marine Science*, 75(3), 1166–1168.
For other services: Merino, G., Maynou, F., & Boncoeur, J. (2009). Bioeconomic model for a three-zone Marine Protected Area: a case study of Medes Islands (northwest Mediterranean). *ICES Journal of Marine Science*, 66(1), 147–154. (short title: Bioeconomic model for a three-zone Marine Protected Area: a case study of Medes Islands); Capella, J. (2010). The positive impact of a Protected Area on a mature tourist destination. The case of Medes Islands Marine Reserve–L'Estartit (Spain). *DECABA Technical Report to the Medes Islands Marine Reserve Management Authority*.
295. Global Commission on Adaptation. (2019). A Global Call for Leadership on Climate Resilience. *Global Center on Adaptation and World Resources Institute*, p. 3.
296. *Growing Better*.
297. WWF. (2020). *COVID19: Urgent Call to Protect People and Nature*.
298. Dinerstein, E., Vynne, C., Sala, E., Joshi, A. R., Fernando, S., Lovejoy, T. E., Mayorga, J., Olson, D., Asner, G. P., & Baillie, J. E. M. (2019). A global deal for nature: guiding principles, milestones, and targets. *Science Advances*, 5(4), eaaw2869.
299. Marine Conservation Institute. (2020). *Atlas of Marine Protection*. <http://mpatlas.org>, accessed August 20, 2020.
300. Sala, E., Costello, C., Dougherty, D., Heal, G., Kelleher, K., Murray, J. H., Rosenberg, A. A., & Sumaila, R. (2013). A general business model for marine reserves. *PLoS One*, 8(4), e58799.; *Bioeconomic model for a three-zone Marine Protected Area: a case study of Medes Islands*
301. For energy consumption: Eurostat. (2020). *Shedding light on energy in the EU*. <https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-3a.html>, accessed August 20, 2020.
For emissions: *Energy performance of buildings directive*.
302. IEA. (2020). *Covid-19 impact on electricity*. <https://www.iea.org/reports/covid-19-impact-on-electricity>, accessed August 20, 2020.
303. Fitch Ratings. (2020). *European Renewables Are Growing Despite Pandemic*. <https://www.fitchratings.com/research/corporate-finance/european-renewables-are-growing-despite-pandemic-07-08-2020>, accessed August 6, 2020.
304. *The impact of the Covid-19 crisis*.
305. Eurostat. (2020). *Greenhouse gas emission statistics - emission inventories*. https://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics#Trends_in_greenhouse_gas_emissions, accessed July 20, 2020.
306. *Global Energy Transformation*, p. 12
307. Energy Transitions Commission. (2017). *Better energy, greater prosperity: Achievable pathways to low-carbon energy systems.; Mission Possible*.
308. International Renewable Energy Agency (IRENA). (2020). *Global Renewables Outlook: Energy transformation 2050*.
309. *Mission Possible*, p. 15.
310. Hydrogen Council. (2017). Hydrogen scaling up, A sustainable pathway for the global energy transition. In *Hydrogen Council: Brussels, Belgium.*, p. 49
311. *Ibid*, p. 8
312. Rapier, R. (2020). *Lifecycle emissions of hydrogen*. <https://4thgeneration.energy/life-cycles-emissions-of-hydrogen/>, accessed July 20, 2020.
313. Schulz, F. (2020). *Germany plans to promote 'green' hydrogen with €7 billion*. EURACTIV. <https://www.euractiv.com/section/energy/news/germany-plans-to-promote-green-hydrogen-with-e7-billion/>, accessed July 20, 2020; Amelang, S. (2020). *Germany's National Hydrogen Strategy*. Clean Energy Wire. <https://www.cleanenergywire.org/factsheets/germanys-national-hydrogen-strategy>, accessed July 20, 2020.
314. Ford, D. (2020). *COVID-19 Has Worsened the Ocean Plastic Pollution Problem*. *Scientific American*. <https://www.scientificamerican.com/article/covid-19-has-worsened-the-ocean-plastic-pollution-problem/>, accessed August 10, 2020; *Indirect effects of COVID-19 on the environment*.
315. Prata, J. C., Silva, A. L. P., Walker, T. R., Duarte, A. C., & Rocha-Santos, T. (2020). COVID-19 pandemic repercussions on the use and management of plastics. *Environmental Science & Technology*, 54(13), 7760–7765. (short title: COVID-19 pandemic repercussions)
316. Mehta, A. (2020). *The war on plastics runs into a perfect storm with Covid-19*. <https://www.reuters.com/sustainability/war-plastics-runs-perfect-storm-covid-19>, accessed August 10, 2020.
317. *The circular economy as economic opportunity in the COVID-19 recovery*.
318. *COVID-19 pandemic repercussions*.

319. *The circular economy as economic opportunity in the COVID-19 recovery.*
320. Forbes. (2020). *COVID-19 Underscores The Need To Invest In Local Waste Management And Recycling To Combat Ocean Plastic.* <https://www.forbes.com/sites/robkaplan/2020/04/03/covid-19-underscores-the-need-to-invest-in-local-waste-management-and-recycling-to-combat-ocean-plastic/>, accessed August 10, 2020.
321. CSR Europe. (2020). *Why We Need Circular Production & End-of-Life Management.* <https://www.csreurope.org/newsbundle-articles/why-we-need-circular-production-end-of-life-management>, accessed August 10, 2020.
322. For circular economy: Heel, O. D. van. (2020). *Can the circular economy support the COVID-19 recovery?* Freshfields Bruckhaus Deringer. <https://sustainability.freshfields.com/post/102g8t6/can-the-circular-economy-support-the-covid-19-recovery>, accessed August 20, 2020.
For transparent supply chains: Alicke, K., Azcue, X., & Barriball, E. (2020). *Supply-Chain Recovery in Corona Virus Times—Plan for Now and the Future.*
323. Asia-Pacific Economic Cooperation. (2020). *COVID-19 and the Circular Economy.* https://www.apec.org/Press/Blogs/2020/0528_COVID, accessed August 20, 2020.
324. Webster, K. (2015). *The Circular Economy: A Wealth of Flows.*
325. For landfills: Eurostat. (2020). *Waste statistics.* https://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics, accessed August 10, 2020.
For lost value: *Growth Within*, p. 18.
326. European Commission. (2015). *Factsheet: an ambitious EU circular economy package.*
327. Waste and Resources Action Programme (WRAP). (2015). *Economic growth potential of more circular economies.*
328. Abergel, T., Dean, B., & Dulac, J. (2017). *Global Status Report 2017: Towards a zero-emission, efficient, and resilient buildings and construction sector.* United Nations Environment Programme, 48.
329. *Completing the Picture*, p. 13.
330. *The Circular Economy - a Powerful Force for Climate Mitigation.*
331. European Commission. (2020). *Critical raw materials.* https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en, accessed August 10, 2020.
332. UNEP, PACE, ITU, ILO, UNIDO, UNITAR, UNU, WBCSD, WHO, & EMG. (2019). *A New Circular Vision for Electronics - Time for a Global Reboot.* http://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf (short title: *A New Circular Vision for Electronics*); Balde, C. P., Forti, V., Gray, V., Kuehr, R., & Stegmann, P. (2017). *The global e-waste monitor 2017: quantities, flows and resources.* United Nations University, International Telecommunication Union. *International Solid Waste Association.* (short title: *The global e-waste monitor*); ResearchAndMarkets. (2019). *E-waste Recycling & Reuse Services, 2019 Report: Global Market Size & Share, Application Analysis, Growth Trends, Key Players, and Competitive Strategies to 2026 - ResearchAndMarkets.com.* <https://www.businesswire.com/news/home/20190206005377/en/E-waste-Recycling-Reuse-Services-2019-Report-Global>
333. *Better business, better world.*
334. For market opportunity: *Better business, better world*
For including refurbishment and recycling: Business and Sustainable Development Commission, & AlphaBeta. (2017). *Valuing the SDG Prize. Unlocking Business Opportunities to Accelerate Sustainable and Inclusive Growth.* <http://s3.amazonaws.com/aws-bsdc/Valuing-the-SDG-Prize.pdf>
335. *The global e-waste monitor; A New Circular Vision for Electronics.*
336. Ellen MacArthur Foundation. (2019). *Austin - Developing Materials Marketplace.* https://www.ellenmacarthurfoundation.org/assets/downloads/Austin_Case-Study_Mar19.pdf
337. McKinsey & Company. (2020). *Perspectives on retail and consumer goods.*
338. Eurofund. (2020). *Work, teleworking and COVID-19.* <https://www.eurofound.europa.eu/data/covid-19/working-teleworking>, accessed August 10, 2020.
339. UNESCO. (2020). *Education: From disruption to recovery.* <https://en.unesco.org/covid19/educationresponse>, accessed August 6, 2020.
340. ITU. (2020). *ITU-D ICT Statistics.* <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>, accessed August 6, 2020.
341. Andrews, E. L. (2020). *AI's carbon footprint problem.* <https://engineering.stanford.edu/magazine/article/ai-s-carbon-footprint-problem>, accessed July 20, 2020.
342. O'Neill, P. H., Ryan-Mosley, T., & Johnson, B. (2020). *A flood of coronavirus apps are tracking us. Now it's time to keep track of them.* MIT Tech Review. <https://www.technologyreview.com/2020/05/07/1000961/launching-mittr-covid-tracing-tracker/>, accessed August 10, 2020.
343. Ibid.
344. Sabbagh, K., Friedrich, R., El-Darwiche, B., Singh, M., & Koster, A. (2013). *Digitization for economic growth and job creation: Regional and industry perspective.* *The Global Information Technology Report, 2013*, 35–42.
345. Ibid.
346. Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., Ross, A. S., Milojevic-Dupont, N., Jaques, N., & Waldman-Brown, A. (2019). *Tackling climate change with machine learning.* *ArXiv Preprint ArXiv:1906.05433.*
347. Ibid.
348. Snow, J. (2019). *How artificial intelligence can tackle climate change.* National Geographic. <https://www.nationalgeographic.com/environment/2019/07/artificial-intelligence-climate-change/>, accessed August 20, 2020.
349. Global Fishing Watch. (2020). *Global Fishing Watch | About Us.* <https://globalfishingwatch.org/about-us/>, accessed August 20, 2020.
350. Global Fishing Watch. (2020). *Transforming fishing through transparency and technology.* <https://globalfishingwatch.org/map-and-data/technology/>, accessed August 20, 2020.





Printed on recycled paper

A SYSTEM CHANGE COMPASS – IMPLEMENTING THE EUROPEAN GREEN DEAL IN A TIME OF RECOVERY

Earlier than expected, we are confronted with a choice: whether to only treat the symptoms of the existing pandemic or to take this opportunity and also create the paradigm shift necessary to recover and prepare against future shocks.

The European Green Deal provides a timely North Star for a prosperous and sustainable Europe. However, as a political program that bridges old and new theories of change, it is vulnerable. This report lays out an integrated systems perspective, based on a System Change Compass. It is applied to the European economic system as a whole and to its individual economic building blocks, which deliver societal needs. For this generational project to succeed, and to achieve the desired system change, we must apply the System Change Compass.



Funded by **SUN** Institute
Environment & Sustainability
Initiated by Deutsche Post Foundation

In collaboration with **MAVA**
FONDATION POUR LA NATURE