



RISKS ON THE HORIZON

Insights from Horizon Scanning

EU Policy Lab

JRC SCIENCE FOR POLICY REPORT

DISASTER RISK MANAGEMENT

HORIZON SCANNING

STRATEGIC FORESIGHT

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RISKS ON THE HORIZON

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EU Policy Lab

The EU Policy Lab is a space for cross-disciplinary exploration and innovation in policymaking. We apply collaborative, systemic and forward-looking approaches to help bringing the scientific knowledge of the Joint Research Centre into EU policymaking.

We experiment with the new, the unprecedented and the unknown. We seek to augment our understanding of the present, challenge and reinvent the way we think about the future.

The EU Policy Lab is also a mindset and a way of working together that combines stories and data, anticipation and analysis, imagination and action. We bring new practical and radical perspectives to tackle complex problems in a collaborative way. Together, we explore, connect and ideate to create better policies.



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Abstract

Decision makers are faced with a world characterised by increasing turbulence, uncertainty, novelty, and ambiguity. These conditions make it more difficult to assess risks when making strategic decisions or planning for the long-term. This study presents a foresight approach to increase preparedness for unexpected developments and the risks they could create.

Foresight methods offer a way to consider and focus on risks that may be beyond the scope of traditional quantitative and qualitative risk assessment approaches. Several snapshots of the future depict different worlds that have undergone substantial changes as a consequence of emerging developments. An analysis of the risks inherent in the possible futures identified ten risk clusters that are relevant for decision makers, and mapped future developments that might lead to them.

The same development pathways that could lead to risks can also create opportunities, and the study provides some examples. Decision makers face the challenge of mitigating the adverse effects of risks, while reaping the benefits of potential opportunities. This study also presents the results of a Delphi survey that evaluated the scope and severity of risks. Three of the 40 risks identified in this study were assessed to be potentially existential for humanity: 1) environmental degradation, 2) environmental disasters, and 3) loss of power by humans.

Acknowledgments

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Glossary

Below is a description of how we use these terms in this report

Cause-and-effect-chain	A chain of developments comprising an initial event in the future, two knock-on effects, and a risk or opportunity
Delphi survey	An iterative survey where participants can revise their answers based on what other participants are answering or commenting
Existential risk	A risk threatening the premature end of intelligent life originating from Earth
Futures wheel	A foresight method that looks into knock-on effects of future developments to encourage non-linear thinking
Globally-catastrophic risk	A risk threatening human well-being at a global scope
Horizon scanning	A foresight method that aims to spot emerging developments at an early stage and to help understand their consequences.
Knock-on effect	An effect that is triggered by an initial event in the future
Opportunity	A future outcome that is positive (in this study the end point of a cause-and-effect chain)
Potential future development	An overarching development that is triggered by an initial event in the future (described in a snapshot of the future), comprising several cause-and-effect chains
Risk	A future outcome that is negative (in this study the end point of a cause-and-effect chain)
Seriousness of a risk	The assessment of how dangerous a risk is, based on its severity and scope
Snapshot of the future	A plausible image of the future built using weak signals and depicting a possible hypothetical future to help readers to think out-of-the-box
Weak signal	Evidence pointing towards an emerging development that could have an impact on the future

Executive summary

Rarely before have the risks faced by human-kind been more complex, interlinked, and interdependent; and rarely have so many crises coexisted. In this context characterised by turbulence, novelty, ambiguity, and uncertainty, foresight plays an essential role and complements more traditional quantitative approaches to help manage risks and disasters. By providing additional perspectives, foresight can help to better envision possible and preferred alternative futures, get prepared, and in doing so provide insights that allow policy makers to influence and change the future and ultimately steer away from danger.

With this study, the EU Policy Lab of the European Commission's Joint Research Centre presents a first attempt to introduce a foresight approach into the analysis of future risks. In participatory foresight processes, and using horizon scanning outputs, the EU Policy Lab developed ten fictional short stories that depict what the future could look like. In a series of workshops with more than 60 participants, we explored **potential future developments** and impacts of change within these futures, and analysed which **risks** and **opportunities** they could lead to. In addition, a Delphi survey with 92 participants assessed the seriousness of the identified risks. The resulting study provides valuable insights to support anticipatory decision making, complementing other risk assessment methods to help minimise and abate the risks identified and help shape a better future. The EU Policy Lab will use the results in future foresight exercises to support policymaking, where it can help to understand risks and threats for the European Union and their implications.

Key takeaways and contribution of the study

1. This study identifies 40 future risks considered relevant for the future of the European Union. These risks have been sorted into ten overarching clusters of risks for policy makers and decision makers to keep in mind when formulating strategies (detailed descriptions below).

[Read more: 3. Ten clusters of future risks \(p.51\)](#)

2. On their own, many of the identified risks could be manageable. However, when several materialise at the same time, as occurs in real life, they could potentially become globally-catastrophic or even existential crises. Three risks are potentially existential for humanity on their own: **environmental degradation**, **environmental disasters**, and **loss of power by humans**.

[Read more: 4. Seriousness of risks \(p.75\)](#)

3. The study shows how 44 potential future developments could lead to the ten risk clusters. This can serve decision makers by increasing their preparedness for what the future(s) may hold. While many of the risk clusters put forward in this study are already known, the study brings them together with potential future developments, linking the risks to the development pathways leading to them.

[Read more: 2. Potential future developments \(p.20\)](#)

4. The potential future developments presented in this study also lead to opportunities. Falling into the trap of pessimism when thinking about future risks is easy, but as this study shows, the keys to positive futures are in our own hands. Change is certain and while most developments and pathways to risks cannot be stopped, they could be influenced.

[Read more: 3. Ten clusters of future risks \(p.51\)](#)

5. Holistic foresight approaches are crucial when evaluating future risks and when providing scientific advice to policy makers on complex multidisciplinary challenges. When looking at potential future developments and what triggers them, it becomes clear that change in a certain area (e.g. the economy) can lead to knock-on effects in many other areas (e.g. society, technology, environment, or politics), and too narrow evaluations would miss these interdependencies. This study presents a holistic foresight approach to complement traditional methods to analyse risks and help to reveal such blind spots.

[Read more: 8.1 Foresight approach \(p.92\)](#)

Ten clusters of risks

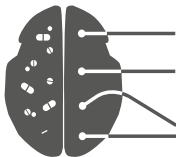
The ten risk clusters are presented in alphabetical order, with **potential future developments** that lead to them, as well as individual **risks** and **opportunities**.



Break-down of international cooperation



Decline of the European Union's economy



Decrease of well-being



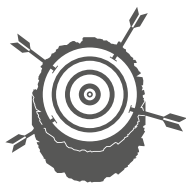
Disrupted critical supply chains



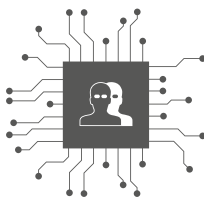
End of dominance of humans



Erosion of democracy



Failure of the green transition



Lawless society



Social division



Weakened European Union



Break-down of international cooperation

What is the risk?

Current multilateral institutions are under threat. Challenges include difficulty in consensus-building, leading to a shift towards more bilateral relationships. Income inequality remains high, hindering a level playing field. Scarcity of life-sustaining resources like water and food is expected to drive future conflicts. An erosion of international cooperation could lead to breakdowns in diplomacy and communication, increased tensions, or even armed conflicts, as seen in recent conflict and martial rhetoric between some countries. The consequences of armed conflicts are severe and indirect impacts include negative effects on health and displacement of people. These challenges underscore the importance of multilateral cooperation to de-escalate difficult situations and avoid devastating consequences. In addition, global cooperation is and will be crucial to face shared and complex global problems such as climate change

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **New economic sectors emerge** and **synthetic food replaces natural food**: New industries and the roll out of innovative solutions could benefit richer countries with higher innovation capacity more than poorer countries.
 - **Power and wealth shift**: Shifts in geopolitical power structures could lead to tensions.
 - **Societies across the globe are less connected**: Fewer international exchanges and reduced communication across borders make international collaboration more difficult.
 - **The old rule the world**: Protecting current standards of living could lead to more protectionist policies, hampering globalisation.
- ⚠️ This risk cluster includes the risks: **armed conflicts**, **dissolution of multilateralism**, **economic inequalities between countries**, and **terrorism**.
- 🔗 The developments also lead to opportunities: **climate change mitigation**, **multiculturalism**, and **sustainable and secure food systems**.

Read more: Chapter 3.1 Break-down of international cooperation (p.53)



Decline of the European Union's economy

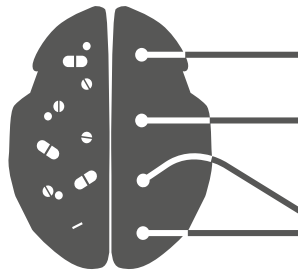
What is the risk?

Global economic power is shifting from traditional regions to emerging economies. The European Union has faced economic setbacks such as recessions triggered by the COVID-19 pandemic and the Russian invasion of Ukraine, leading to long-term negative impacts, supply chain disruptions, and a cost-of-living crisis. European businesses tend to recover more slowly from contractions compared to the US, widening the productivity gap. A sluggish economy increases the risk of poverty and social exclusion. Economic instability poses a threat to political stability, making economic precariousness a serious issue for citizens. Being aware of these factors and trends allows that steps can be taken to mitigate the future risk.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **New financial services increase debt levels:** New debt instruments for private consumers could increase debt levels of households and hamper the economy in the long-term.
 - **Nuclear energy experiences a renaissance:** If energy systems shift to a more decentralised power generation, re-centralisation could lead to stranded assets.
 - **Resources become more scarce:** Less material and fewer product choices could hamper innovation.
 - **The economy becomes circular:** Switching to recycled secondary materials could be more costly than exploiting primary materials.
 - **The job market becomes more flexible:** In an environment with reduced job security, the livelihood of many workers is at risk.
- ⚠️ This risk cluster includes the risks: **economic contraction, financial bubbles, poverty, and unemployment.**
- 🔗 The developments also lead to opportunities: **circular economy, EU green leadership, and fair economy.**

Read more: Chapter 3.2 Decline of the European Union's economy (p.55)



Decrease of well-being

What is the risk?

Physical well-being is threatened by the spread of disease in today's globalised world, despite the reduction in infectious diseases. Unhealthy lifestyles, pollution, and other anthropogenic causes are increasingly health burdens. There is a growing focus on measuring success beyond monetary indicators and considering sustainable well-being within planetary boundaries. Organisations such as the World Health Organization (WHO) and the United Nations (UN) use well-being indices to assess societal well-being, linking poor mental health to physical health, relationships, and quality of life. Psychological well-being (mental health) has become a priority due to factors like war, climate change, and the impact of online media (stress and anxiety). Eroding social trust, inequality, and discrimination because of ethnicity, immigration status, gender, sexuality, disability, and age also negatively impact well-being. As migration and ageing increase, these issues become more visible, affecting social cohesion. The future of well-being could encompass more purpose and sustainability, and positively impact future generations.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **Human-animal relations are closer:** A closer relationship between humans and animals could lead to the more frequent transmission of diseases.
 - **More information is widely available:** An overload of information can reduce emotional well-being.
 - **Niche thinking increases:** Niche thinking and communication in echo chambers can foster a fragmentation of society.
 - **Synthetic food replaces natural food:** Fundamental shifts in the food system could lead to regional unemployment with related psychological health issues.
 - **The innovation landscape becomes more fragmented:** A fragmented innovation landscape could slow down innovation towards cures for diseases.
- ⚠️ This risk cluster includes the risks: **discrimination**, **loss of privacy**, **physical health issues**, and **psychological health issues**.
- 🔗 The developments also lead to opportunities: **green values and goals**, **inclusiveness**, and **robust democracies**.

Read more: Chapter 3.3 Decrease of well-being (p.57)



Disrupted critical supply chains

What is the risk?

Growing demand for goods and services puts a strain on supply chains and makes them more vulnerable to disruptions. Unexpected shocks such as the COVID-19 pandemic and Russia's war against Ukraine can disrupt critical supply chains, impacting citizens. Risks of such shocks include limited access to food, as well as shortages of medicines, equipment, and critical raw materials. The European Union's dependence on imports of critical raw materials, mainly supplied by China, can lead to disruptions due to potential geopolitical tensions. Additionally, there is a risk of failure of critical infrastructures in the European Union, including energy and health delivery systems, due to triggers such as climate change events or cyber-attacks. These disruptions pose significant challenges that need to be addressed to ensure the resilience of supply chains and critical infrastructures that can withstand disruptions and ensure the continued flow of goods and services for the future.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **Access to food becomes less secure:** A reduction in agricultural trade could interrupt global food supply and increase the risk of famine in several countries.
 - **Digitalisation creates new vulnerabilities:** System failures due to hacking, personal data exposure, and identity theft are all potential cybersecurity risks.
 - **New dependency on critical resources is created:** The production, delivery, and processing of some critical raw materials could still be strongly led by only few producers.
 - **Synthetic food replaces natural food:** A shift to new food production methods could lead to a centralisation of food production by newly emerging technology leaders, which in turn is more susceptible to interruptions.
 - **The economy becomes circular:** A more circular economy could make food less affordable.
- ⚠️ This risk cluster includes the risks: **critical raw materials dependency, failure of critical infrastructure, interruption of food supply, and technology dependency between countries.**
- ➡️ The developments also lead to opportunities: **accelerated innovation in the EU, autonomous households, and recovery of ecosystems.**

Read more: Chapter 3.4 Disrupted critical supply chains (p.59)



End of dominance of humans

What is the risk?

Several factors could contribute to the risk of the end of dominance of humans. Advocates for eco-democracy are pushing for the recognition of legal rights for non-humans, such as animals and ecosystems, based on the interdependence of humans, animals, plants, and the environment. This approach explores legal reforms, which would limit exploitative human lifestyles. Another issue is the increasing reliance of humans on technology, particularly artificial intelligence (AI). If AI surpasses human capabilities it could shift power dynamics. With progressing digitalisation, technology reliance increases and poses risks such as poor decision-making. AI also has the potential for future misuse in lethal autonomous weapons, information manipulation, discrimination, and will have future impacts on work and employment. The question is whether tools will be designed and implemented in a way that generates shared and positive benefits at the service of workers, humanity, and the planet for the longer-term future.

What this analysis revealed

⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:

- **Democratic processes become virtual:** Virtualisation could introduce technology-based biases in democratic processes.
- **Improved rights are granted to animals:** Non-human political representation could make it very difficult to reach consensus in society.
- **More information is widely available:** It could become more difficult to process all relevant details before making any decision.
- **Natural habitats are better protected:** The way land is used would have to be rethought.
- **Research and innovation strongly focus on green technologies:** A strong focus on green technology innovation could lead to slow innovation rates in other areas.

⚠️ This risk cluster includes the risks: **inefficient decision-making processes**, **loss of power by humans**, and **slow technological innovation pace**.

✨ The developments also lead to opportunities: **climate change mitigation**, **inclusiveness**, and **recovery of ecosystems**.

Read more: Chapter 3.5 End of dominance of humans (p.62)



Erosion of democracy

What is the risk?

Europe faces the risk of a continued loss of trust in political institutions. Potential triggers include the decreasing interest of younger generations in political engagement and the influence of emotions and personal beliefs over critical thinking and objective facts in media and technology. Increasingly polarised societies with deep divisions between different groups of people can make it difficult for governments to find common ground and build consensus, further eroding democracy. Foreign interference in elections also damages democracy. Strong cynicism about political leaders and unmet voter expectations can lead to approval of authoritarian leaders. Populist and nationalist movements have been gaining ground, factors which can undermine trust in democratic institutions and processes. Being aware of the trends allows for the consideration of steps to address the risk and preserve democracy, for example positive trends that include introducing more dynamic and participatory governance models involving citizens in policy shaping and delivery.

What this analysis revealed

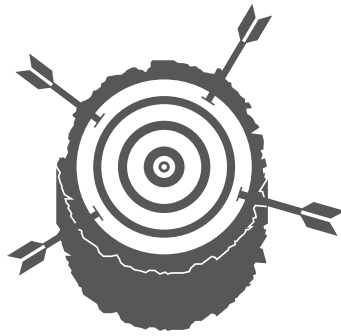
⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:

- **Governments become transparent:** With higher scrutiny comes also the possibility of unveiling more political scandals or transgressions of political decision-makers.
- **Inequality in Europe increases:** Inequalities make it different to find common ground among different groups of society.
- **Power and wealth shift:** A shift of power from governments to private entities might undermine the operations and functioning of governments.
- **Technology manipulates society's beliefs:** Interference in political processes, such as elections, could undermine democracies.
- **The old rule the world:** If elections and party programmes are dominated by interests of the old, democratic participation of other groups of society might decrease.

⚠️ This risk cluster includes the risks: **authoritarianism, collapse of democratic governments, inadequate regulations of emerging issues, loss of democratic values, and loss of trust in political institutions.**

🔄 The developments also lead to opportunities: **EU defence capabilities, EU enlargement, and voice of regions.**

Read more: Chapter 3.6 Erosion of democracy (p.64)



Failure of the green transition

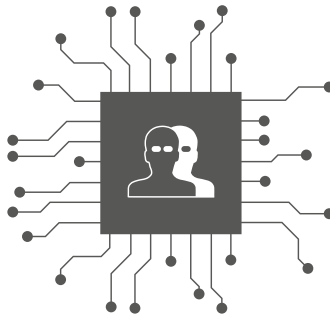
What is the risk?

Anthropogenic greenhouse gas emissions are leading to increased weather extremes, impacting the European Union. Global warming is expected to cause more frequent severe wildfires and water scarcity in Southern Europe, and biodiversity loss is also a concern. While the European Union aims for climate neutrality by 2050, it is at risk of missing its 2030 targets. There is a need for sufficient investment in green technologies and infrastructure and a drastic change in the way society lives. At the same time, other regions are advancing in green technology production. The European Union develops many technologies to combat environmental degradation, but does not have its own sources of some critical raw materials for technologies like batteries and solar panels. This poses challenges for reaching climate goals and environmental protection and risks not ensuring a successful transition.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **New dependency on critical resources is created:** Dependency on rare earths needed for green technologies makes the European Union vulnerable if there are export restrictions in the countries supplying them.
 - **New economic sectors emerge:** The European Union has not always managed to become technology leader in new, innovative technology areas.
 - **New indicators for success are introduced:** Switching from economic to environmental indicators in the European Union could reduce its competitiveness.
 - **New information channels are available:** A fragmented information space could lead to the dissemination of misinformation about environmental issues.
 - **New resources become accessible:** The processing of materials and usage of man-made products could result in negative environmental consequences.
- ⚠️ This risk cluster includes the risks: **environmental degradation, environmental disasters, and loss of European Union (green) technology leadership.**
- ➡️ The developments also lead to opportunities: **EU global influence, multilateralism, and wealth.**

Read more: Chapter 3.7 Failure of the green transition (p.66)



Lawless society

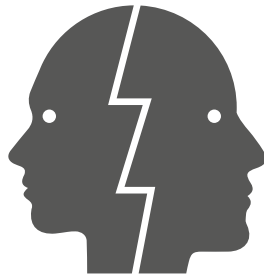
What is the risk?

There is a risk of a lawless society where established rules are flouted in the European Union, as observed across several current trends. For example, cybercrime has multiplied and other crimes such as sexual violence and fraud are on the rise. Better collaboration between Member States is crucial for law enforcement due to the international dimension of serious and organised crime. Additionally, the perceived risk of being a crime victim varies across the European Union, with high unemployment rates linked to increased worry about crime. Increasing economic inequality and social exclusion within the European Union also contributes to a rise in crime. These are cross-cutting factors of many risks that could also lead to a breakdown in law and order. Strengthening social cohesion will be key to ensuring a law-abiding, safe, and secure European Union for future generations.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **Businesses move to the metaverse:** New, disruptive business models and innovations create a space for new players to become dominant.
 - **Digitalisation creates new vulnerabilities:** Users of digital services who are not familiar with cybersecurity are at risk of unknowingly exposing personal data.
 - **New local economies emerge:** Monitoring a higher number of small-scale, dispersed market players is difficult to achieve.
 - **Synthetic food replaces natural food:** If that happens, a black market for traditional 'illegal meats' could emerge, with potential implication for food safety.
 - **The internet becomes less reliable:** Reverting back to cash instead of digital transactions could create a multitude of loopholes for illicit unrecorded transactions.
- ⚠️ This risk cluster includes the risks: **corruption**, **cybercrime**, **fixing of market prices by cartels**, and **illegal parallel economy**.
- 🔗 The developments also lead to opportunities: **growing digital economy**, **thriving local communities**, and **wealth**.

Read more: Chapter 3.8 Lawless society (p.68)



Social division

What is the risk?

The European Union is a rich and diverse region with many cultures, languages, and religions which are a source of strength, but can also result in social division. Future economic growth can lead to increased wealth overall, but can widen the gap between the rich and poor, exacerbating inequalities. In the European Union, some Member States have high income inequality. Societal divisions also stem from gender, ethnic, educational, geographical, labour market, and health inequalities. The unequal distribution of the adverse effects of climate change is also growing. Social division is problematic as it affects well-being and stability, and it can lead to the stigmatisation of certain social groups. For the future, the European Union will need to be aware of the risk of social division to build a more cohesive future.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **Life moves on-line:** Some groups of society might not be able to participate in online exchanges, exacerbating social isolation and a digital divide.
 - **Niche thinking increases:** Different social groups are constrained to their circles of society without being aware of the opinions of other social groups.
 - **Technology manipulates society's beliefs:** Technology channels could be used to manipulate individuals in order to make them believe that extreme political positions are the mainstream.
 - **The economy turns into super-capitalism:** A strong focus on economic growth could lead to one-sided legislation that does not keep vulnerable groups of society in mind.
 - **The job market becomes more flexible:** Low job security for some parts of the labour force could create a new working class of modern-day labourers.
- ⚠️ This risk cluster includes the risks: **economic polarisation, inability to reach consensus in the society, lack of equality, and migration.**
- ➡️ The developments also lead to opportunities: **accelerated innovation in the EU, EU defence capabilities, and regional mobility of people.**

Read more: Chapter 3.9 Social division (p.70)



Weakened European Union

What is the risk?

The European Union is a resilient institution that has overcome many challenges in the past; however, it currently faces numerous threats to its cohesion and effectiveness. The rise in populism, nationalism, hate speech, and economic difficulties can lead to strikes, riots, and political upheaval. Despite self-reinforcement through crises historically, and alignment during the COVID-19 pandemic, some disunity across the European Union has recently occurred, for example during Brexit or the Eurozone crises. Trust in governing institutions decreases during tough economic times, raising questions about their declining power. The European Union must find a way to overcome challenges and maintain its effectiveness in the face of growing internal and external pressures to secure its core values for future generations. In doing so, it could emerge stronger than ever before.

What this analysis revealed

- ⚙️ Several potential future developments could reinforce the risks of this risk cluster or turn them into crises, such as:
 - **Geopolitical power shifts to the East:** The fast growth of South-Eastern economies could reduce the relative influence of the European Union.
 - **Improved rights are granted to animals:** Better protection of animals could create severe limitations on the way of life and could lead to social unrest.
 - **Inequality in Europe increases:** If social coherence decreases, European Union institutions could lose power.
 - **New local economies emerge:** Local economies might reduce the ability to act in unity across the European Union, which could relinquish influence in policymaking to the private sector.
 - **The old rule the world:** Increasing power of older generations could lead to a fracture between the old and young and foster discontent among the youth.
- ⚠️ This risk cluster includes the risks: **civil wars in the European Union, dominance of the private sector in policymaking, foreign interference, powerless European Union institutions, and social unrest.**
- 🔗 The developments also lead to opportunities: **recovery of ecosystems, robust democracies, and thriving local economies.**

Read more: Chapter 3.10 Weakened European Union (p.72)

Introduction

Foresight is about exploring alternative futures: its fundamental premise is that the future can be influenced and shaped.¹ History has taught us that decision makers do not always consider the big picture or the longer-term future in their decisions. They may underestimate the impact or speed of developments that will have a long-term impact on nature and society, such as environmental degradation, changing global power structures, or the introduction of disruptive technologies. They may look separately at crises, shocks, and forces that are driving change in society, without considering that they are increasingly interconnected, interdependent, growing in number, and happening at the same time.² Or they may focus on one aspect of a system, such as the efficiency of the global economy, while ignoring other aspects, such as the resilience of the system's supply chains or raw materials. The combination of strong megatrends³ influencing every aspect of our life coupled with some kind of perma-crises and a single, global socio-economic system makes it that decision makers have to deal

with a world characterised by TUNA conditions: Turbulence, Uncertainty, Novelty, and Ambiguity.⁴

This TUNA reality poses challenges for political decision makers that must keep up with the speed of developments and make regulations that best serve societies' needs today and for the future. With cascading impacts of risks, anticipation requires broader sets of approaches that can capture complexities and systemic elements complementing the process-oriented approach.⁵ Therefore, an understanding of possible future risks and disasters – outside of the routine methods and known ones – is necessary when forming strategies in any policy area and in the private sector.

Limited resources and urgencies often force decision makers to focus on current or very near-term risks, and limit their capacity to think about uncertainties, slowly evolving ones, and those that are looming for the longer-term future.⁶

1 Störmer et al. (2020), Wilkinson (2017)

2 European Commission (2022), Science Advice for Policy by European Academies (2022)

3 European Commission, Joint Research Centre (2023)

4 European Commission, Joint Research Centre (2024a), Ramírez and Wilkinson (2016)

5 Corbane et al. (2024), International Organization for Standardization (2024)

6 Riddell et al. (2019)

This focus on the near term leads to low levels of resilience, as resources for evaluating future implications and long-term planning are competed out by short-term reactionary requirements.⁷

Foresight approaches can help to better prepare for unforeseeable events by considering not only past experiences, but also potential alternative futures.⁸ The use of foresight in managing risks is attracting an increasing degree of attention as a complementary process. Indeed, several foresight approaches, such as horizon scanning, trends analysis, or scenario building can help to challenge assumptions about the future and improve disaster resilience.⁹

The European Union has embedded practices of strategic foresight within European Union policymaking and within Member States, with the support of several bodies including the Joint Research Centre's EU Policy Lab.¹⁰ For example, reference foresight scenarios¹¹ and supporting studies for three annual Strategic Foresight Reports¹² explore pathways towards the future. This pilot study complements that body of knowledge by looking at the various risks that policy makers may face in the future.

The European disaster resilience goals aim to improve the capacity of the European Union, its Member States and participating states in the EU Civil Protection Mechanism to anticipate and withstand the effects of future major disasters and emergencies.¹³ This mechanism aims to improve anticipation, prevention, preparedness, and response to disasters, and also to confront an increasingly complex and evolving risk landscape across borders.¹⁴ Science for disaster risk management also aims to provide guidance to European Union and global stakeholders on

how to work together across sectors, disciplines, and organisations to reduce disaster risk.¹⁵ While preparedness and early warning mechanisms, such as Copernicus, monitor various risks and threats, foresight aims for much earlier anticipation. Furthermore, a main goal of foresight on risks is to encourage new perspectives for decision makers dealing with risks and 'thinking outside the box' beyond the traditional risk management processes.

The United Nation's Sustainable Development Goals are a blueprint to achieve a better and more sustainable future for all.¹⁶ There have been several global risks reports in recent years, in part due to the crises, global uncertainty, and speed of change we see today.¹⁷ These examine trends, hazards, and links with vulnerabilities to meet the challenge of governing drivers of risks, but do not have a focus on the European Union. The existing body of research literature on the use of foresight in risk analysis however, has some gaps. While there are several studies that use foresight to evaluate risks in narrowly scoped fields,¹⁸ there is a clear lack of holistic foresight studies in the domain of risk management that look at systemic change. Addressing only a narrow topic has the advantage that a foresight process centred on it can go into the details of a certain area. However, holistic foresight studies are also necessary to unveil blind spots, and interlinked issues that are known, but that experts in a certain field might overlook.

This study aims to address this issue. It applies the outputs of a horizon scanning approach, which is a structured activity whose objective is to detect and analyse emerging 'game changers' that could have significant impact on society and policy in the future, also termed 'weak signals'. We used the 'weak signals' in this study as a starting point

7 Anderson et al. (2018)

8 Wilkinson (2017)

9 Kohler (2021)

10 European Commission, Joint Research Centre (2024b)

11 Vesnic-Alujevic, Muench, and Stoermer (2023)

12 Cagnin et al. (2021), Matti et al. (2023), Muench et al. (2022)

13 European Commission (2024a)

14 European Commission (2024b)

15 European Commission (2024c), Poljanšek et al. (2021)

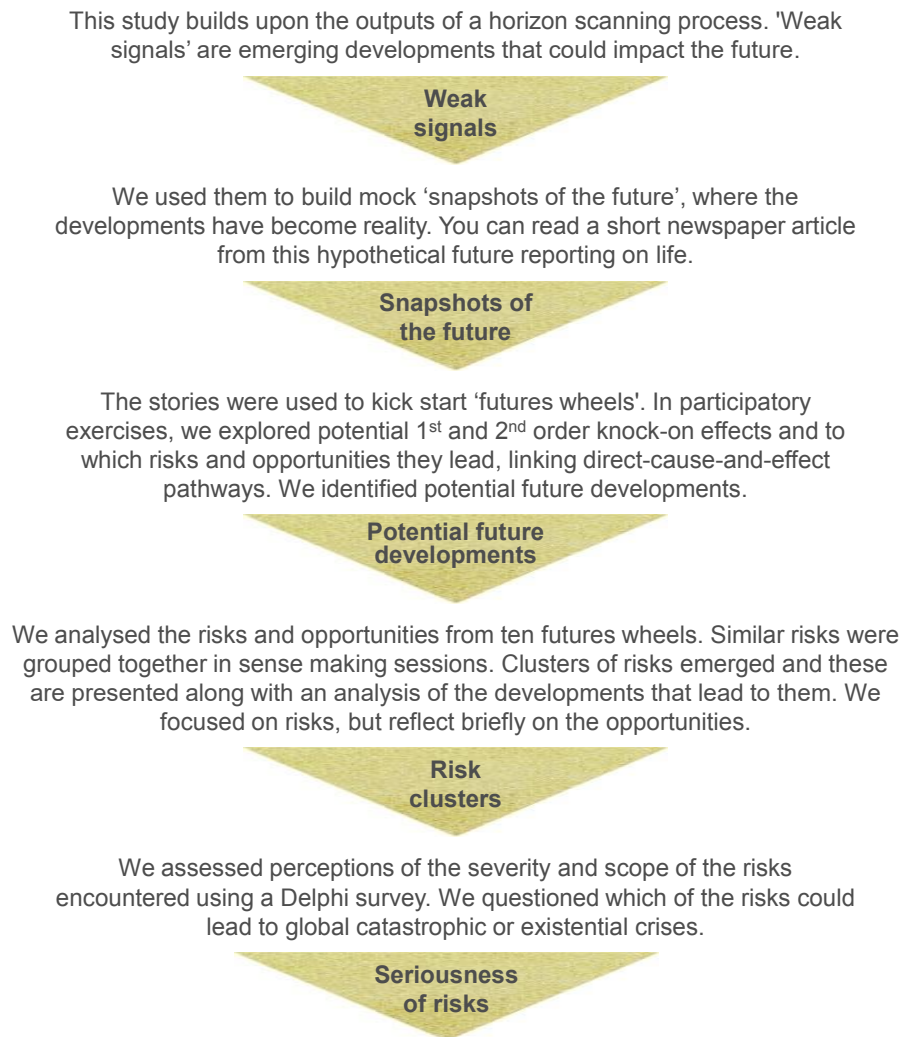
16 United Nations (2024)

17 United Nations Office for Disaster Risk Reduction (2015), World Economic Forum (2024)

18 E.g. Héry and Malenfer (2020), Raban and Hauptman (2018)

Figure 1: Foresight approach (Source: Own illustration)

Note: This is a simplified schematic overview of the foresight approach. More detailed information about each step of this process can be found in the Appendix (p.92)



to identify potential future developments, and to explore to which kinds of risks and opportunities they could lead. We also apply other participatory foresight methodologies to explore and analyse possible futures. We briefly overview the approach used in this study in the schematic in Figure 1, but a full detailed description of the research methods and foresight processes can be found in Chapter 8.1 Foresight approach (p.92).

There are many definitions and applications of the term 'risk'. In this study, we used the definition: risk is "the possibility of an undesired effect associated with an event, or an activity"¹⁹. We do not review the many approaches to measuring and managing

risks. Instead, our goal is to provide decision makers with a glimpse of possible futures and to identify future risks and developments that could lead to them. This study aims to provide new perspectives for decision makers to look out for trajectories of certain developments and be aware of their potential long-term implications with regards to risks, as a first step towards preparedness. By mapping out potential future risks and developments towards those risks, this study supports better anticipatory decision making, helping to understand and to consider strategies that could mitigate the impact of risks should they materialise.

19 Renn (2008)

Potential future developments

In this chapter, we describe ten ‘snapshots of the future’. A snapshot of the future aims to show a plausible image of what the future might look like. We have imagined futures where a certain change has been realised and written a newspaper article ‘from the future’ that reports on it. In this version of the future, the change has had an impact on society, culture, and business. The stories describe how such a change is affecting future lives. The snapshots do not depict a ‘likely’ future, but a ‘possible’ hypothetical future and in doing so help readers to make sense of the developments that could be impactful.

Ten snapshots set the scene: they were the starting point for developing ‘futures wheels’ (see Appendix, p.93), where we explored potential knock-on effects of the change described in the snapshots. Knock-on effects are events that are triggered by change. We explored first, second, and third order cause-and-effect ‘knock-on’ impacts. We do not describe risks *per se* in this chapter, but the development pathways that carve a path towards them.²⁰

In participatory exercises, we discussed potential consequences and specific cause-and-effect chains

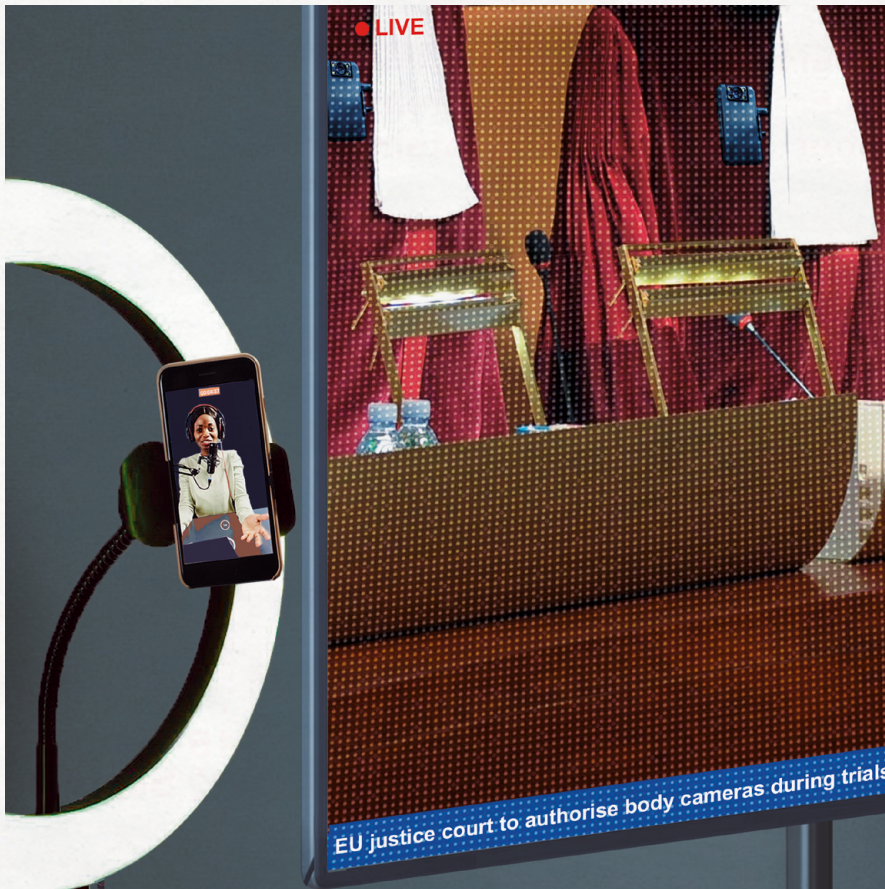
that could happen in the future, as developments unfold. This chapter also includes an analysis of those cause-and-effect chains. In our analysis, we have distilled possible future developments and this chapter also presents a description of them. Some of the potential future developments can already be observed to a certain degree today but when we talk about them as potential future developments, we imply that they become much more pronounced than what we see today.

Facing the future: the aim of this chapter is to confront readers with possible futures and developments that they might not otherwise think about. In this way, it aims to push readers out of their expertise comfort zone, and to think about the unexpected and unknown.

²⁰ We describe the risks in Chapter 3 Ten clusters of future risks (p.51)

WHAT IF LIFE BECOMES RADICALLY TRANSPARENT?

TRANSPOL'S TRANSPARENCY REVOLUTION GETS CLOUDY²¹



The transparent policies group TRANSPOL's radical transparency model birthed a new form of democracy called 'Transpocracy', that shook the world. It rewrote the rules for public and professional affairs back in the 2040s, turning them inside out, playing a key role to reverse lost levels of trust. They surfed the information wave delivering accountability where it had been lost. But have they become too powerful, and why is Brussels still not on-board?

From high-profile trials against political heavyweights, multinationals, and showbiz icons, to the explosive release of confidential information – the group rocked the foundations of power with their ground-breaking actions. Even Pope Jean Pierre the III's student years were laid bare in media. In this new era where radical transparency reigns, public and private organisations face an unrelenting mandate: publish

contracts, salaries, assets, debts, and pivotal documents leading to major decisions, with no excuses! There is nowhere for corruption to hide these days. But TRANSPOL's latest actions are raising eyebrows. Have they gone too far? They are pushing for the live streaming of all meetings, urging participants to activate all body cameras. A swarm of volunteers scrutinise and extract evidence. The association is

then quick to prosecute wrongdoers with their formidable legal arsenal, becoming more TRANSPOLICE than TRANSPOLICIES.

Some nations, such as India, remain unfazed, continuing to wholeheartedly embrace the transparency wave. With a robust and open economy, India is a breeding ground for creativity. A whopping 150 business ecosystems have sprung to life, creating new roles such as public whistle-blower and data mediator. The thriving data market in Kolkata exchanges an astonishing five billion yotta bits daily. While they surge ahead, Brussels lags behind in transparency measures, resisting political disclosure even among European Court of Justice Judges. With Finland's presidency looming, the future of the European Union hangs in the balance – with calls to modernise approaches or face becoming obsolete.

Signs indicating a pathway to this snapshot of the future:

- Transparency in environmental governance is no longer an uncontroversial answer to problems of accountability and effectiveness²²
- Power is concentrated in the hands of a handful of actors who increasingly control what the public reads and sees²³
- The entirely predictable impact of salary transparency reveals outspoken companies' pay inequalities²⁴
- Behind the One-Way Mirror: Surveillance trackers are hiding in nearly every corner of today's internet, and every corner of corporate life and modern technology²⁵

21 This snapshot of the future was informed by the two weak signals 'radical transparency' and 'public digital infrastructure' (see Appendix Weak signals used to develop snapshots of the future, p.97)

22 Gupta, Boas, and Oosterveer (2020)

23 Bego (2022)

24 Carnegie (2022)

25 Cyphers and Gebhart (2019)

Emerging developments

The futures wheel looking into the potential knock-on effects of 'radical transparency' and 'public digital infrastructure' resulted in four potential future developments (depicted in Figure 2 and described below).

1. **More information is widely available:**

Radical transparency could mean better access to and wider distribution of information. One of the possible results of this development could be improved education and innovation systems. For example, global education could become fully free, which could lead to a general population that is better educated, and thus more democratic and resilient. Openly available information through public digital infrastructures could help to cultivate common public values and boost the adoption of sustainability goals. It could enhance inclusiveness and give access to high quality education to all groups of society. More diverse sources of information could also lead to information overload or to more fragmented communication and thus divided societies.

2. **Digitalisation creates new vulnerabilities:**

Digitalisation could become so widespread that society could become even more dependent on digital infrastructures. Potential disruptions of networks could shut down critical support systems such as energy, hospital, traffic, or food systems. In a society that is highly dependent on its digital infrastructure, such failures could have far more severe consequences than today. Governments therefore would have to step up cybersecurity measures. Lastly, exposure of personal data could reach new heights, with a higher risk of discrimination, virtual identity theft, and related crimes.

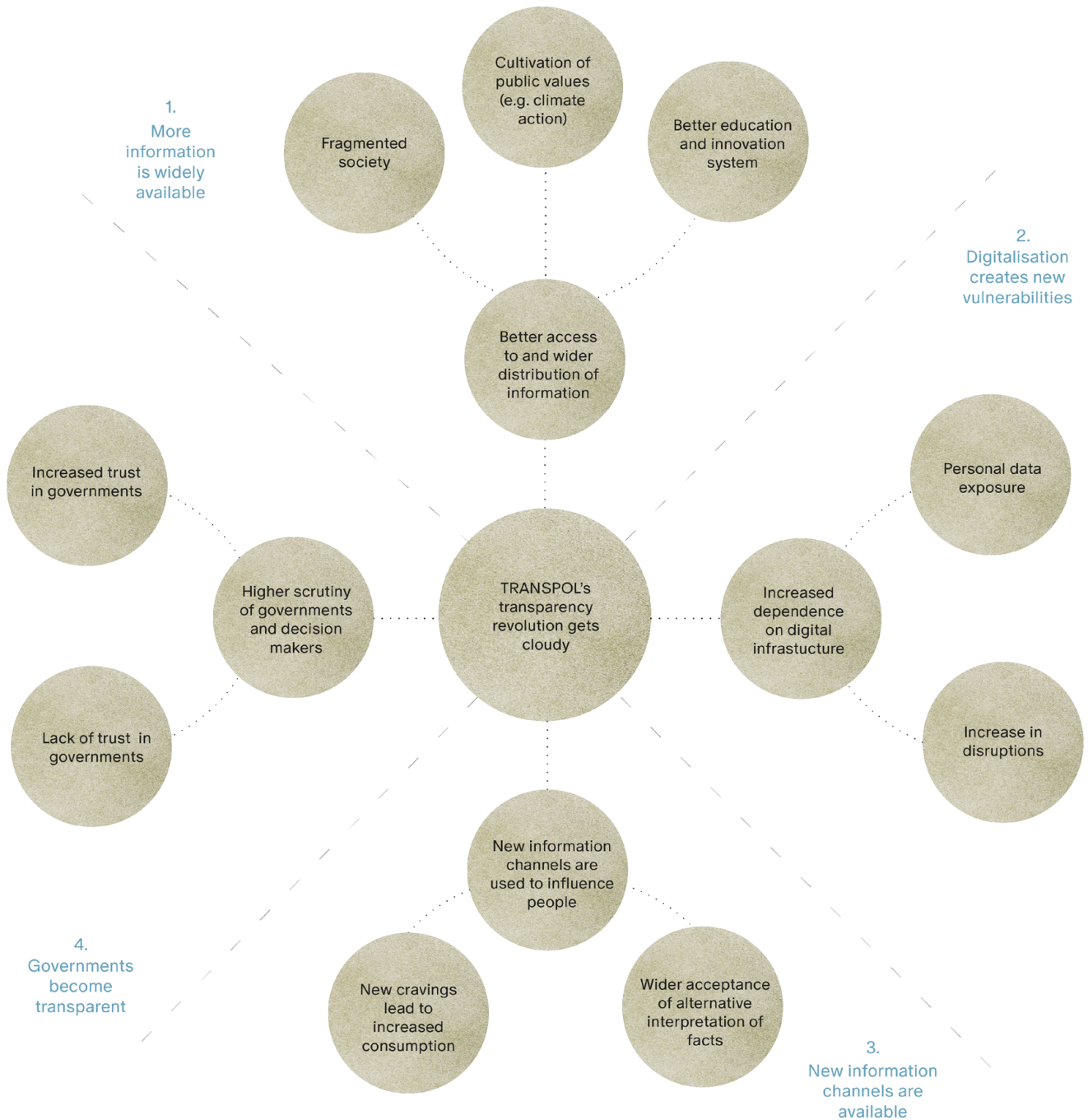
3. **New information channels are available:**

The increasing willingness to share information (data, emotions, etc.) could be a catalyst for new information distribution channels. These information channels could have various impacts on society. For example, they could multiply avenues for influencing people. Influencers might instigate new 'cravings', which could increase consumption demands more. The current negative side effects of social networks could be amplified, such as increased levels of jealousy and depression. Furthermore, niche information channels could enable the spread of alternative facts and fake news, which could lead to the further growth of radical and populist parties and conspiracy theorists.

4. **Governments become transparent:**

Fully transparent public information could increase the levels of scrutiny in governance and decision making. It could complicate political decision-making processes. Citizens could have high political expectations which could either undermine, or strengthen trust in governments. On one hand, more scandals might be unveiled, which could lead to lower levels of trust in political institutions. In that case, civil unrest could grow until potential government collapse. On the other hand, more transparent systems could avoid political scandals by deterring illegal practices. Furthermore, the public could become more involved in the policymaking process and political engagement and trust could expand.

Figure 2: Futures wheel: TRANSPOL's transparency revolution gets cloudy
(Source: Own illustration)



WHAT IF NATURAL ECOSYSTEMS GAIN BASIC RIGHTS?

FUNGI REVOLUTION: FARMERS AND FUNGI FIGHT²⁶



Mushrooms and the farmers are heading to the European Courts this week for a significant battle about rights that could have long-term repercussions. That all products are environmentally sustainable in Europe was not always the no brainer that it is today, and that natural entities could fight it out in court was unprecedented 50 years ago. However, farmers honking their horns in the streets to express their feelings is an age-old tradition.

As part of lengthy consultations, it was back in 2030 that global multilateral companies first agreed on the ‘rights-based solutions’ to preserve natural ecosystems – essential to combat the destruction of the planet at the time. They committed to 100% sustainable approaches in the subsequent decades,

assigning legal personalities and giving rights to nature followed, setting the stage for the confrontations of today. It was a surprise to many when the humble mushroom held the answer to so many sustainability challenges. Pioneering research and innovation birthed a range of fungi-

based products, from food, clothing, and pharmaceuticals to fuel, making mushrooms a versatile ally and sustainability saviour.

Yet, as time marched on, many promised rights never materialised, and the eco-brigade grew louder. At the same time critics still decry the calls to apply the rights-based approach to all entities including the mushrooms in particular, but also to land. The collision of much-needed production with rights for nature presents a clear paradox.

While rights-based approaches mark progress in the quest for nature’s protection, numerous battles lie ahead, and this week’s courts finally open Pandora’s Box. Generational businesses, sustainable products, and the rights of people and nature remain tangled in this complex web of interests, and fungi emerge as the unlikely pioneer once again!

Signs indicating a pathway to this snapshot of the future:

- Realising the rights of billions of people within ecological limits has both potential and limitations²⁷
- Water: A civil right before the European Court of Human Rights²⁸
- The rights of nature as an idea has come of age²⁹
- Growing a circular economy with fungus: opportunities for tackling the urgent challenges of humans³⁰

26 This snapshot of the future was informed by the two weak signals ‘rights-based approach to resources and environment’ and ‘the fungi economy’ (see Appendix Weak signals used to develop snapshots of the future, p.97)

27 Wewerinke-Singh (2022)

28 Keller and Hefti (2022)

29 Corrigan and Oksanen (2021)

30 Meyer et al. (2020)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘rights-based approach to resources and environment’ and ‘the fungi economy’ resulted in four potential future developments (depicted in Figure 3 and described below).

1. **New indicators for success are introduced:**

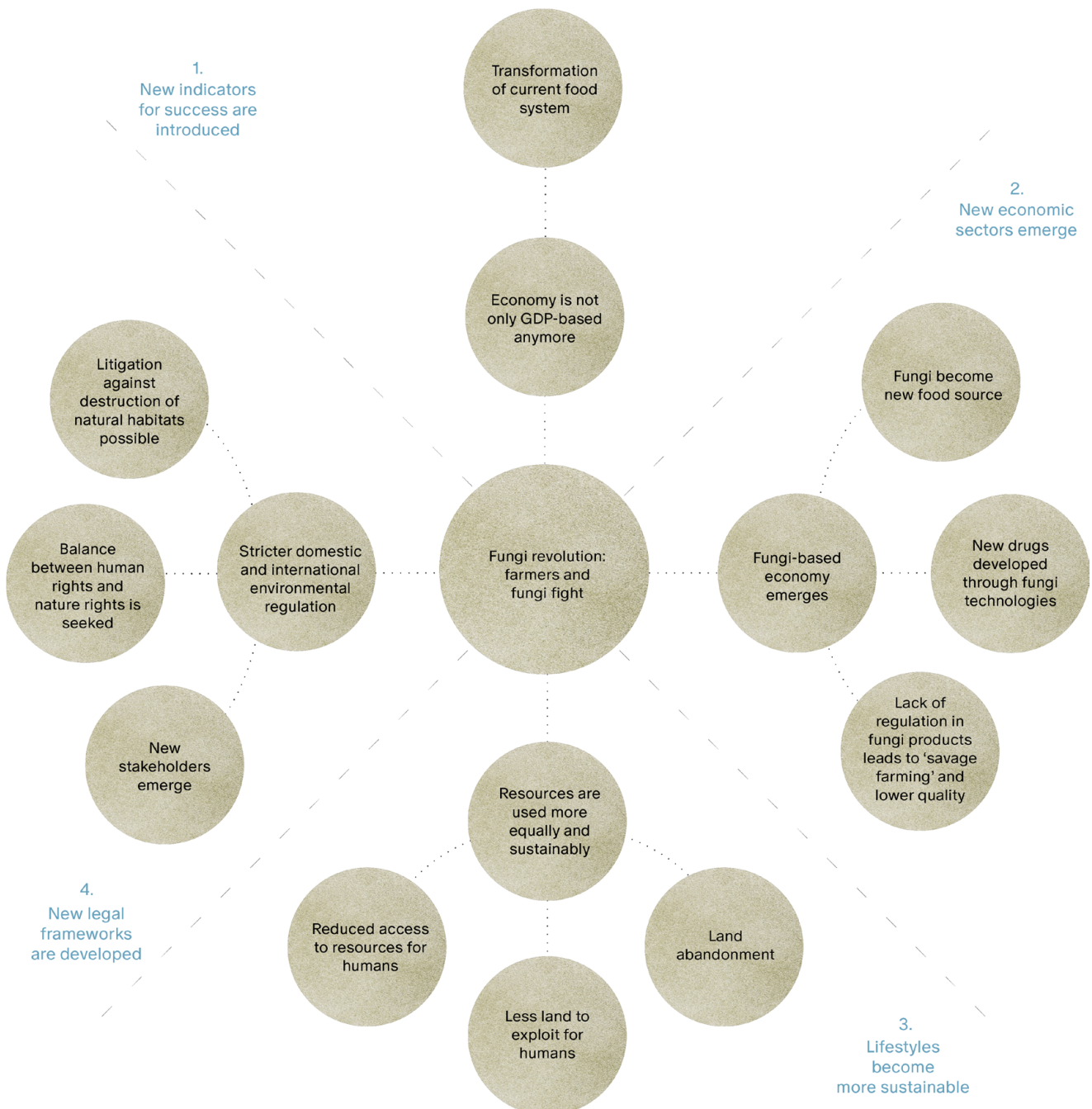
The enforcement of rights for natural habitats or animals could lead to a change in how the success of a nation is measured. Well-being, social, and environmental aspects could become more important than economic growth. A nation’s strength could be measured beyond gross domestic product. This development could lead to fundamental changes in how we live, for example to the rapid transformation of food systems with a focus on sustainability. While sustainable food systems would be beneficial for the restoration and protection of natural ecosystems, it could also mean that the European Union’s agriculture sector would lose competitiveness in comparison to other regions, should they not implement similar rights for their natural habitats and animals.

1. **New economic sectors emerge:** An emerging fungi economy could generate a multitude of economic opportunities. Fungi could become a new (enlarged) food source providing sustainable protein for human consumption. The fungi economy, for example, could diversify food production systems and thus reduce reliance on other food sources and food imports. Fungi-based innovation could also lead to the development of new drugs and could be an opportunity for the European Union to position itself as a technology leader in this emerging market. This would require new regulations to ensure the quality and safety of fungi-based products and the protection of wild fungi from overharvesting.

1. **Lifestyles become more sustainable:** Giving rights to natural habitats or animals could bring established ways of life into question, for example, if the unlimited exploitation of natural resources is no longer possible and humans face reduced access to resources. Another effect could be further increased scarcity of land, as natural ecosystems could not be transformed into human settlements or used for industry. Land abandonment could also lead to new challenges, such as an increase in forest fires in unmanaged forests, or the unabated impact of pests that flourish in wild nature. For all of these issues, questions could follow about whether or not individuals should be compensated for disadvantages, and by whom and how.

1. **New legal frameworks are developed:** Giving rights to natural habitats and animals would introduce new and improved environmental protection regulations, which would require stronger international treaties to be enforced. The possibility to litigate against the destruction of natural habitats could lead to a regeneration of nature and increased quality of air, soil, and water. However, finding the right balance between human and natural rights could be a struggle, as humans cannot survive without food and shelter. A particular challenge could arise from conflicting views on the extent of nature’s rights across different global regions. New actors could emerge that actively fight for nature’s rights and ensure that violations are prosecuted.

Figure 3: Futures wheel: Fungi revolution: farmers and fungi fight
(Source: Own illustration)



WHAT IF WE CAN TALK TO ANIMALS?

ANIMS SA IGNITES A NON-HUMAN RIGHTS REVOLUTION³¹



In a ground-breaking leap for humankind (!), Anims SA unveiled the ‘humal’ helmet on March 12, 2054. The innovative device – designed to bridge the gap between humans and non-humans – has taken the world by storm, with almost 60 million sold. A revolution comparable to the advent of the radio and internet, the helmet has fundamentally transformed our perception and experience of the natural world and its inhabitants.

After three decades of intensive research into animal cognition and behaviour, coupled with technology breakthroughs, the impossible has become reality: seamless communication with our beloved pets. But the impact of this newfound connection runs deeper than we could have imagined. Just yesterday, on 21 December 2054, the animal-plant slavery abolition bill was overwhelmingly approved by 34 countries across the globe. This

landmark legislation marks a pivotal moment, paving the way towards equal rights for humans and all non-humans. The European Council and the United Nations are now collaborating on a ‘non-human rights charter’, with hopes of signing it by the end of next year.

Ownership of natural habitats and the consumption of once-living foods may soon be a thing of the past. The new bond between humans

and non-humans is also leading to a complete re-think of how energy can be provided, i.e. without harming any living thing. There is a resounding endorsement of artificial photosynthesis as the primary source of energy for our planet that is even going so far as to introduce economic rights for plants and animals as producers.

As we embark on this transformative journey, the humal helmet and its consequences continue to herald in a new era of connection between all living beings. This shift in paradigm opens the door to a potential need for entirely new governance models, where each species has representation in democratic bodies.

Signs indicating a pathway to this snapshot of the future:

- New technologies to interact and communicate with animals allow us to understand how they see the world and help us protect them³²
- Animal-computer interaction technologies diversify and become embedded in everyday life³³
- The British Parliament debates Lobsters’ feelings³⁴
- Technology coupled with knowledge about sound is bringing us closer to plants and animals³⁵

31 This snapshot of the future was informed by the two weak signals ‘technologies for human-animal relations’ and ‘artificial photosynthesis’ (see Appendix Weak signals used to develop snapshots of the future, p.97)

32 Van Der Linden (2021)

33 Hirskyj-Douglas et al. (2018)

34 Greenall et al. (2022)

35 Bakker (2022)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘technologies for human-animal relations’ and ‘artificial photosynthesis’ resulted in four potential future developments (depicted in Figure 4 and described below).

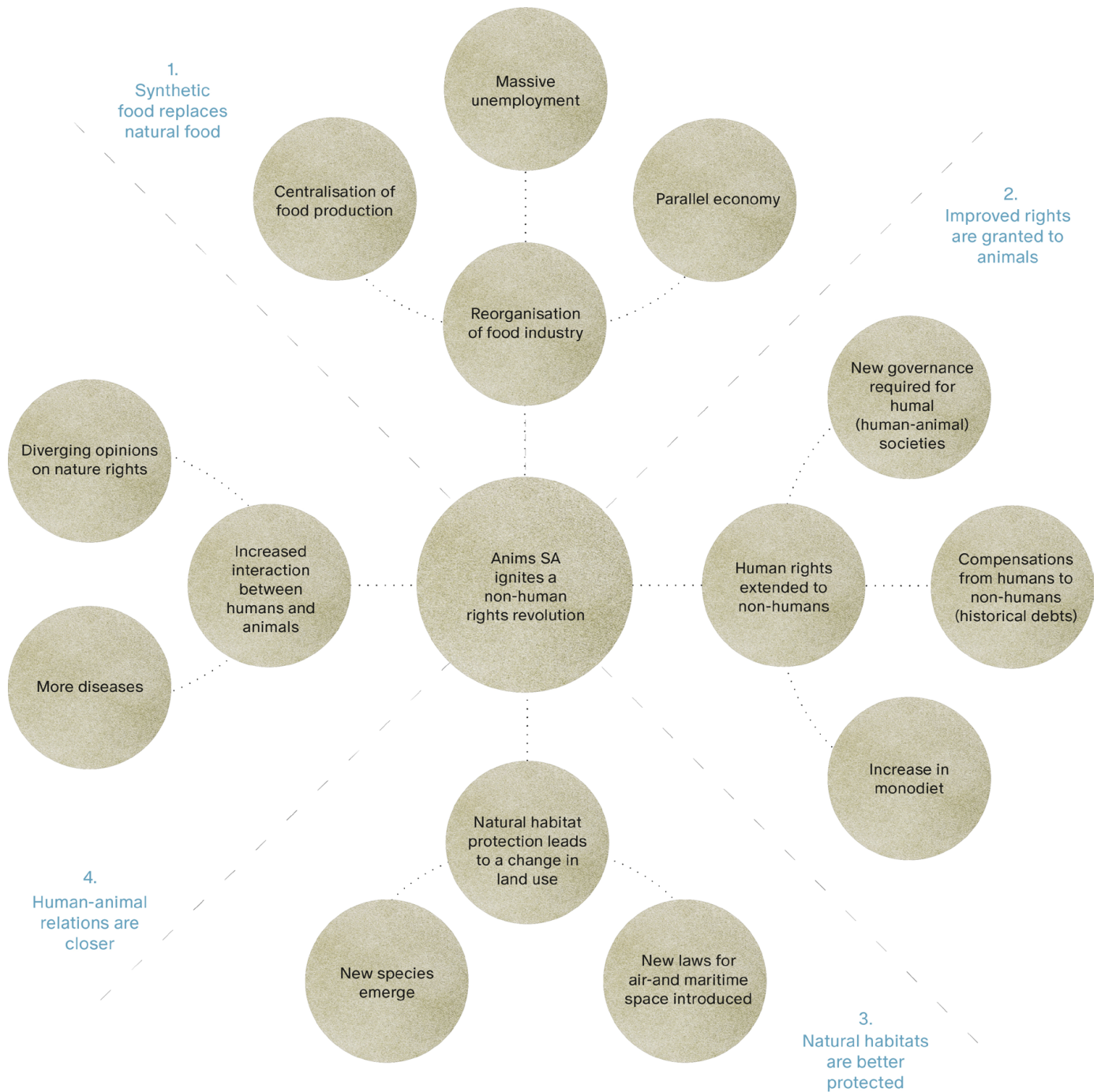
1. **Synthetic food replaces natural food:** The possibility to communicate with animals could help humans adapt their views on nutrition and health (human and animal). This development could trigger a fundamental reorganisation of the food industry. Traditional food production (e.g. livestock farming) could be abandoned, which could lead to massive shifts of jobs within the food production sector and unemployment in traditional food production. Synthetic food production refers to engineered cells that are used in the production of food (e.g. artificially grown meat), which could change the market, however with the risk of a centralised market structure dominated by only a few multinationals. Such a centralisation of a critical supply chains could lower the resilience of the food system. Rogue food production could appear with trafficking of ‘traditional’ meats and plants.
2. **Improved rights are granted to animals:** Legal rights (comparable to human rights) could be extended to non-humans, which could lead to more equality between humans and animals. Granting exhaustive rights to non-human species could have substantial repercussions. New forms of governance might be needed, and there could be tension and resistance in society. Opponents of such legislation might emigrate to more human-centric countries outside the European Union, which could shift geopolitical power. Reparations for past injustices towards other species by humans might become a substantial burden to public finances. New regulations could drastically limit sources of food for humans, with a potential to trigger widespread under- and malnutrition.

3. **Natural habitats are better protected:**

Increased protection of natural habitats could lead to a rethink of rights to land usage. Stricter laws could be introduced to protect air, soil, and water. Depending on the scope of these laws, a goal to re-wild already transformed natural habitats could create shortages of land for humans, particularly in densely populated countries. Higher natural protection would have implications for everyday life. For example, the production of many goods could be at risk, or the ability to travel using polluting means of transport could be over. Stricter environmental protection could lead to the emergence of new species and set humanity on a path to live sustainably within planetary boundaries.

4. **Human-animal relations are closer:** Being able to talk to animals might fundamentally change the relationship between humans and animals, giving more rights and protection to the latter. Humans that fear for their living standards or the ability to feed themselves could be drawn to follow extremist movements against, or in favour of animal and nature rights, creating new societal fault lines. Closer interactions between humans and animals could also increase the likelihood of the transfer of zoonotic diseases from animals to humans (such as the Ebola virus), bringing a higher probability of new diseases, or new pandemics.

Figure 4: Futures wheel: Anims SA ignites a non-human rights revolution
(Source: Own illustration)



WHAT IF THERE IS A GLOBAL POPULATION DECLINE?

THE KIKKO EMPIRE BOWS OUT AND KINDNESS TAKES ITS PLACE³⁶



In a striking turn of events the beloved toy giant, KIKKO, has closed its doors. KIKKO's downward spiral is marked by catastrophic losses and attributes its demise to 'impossible sustainability standards' and a dwindling customer base no longer interested in plastic toys. In a happy twist for them, similar to other classics, collectors are now clamouring to get their hands on the last iconic dolls.

The decline in birth rates globally, accelerated by the 2020 pandemic and cost of living crisis, cast a shadow over the toy industry. Fewer babies meant a shrinking market, and among those who still purchased toys, there was a preference for sustainable Montessori or digital ones. As products inevitably wore out, consumers transformed into producers, embracing the repair-it-yourself ethos and the circular economy. The emerging prosumer

culture represented a significant departure from the throwaway practices of the past. As the world adapted to a smaller population and fewer resources, innovative solutions were imperative.

The European Union, United States, China, and India were all reporting more deaths than births for decades, but planetary challenges had to take political precedence, and so the issue of declining birth rates was ignored.

The once-projected peak of 10 billion people in the world has never been realised.

Amidst these challenges, hearteningly, the social economy and kindness are thriving, as values have shifted. Online marketplaces, the sharing of goods and services for free or resale, and volunteering continue to flourish and have reached new scales, aligning with the hard-set sustainability rules, and in this way fulfilling many people's needs. And for those who used to work at KIKKO, sources say that they were able to take a doll home with them, which might be a comfort now as they search for a new career.

Signs indicating a pathway to this snapshot of the future:

- Demographic population predictions become more challenging and some say the global population will peak and fall³⁷
- The sharing economy and sustainable forms of collaborative consumption become the norm³⁸
- The world's population continues to grow, but the pace of growth is slowing down³⁹
- There is growing environmental concern amongst consumers, with many taking a more social, environmental, or political view than in the past⁴⁰

³⁶ This snapshot of the future was informed by the two weak signals 'generalised population decline' and 'consumer-traders' (see Appendix Weak signals used to develop snapshots of the future, p.97)

³⁷ Adam (2021)

³⁸ Arrigo (2021)

³⁹ United Nations (2022)

⁴⁰ Arshad (2022)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘generalised population decline’ and ‘consumer-traders’ resulted in four potential future developments (depicted in Figure 5 and described below).

1. **The job market becomes more flexible:**

Economic contraction could lead to changing employment and career models, new organisational structures, and new labour force practices. There could be fewer career options for individuals. People might need to re-locate more often for work, though remote work could still be an option for some types of workers. Innovation to overcome ageing-population-related challenges within the workforce might begin. Reskilling, upskilling, and retraining could be needed, but motivation might be low, and incentives needed.

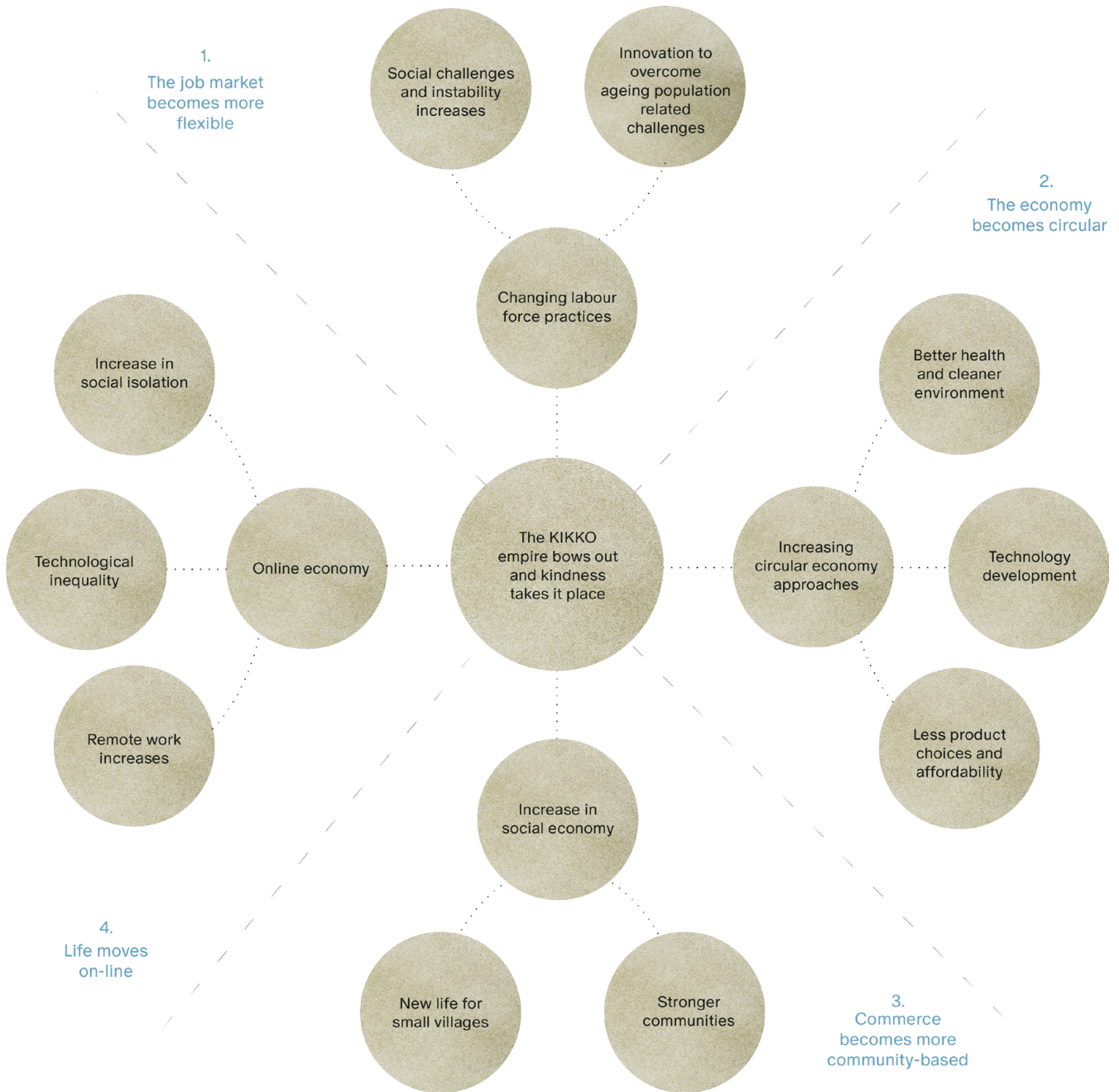
2. **The economy becomes circular:** Sustainability could become a central underpinning element of education and the economy. This development might include technical innovation and the production of more durable products, along with increasing circular economy approaches. A more circular economy could reduce resource consumption, increase the re-use and repair of products, and create less waste. Implementation of One Health approaches (taking into account the links between the environment, food, humans, and animals) could lead to overall better health for an ageing population and a cleaner world. However, as product choices become increasingly limited and items become more Artificial Intelligence (AI)-based and expensive, there could be reduced sales, putting pressure on the economy.

3. **Commerce becomes more community-based:**

Sharing with one another and relying on one’s community could become more important as resources become increasingly scarce. There could be a boost in the social economy, in particular business activities driven by a strong social mission, but also aiming to be economically viable. Humane values and the notion of helping one another could lead to stronger local communities. For rural communities, shared values and support for local businesses could give a new lease of life to small villages and there could be new local infrastructure.

4. **Life moves on-line:** As the consumer class with purchasing power grows globally, there could be a marked increase in online shopping and new AI-based applications created to make the experience nicer and easier to spend. People might become less inclined to leave their home and interact with each other, which could in turn increase social isolation, especially for the large cohort of the old. More checkout counters with humans could be installed in some shops, purely for social interaction and VIP purposes. Access to technology and AI tech skills could reinforce age-related inequalities too.

Figure 5: Futures wheel: The KIKKO empire bows out and kindness takes its place
(Source: Own illustration)



WHAT IF DREAMS CAN BE HIJACKED?

WHILE YOU WERE SLEEPING: SWEET DREAMS OR DIGITAL NIGHTMARE?⁴¹



Companies are getting in on the action too, bypassing banking regulations to offer credit and new financial services through the various apps, such as 'Funtimes' and 'Dream-maker'. With inbuilt pay-as-you-go features, there's a real hidden risk of overspending while you are sleeping. Calls are growing for policy makers to step in to deal with these blatant consent violations, as vulnerable users sleepwalk into debt... and what else? Vigilance is paramount.

Signs indicating a pathway to this snapshot of the future:

- Nearly any sensory stimulus has the potential for modulating experience in sleep⁴²
- Scientists warn that there are efforts to place advertisements into dreams⁴³
- Banks might not be needed anymore, if companies can embed finance and provide services⁴⁴
- Advertisers are hijacking your dreams, scientists say⁴⁵

In an era where technology rules supreme, the intimate realm of our personal dreams has been invaded. The latest technological marvels – the 'Dream Hats and Gloves' – are reshaping the way we dream, but is it all sweet dreams, or is it a digital nightmare?

The importance of good sleep, mental well-being and dream quality for a happy life and longevity is recognised more than ever. The wellness market, propelled by the global pandemic of the 2020s, now includes brain-healthy lifestyles and sleep enhancement as a cornerstone of health. Enter dream-shaping technology, the supposed saviour for those suffering from poor sleep, recurring nightmares and anxiety disorders, all without the use of pills. And dream-shaping technology is sweeping the market, promising to transform your nightly adventures. But as the demand for

dream hats and gloves go through the roof, questions about control and ethics of the technology suppliers are growing, as well as their longer-term impacts on brain inflammation, overall health, and relationships.

Because there are a few catches – some brands have not been fully transparent, and surprise advertising has been appearing, invading dreams and pushing the boundaries of subconscious manipulation. You can pay to avoid these intrusions if you are aware of them and if you can afford it, but trust and ethical concerns remain.

41 This snapshot of the future was informed by the two weak signals 'dream shaping' and 'embedded finance' (see Appendix Weak signals used to develop snapshots of the future, p.97)

42 Carr et al. (2020)

43 Moutinho (2021)

44 Townsend (2021)

45 Delbert (2021)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘dream shaping’ and ‘embedded finance’ resulted in five potential future developments (depicted in Figure 6 and described below).

1. **Education and work are transformed:**

Developments in this world could create new types of jobs and ways of learning. Dream learning could help the development of skills for identifying fake news and misinformation. Trust and democracy could be reinforced. Dream technologies could offer new and more personalised ways of learning, for example: a language. This could bolster social equality, particularly for disadvantaged social groups such as immigrants. An economic sector of ‘dreamual tourism’ (for dream and virtual) could emerge, but could hit tourism hard in some regions of the European Union.

2. **Bio-innovation impacts health and connectivity:**

New leisure and health (dream) technologies could enter the market, resulting in improved physical and mental public health levels. An increase in well-being could also drive productivity. Healing through dreaming could boost some sectors, while hurting others economically. The ‘Dream Hats and Gloves’ could introduce new ways of socialising, bringing fun, relaxation, and more connected (digital) human relations, while reducing loneliness. However, increasingly sedentary behaviour could decrease overall health and addiction could occur. Intensified neuronal activity could give rise to new brain disorders.

1. **Virtualisation reduces resource**

consumption: People could prefer to dream their experiences rather than be awake. The decrease of resource consumption could limit carbon emissions and help preserve natural resources. The European Green Deal might succeed, and by some measurements, overall health levels could improve. Reduced consumption of goods and services could lead to economic losses, job losses, potentially a recession, with more poverty and widening of inequalities in European Union Member States.

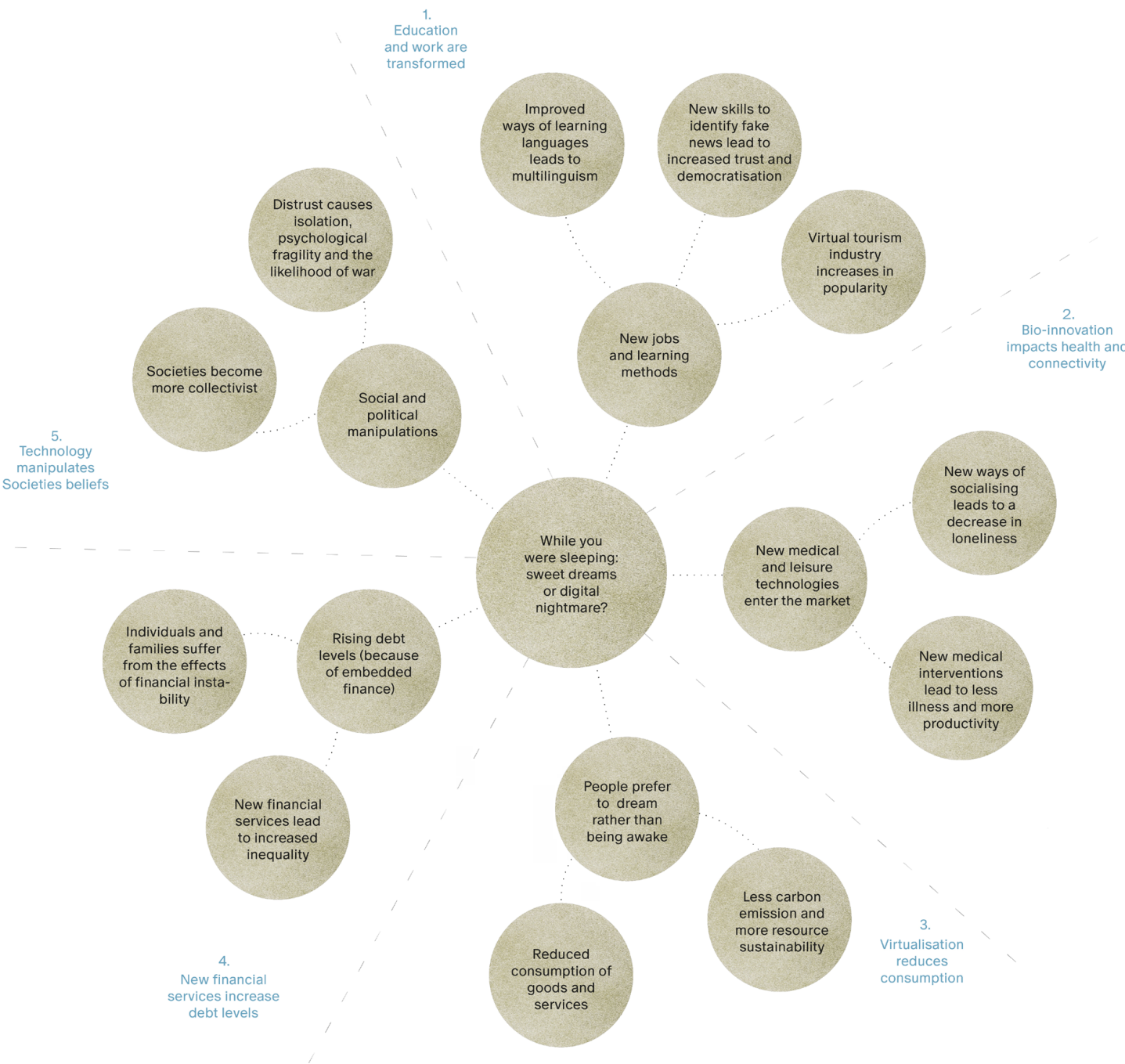
1. **New financial services increase debt levels:**

Technology with embedded finance could potentially result in increased debt levels for vulnerable individuals and families, who might then suffer from long-term financial instability. Such inequalities could reduce cohesion in the European Union, and could even develop into a threat of disintegration over the long term. Inequality could widen if the European Union reacted too late or without enough ambition.

2. **Technology manipulates society’s**

beliefs: Developments in dream shaping technology could offer new pathways for information, misinformation, and manipulative disinformation. Ensuing political and societal outcomes could have positive or negative impacts. A possible negative consequence could be increased distrust, increased individualism, and social isolation, triggered by stoking fears and manipulating beliefs. A possible positive consequence is the rise of a collectivist society, which might enable the implementation of ambitious policies and the transformation of the European Union.

Figure 6: Futures wheel: While you were sleeping: sweet dreams or digital nightmare?
(Source: Own illustration)



WHAT IF A LUNAR ECONOMY IS ESTABLISHED?

MOON SAND: A COSMIC SOLUTION TO EARTH'S SAND CRISIS⁴⁶



There is newfound hope to alleviate the sand scarcity crisis and keep building with the arrival of the first shipment of sand from the Moon landing in Egypt yesterday. Following decades of relentless construction and land reclamation, the world was running out of sand, but yesterday marked a monumental moment in the Earth's quest for sustainable growth.

Recycling old sand-intensive structures and materials simply couldn't keep up with the insatiable demand for new buildings and land. The battle between conservationists, who wanted to protect historical sites, and those desperate for sand was reaching boiling point. Developing countries' middle class aspirations for Western standards of living surged at the same time as the number of single households increased, and the demand for new construction soared too. Alongside the rising sea

levels everywhere that require sand-intensive land reclamation banks, it was clear – sand is the new oil and has become more precious than ever.

The first Moon sand delivery was made possible through an unprecedented global collaboration. Bringing hope for the future global agreements still pending, in 2046, the United Space Administration brought together the United States, China, India, Europe, and the United Arab Emirates to establish a Moon base.

This lunar foothold jump-started the transport of resources, a testament to the boundless potential of human ingenuity and global partnership. From the moment of the discovery that the speed of light was the exact coordinates of the pyramids of Giza (299,792,458 M/S and 29,9792458 ON), a global innovation partnership thrived, leading to yesterday's first delivery, with many more scheduled.

The lunar economy holds incredible promise for closing the gaps in our 'not-so-circular' economy today. Beyond resource salvation, the lunar economy is one of Earth's fastest-growing sectors, revitalizing the global economy. Visionaries are even dreaming of Moon colonies to accommodate our ever-expanding human population sooner than was ever dreamed of before. Watch this space!

Signs indicating a pathway to this snapshot of the future:

- Creation of the European Centre for Space Economy and Commerce⁴⁷
- Modelling exercises show a 45% increase in global building sand use from 2020 to 2060⁴⁸
- Odysseus is the first private spacecraft to land on the moon⁴⁹
- Roads on the Moon could be built by melting lunar dust⁵⁰

46 This snapshot of the future was informed by the two weak signals 'lunar economy' and 'the sand crisis' (see Appendix Weak signals used to develop snapshots of the future, p.97)

47 European Space Agency (2022)

48 Zhong et al. (2022)

49 Witze (2024)

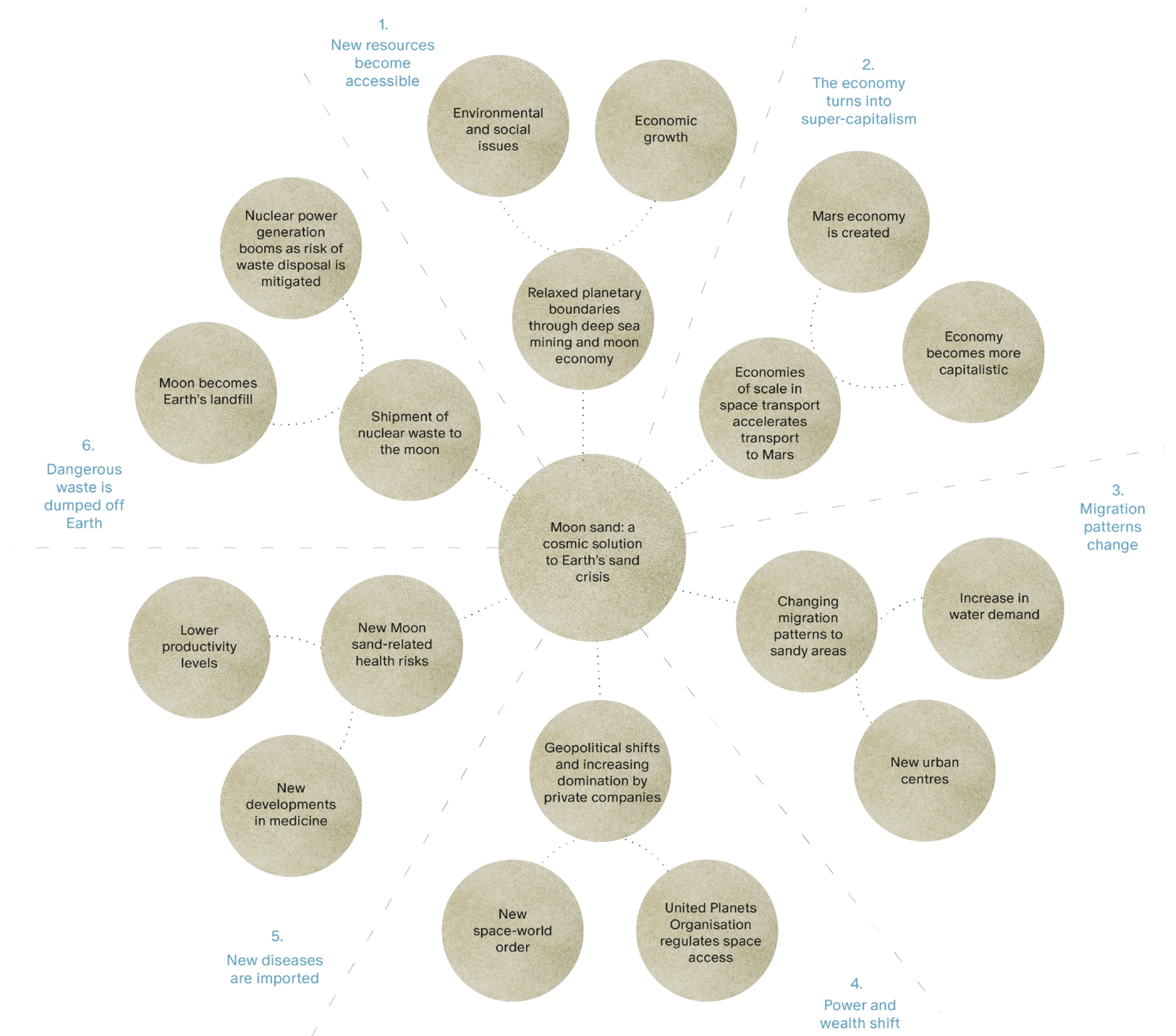
50 O'Callaghan (2023)

Emerging developments

The futures wheel looking into the potential knock-on effects of 'lunar economy' and 'the sand crisis' resulted in six potential future developments (depicted in Figure 7 and described below).

1. **New resources become accessible:** The lunar economy could be part of a development of exploiting new sources of raw materials that also includes deep sea mining. Accessibility of sand on the Moon could open the door to other 'in demand' resources and production facilities. There could be an economic boom. Deep-sea mining activities could however also hurt biodiversity and amplify threats of ocean desertification and coastal erosion.
2. **The economy turns into super-capitalism:** The development of new machinery for resource extraction, and spacecraft for transportation of goods from the Moon to Earth could create the economies of scale needed for wider space exploration, for example travelling to Mars. 'Terraforming' a long-term future on Mars could become more likely. These developments could greatly expand the human experience and economy on Earth too. However, the already wealthy could profit more than the public good, and the distribution of benefits might not reach all families across different planets or moons, (e.g. Moon workers).
3. **Migration patterns change:** The scarcity of sand could trigger migration to sand-rich regions, either because workers have to move to where sand can be harvested, or because other regions lack the space for new buildings to accommodate people. The development of new urban centres and migration could drive an increase in regional water demand and therefore amplify water scarcity issues. There could be a brain drain from decreasingly vibrant regions to new centres of economic and cultural growth. While innovation could be boosted, families could become scattered, even across the galaxy.
4. **Power and wealth shift:** Extending our reach to different planets could lead to a fundamental shift in geopolitical power towards countries that benefit the most from the new opportunities. How access to Space resources or new planets and the relations between planets is governed will determine whether our future will be collaborative or combative. In the best case scenario, inter-planetary relations could be peaceful and even current conflicts on Earth that are rooted in scarcity of resources might ease. In the worst case, future relations could be competitive and hostile and new wars between planets and Earthly territories could emerge. Private companies could become overly dominant.
5. **New diseases are imported:** The import of 'foreign' material from Space brings with it the possibility of introducing invasive alien plant species, insects, and infectious microorganisms such as bacteria, fungi, or viruses, or something entirely new. Any of these could massively impact fragile ecosystems and health. Negative environmental and health developments could lead to lower productivity levels of the human workforce, but could also indirectly stimulate new developments in medicine to treat new and old diseases.
6. **Dangerous waste is dumped off Earth:** The disposal of dangerous waste in Space (e.g. nuclear or chemical waste) could reduce the production costs of some products, or be a solution for nuclear-based power generation. Lower energy costs could improve the cost of living for the poor. However, cheaper nuclear power generation could lead to an increase in nuclear power plants, and with them therefore a higher risk of nuclear incidents from operating these plants or transporting nuclear waste on spacecraft. Furthermore, using other planets as landfills for dangerous waste could trigger unknown issues and make it impossible to live on them in the longer term.

Figure 7: Futures wheel: Moon sand: a cosmic solution to Earth's sand crisis
(Source: Own illustration)



WHAT IF MODULAR MANUFACTURING IS MAIN-STREAMED?

AI-GENERATED MODULAR FARMS: SMART STABLE SOLUTIONS OR MOUNTING PROBLEMS⁵¹



Across the picturesque countryside of Ober-Graz, Austria, a remarkable transformation is unfolding. AI-driven modular farm structures are offering a lifeline to local farmers such as Martin Higger. A series of extreme weather events had taken a devastating toll on his cattle, but a recently launched government initiative is paving the way for resilient smart stables, designed to apply AI technology with on-site self-assembly approaches to enable farm structures to withstand unforeseen disasters. It ushers in a new era of agriculture combining technology with farming tradition.

Modular farming has come a long way from the shipping containers first created as part of the environmentally friendly agriculture movement of the 2010s. These innovative triple carbon mesh compounds are assembled

by AI, and can adapt to various parameters for dynamic and stress-proof structures, also maximising land space as they stack upwards. GPS data from Higger's farm can enable the rapid local reinforcement

of his barns to brave fires, floods, or tornado-like winds. The buildings are equipped with early warning systems that can detect and react to pests and diseases too, offering a crucial defence against the spread of infections such as tuberculosis. For farmers like Higger, investing in these smart stables ensures not only a future for his livestock, but also a legacy for his next generation. With grants available, farmers are finding much-needed financial relief too. However, challenges loom nevertheless.

Activists such as Danica Miljena are voicing concerns about the potential for internet outages and the vulnerabilities exposed by allowing autonomous systems make decisions that could impact both cattle and residents in unexpected ways. Despite these valid concerns, governments remain committed to the scheme, viewing it as a vital resilience tool for eradicating disease, mitigating land scarcity issues, and coping with extreme weather losses. A collaboration with insurance companies is further bolstering credibility.

Signs indicating a pathway to this snapshot of the future:

- Modular manufacturing could help companies better navigate weather-related issues⁵²
- There are several scenarios that show how the internet could crash⁵³
- Modular farming revolutionises practices by incorporating smart adaptable techniques⁵⁴
- Modular farms solve many of the challenges associated with traditional agriculture⁵⁵

51 This snapshot of the future was informed by the two weak signals 'modular manufacturing' and 'crashing of the internet' (see Appendix Weak signals used to develop snapshots of the future, p.97)

52 Haywood Queen (2022)

53 McDonald (2018)

54 GreenState (2024)

55 Pure Greens (2024)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘modular manufacturing’ and ‘crashing of the internet’ resulted in four potential future developments (depicted in Figure 8 and described below).

1. **The internet becomes less reliable:**

Disrupted access to the internet, news, online media, and online banking transactions could trigger a wide array of developments. If online transactions are not possible, many businesses could decline. There could be a reduction in the range of products available, and a return to cash payments, in turn triggering an increase in black-market transactions, or a new ‘offline’ economy. But there might be a new version of the internet. There could be a reshuffle of societal values with strengthened local communities, where individuals and regions support each other through the exchange of goods and knowledge. With reduced focus on international affairs, the European Union could lose geopolitical power.

2. **Societies across the globe are less connected:**

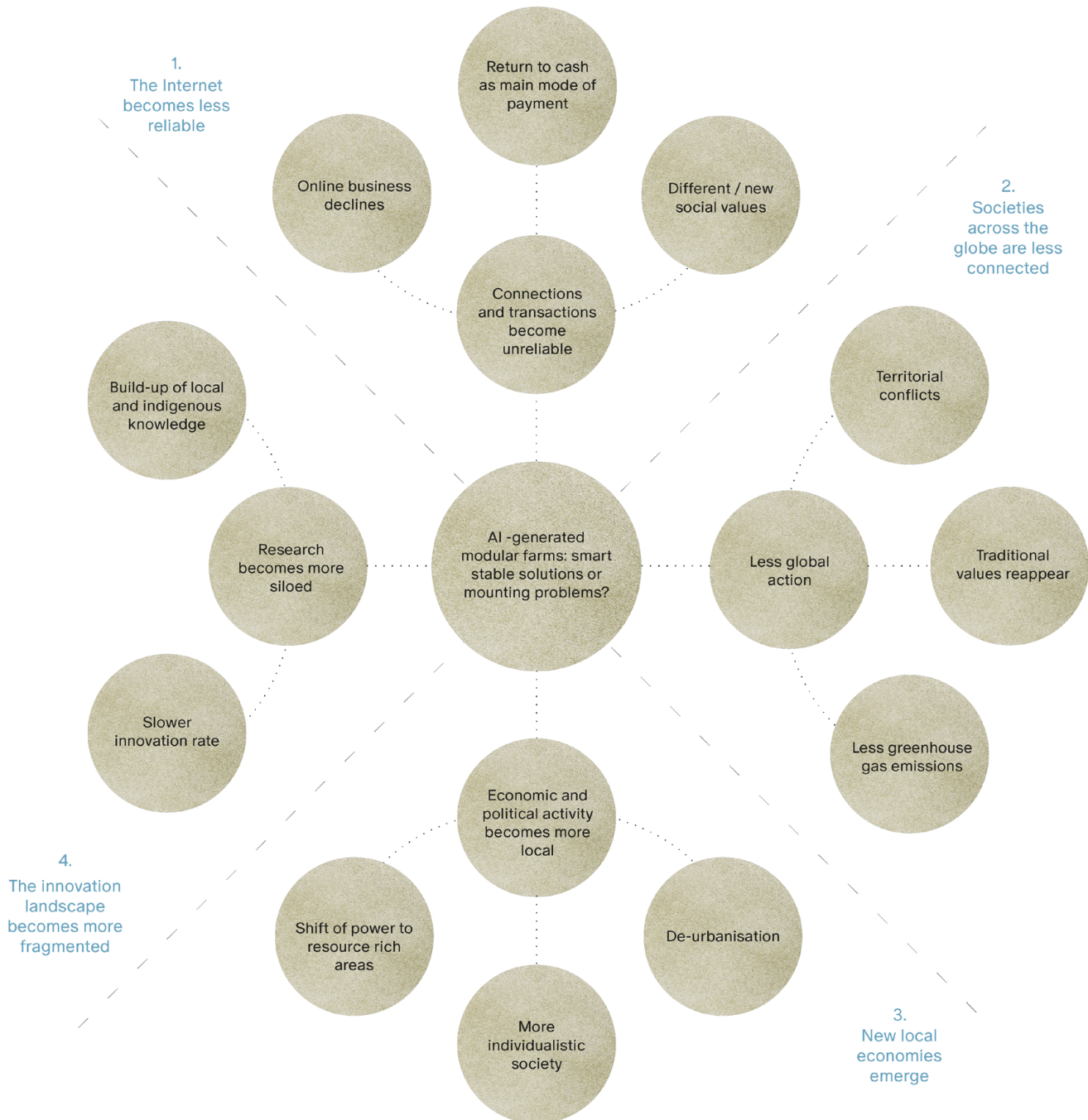
A return to more traditional ways of life might follow increased local modular manufacturing, implemented to secure supply chains and respond to the volatile ‘offline’ business environment. Reduced global transport could have negative economic impacts, but it could positively impact greenhouse gas emissions. Coupled with energy savings from reduced internet activity, climate targets could be realised. If European Union Member States’ foreign policies become more protectionist, border or territorial conflicts could be triggered. This could encourage a multipolar world with divided opinions, and result in a disbanded European Union.

3. **New local economies emerge:** If economic and political activity becomes more localised (following the local modular manufacturing developments), a more individualistic ‘new rich’ society might appear, one less interested in multilateral international cooperation and less exposed to other regions (no internet, no interests). De-urbanisation and the shift of power to resource-rich areas could have several potential impacts, including mass migration of citizens from the areas of de-growth, but conversely growth in resource-rich local communities. Increased local transport and activity to exploit resource-rich regions might introduce new environmentally-induced health problems.

4. **The innovation landscape becomes more fragmented:**

Cross-border research and innovation could be hit hard by a less connected (‘closed’) innovation landscape (on- and offline). This could impede global progress towards shared goals and result in silo-ed, or redundant research. Vaccine efficacy could drop if data is not shared and climate goals might not be met. In a world with reduced and less open innovation, the spread of disease could increase. On the positive side, redistributed funding could bring innovation to other less explored (e.g. social sciences and humanities) areas. There could be an increased appreciation for local and indigenous knowledge.

Figure 8: Futures wheel: AI-generated modular farms: smart stable solutions or mounting problems
(Source: Own illustration)



WHAT IF WE LIVE MOSTLY ONLINE?

SECOND SELF AVATARS: A BOON OR A BANE?⁵⁶



The rise of avatars embodying your second self has captured the world's imagination. Developed by the tech start-up 'Storm', which recently turned into a unicorn, 'Your Second Self' promises to replicate your thoughts and potentially your decisions and actions through virtual avatars. Offered as a monthly subscription, it pledges to make fast, reliable decisions on your behalf. But will it make your mistakes for you too?

One individual applauding this innovation is activist Heiner Kroshkweski. Struggling with the demands of his intense job, juggling protests, community meetings, and legal cases, he found himself drained of energy. "The reality of activism is that it's a seven-day workweek, filled with community meetings, scientific discussions, and legal affairs," he said. "I couldn't keep up with emails, and even simple decisions felt overwhelming. I'm grateful I can now

delegate tasks to my avatar, the perfect assistant."

The virtual selves adapt their writing style and decision-making by analysing their owner's email archive, both personal and professional. This fine-tunes intellectual and emotional responses and ensures customised communication. However, recent errors are raising concerns. In the "Hiller versus Hiller" legal case, a second self-regulated decision led to

a divorce trial being determined by outdated emails. Marcus Hiller lost a \$2.6 million wine estate because his second self-considered it the most plausible decision based on a previous dispute with his ex-wife. Sobering indeed.

As the technology evolves, it is becoming evident that tighter legal regulations are essential alongside technical refinements. And "what happens when employers start to double workloads for those without avatars as well," say the workers' unions?

In response, 'AI Now' has issued an open letter to government leaders, urging immediate action to slow down production until regulation catches up. There's a growing recognition that saving time comes at a cost.

Signs indicating a pathway to this snapshot of the future:

- The physical and digital worlds are increasingly merging into a 'phygital world'⁵⁷
- Robot 'avatar' waiters operated by remote disabled workers are changing Japan's work landscape, bringing inclusivity and a personal touch, while solving labour shortages⁵⁸
- Beaming in via digital projection hologram technologies may soon replace video calls⁵⁹
- New virtual environments make online meetings feel like a shared physical space⁶⁰

56 This snapshot of the future was informed by the two weak signals 'metaverse' and 'age of complex and diverse emotions' (see Appendix Weak signals used to develop snapshots of the future, p.97)

57 Prog.World (2024)

58 Newman (2022)

59 Murad and Smale (2021)

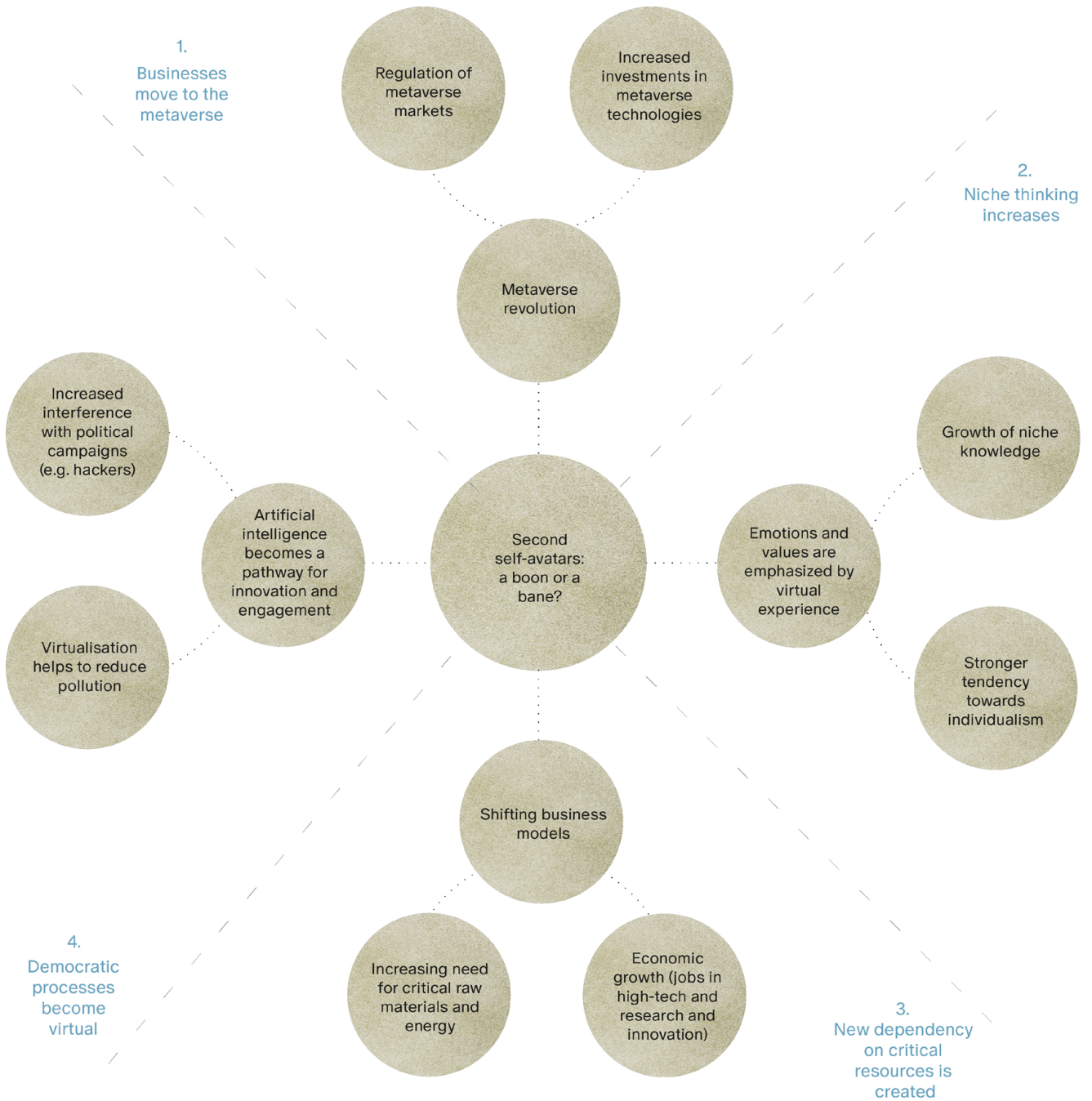
60 Aalto (2020)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘metaverse’ and ‘age of complex and diverse emotions’ resulted in four potential future developments (depicted in Figure 9 and described below).

1. **Businesses move to the metaverse:** The roll out of ‘metaverses’ (virtual worlds with avatars in the online environment) could fundamentally change how business gets done, by establishing new markets and novel platforms within which to conduct transactions. These new markets could lead to new pathways to economic growth in an otherwise stagnating economy. The metaverse could also be a catalyst for exchanges between policy makers and citizens, bringing them closer together and increasing democratic participation.
2. **Niche thinking increases:** The concept of a ‘new virtual life’ could be reinforced, resulting in stronger emotions and reinforced values. Fragmentation of knowledge could increase, reducing institutional trust because common assumptions would no longer be shared. The fragmentation of knowledge may also be an enabler to increase awareness in society of the challenges of minorities, as information on niche issues becomes better available. However, such a development might also lead to a more self-centred and exclusive society. If smaller social groups stick only to themselves, this could result in a stronger tendency towards individualism.
3. **New dependency on critical resources is created:** Shifting of business models to selling goods virtually could drive strong economic growth. There could be significant job growth, particularly in knowledge-intensive economic sectors such as high-tech, or research and innovation sectors. However, the increase in demand for high-tech components (such as microelectronics), and the increase in demand for energy to run virtual businesses (and their devices and apps), could create new dependencies on imported critical goods and raw materials. Such a development could expose the European Union to geopolitical risks. Demand for critical goods and raw materials could also drive opportunities for stronger alliances with like-minded partners.
4. **Democratic processes become virtual:** Virtualisation could be a breeding ground for democratic discourse, bringing people together, even over long distances and across different social classes. Virtualisation could illustrate how today’s decisions may impact our future, gaining public support for long-term, future-oriented policies that ensure the protection of common goods for future generations (e.g. air or water quality). However, in virtual interactions, targeted interference to influence public opinion could also lead to political disengagement, stoke divisions, or lead to biased decisions.

Figure 9: Futures wheel: Second self avatars: a boon or a bane?
(Source: Own illustration)



WHAT IF THE AVERAGE LIFESPAN IS HIGHER THAN 100 YEARS?

LONGEVITY-INDUCED CHALLENGES: WHO WANTS TO LIVE FOREVER?⁶¹



Governments are being called upon to act: they had prioritised investment in the circular economy and nuclear power arenas to combat resource scarcity and energy demands in recent decades. But calls to redirect attention to longevity matters grow louder. The increase in retirement age offered some relief for social systems, but it introduced even more challenges. Inequalities with regards to who can afford to retire and who cannot, and who can afford to age well can no longer be ignored. Less pension, more tension.

Age discrimination in the workforce has surged. And a proportion of the old still suffer from age-related diseases and reduced mental capacity, also questioning the desirability of a longer lifespan. While some claim being old beats the alternative, whispers are getting louder for 'opt out' options because some simply don't want to live forever, despite what the salespeople say. The path to a brighter future will involve innovative solutions to ensure that progress in longevity benefit all.

The 40th annual Ageing Research and Drug Discovery (ARDD) conference has marked a historic milestone: human ageing potential is being fully realised with increasing numbers of people reaching the ripe old age of 125. Many 'golden oldies' claim to be enjoying life more than ever, and say that with the right attitude you can thrive being older. Less tension, more pension! But do they mean with the right wallet? Attention is now shifting from developing life-prolonging technologies to ensuring their widespread access. And questioning the trade-offs is reaching new levels.

The ARDD meeting participants re-emphasised that longevity presents a dual challenge for society – offering the promise of a longer, healthier life, while simultaneously introducing societal pressures. The meeting showcased the great possibilities,

but one crucial aspect remained unaddressed: the social and economic consequences for those left behind. Longer lifespans strain resources, overwhelm social support systems and create financial burdens on the workforce.

Signs indicating a pathway to this snapshot of the future:

- Longevity and anti-ageing research is growing as the pandemic reinforced interest in health⁶²
- Believers in 'The Singularity' (including Google's chief futurist Ray Kurzweil) believe that humans could live forever with technology by 2029⁶³
- 30 countries are planning to increase their nuclear power generation capacity⁶⁴
- Humans could live to a maximum age of 125 years by 2070 say scientists⁶⁵

61 This snapshot of the future was informed by the two weak signals 'individual longevity' and 'nuclear goes forward' (see Appendix Weak signals used to develop snapshots of the future, p.97)

62 First Longevity (2022)

63 Ranj (2016)

64 World Nuclear Association (2023)

65 Dong, Milholland, and Vijj (2016)

Emerging developments

The futures wheel looking into the potential knock-on effects of ‘individual longevity’ and ‘nuclear goes forward’ resulted in four potential future developments (depicted in Figure 10 and described below).

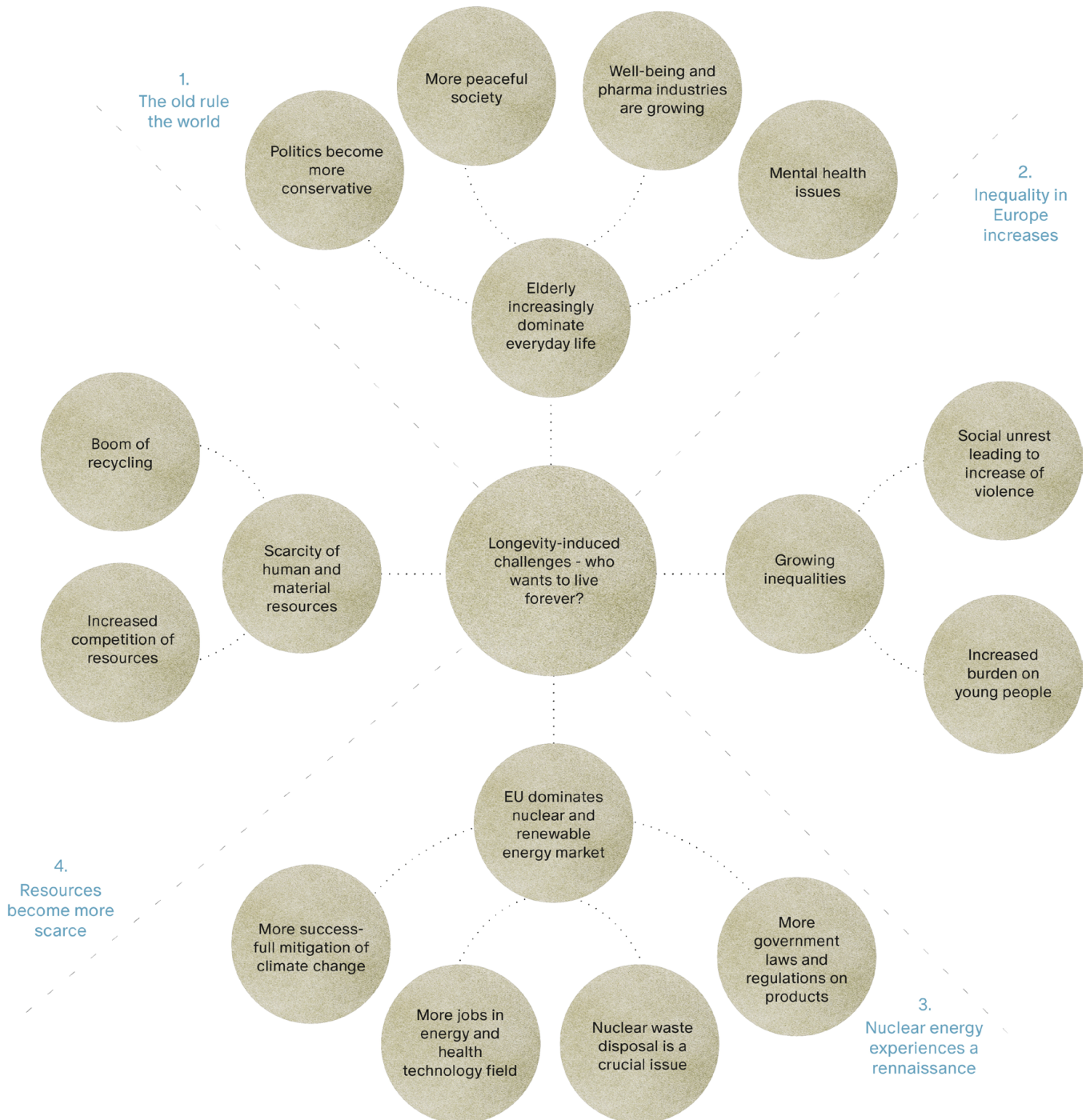
1. **The old rule the world:** As people live longer, retirement age could increase, along with the share and influence of the old on politics and daily life. An influential old cohort could result in a wiser, more peaceful society focused on protecting a good standard of living, which in turn could result in an expansion of the European Union. A very conservative society and political behaviour could develop, which could cause intergenerational conflict. Ageing-related health issues would require care (e.g. cardiac disease, dementia, longevity treatments). A less fit society would be a less resilient one. There could be a boost in the well-being sector to an extent that economic growth is stimulated, but medical lobbies could become overly dominant.
2. **Inequality in Europe increases:** Ageing populations could have implications for inequality and the sustainability of public finances. A type of inequality that could occur is that the majority does not consider the needs of minority groups. Ageing populations could produce divisions in intergenerational relations. Reduced access to jobs, houses, and increased burden on the younger population could induce social unrest and violence, and threaten democracy. A less resilient society coupled with adverse economic developments could reduce the European Union’s standing. On the other hand, old age poverty could also increase. Cost of living increases could result in unequal standards of living for both the young, and old.

3. **Nuclear energy experiences a renaissance:**

A future energy system that focuses on nuclear power generation could increase the European Union’s global influence if it capitalises on its historic expertise in this area. A potential development could be the creation of jobs and economic growth. A nuclear renaissance could lead to new critical technology and raw material dependencies, and dependency on dominating companies. If these are overvalued, there could be financial implications. It could also mean that more nuclear waste needs to be disposed of, with risks to public health and the possibility of nuclear incident.

4. **Resources become more scarce:** With extended lifespans, global consumption levels could further grow at the same time as resource scarcity increases. There could be increased prices and competition for the Earth’s limited resources between regions. Such demand and scarcity could boost recycling, and the quicker uptake of circular economy concepts within the European Union. The smaller proportion of a working age population could increase competition for talent, including for migrants and low-cost labour.

Figure 10: Futures wheel: Longevity-induced challenges: who wants to live forever?
(Source: Own illustration)



WHAT IF ENVIRONMENTAL HISTORY GETS REWRITTEN?

FUTURE-ORIENTED ACTIONS ARE MANIPULATED⁶⁶



The breach of the very first Climate Black Box, IMA 896, has rattled the global community. What was once championed as a trustworthy record for future generations of ecological catastrophes – such as the Malaysian Haze of 2005 and the destruction of the Great Barrier Reef in 2035 – appears to have been entirely erased.

The reveal of the shocking incident serves as a stark reminder of the hybrid tactics serving geopolitical interests of the 2020s that many had hoped were over. It was the desperate need to preserve the planet for future generations that led to the preservation of accurate accounts and objective facts of where it all went wrong with planetary boundaries in the first place. The inventors of the 'Climate Black Box' are now under pressure to justify the security breach,

and to see if the data can be restored, as the scale and impact of the hack is yet to be fully understood.

IMA 896 was the first of its kind and declared impenetrable. Focusing on climate data and such a strong focus on intergenerational fairness was new back in the early 2000s. The boxes were part of society's reaction to the seismic changes of those decades and a reaction to nuclear war threats from Russia. The rise of China as a formidable global influencer

had sparked concerns in Europe regarding its influence on multilateral agreements too. Both demanded a new approach to international relations and futures governance.

However, this recent hacking has sparked a heated debate, raising new concerns about the manipulation of historical facts related to significant environmental catastrophes. Experts now highlight a connection between this hack and introduced international policies, which allowed controversial environmental interventions, such as the construction of the hydrogen production island in the Pacific. The international courts are set to debate it all next week. Things could get hot.

Signs indicating a pathway to this snapshot of the future:

- The future self is thought of as another person and feelings about this 'other' person impact decisions⁶⁷
- Scientists and artists create indestructible storage devices to record humanity's handling of the climate change crisis to hold the world accountable for the Earth's future⁶⁸
- Leak of Chinese hacking documents offers a look at prevalent state surveillance⁶⁹
- Disinformation operations and China's influence operations show how information warfare might look like in the future⁷⁰

⁶⁶ This snapshot of the future was informed by the two weak signals 'dealing with future selves' and 'Chinese narratives in international politics' (see Appendix Weak signals used to develop snapshots of the future, p.97)

⁶⁷ Hershfield (2019)

⁶⁸ Cordelia Hsu, Ana Nicolaci da Costa, and Birsal (2021)

⁶⁹ Bajak and Kang (2024)

⁷⁰ Solon and Dilanian (2020)

Emerging developments

The futures wheel looking into the potential knock-on effects of 'dealing with future selves' and 'Chinese narratives in international politics' resulted in five potential future developments (depicted in Figure 11 and described below).

1. **Geopolitical power shifts to the East:**

Increased integration of Chinese narratives in international legislations and politics could accelerate the shift of power from the West to the East for future generations. China could emerge as the new top global superpower and a stronger influence of Chinese culture and language in Western society could follow. This development could also have implications for global finance systems. For example, Western economies could decline, and some could even go into crises. The yuan could become the leading global currency with a stronger China.

2. **Environmental disasters catalyse the foundation of a global green alliance:**

Due to greater control of and human attention to the legacy that will be left to future societies, ambitious international policies could be implemented that actually reduce CO₂ emissions and protect the environment. Temperature increases could remain at below +1.5°C, and Planet Earth could be saved. However, natural disasters might still occur frequently. Similarly, although the loss of biodiversity could be contained, it could require substantial investment to protect endangered species.

3. **Research and innovation strongly focus on green technologies:**

Accepted responsibility towards future society, especially regarding climate change and environmental degradation, could redirect innovation funding to sustainable innovation. Academia, governments, and businesses could increasingly invest in and focus on 'green technologies' to address shared international challenges related to energy supply and decarbonisation. The result could be an innovation revolution, with new sources of fuel, no dependency on fossil fuels, but inevitable trade-offs for areas that do not get funded, including job losses in these areas. If energy becomes plentiful and affordable, the cost of living and (e)quality of life could improve.

4. **Access to food becomes less secure:**

The strong focus on intergenerational fairness could lead to a reduction in the use of fertiliser and pesticides, to help soils recover. A reduction in agricultural output could follow this development. There could be the wider roll-out of genetically modified food crops. Disruption of international trade, agreements, and food production by China, might lead to famine in countries dependent on imports. These developments might further increase East-West tensions and tensions within the European Union. The pressure on food systems could drive support mechanisms for vulnerable groups and agricultural production in countries that can afford it.

5. **People oppose state surveillance:**

Societies could end up with polarised groups of individuals supporting very different values and worldviews. If the level of crime in society drops, it could be at the cost of major invasions of privacy. In response, there might be a demand for more individual freedom. States could become hesitant to perform mass surveillance, as privacy is demanded. Social unrest and demonstrations could explode, leading to the destabilization of some countries.

Figure 11: Futures wheel: Future-oriented actions are manipulated
(Source: Own illustration)



Ten clusters of future risks

In this chapter, we present the results of analysing the risks across all futures wheels and assorting them into ten clusters of risks. We first introduce phenomena that are observed today with regards to each of the risk clusters (what is the overarching risk and are there signs today that we can already see pointing to it), along with a short description of their potential impact, should one or more of the individual risks they comprise materialise. Furthermore, for each risk cluster, we next present the results of our participatory analysis. We give examples of how potential future developments identified could reinforce the risks or turn them into a crisis.

The ten risk clusters cover many different kinds of risks and can help decision makers to uncover blind spots in their assessment of potential sources of future disasters – both by providing a holistic overview of risks, and by describing which potential developments can lead to them. The analysis of risks here can help to understand threats and their future implications better.

In the previous chapter, we presented the exploration and analysis of different possible futures, where 44 potential future developments were identified. Figure 12 is an overview of all of the developments grouped into STEEP categories (**S**ociety, **T**echnology, **E**nvironment, **E**conomy, (Geo) **P**olitics). These developments describe common trends and patterns found in the cause-and-effect chains of the futures wheels presented in this report (a detailed description of how they were developed can be found in the Appendix, p.93). Cause-and-effect chains that form part of such a potential future development also show to which risks and opportunities they lead to. Therefore, it is possible to indicate which developments could be a pathway to a certain risk cluster.

Figure 12: Overview of potential future developments (Source: Own illustration)

Society

Access to food becomes less secure

Education and work are transformed

Human-animal relations are closer

Inequality in Europe increases

Migration patterns change

New information channels are available

Niche thinking increases

Improved rights are granted to animals

Technology manipulates society's beliefs

Technology

Bio-innovation impacts health and connectivity

Digitalisation creates new vulnerabilities

Life moves on-line

More information is widely available

Nuclear energy experiences a renaissance

Synthetic food replaces natural food

The innovation landscape becomes more fragmented

The internet becomes less reliable

Environment

Dangerous waste is dumped off Earth

Environmental disasters catalyse the foundation of a global green alliance

Lifestyles become more sustainable

Natural habitats are better protected

New diseases are imported

Research and innovation strongly focus on green technologies

Resources become more scarce

The economy becomes circular

Economy

Businesses move to the metaverse

Commerce becomes more community-based

New economic sectors emerge

New financial services increase debt levels

New local economies emerge

New resources become accessible

The economy turns into super-capitalism

The job market becomes more flexible

Virtualisation reduces resource consumption

(Geo)Politics

Democratic processes become virtual

Geopolitical power shifts to the East

Governments become transparent

New dependency on critical resources is created

New indicators for success are introduced

New legal frameworks are developed

People oppose state surveillance

Power and wealth shift

Societies across the globe are less connected

The old rule the world

**What kinds of risks
and opportunities are
triggered by these
developments?**

While the potential future developments from our analysis can lead to risks, they could also lead to opportunities. Positive and negative effects can both be a consequence of change. This chapter also briefly presents some of the opportunities that could be created by the same development pathways that lead to the risk clusters. By contrasting risks and opportunities we show that the potential future developments are not only menacing, but create new positive chances at the same time. Decision makers have to be aware of the bad and the good to be able to navigate away from the risks and towards the opportunities, as much as possible.

3.1. Break-down of international cooperation



What is the risk?

Multilateralism has been a cornerstone of avoiding large-scale global wars since the end of World War II. However, current multilateral institutions are increasingly being challenged.⁷¹ Several factors make it difficult to ensure a functioning multilateral system. One of the issues is the difficulty in building consensus in negotiations with many parties involved,⁷² and there is a shift from multilateral to more bilateral relationships.⁷³ While income inequality between countries has declined recently, it still remains high, with an average income in the European Union being eleven times higher than in sub-Saharan Africa today.⁷⁴ This inequality makes it difficult to act on a level global playing field. US foreign policy volatility could be used by other powers seeking their own partnerships, which could lead to increased global trade costs.

Furthermore, the scarcity of life-sustaining

resources, such as water or food, is expected to be a driver of future wars.⁷⁵ The erosion of international cooperation could lead to breakdowns in diplomacy and communication, and can be ultimately a step towards armed conflicts with potentially devastating impacts. There have been signs of this development recently, with increasingly martial rhetoric between countries, for example between China and Taiwan.⁷⁶ The consequences of wars are dire. 2022 saw the highest number of deaths from armed conflict since 1984.⁷⁷ Many consequences are indirect too, such as the grave negative impacts on health, and the displacement of people.⁷⁸

Several **potential future developments** from the futures wheels in our analysis point toward **a breakdown of international cooperation**. Examples of such developments are depicted in Figure 13, and described below along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Societies across the globe being less connected could result in reduced communication and understanding across borders, which would make international cooperation more difficult. De-globalisation could induce a stronger focus on regional issues and regional supply chains too, also leading to more protectionist policies that might trigger conflicts between countries – in the worst case even **armed conflicts** or **terrorism**.

As human longevity increases and the proportion of old people voting in elections increases, **the old** could increasingly **rule the world**. There could be many impacts in society as a result, including that policies become more conservative and, similar to de-globalisation, more protectionist. This

71 Singh and Woolcock (2022)

72 Hampson and Heinbecker (2011)

73 Observer Research Foundation (2021)

74 Taconet, Méjean, and Guivarch (2020), United Nations (2020)

75 Gleditsch (2015)

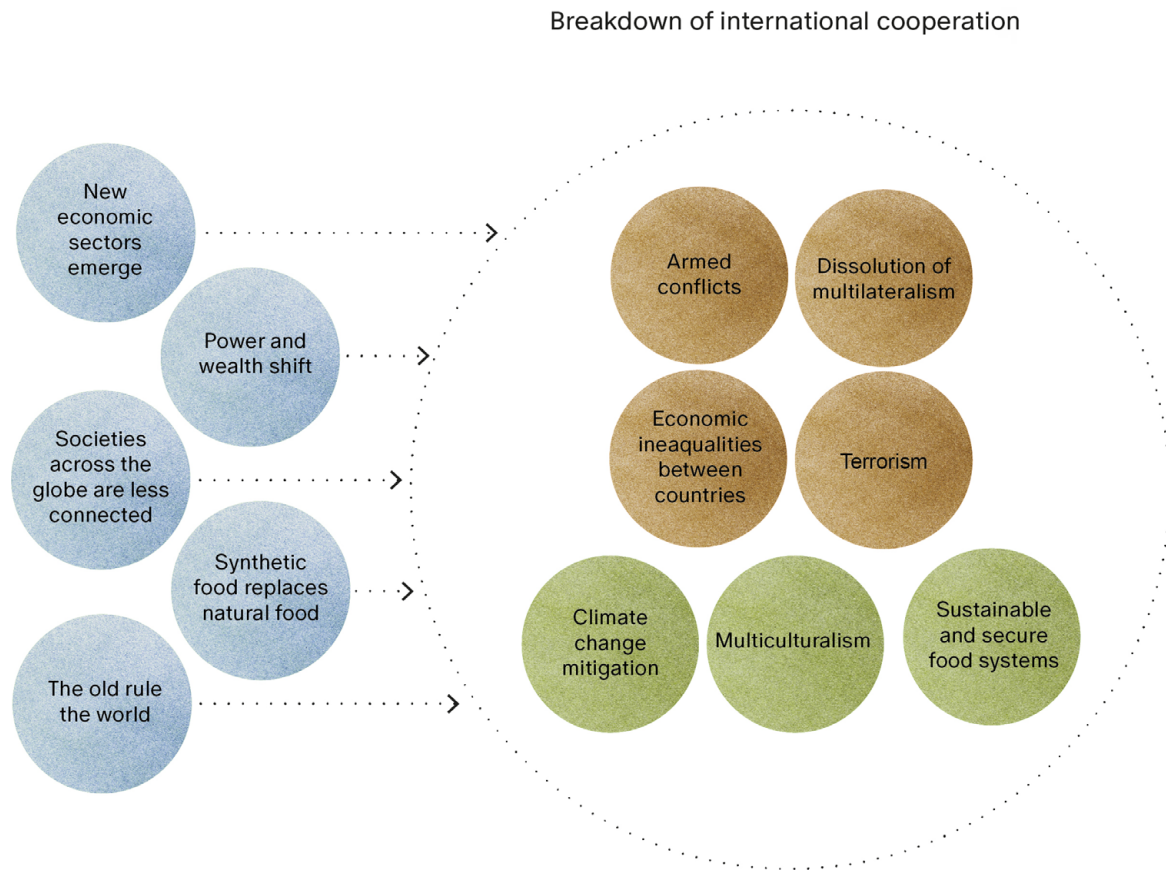
76 Obermeier, Strand, and Berry (2023)

77 Obermeier, Strand, and Berry (2023)

78 Murray (2002)

Figure 13: Overview of risk cluster breakdown of international cooperation (Source: Own illustration)

Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



development could lead to tension building within society and among multilateral organisations – if the benefit of one’s own country is placed more strongly above the benefit of any union. Protectionist policies could also lead to tensions within a country, and refocus all attention to internal issues instead of international ones, leading to a **dissolution of multilateralism**.

With ageing populations, demand for medicines could grow. Pharmaceutical companies could see an increase in profits and lobbying power as **new economic sectors emerge**. Another development leading to this risk is the **replacement of natural food by synthetic food**, which could lead to big changes in food production and a rethink of how the growing population is being fed. While there is hope that synthetic food could help to develop a carbon neutral food system, there could also be negative impacts. For example, new monopolies could concentrate the positive impact within countries that are able to fund innovation in this sectors. These developments could increase **economic inequalities between countries** and regions.

If governments have to react to new developments of a global scale at speed, the implementation of new regulation can be slow and there could be a regulatory vacuum that could in time lead to international conflicts. Several accompanying developments from the rise of new technology leaders, or the increasing importance of scarce resources could lead to fundamental shifts of geopolitical power. Such shifts could lead to ruptures in international relationships as established powers could try to protect their position by undermining the development of new rising powers. Following a **power and wealth shift**, there is an added risk of social unrest and even violence and **armed conflicts**.

How do potential future developments lead to opportunities of this cluster?

Less connected societies across the globe could result in a reduction in physical in person exchanges between countries and continents and thus fewer emissions due to long-distant travels, which would support the **mitigation of climate change**. **Less connected societies** and **power**

and wealth shifts could lead to an increased variety of languages, if English is not the dominant language globally anymore, and there could be more **multiculturalism** in the sense of a wider variety of local cultures. **Newly emerging sectors** can also create opportunities. For example, a fungi economy or synthetically grown food could replace carbon-intensive, non-domestic sources of proteins with local ones. The result could be a reduction in emissions and lower risks of supply disruption, and thus a more **sustainable and secure food system**.

In summary: concluding reflections

Developments that reduce connections between countries and regions globally, or increase protectionism within a country, can lead to lower cooperation and an increase of international conflicts. Another source of international dissent are shifting power structures, either because of the emergence of new technologies and industries, new leaders that bring a lot of uncertainty, or because of demographic developments. However, it is exactly international cooperation that is fundamental to finding solutions to the shared complex challenges humanity faces together – global solutions are needed for global problems. Nevertheless, on the flip side such fragmentation could have positive consequences for climate change, due to the reduction of movements of goods and people. If the trend of globalisation fully reverses, monoculturalism could once again prevail and local products could predominate over imports.

3.2. Decline of the European Union's economy



What is the risk?

The shift of global economic power from North America, Western Europe, and Japan, towards the emerging economies in the East and South looks likely to continue.⁷⁹ The economy of the European Union and its Member States has experienced several setbacks recently, such as recessions triggered by the COVID-19 pandemic, and the Russian invasion of Ukraine.⁸⁰ Such recessions are costly, as physical and human capital is destroyed leading to adverse long-term impacts and long recovery times.⁸¹ They trigger supply chain disruptions and price spikes in key commodities such as energy and food, increasing the cost of living.⁸² While economies inevitably experience cycles, past experience has shown that European businesses recovered more slowly from contraction periods than US companies, widening the productivity gap between these two regions.⁸³

Some countries are becoming more protectionist, making it more difficult for businesses to trade across borders, which could lead to a decrease in economic growth. A sluggish European economy has several consequences for its citizens. One of them is the increased risk of poverty and social exclusion, which affected 22% of the population of the European Union in 2022.⁸⁴ While this risk predominantly affects unemployed people (65% of unemployed were at risk), in-work poverty is still an issue, and is particularly associated with single-earning households and low work intensity.⁸⁵ The ageing population could also put a strain on the economy. Economic precariousness is a serious issue as it endangers political stability.⁸⁶ Being aware of current trends allows that steps can be taken to mitigate the future risks.

79 Cagnin et al. (2021), Gong et al. (2022)

80 OECD (2023)

81 Brunnermeier and Oehmke (2013), van der Hoog and Dawid (2019)

82 Guan et al. (2023)

83 Bravo-Biosca (2011)

84 Eurostat (2022)

85 Marx and Nolan (2012)

86 van der Hoog and Dawid (2019)

Several **potential future developments** from the futures wheels in our analysis point toward the possible threat of a **decline of the European Union's economy**. Examples of such developments are depicted in Figure 14, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

New financial services (such as those embedded in technology) could inadvertently **increase debt levels**, hindering economic growth in the long term. Downward pressure on gross domestic product could lead to a reduction of tax income for governments, and to an increase in **unemployment**. This combination would be problematic, as either a decreasing budget would have to be used to support people in need, or support would have to be reduced. In the latter case, the suffering of the most vulnerable in an economic crisis could become even worse.

A fundamental change to the energy mix in the European Union, for example one in which **nuclear energy experiences a renaissance** could be costly for the economy. Existing power generation assets may no longer be needed and are at risk of becoming obsolete. In addition, the investment required to build new infrastructure (for example power plants or nuclear waste management) might increase the cost of electricity in the long term, which could increase the number of households at risk of energy **poverty**. Dependency on overvalued dominating companies, could create stock market fluctuations and **financial bubbles**.

A strong focus on the green transition and on making **the economy more circular**, could have mixed impacts, also risking **economic contraction** in an age of **scarcity**. For example, the range of products on the market could decrease, which could lead to less innovation in the long term (less demand for new products). Some goods could also become unaffordable as the share of secondary materials increases, which would make them inaccessible to parts of the population.

The potential consequences of a **job market that becomes more flexible** could include indirectly

increasing **unemployment** and **poverty**. Essential workers and low paying jobs could still require in person workforces, exacerbating inequalities. In an environment with reduced job security, the livelihood of many workers is at risk. This is a particular issue for those who do not have sought-after skills profiles, or could easily be replaced – either by other humans or machines.

How do potential future developments lead to opportunities of this cluster?

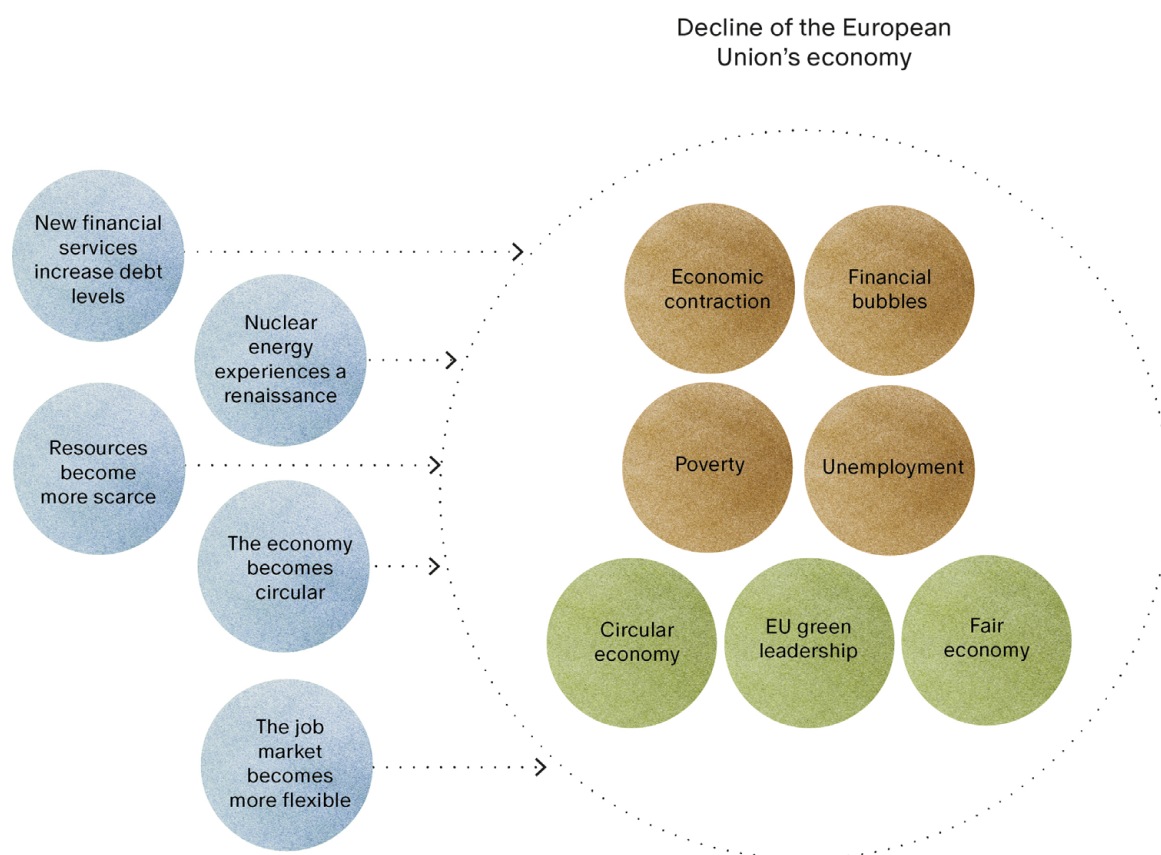
A **more circular economy** could lead to more distributed economic activity, as repair and recycling centres do not have to be as centralised as production sites of new products. It could also create more jobs in the low- to mid-skills categories and thus, lead to a **fair economy** with high-quality jobs. **Increased resource scarcity** could fuel the development of a **circular economy**, because re-using materials and prolonging product life cycles would reduce the need for importing primary raw materials. Lastly, the roll out of renewable energy technology and a new generation of **nuclear power** reactors could help the **European Union** to consolidate its **green leadership**.

In summary: concluding reflections

Economic decline in the European Union is risked if there is not careful consideration and monitoring of trade-offs associated with increasingly flexible job market developments, and new financial services that could inadvertently trigger impacts such as unemployment, wealth concentration, increasing inequalities, loss of social cohesion, and poverty. Developments that could occur in the seemingly distant area of new energy generation, resource scarcity, and the encouragement of a circular economy could enable the European Union to strengthen its green leadership. They could also create high-quality jobs, and promote the exchange of goods and services outside of traditional economic channels.

Figure 14: Overview of risk cluster decline of the European Union's economy (Source: Own illustration)

Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



3.3. Decrease of well-being



What is the risk?

After a long period of measuring success by monetary performance indicators, there is much discussion around refocusing the attention of policy makers 'beyond GDP', towards criteria that factor in sustainable well-being within planetary boundaries.⁸⁷ The WHO defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".⁸⁸ Its well-being index, while subjective and self-reported, is still widely used.⁸⁹ Indicators of societal well-being by the United Nations, the World Bank, the Organisation for Economic Co-operation and Development (OECD), non-governmental organisations, countries, and

academics are available.⁹⁰ Poor mental health often means having poor physical health, poor relationships, and a lower quality of life. It can mean being less able to succeed at school or work, and more likely to be unemployed.⁹¹

In addition, several developments (including war and climate change) have pushed psychological well-being (mental health) into the spotlight of treatment and research needs. The use of online media and constant sensory connectivity and stimulation has been linked to an increase in psychological problems such as stress, anxiety, and depression.⁹² While the young are especially impacted, it is not yet fully understood what the long-term implications will be. Furthermore, inequality and discrimination have a negative impact on well-being. There are several types of discrimination, including ethnicity, immigration status, gender, sexuality, disability, and age.⁹³

87 Huggins and Thompson (2012)

88 WHO (2023)

89 Topp et al. (2015)

90 Costanza et al. (2014)

91 Martin et al. (2022), Virgolino et al. (2022), WHO (2022)

92 Brailovskaia and Margraf (2020), Scott, Valley, and Simecka (2017)

93 Krieger (2014)

In a world with increasing migration, an ageing society, and a more open discussion of self-determination, these issues will become more visible. This is problematic, because not only is well-being negatively impacted by discrimination, so too is the sense of belonging to society,⁹⁴ significantly affecting its social glue. Physical well-being is under threat too, as diseases can spread faster in today's globalised world, and containing them is more difficult.⁹⁵ The future of wellbeing could encompass factors such as purpose, significance, sustainability, and positively impact future generations, mitigating risks of a decrease in wellbeing. A future where success is measured beyond monetary indicators and that shifts towards a more holistic and multidimensional approach of measuring success could reduce the risk of a decrease in well-being and instead secure an increase in well-being for future generations.

Several **potential future developments** from the futures wheels in our analysis point toward the possible threat of a **decrease of well-being** in the future. Examples of such developments are depicted in Figure 15, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Human-animal interactions and relations could become closer due to new technologies that allow communication between humans and animals and due to the loss of natural habitats of animals. This development could lead to the more frequent transmissions of diseases between them. Such transmissions present several risks. Existing diseases could mutate faster and become stronger, more quickly evading vaccines and ultimately become more threatening to humans. There could be increased **physical health issues**. In addition, new diseases might have no cures yet. Lastly, the risk of pandemics could increase.

Having ever **more information widely available** can induce overload, which could

have a severe impact on psychological well-being. Such an overload could also trigger or increase **mental diseases**. **Niche thinking can increase** the challenges of **psychological harm** and **discrimination**, if different social groups communicate in isolated echo chambers, exposed to hackers and disinformation. It could lead to a more individualistic, fragmented society, which could have knock-on effects on shared knowledge and even democracy.

If **the innovation landscape becomes more fragmented** this could induce more local research in the short term, but the speed of innovation could slow down globally. This development could pose several risks, including substantially influencing capacity to react to new health threats, and less effective vaccines, risking increased **health issues** and reduced progress towards cures. Lower levels of international cooperation and slowed down global research leads to slower innovation cycles, which makes it less likely to develop effective new medicines quickly. Lastly, a fragmented innovation landscape could limit accessibility to state-of-the-art drugs, if export limitations are put in place to ensure local population have sufficient quantities.

Synthetic food replacing natural food could mitigate climate change and guarantee food security. However, it also presents several risks when it comes to well-being and questions about who is in charge of the synthetic food. For example, synthetic food taking over could have a substantial impact on the current food industry and farming practices, and could negatively impact rural communities. It could potentially lead to the collapse of many existing food industry branches bringing massive unemployment, and with that **psychological health issues**. An unregulated parallel economy, or black market could develop, risking **new diseases emerging** as a consequence.

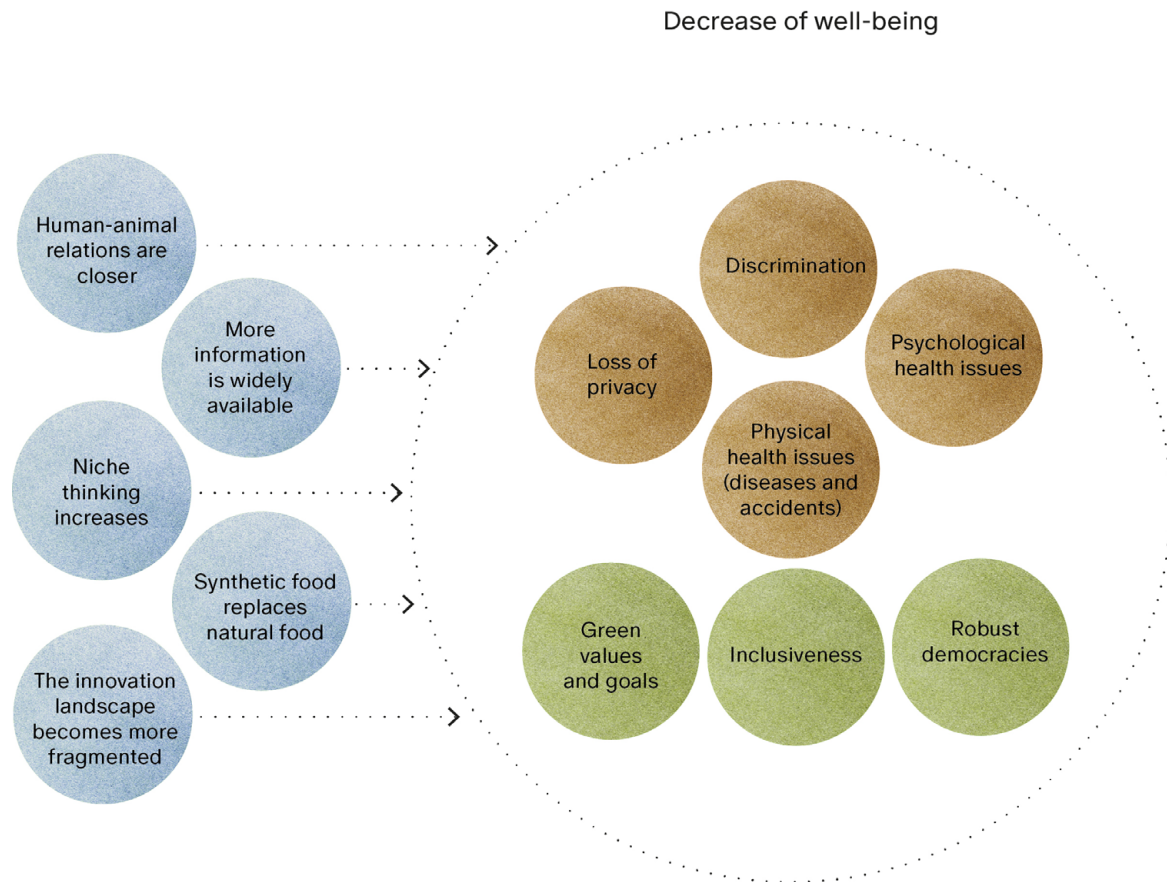
How do potential future developments lead to opportunities of this cluster?

More information being available can make the negative impacts of environmental degradation

94 Wu and Finnsdottir (2021)

95 Fidler (1996), Fukuda-Parr (2003)

Figure 15: Overview of risk cluster decrease of well-being (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



more visible to the wider public and thus help to boost **green values and goals** as well as understanding and support for the green transition.

Furthermore, **more available information** and **niche thinking** could also lead to more **inclusiveness**, as more tailored and personalised information can cater to the interests of a more pluralistic society. Lastly, a **more fragmented innovation landscape** could lead to more local research efforts and the build-up of local knowledge and awareness and thus, **strengthen** more federal and bottom-up **democracies**.

In summary: concluding reflections

With potential knock-on effects emerging following developments in new food consumption pathways, and the widening infodemic of widely unfiltered information available, alongside increasingly isolated niche thinking and a fragmented innovation landscape, there could be increased discrimination and a loss of privacy for individuals. Measures of well-being could subsequently decline via a variety

of drivers, as society runs the risk of increased psychological and physical health issues. However, the availability of information, combined with the fragmentation of innovation, could encourage the emergence of local solutions, including those to address green goals. Multi-stakeholder approaches and these solutions could strengthen community ties and inclusiveness, as well as improve overall mental health, overall wellbeing, and thereby strengthen democracies.

3.4. Disrupted critical supply chains



What is the risk?

Growing demand for goods and services puts a strain on supply chains and makes them more vulnerable to disruptions. Unexpected shocks such as the COVID-19 pandemic can trigger substantial disruptions of various critical supply chains. The pandemic and most recently Russia's war on Ukraine have provided a first glimpse of how a

failure of supply chains can impact citizens.⁹⁶ The most obvious effects have been experienced through worldwide inflation and may be so severe in the future that they further risk national access to food.⁹⁷ However, other impacts should also be considered,⁹⁸ including the shortage of medicines and critical raw materials. The European Union is dependent on the import of several critical raw materials that are essential for electric cars or wind and solar power generation.⁹⁹ China is the main supplier for a number of critical materials (lithium-ion batteries, magnets, and rare earth metals among others) and potential future geopolitical tensions between the European Union and China may cause a disruption of their delivery. They may for example decide to restrict exports or introduce new environmental policies that may limit their production processes.¹⁰⁰

Lastly, there is the risk of failure of critical infrastructures in the European Union, such as the energy or health systems. Such failure could be induced by several triggers, such as climate change events, or cyber-attacks.¹⁰¹ These factors pose significant challenges that need to be addressed to ensure the resilience of supply chains and critical infrastructures that can withstand disruptions and ensure the continued flow of goods and services for the future.

Several potential future developments from the futures wheels in our analysis point toward the possible disruption of critical supply chains in the future. Examples of such developments are depicted in Figure 16, and described along with specific risks and opportunities they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Food systems are under pressure today, and several potential developments lead to pathways where **access to food is becoming less secure**

in the future. A reduction in agricultural trade could **interrupt food supply** and increase the risk of famine in several countries. This development may drive the production and access to new types of food, such as artificial meat or genetically modified crops to meet demand, with potential risks for health and health systems if the nutritional value is not properly regulated. A less secure food supply could also drive the **replacement of natural food by synthetic food**. A shift in production methods of foods that are no longer locally and naturally grown may also lead to a centralisation of food production and the takeover of food systems by large corporations. Therefore, with the event of synthetic food gradually replacing natural food, a new area of food insecurity could be introduced which may again strengthen the risk of a failure of critical supply chains.

The growing level of **digitalisation** exposes increasing **vulnerability** to cyberattacks, and such a risk is increased further by technology dependency on other countries (e.g. 5G communication technologies). System failures due to hacking, personal data exposure, and identity theft are all potential cybersecurity risks. Breaches of data could be caused by hackers or terrorists looking for ransom. If cyberattacks are launched that cause a **failure of a certain critical infrastructure** (e.g. power generation or water treatment), cascading effects may cause other critical infrastructures of cities and states to also shut down, further threatening the security of civilians.

With a shift to new business models and green technologies, **new dependencies on critical resources are created**. The production, delivery, but also processing (separation and purification) of some critical raw materials is still strongly led by China. Alternatives to this **dependency** are urgently needed as Europe's **demand for critical raw materials** will grow. This development could lead to the invention of new durable materials,

96 OECD (2022)

97 RAND (2021)

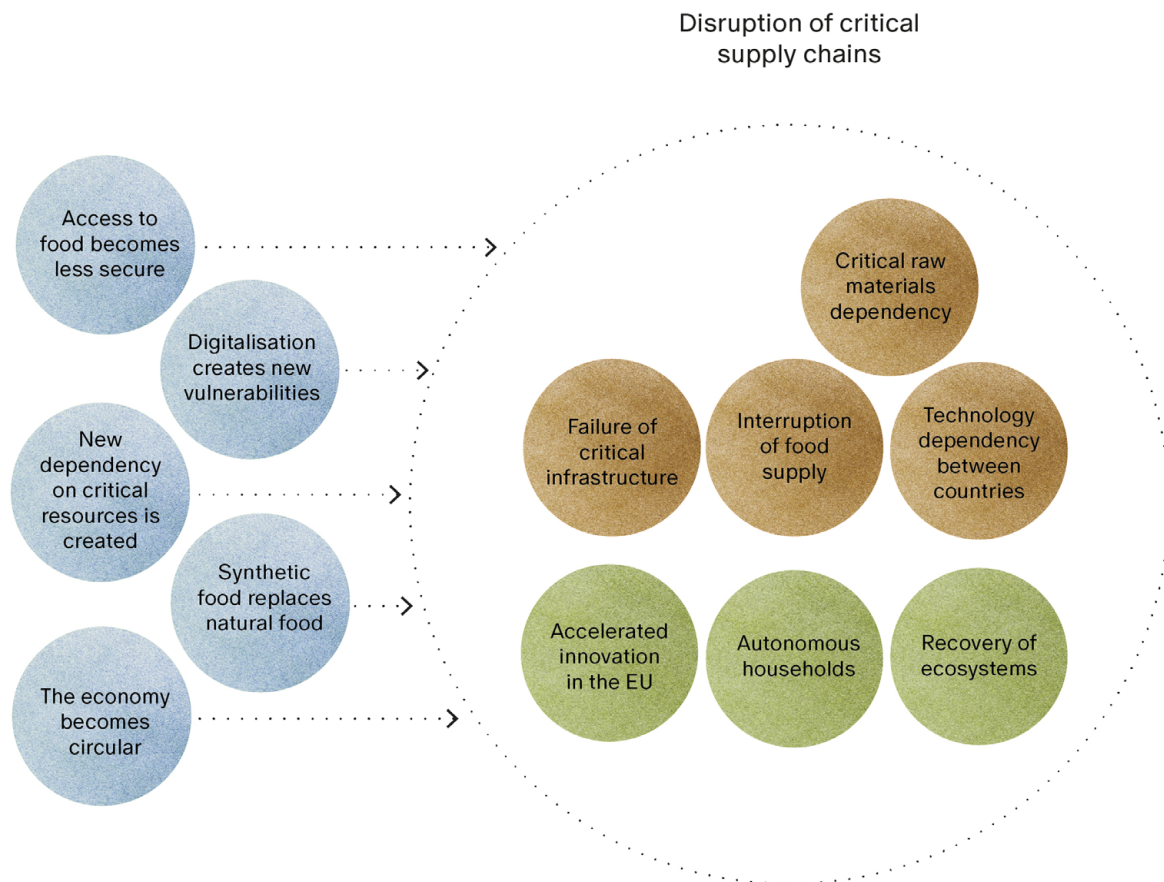
98 Béné and Devereux (2023)

99 Rabe, Kostka, and Smith Stegen (2017)

100 RAND et al. (2022)

101 Alcaide and Llave (2020), Silvast et al. (2021)

Figure 16: Overview of risk cluster disruption of critical supply chains (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



strategic technological inventions, and the expansion of recycling methods to avoid the risk of shortages of goods, **technology**, and **raw materials** caused by too strong **dependencies** on only few suppliers.

How do potential future developments lead to opportunities of this cluster?

A **more circular economy** could reduce reliance on the imports of raw materials and at the same time reduce pressure on the environment, as less primary raw materials would have to be exploited. It could thus lead to a **recovery of ecosystems**. While **vulnerabilities created by digitalisation** could induce supply chain disruptions due to technical glitches, they could also lead to the development of sustainable measures for self-reliance that are not dependent on digital infrastructure, and thus lead to more **autonomous households**. Lastly, **new dependencies on critical resources** could trigger **accelerated innovation** in the European

Union to find substitutes that do not create dependencies on third party countries that are sometimes not reliable.

In summary: concluding reflections

The European Union has benefitted from low-cost and stable critical supply chains in the past. These supply chains were enabled by globalisation and international collaboration as well as new technologies (e.g. digitalisation). However, while these aspects led to efficient supply chains, they have reduced their resilience. For example, dependency on technologies and critical raw materials has increased. With changing paradigms introduced by the green and digital twin transitions (e.g. fast mobile internet or green power generation), new dependencies on technologies and raw materials are being created, that make the achievement of European Union targets dependent on third parties. A big challenge for politicians is to increase the resilience of critical

supply chains without a dramatic loss of economic efficiency. However, pressure on critical resources could boost investment in research and innovation for solutions that are less dependent on resources held by competitors and, as a result, limit the need for imports.

3.5. End of dominance of humans



What is the risk?

Several factors could contribute to the risk of an end of dominance of humans on Earth. In support of a (sustainable and healthy) eco-democracy, Planetary and One Health approaches are paving the way towards the introduction of rights for non-humans, including animals and ecosystems.¹⁰² The calls for these concepts are based on the recognition of the links and dependencies between humans, animals, plants, the environment, and the planet as a whole. Informed by the Earth System Council, a UN-based security council that explores environmental legal reforms,¹⁰³ eco-democracy could even go as far as creating equal legal standing for humans, animals, and the environment. Such a development would render many of the exploitative lifestyles of humans impossible.

Furthermore, humans are increasingly dependent on technologies and this reliance could become an issue if technology is not at the service of citizens, animals, and the planet. For example, AI is increasingly used as a tool in decision making. However, it still lacks analytical thinking and thus could lead to poor decision-making if technical failures are overlooked.¹⁰⁴ If AI surpasses human capabilities it could shift power dynamics. The threat of AI is being perceived as very serious and calls become louder to slow down the development of AI-based tools.¹⁰⁵ The threats posed by AI are manifold and include a loss of control, the misuse of lethal autonomous weapons, the manipulation and discrimination of people, and substantial

impacts on work and employment.¹⁰⁶ The question is whether tools will be designed and implemented in a way that generates shared and positive benefits at the service of workers, humanity, and the planet for the longer term future.

Several **potential future developments** from the collection of futures wheels in our analysis point to the potential **end of dominance of humans** in the future. Examples of such developments are depicted in Figure 17, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks linked to cluster?

If **animals are granted improved rights**, there could be many potential knock-on effects. While the environmental benefits appear obvious, granting animals rights similar to humans would **risk a loss of power and representation by humans**. Non-human political representation could make it very difficult to reach consensus in society, **induce inefficient decision-making processes** and destabilise governments. Humans are currently a main cause of the extinction of animals, and more rights to other species would mean that all humans have to accept severe limitations with regards to how they behave towards them, or face legal repercussions.

With a **stricter protection of natural habitats**, the way land is used would have to be rethought. It would severely influence housing space for a growing population, reduce access to natural resources, and limit transportation options for humans. Effective, timely solutions would be needed or severe negative implications could be the result for society. For example, supply chain disruptions from a lack of raw materials could **slow down innovation**. **Research and innovation strongly focusing on green technologies** could also lead to the same effect. While these investments could likely lead to high innovation rates in the green

¹⁰² Gray et al. (2020)

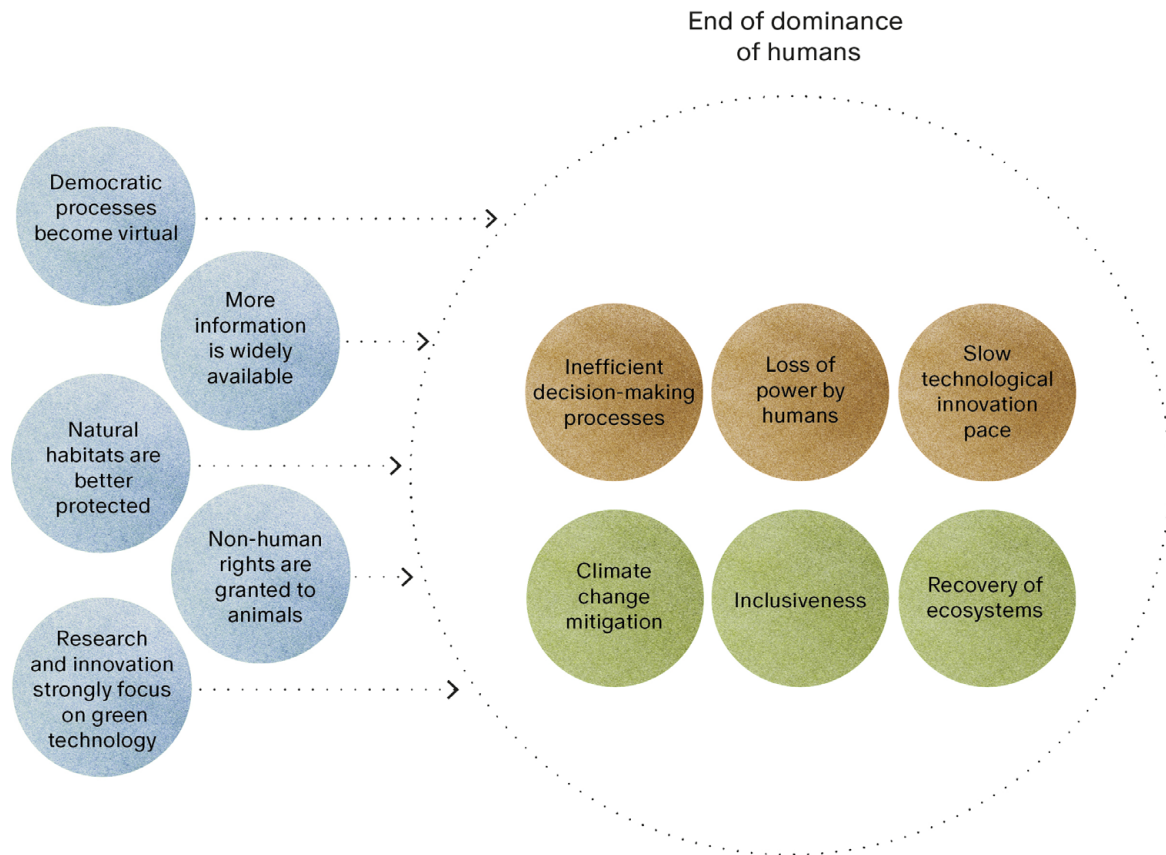
¹⁰³ Burke and Fischel (2016)

¹⁰⁴ Beard et al. (2023), Lerner and Berg (2015)

¹⁰⁵ Koskimies et al. (2022)

¹⁰⁶ Federspiel et al. (2023)

Figure 17: Overview of risk cluster end of dominance of humans (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



tech sector, it could lead to problems in other areas, such as unemployment, or non-innovative policymaking.

If **more information is widely available**, and came from wider sources, there could be many benefits for society and democracy, but it could also become more difficult to process all the relevant details before making any decision. Fact checking in an 'infodemic' becomes a challenge. If technology and AI open up machine-human-animal interfaces, and **democratic processes become virtual**, tech biases could be introduced. The reliance on AI could therefore become problematic if hidden. In addition, unequal access to technologies and varying digital skills levels could lead to the exclusion of parts of society and further the biased discourses. Both of these issues could ultimately lead to **flawed, biased decisions**.

How do potential future developments lead to opportunities of this cluster?

While these potential future developments create risks, they could also lead to opportunities. For

example, **improved rights being granted to animals** and a **better protection of ecosystems** could limit access to resources in the short term, they could lead to a **reduction of global warming** and a **recovery of ecosystems**, which are essential for the survival of humans. Similarly, the **increase of available information** might make it difficult for humans to process it without relying on AI. Nevertheless, it can lead to a better informed society, particular when it comes to the issues of minorities, and this can lead to more **inclusiveness**.

In summary: concluding reflections

Humans have evolved and thrived to become a dominant, powerful species, but this does not necessarily mean that they are at the apex of any pyramid (ecological, food, or evolutionary), as many believe. A loss of power and representation is one risk that humanity is facing. Such a development could help in mitigating climate change and could also foster a recovery of ecosystems. If more information becomes increasingly virtual, AI-

based, and more widely available, it could enhance inclusiveness but at the same time increase the risk of further interference via bias and misinformation campaigns. This could ultimately lead to poor and inefficient decision making.

3.6. Erosion of democracy



What is the risk?

Europe faces a continued loss of trust in political institutions in some Member States and the rise of authoritarian regimes. This trend may have been triggered by many causes, one amongst them the overemphasis of ‘legalism’¹⁰⁷ of the European Union.¹⁰⁸ Another potential trigger is the decreasing interest of younger generations in political engagement, which leads to a disconnection between them and political decision makers.¹⁰⁹ There is an increasing need for critical thinking skills as well as quality news and media production, as the appeal to emotions and personal beliefs is becoming more influential than objective facts, and social media and technology are influencing political behaviour.¹¹⁰ Increasingly polarised societies with deep divisions between different groups of people can make it difficult for governments to find common ground and build consensus, further eroding democracy.

Foreign interference in elections also damages democracy. Strong cynicism about political leaders and existing democratic values as well as more possibilities to express views and criticism of governments can lead to the approval of authoritarian leaders.¹¹¹ Populist and nationalist movements have been gaining ground, factors which can undermine trust in democratic institutions and processes. Current democratic values are also under threat when political leaders do not keep their promises and voter expectations are thus not met.¹¹² Nevertheless, the pressure on democratic values could also be an opportunity to

re-evaluate function and structure of governments, for example by introducing more dynamic and participatory governance models involving citizens in the shaping and delivery of policies.¹¹³

Several **potential future developments** from the futures wheels in our analysis point toward the possible threat of an **erosion of democracy**. Examples of such developments are depicted in Figure 18, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Increasing inequalities in Europe make it difficult to find common ground among groups in society. Furthermore, if elections are decided by the **old majority**, politics could disadvantage future generations. In such a case, young citizens might **lose trust in political institutions**. If political systems do not accommodate participation, contestation, and power-sharing, there is a risk of lack of legitimacy and accountability. If political institutions place unfair burdens on certain groups, there is the risk of fostering resentment among those left behind, and ultimately **losing democratic values**.

If **governments become transparent**, it would allow closer scrutiny of political decision-making processes. With higher scrutiny comes the possibility of unveiling more political scandals or transgressions of political decision-makers. This development could be harmful for political institutions if private companies remain less transparent and only the political transgressions remain revealed, because it could amplify the possible shift of power from public to private entities and further fuel a **loss of trust in political institutions**.

The manipulation of society through new technological channels could allow further

¹⁰⁷ Legalism refers to a very close following of legal rules, sometimes without considering their original intention.

¹⁰⁸ Oleart and Theuns (2023)

¹⁰⁹ Mounk and Foa (2016)

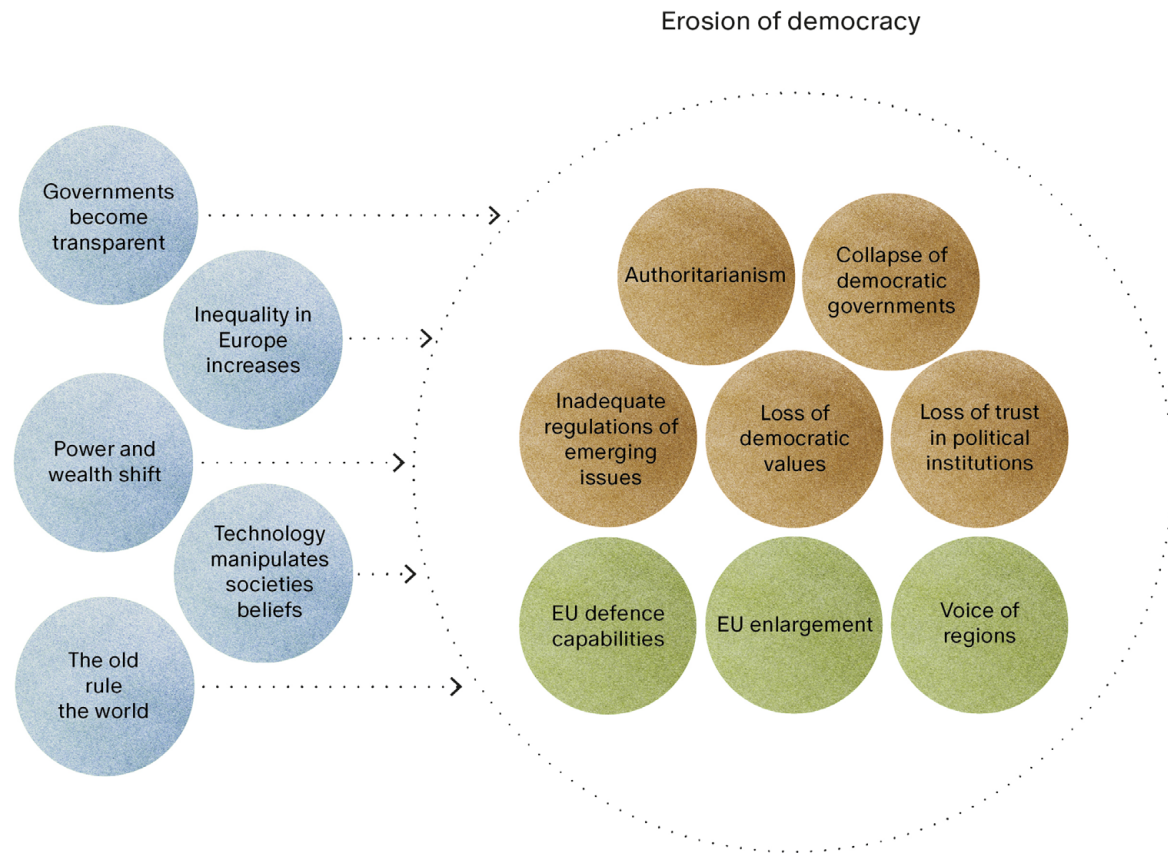
¹¹⁰ Garcia et al. (2020)

¹¹¹ Mounk and Foa (2016)

¹¹² Cave (2015)

¹¹³ Besley and Dray (2022), Cave (2015)

Figure 18: Overview of risk cluster erosion of democracy (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



interference in political processes, such as elections, leading to manipulation and potentially the **collapse of democratic governments**. As witnessed during the Brexit referendum for example, targeted nudging can identify people that are easy to manipulate and give them the impression that extremist opinions are mainstream. Such developments could lead to a more fragmented and individualistic society, when finding common ground, particularly in political decision-making, is more difficult. The establishment of extremist groups could be a result if groups feel that no other option remains. A **rise in authoritarianism** could further trigger the spread of disinformation and lack of political stability.

A **power and wealth shift** could follow the exploitation of new sources of raw materials (e.g. in Space or deep seas), such as in the access to and benefit of the resources. Multilateral organisations will play an important role in developing these regulations, but it might be difficult to enforce them if some countries don't

stick to their agreements. In monopolistic markets, and technology-driven societies, there is also the possibility of an imbalance and shift of power from governments to private entities, which would reduce the agency of governments to introduce and enforce necessary 'human-centric' regulation, and **inadequate regulations** could impinge broader societal benefit.

How do potential future developments lead to opportunities of this cluster?

The overrepresentation and **influence of the old** on political decision making could focus attention that results in improved, secure social support systems. This could lead to more willingness to **enlarge the European Union**, in order to attract young talent and labour that can support the economy and particularly the health system. The orientation towards conservative policies, associated with the **transfer of power and wealth** to rising powers that can seek a direct confrontation, could lead the **European Union** to an increase in its

defence capabilities. If technologies allowing the **manipulation of beliefs** emerge and grow, they could also allow better, more tailored small-scale political campaigning and lead to a shift to more regional governance and thus more dominant **voices of regions**.

In summary: concluding reflections

Increasing imbalances of power, inequalities, and polarisation in society pose a risk for democratic values, systems, and institutions. Government failures to act to protect citizens against inequalities, price rises, and shortages for example, can unite people across societies on their shared grievances. The result can be protests, which hurt faith in democracy and make room for authoritarian regimes. Another result could be a loss of political stability that risks democratic collapse. If democracy in the European Union (and globally) is under threat, understanding the reasons for it is important. It appears that there are multiple pathways, different developments driving this risk, and not one single pathway to monitor. However, these developments could give rise to the strengthening of the European Union's defence capacities, complete the ongoing enlargement processes, and strengthen the voice of European regions.

3.7. Failure of the green transition



What is the risk?

Anthropogenic greenhouse gas emissions are already increasing the occurrence of weather extremes and climate change models point to further increases.¹¹⁴ This development has direct implications for the European Union and its citizens. For example, with global warming of 3°C by the end of the century, there could be more frequent and severe wildfires across the European Union and substantially decreased water availability

in Southern Europe and beyond.¹¹⁵ There are risks of food shortages, supply chain disruptions, and increased health and costs of living issues. Furthermore, biodiversity has been continuously decreasing in recent years with more and more species coming under threat.¹¹⁶ Nevertheless, current climate mitigation efforts would merely limit global warming to 2.8°C by the end of the century.¹¹⁷

As the first region to have a legally binding target to reach climate neutrality by 2050, the European Union is the frontrunner when it comes to environmental protection. However, the European Union is at risk to miss its own targets for 2030.¹¹⁸ In addition, other regions are catching up with regards to the production and deployment of green technologies such as renewable energy or electric vehicles.¹¹⁹ There is a need for profound change in the way we live. These challenges threaten climate goals and collectively risk not ensuring a successful transition.

Several **potential future developments** from the futures wheels in our analysis point toward the possibility of a **failure of the green transition**. Examples of such developments are depicted in Figure 19, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Environmental risks are driven by many potential future developments explored (such as temperatures rising, water demand increasing, waste being dumped off Earth, or nuclear energy experiencing a renaissance). Many of the technologies that are needed to become more sustainable (e.g. batteries, solar panels, or wind turbines) rely on the use of critical raw materials that are not sufficiently produced in the European Union. Therefore, Europe's increasing **dependency**

¹¹⁴ International Panel on Climate Change (2023)

¹¹⁵ Feyen et al. (2020)

¹¹⁶ International Union for Conservation of Nature (2023)

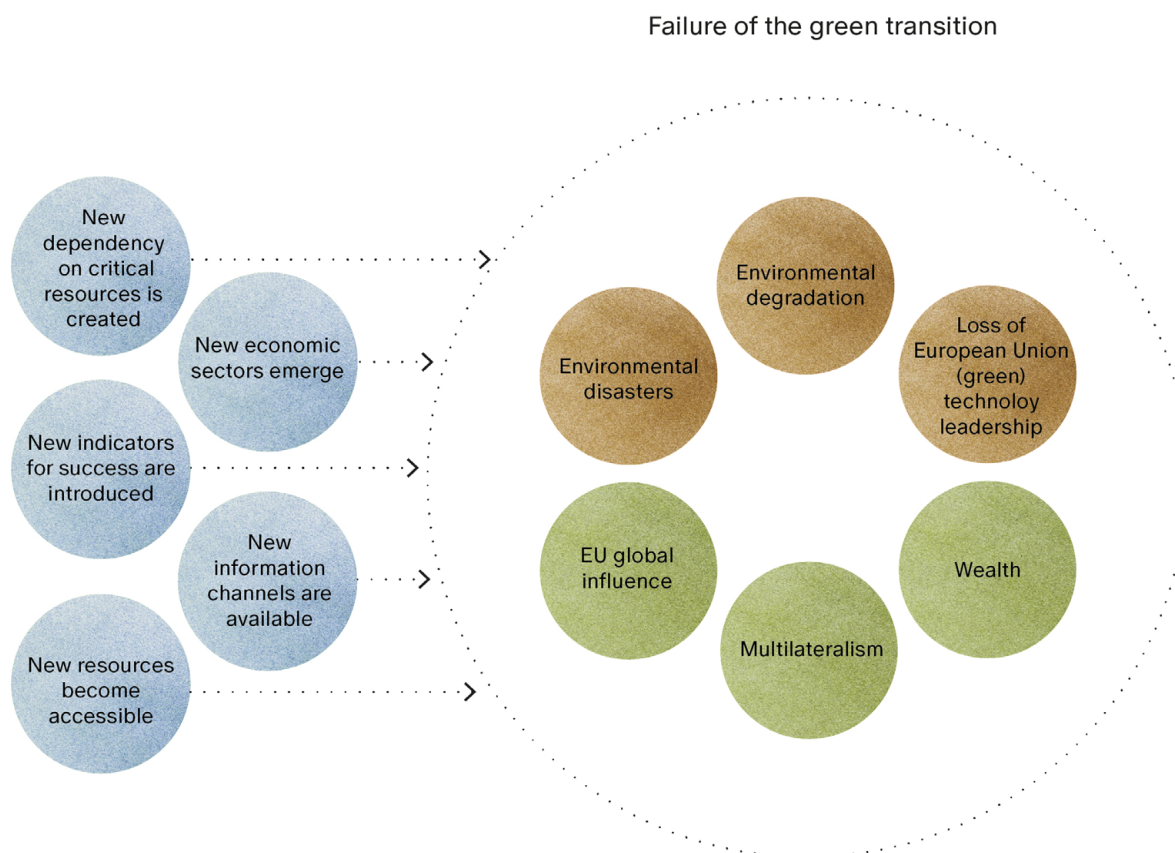
¹¹⁷ United Nations Environment Programme (2022)

¹¹⁸ European Court of Auditors (2023)

¹¹⁹ International Energy Agency (2023a), International Energy Agency (2023b)

Figure 19: Overview of risk cluster failure of the green transition (Source: Own illustration)

Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



on the **import of critical resources** makes the European Union vulnerable in the case of export restrictions in the countries supplying them. In such a case, it would not be realistic for the European Union to meet green targets, and the frequency of **environmental disasters** could increase.

New resources might become available for raw materials, for example via deep sea mining or the exploitation of other planets. These new sources for raw material extraction could reduce the pressure to transform the economy into a circular one. However, resource consumption is only one of many environmental issues, and the processing of materials and usage of man-made products would still lead to emissions, hence leading to continued **environmental degradation**.

Environmental action is a catalyst for the development of new solutions and new economic sectors could emerge. While the European Union has a good track record in the development of green technology, when it comes to rolling out these solutions at scale and becoming global

market leaders, Europe has already shown in the past that it is not always able to compete with other regions in the long term. Furthermore, the **introduction of new indicators for success** only in the European Union could increase environmental performance and well-being, while both developments could at the same time lead to missed business opportunities and a **loss of the European Union's (green) technology leadership**.

New information channels available and an increasingly fragmented information space could lead to the dissemination of misinformation and misinterpretations of information about environmental issues. It could also spread erroneous solutions that go against the established scientific consensus. Fake information channels could lead to a rise of environmental scepticism and ultimately make it harder for the European Union to limit **environmental degradation**.

How do potential future developments lead to opportunities of this cluster?

The **exploitation of new resources** could enable economic growth and the creation of **wealth**. **New dependency on critical raw materials** could lead to a more active European foreign policy agenda to reinforce existing and build new alliances and ultimately strengthen **multilateralism**. The **emergence of new economic sectors** is also an opportunity for the European Union to become technology and market leader in growing business sectors and, hence, increase its **global influence**. However, these opportunities are rather short-term effects that are most likely negated by the negative consequences of a **failure of the green transition**.

In summary: concluding reflections

Several development pathways emerging from the different futures wheels could reinforce change that instead of climate change relief, could have negative and undesirable consequences. Whilst new resources and economic sectors could emerge from good intentions and foster wealth and multilateralism, they could mean exacerbated dependencies, and inadvertently increase the risk of further environmental disasters and degradation, instead of a net positive impact. New indicators for measuring societal well-being and policy success, and new channels of sharing information could be introduced, strengthening the European Union's global influence, but as pressure is released in some areas, it could be redistributed, and instead, feed into outcomes that adversely impact the environment.

3.8. Lawless society



What is the risk?

There is a risk of a lawless society where established rules are flouted in the European Union, as observed across several current trends. High crime levels pose a significant challenge for policy makers in the European Union, as they have implications for the security of citizens and communities. In

the European Union, 3,690 intentional homicides were recorded in 2021, which is a decrease of 4.3% compared to the previous year.¹²⁰ Similarly, the European Union experienced a decrease in the number of recorded offences for many crime categories, such as robberies, burglaries, and theft, marking the lowest offence rates since 2010. However, cybercrime levels have multiplied recently, and are a serious issue for authorities.¹²¹ And there are other types of crimes that are on the rise, such as sexual violence and fraud.¹²²

A particular development in the European Union is the international dimension of serious and organised crime, which makes collaboration between Member States an absolute necessity.¹²³ Another relevant aspect of crime is the perceived risk of being a crime victim, which varies substantially across different Member States. Research suggests that high unemployment rates correlate with irrationally-high levels of anxiety about crime.¹²⁴ Increasing economic inequality and social exclusion within the European Union can also contribute to a rise in crime and social unrest, contributing to a breakdown in law and order. Strengthening social cohesion will be key to ensuring a law-abiding, safe and secure European Union for future generations.

Several **potential future developments** from the futures wheels in our analysis point toward a **lawless society**. Examples of such developments are depicted in Figure 20, and described along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Metaverses constitute a new and potentially fast growing type of platform that can fundamentally change the way some businesses work. They may offer opportunities as they could potentially trigger innovation and the creation of new profitable markets. Such disruptive new business models

¹²⁰ Eurostat (2023)

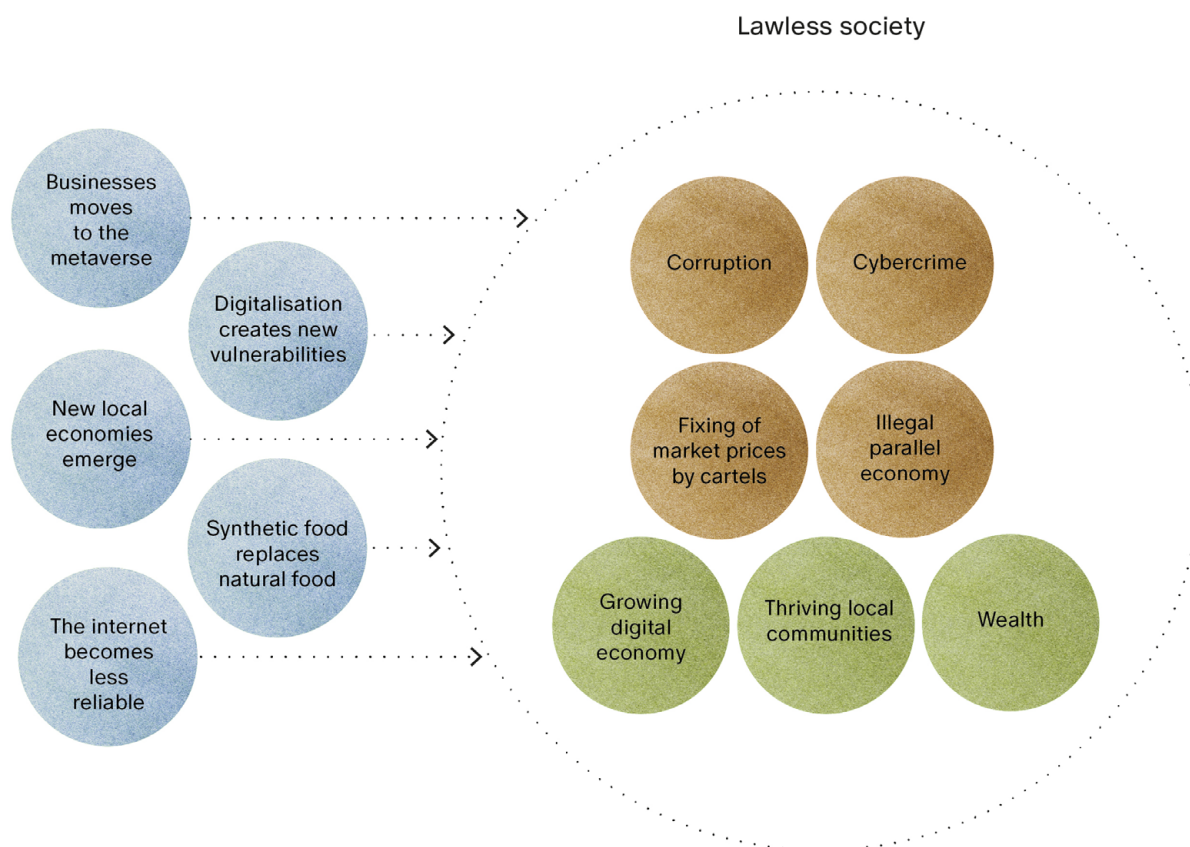
¹²¹ Lee and Wang (2022)

¹²² Eurostat (2023)

¹²³ Block (2008)

¹²⁴ Buil-Gil et al. (2021)

Figure 20: Overview of risk cluster lawless society (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



and innovations create a space for new players to become dominant. This development could, at the same time, introduce monopolistic market structures. Competition authorities might need to step in to address any dominant position on the market and address the **risk of cartels**, monopolies, and too-powerful big tech.

The continued trend of **digitalisation creates new vulnerabilities** too. In particular, users of digital services who are not familiar with cybersecurity are at risk of unknowingly exposing personal data. They are vulnerable to becoming victims of **cybercrime**, such as identity theft and ransom demands. Hacking could also induce system failures and public infrastructure could shut down. Unstable communication channels and widespread disruptions in internet connectivity could lead to a reverse in the current trend towards virtual payments. If **the internet becomes less reliable**, reverting back to cash instead of digital transactions could create a multitude of loopholes

for illicit transactions and lead to the creation of **illegal parallel economies** (black markets).

The **localisation of economic activities** and political power could lead to an increase in small-scale businesses and decision-making. Such a shift to smaller scale human activity raises the risk of **corruption**, as the monitoring of a higher number of small-scale, dispersed market players is difficult to achieve.

If new food industries in **synthetic food** emerge that **replace natural food**, there could be fundamental disruptions in the food system that could lead to a fallout between those pushing for new ways and those relying or depending on existing structures. One of these examples is the substitution of natural food, such as meat, with synthetic alternatives. There might be wide opposition in society to eating synthetic, or 'unnatural meat', which could in turn lead to **illegal parallel economies** for food products.

For example, a black market for ‘illegal meats’ could emerge.

How do potential future developments lead to opportunities of this cluster?

Digitalisation creates not only **new vulnerabilities** but also new opportunities, such as **metaverses**, which could attract new business that roll out new business models. Another example for a new, growing business segment is **synthetic food that could replace** carbon-intensive **natural food** sources in the future. All these developments bear risks as described above but could also catalyse a **growing digital economy**, and ultimately lead to an increase in **wealth**. In contrast, **new local economies** and a **less reliable internet** could trigger a more decentralised, more local economy which could strengthen **local communities**.

In summary: concluding reflections

While crime in many areas of society has declined, there are several developments that require attention for the future. Digitalisation certainly is one of the domains that creates new economic activities and, consequently, greater wealth. But at the same time, it has opened up new avenues for crime, such as identity theft. Another example is the emergence of new technologies, products, and business models that could lead to a market concentration enabling the biggest players to abuse their market power. Political decision makers have to keep up with these developments at speed to make sure that adequate legal frameworks are in place to govern these new technology and societal areas. The response to such risks and vulnerabilities could foster the use of local trustful resources, leading to thriving local communities.

3.9. Social division



What is the risk?

The European Union is a rich and diverse region with many cultures, languages, and religions which are a source of strength, but which can also lead to social divisions. Future economic growth can lead to increased wealth overall but also to a widened gap between the rich and the poor, exacerbating inequalities.¹²⁵ In fact, the poorest 40% of the population of OECD countries has not profited much from the overall economic growth since 1985, and in some cases have even experienced a decrease in income in real terms.¹²⁶ Globally, there is also a substantial wealth inequality with the eight richest individuals owning more than the poorest 50% of the world’s population together.¹²⁷ In the European Union, some Member States have high levels of income inequality as measured by the Gini coefficient, in particular Bulgaria (39.7), Latvia (35.7), Lithuania (35.4), and Romania (34.3).¹²⁸ However, income is not the only source of societal division. Other sources include gender inequalities, ethnic inequalities, inequalities in education, geographies, the labour market, and health, and the existence of different social classes.¹²⁹

An uneven distribution of the adverse effects of climate change around the world is also growing.¹³⁰ Missing social cohesion is problematic, as it is a significant driver of well-being and stability.¹³¹ A lack of social cohesion has been linked to protests and riots as well as prevailing structural privilege and power for some social groups and the stigmatisation of others.¹³² For the future, the European Union will need to be aware of the drivers of risk for social division to build a more cohesive future.

¹²⁵ Cohen (2011), Albertini, Ballarino, and De Luca (2020)

¹²⁶ OECD (2015)

¹²⁷ Oxfam (2017)

¹²⁸ Eurostat (2022). The Gini coefficient indicates deviations from equally distributed income and ranges from 0 (perfectly equal) to 100 (all income in one country goes to one person).

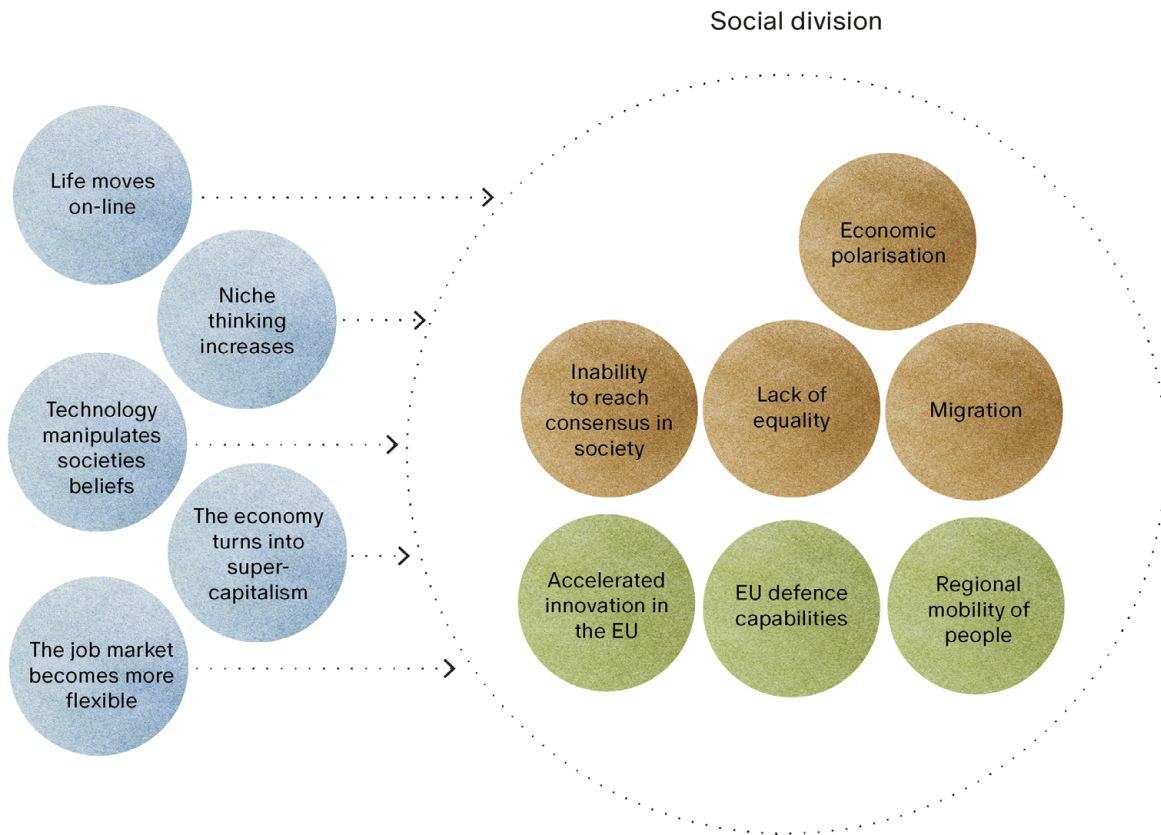
¹²⁹ Anthias (2001)

¹³⁰ UN DESA (2017)

¹³¹ Delhey and Dragolov (2016)

¹³² Antonucci and Varriale (2020), Cohen (2011)

Figure 21: Overview of risk cluster social division (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



Several potential future developments from the futures wheels in our analysis point toward increasing social division and widening inequalities. Examples of such developments are depicted in Figure 21, and described along with specific risks and opportunities they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Growing digitalisation could lead to the creation of new classes in society. As our physical **life moves online**, some groups of society might not be able to participate in it to the full extent, exacerbating social isolation and digital divide. Social groups at risk include rural communities with lack of access to fast internet, older citizens that do not have the skills needed to access digital services, and those who cannot afford the hardware needed to access digital services. The result would be a **lack of equality** between different social groups.

In a world with increasingly fast innovation cycles, it can be hard for some people to keep up with

new developments. If **the job market becomes more flexible** it can also lead to a low job security situation for some parts of the labour force, creating a class of modern-day labourers that are more vulnerable than those with long-term working arrangements. There can be a need for job-related **migration** for example. Parts of the workforce could possess skill sets that are not adapted to the current requirements of the job market and subsequently cannot find jobs, while companies experience a shortage of labour.

The **economy turning into super capitalism** is a potential trigger for **economic polarisation**. A strong focus on economic growth alone as new economies are created could lead to one-sided legislation that does not keep vulnerable groups of society in mind. In particular, the exploitation of new markets (e.g. the metaverse), or emerging areas (e.g. Space) could create new platforms and lead to these risks.

More tailored communication and knowledge-sharing can lead to better information spaces for minorities or expert groups. However, it could also

lead to **an increase in niche thinking**, with a fragmented society in which different social groups are constrained to their echo chambers without being aware of the opinions of other social groups. The result could be a reduced social glue and the **inability to reach consensus in society**. This risk is further magnified with the potential of new **technologies to manipulate society's beliefs**. For example, technology channels could be used to manipulate individuals. Such a development could lead to a rise of extremist thinking in society, increase the social divide between groups and geographies, and an increase of **social division** overall.

How do potential future developments lead to opportunities of this cluster?

A **more capitalistic society** and **lives moving more and more online** could create new business opportunities. While this development could lead to a more polarised society, it could lead to an **accelerated pace of innovation in the European Union** with positive impacts for society. If **technologies** are used to **manipulate societies' beliefs**, governments could put a stronger focus on cybersecurity, which could ultimately lead to **better European Union defence capabilities** and higher levels of security. Lastly, **lives moving online** and **increased job market flexibility** could end up leading to more cross-border exchanges and ultimately to a higher **regional mobility of people** within the European Union.

In summary: concluding reflections

Several development pathways could have the consequence of exacerbating inequalities, driving further economic polarisation, and dividing society. There could be a high social price to pay if policies become completely out of line with the reality of how society is functioning and how it can support itself. The job market could become more flexible, encouraging the mobility of people.

Living online in niche groups of groupthink echo chambers, could result in a loss of awareness and understanding of one another. There could be negative consequences for all if some groups are left behind. On the other hand, lives moving online could lead to a stronger focus on cybersecurity, reinforcing the European Union's defence capabilities and accelerating innovation. Niche thinking on polarising issues such as migration, and an inability to understand different communities and reach decisions in policy making collectively drive the risk cluster **social division**.

3.10. Weakened European Union



What is the risk?

The European Union is a resilient institution that has overcome many challenges in the past. It is most likely that it will be able to navigate current complex times, and emerge stronger than ever before. However, despite its many success stories, there is a risk of the European Union weakening, as it faces a multitude of challenges that have the potential to weaken its cohesion and effectiveness.¹³³ A result, and itself a challenge is the frustrated citizens who gather to protest. Compared to other regions globally, the European Union is a hotspot for protests triggered by perceived low wages, inequality, or corruption.¹³⁴

The rise in populism, nationalism and hate speech, for example in social media bubbles, can make this issue worse.¹³⁵ In particular, expenditure cuts in times of economically difficult periods can fuel strikes, demonstrations, riots, political assassinations, and attempts at revolutionary overthrow.¹³⁶

Another issue is the division between Member States. Despite self-reinforcement through crises historically, and alignment during the COVID-19 pandemic, some disunity across the European Union has recently occurred, for example during

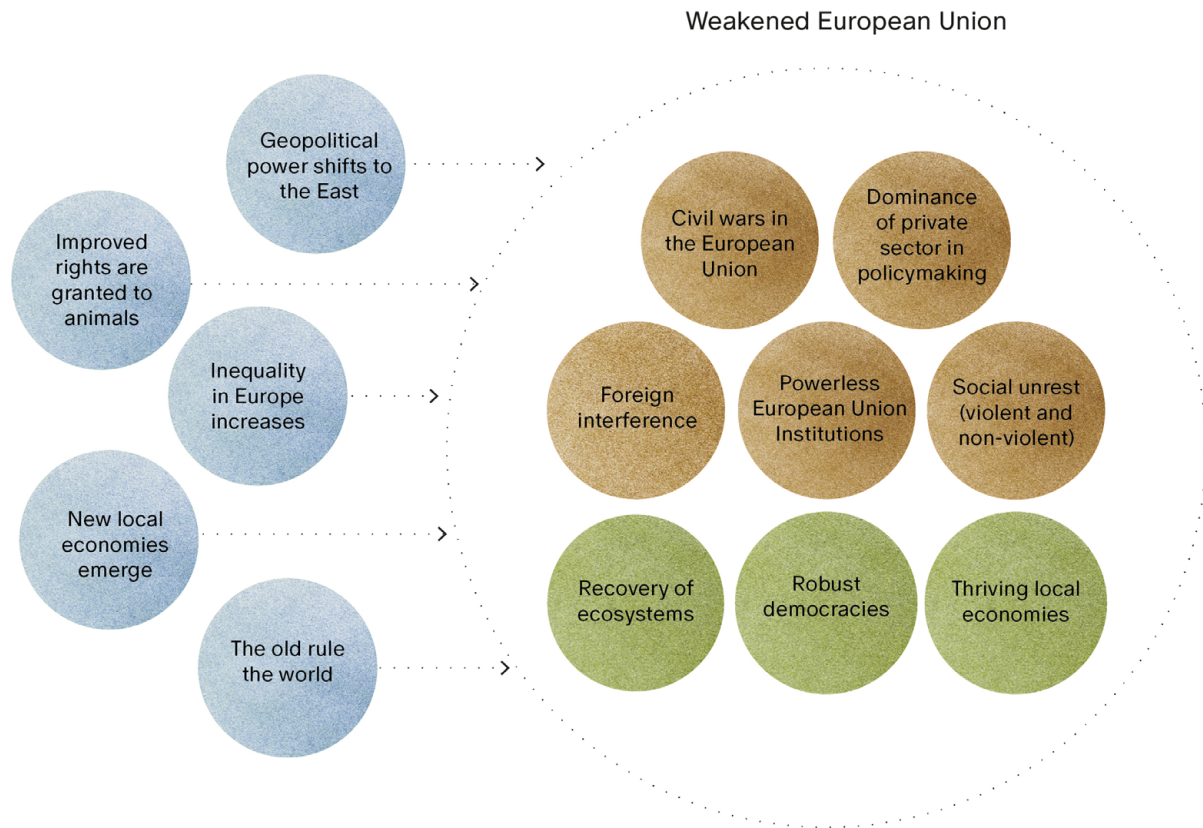
¹³³ European Parliamentary Research Service (2022)

¹³⁴ Carnegie Endowment for International Peace (2022)

¹³⁵ Lupu et al. (2023)

¹³⁶ Ponticelli and Voth (2020)

Figure 22: Overview of risk cluster weakened European Union (Source: Own illustration)
 Note: The illustration shows examples of potential future **developments** as well as **risks** and **opportunities**.



Brexit or the Eurozone crises.¹³⁷ An increasingly visible issue is the question of the 'rule of law', and the European Union seems to find it difficult to bring Member States that have deviated back in line.¹³⁸ Research suggests that difficult economic periods historically have also been characterised by a decrease in trust in governing institutions,¹³⁹ and there is a debate on whether the power of European Union institutions is in decline.¹⁴⁰ The Eurozone crisis exposed deep divisions over economic policy where some countries struggled to repay their debts, while others were reluctant to provide assistance, leading to tensions.¹⁴¹ Going forward, the big question is whether the European Union can be reformed to better deal with upcoming challenges. However, the past suggests that such a process is cumbersome and lengthy. For example, the adoption of the Lisbon Treaty took ten years.¹⁴² The European Union must find a way to overcome

challenges and maintain its effectiveness in the face of growing internal and external pressures to secure its core value for future generations. In doing so, it could emerge stronger than ever before.

Several **potential future developments** from the futures wheels in our analysis point toward the possible threat of a **weakened European Union**. Examples of such developments are depicted in Figure 22, and described below along with specific **risks** and **opportunities** they are driving.

What this analysis revealed

How do potential future developments lead to risks of this cluster?

Increasing inequality in Europe between different social groups could develop into a variety of issues in the European Union. Because the

137 Cohen and Musmar (2020), Guerra (2020)
 138 Pech and Scheppele (2017)
 139 Guerra (2020)
 140 Nugent and Rhinard (2016)
 141 Deloitte (2024)
 142 Tsebelis (2013)

European institutions are a key cross-country actor in social cohesion, discontent due to inequality, economic disparity, and polarization could be a factor that weakens it in the long-term, and **European Union's institutions could lose power** as a result. More local decision-making could improve citizen engagement in democracy, but could also result in a more heterogeneous policy landscape. The European Union could face challenges related to the functioning of its internal market if **new local economies emerge**, but also its ability to act in unity. The **private sector** could increase its leverage by filling the void of assertive single market policies and **dominate policymaking**.

Animals being granted improved rights, the markedly better protection and increased status of animals within the European Union could transform life as we know it. If the European Union is the only place this happens globally, there could be substantial implications for its competitiveness, and the further widening of inequalities too. If people reject notions about animal rights, there could be **social unrest**. Another catalyst for this risk is demographic ageing and if the increasing proportion of **old people rule the world**, there could be intergenerational inequalities that contribute to a more divided society.

Foreign interference in democratic processes is detrimental. This risk could be driven by a **shift of geopolitical power to the East**. Several countries in Asia are expected to increase in population size and wealth. In contrast, Europe's ageing society is expecting to reduce its population size, which could severely impact its competitiveness. As Western countries lose financial and economic power, economic disparities and developments could lead to riots, and **civil war** could break out in a (struggling to survive) European Union.

How do potential future developments lead to opportunities of this cluster?

If **animals are granted improved rights**, this could improve human health through changes in the food system and the environment. Ultimately,

this could lead to the **recovery of ecosystems** if more sustainable farming and land use practices are deployed. **Geopolitical power shifts to the East** could also lead to increased wealth in developing countries, and people in these regions might refocus on social and self-fulfilment needs instead of basic needs, which might be hampered by autocratic government structures and lead to **more robust democratic systems** there. **New local economies** could make local politics more influential and make sure that local needs are better represented in policymaking, leading to **thriving local communities**.

In summary: concluding reflections

Possible future crises include those deriving from these emerging drivers of social unrest, civil war, a powerless European Union with foreign interference, and the private sector 'taking over' – where the common good no longer underpins decision making within life in the European Union. While the situation is dynamic, some potential future developments chart an under-recognised course towards these risks that individually and collectively could weaken the European Union. There are also risks and uncertainty with regards to shifting geopolitical power. On the flip side, the same developments could force some local communities to take the lead in meeting the challenges of their population, particularly in terms of protecting ecosystems. This strengthening of the local level could, in the long term, strengthen the democratic process of some Member States of the European Union.

Seriousness of risks

The analysis in this chapter looks into the seriousness of the 40 risks reported in the previous chapter, aiming to rank and prioritise how serious they are. We used a framework that evaluates the scope and severity of risks to determine whether they are globally catastrophic or even existential to humanity and assessed them via a Delphi survey.¹⁴³

The scope of a risk can be *personal* (only one person affected, e.g. a fatal car crash), *local* (a geographical region or distinct group is affected, e.g. genocide), *global* (the entire human population, or a large part of it is affected, e.g. thinning of ozone layer), *trans-generational* (humanity for several generations is affected, e.g. demographic ageing), or *pan-generational* (humanity over all or almost all generations is affected, e.g. destruction of cultural heritage).

The severity of a risk can be *imperceptible* (barely noticeable, e.g. biodiversity is reduced by one species of beetle), *endurable* (causing significant harm, but not completely ruining life, e.g. dark age), or *crushing* (causing death or completely ruining life, e.g. deadly painful plague).

A risk becomes globally catastrophic if the scope is global or wider, and the severity is enduring or more severe. In the case of pan-generational scope and crushing severity, a risk can be even considered existential. Figure 23 presents the assessments we received through the Delphi survey with regard to the scope and severity of the risks identified in this

research process. The assessment is based on the mode of answers (i.e. the answer with the highest frequency). The Appendix provides more detailed results (p.103) and an explanation of the method applied (p.92).

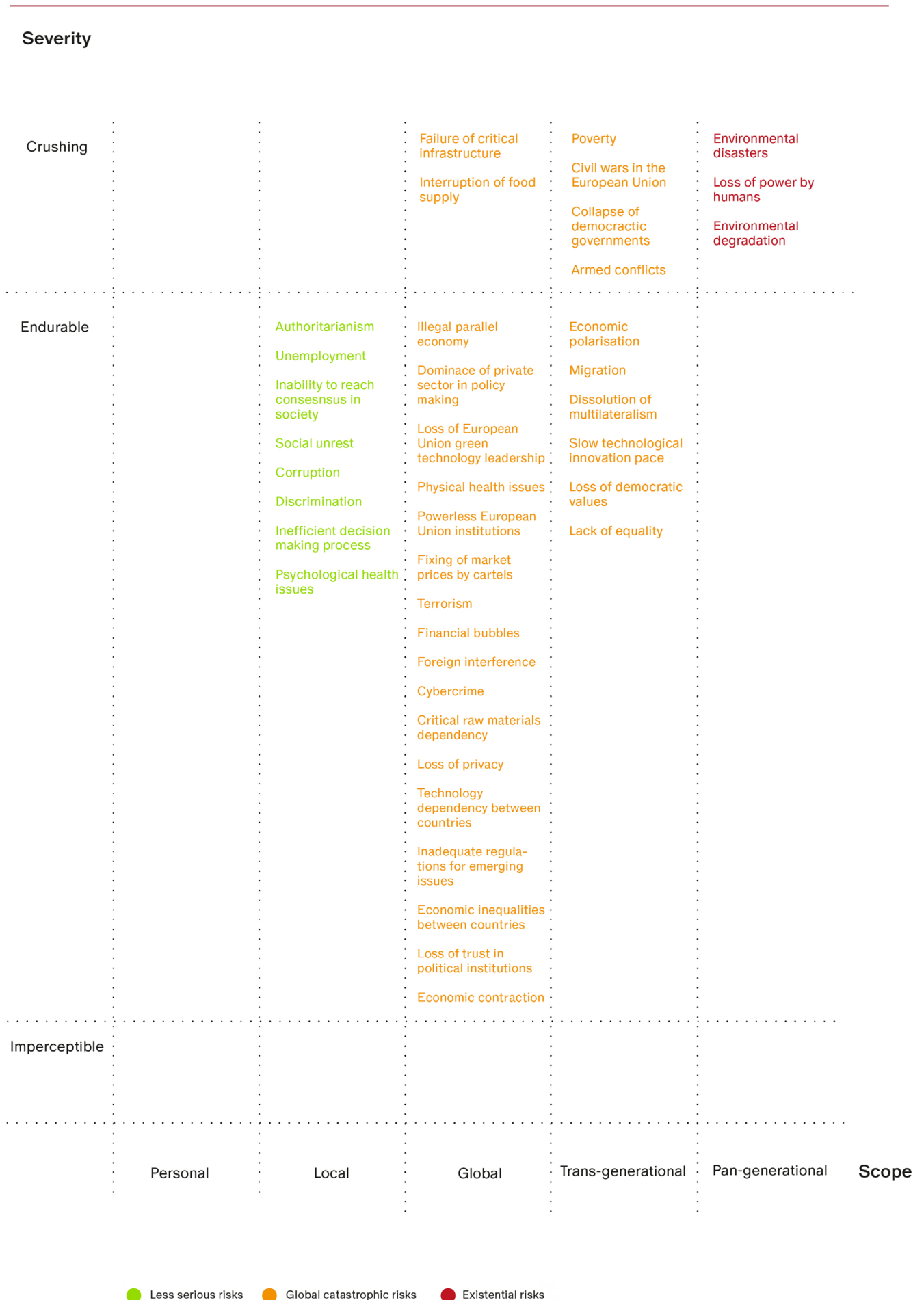
All of these risks were evaluated to have at least an enduring severity and a local scope. This shows that the foresight methodology used to identify the risks was robust in that none of the identified risks were rated insignificant.

The majority of the 40 individual risks (29 out of 40) were identified as globally catastrophic. Two of the ten risk clusters introduced in Chapter 3 (p.51), **disruption of supply chains** and **breakdown of national cooperation**, contain exclusively globally-catastrophic risks. Furthermore, within the rather wide category of globally-catastrophic risks, there are differences in severity and scope. For example, ten out of the 29 were assessed to be at the higher end of seriousness, with a trans-generational scope.

The Delphi survey identified three risks as existential risks: **loss of power by humans**, **environmental disasters**, and **environmental degradation**. The latter two risks are part of the risk cluster **failure of the green transition**, which is therefore the risk cluster that contains the most serious risks.

¹⁴³ The framework was developed by Bostrom (2013) whose examples are also used in the description of severity and scope.

Figure 23: Seriousness of risks (Source: Own illustration)



Many risks could be manageable when materialising on their own. However, in an interconnected, fast-paced world, several risks could turn into crises at the same time and become a polycrisis. The combination of two or more risks, even if less serious, can become much more threatening.

The Delphi survey participants were also asked to suggest risks that they felt were missing from the questionnaire. Most of the suggestions (54) were risks with a granularity lower than that used in the survey. In fact, in most cases, they were already included in sub-categories of the risks mentioned in the survey (but not explicitly stated). Nevertheless, three risks in addition to the ones identified from the futures wheels were mentioned: aliens, shift in culture-based values, and loss of cultural heritage.

The Delphi survey also allowed a detailed evaluation of the seriousness of the risks in each of the ten risk clusters. In addition, participants submitted comments on each of the risks' scope and severity. Here is an overview:



The risk cluster **break-down of international cooperation** comprises the risks of **armed conflicts**, **dissolution of multilateralism**, **economic inequalities between countries**, and **terrorism**. All of these risks were considered to be globally catastrophic, but armed conflicts was assessed as more serious than the other risks.

Terrorism was considered to have a local (30%) or global (53%) scope while participants assessed the other risks to be rather global or even trans-generational (**dissolution of multilateralism** 33% and 43%, **economic inequalities between countries** 44% and 32%, and **armed conflicts** 32% and 42%). With regard to severity, the majority considered **terrorism** (58%), **dissolution of multilateralism** (52%), and

economic inequalities between countries (84%) as endurable. **Armed conflicts** stood out in that it was perceived as crushing by the large majority (71%).

Participants mentioned that there is a stark difference between the actual and perceived impact of **terrorism**. While the impact of terrorism when considering death, injuries, or disruptions is much lower than that of more common problems such as diseases or drug abuse, its perceived impact is much higher. With regard to **armed conflicts**, it was pointed out that the context can be very different among wars, such as the ones that are currently ongoing, or a third World War.

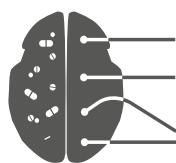


The risk cluster **decline of the European Union's economy** comprises the risks of **economic contraction**, **unemployment**, **poverty**, and **financial bubbles**. Among these risks, **poverty**, **financial bubbles**, and **economic contraction** were perceived to be globally-catastrophic risks, while **unemployment** was assessed to be less serious.

Unemployment was judged to have either a local (48%) or trans-generational (25%) scope and to be endurable in its severity (73%). **Economic contraction** was perceived to be a risk of global scope (65%), but which was also largely endurable (79%). **Financial bubbles'** scope was perceived to be global (77%), even if it was deemed largely endurable in severity too (82%). **Poverty** on the other hand, was perceived by a majority of participants to have a trans- (49%) and pan-generational scope (23%) and to be crushing (49%) or endurable (44%). Only 10% thought it imperceptible.

The comments received on **economic contraction** referred to the connections of economic stability with employment and ongoing conversations about general basic income. A basic income could enable

more volunteer work, which could have enormous benefit and value to future society. **Poverty** has many dimensions, which include unemployment and vulnerabilities to challenges and diseases. The comments of participants reflected how society has accepted a level of poverty for others, and stated that it may be a symptom and cause of many of the issues and risks raised. Participants also mentioned that often there is distraction about non-serious threats on humanity as a way to maintain the status quo, as it is working well for those benefitting from current economic models. Regarding **financial bubbles**, much depends on the specific market in question, as to what the impact could be should it burst.



The risk cluster **decrease of well-being** includes the risks of **discrimination**, **loss of privacy**, **physical health issues**, and **psychological health issues**. While **physical health issues** and **loss of privacy** were considered to be globally-catastrophic risks, participants assessed the seriousness of **discrimination** and **psychological health issues** as rather low.

Psychological health issues (mental health issues) were considered to have rather a personal (35%) or local (30%) scope, and to be mostly endurable (54%), or imperceptible (29%). The assessments for the scope of **discrimination** were split between local (38%) and trans-generational (30%), but most participants considered this risk to be endurable (72%). Two of the risks were considered globally catastrophic, but rather at the lower end of seriousness. **Loss of privacy** was mostly considered a global (37%) or personal (22%) issue, but largely endurable (67%). **Physical health issues** were assessed as having a global or narrower scope (77%) but with endurable (45%) or even crushing severity (36%).

Regarding **loss of privacy**, it was mentioned that

people could get used to a certain (low) level of privacy and that high privacy could actually lead to increased loneliness. It was also commented that growing up in an interconnected world could lead to a lower awareness of issues around the **loss of privacy**. Lastly, while discrimination was not considered to be a globally-catastrophic risk, its impact on affected groups can be crushing, and depending on the type of **discrimination**, can have substantial opportunity costs that impact more than just the affected people.



The risk cluster **disruption of critical supply chains** comprises the risks **critical raw materials dependency**, **failure of critical infrastructure**, **interruption of food supply**, and **technology dependency between countries**. All risks in this cluster were assessed as globally catastrophic.

The majority of respondents assessed **failure of critical infrastructure** (64%), **interruption of food supply** (66%), and **technology dependency between countries** (71%) as global in scope. There was less agreement on the scope of **critical raw materials dependency**, with 40% of participants leaning towards global and 36% towards trans-generational. **Failure of critical infrastructure** and **interruption of food supply** were considered most severe with the majority of participants assessing these risks as crushing (53% and 59%). On the other hand, **technology dependency between countries** and **critical raw material dependencies** were considered mostly endurable (57% and 67%).

Participants commented that **being dependent on critical raw materials** is not problematic as long as there are good relationships with exporting partners. It was also mentioned that in the past when facing the shortage of certain materials, solutions were found to substitute them to mitigate the issue. An **interruption of food supply** was considered endurable in the short term.

However, if such an interruption persisted for longer, many other risks could be triggered, such as famine, a collapse of governments, or civil wars.



The risk cluster **end of dominance of humans** comprises the risks of **inefficient decision-making processes**, **loss of power by humans**, and **slow technological innovation pace**. **Loss of power by humans** was assessed as an existential risk, slow technological innovation pace as globally catastrophic, and **inefficient decision-making processes** as less serious.

Inefficient decision-making processes were considered to be a local issue (45%), whereas **slow technological innovation pace** was less clear with 42% considering its scope trans-generational, 29% global, and 21% local. In contrast, **loss of power by humans** was considered much wider in scope with the majority considering it a pan-generational issue (53%). Similarly, inefficient **decision-making processes** (58%) and **slow technological innovation pace** (55%) were considered endurable while **loss of power by humans** was considered substantially more severe (50% crushing).

Depending on how it evolves, **loss of power by humans** was considered a risk that could be managed. For example, machines could be deactivated, and nature or animal rights were considered to be developed by humans and hence their negative impacts could be mitigated or limited. **Inefficient decision-making processes** were considered to be a risk that can already be widely observed nowadays.



The risk cluster **erosion of democracy** comprises the risks of **loss of democratic values**, **loss of trust in institutions**, **authoritarianism** and **inadequate regulation of emerging issues**. All of these were ranked as globally-catastrophic risks by the participants surveyed, with the exception of **authoritarianism**, which was perceived to be a less serious risk.

Perceptions on who the **loss of trust in political institutions** would impact were somewhat dispersed, from local (27%), to global (32%) to trans-generational (31%). Participants had diverging views on who would be affected by the risk of having an **authoritarian** leader or government in power, with similar assessments for personal (43%), local (26%), and global (27%) scope. However, the **loss of democratic values** was clearly perceived by a majority to be a trans-generational risk (54%). Regarding the severity of the risks, a different pattern emerged. A **collapse of democratic governments** was deemed crushing by 59% of participants. **Authoritarianism** was perceived to be endurable by 61% of respondents, while 32% thought it crushing quality of life. **Loss of democratic values** had a similar pattern, (but with 51% and 44% respectively). **Inadequate regulations** were judged to be endurable (69%), as was **loss of trust in political institutions** (65%).

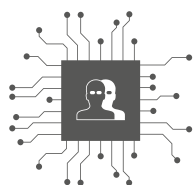
Participants mentioned that there are many interlinkages between the risks in this cluster (e.g. **authoritarianism** and **loss of democratic values**). It was also mentioned that the collapse of any democratic government would of course have its own specific set of impacts and magnitude, with increasing seriousness if the collapse would happen in a larger country.



The risk cluster **failure of the green transition** comprises the risks of **environmental degradation**, **environmental disasters**, and **loss of European Union green technology leadership**. Two out of the three risks of this cluster were assessed as existential.

Environmental degradation was deemed the most problematic with pan-generational scope (68%) and crushing severity (80%). **Environmental disasters** was considered to have either trans-generational (48%) or pan-generational (25%) scope and crushing severity (79%). Thus, these two risks were assessed to be existential. **Loss of European Union green technology leadership** was deemed a less serious risk, with global scope (40%) and endurable (48%) or imperceptible severity (37%).

Regarding the **loss of European Union green technology leadership**, participants mentioned that this could result in a slower pace of innovation in the European Union, and that this is already observed now, particularly in areas with narrow gaps between technology leaders and followers. **Environmental disasters** were considered as possible to cope with while this could change depending on the scale of the disasters.



The risk cluster **lawless society** comprises the risks of **corruption**, **cybercrime**, **fixing of market prices by cartels**, and **illegal parallel economy**. All were considered to be globally catastrophic with the exception of **corruption** for which the seriousness was considered to be lower. Most participants considered **corruption** (94%),

cybercrime (76%), **fixing of market prices by cartels** (91%), and **illegal parallel economy** (92%) to have a global or narrower scope with the highest number of participants considering the scope rather global. With regard to severity, there was a similarly homogenous assessment that **corruption** (75%), **cybercrime** (58%), **fixing of market prices by cartels** (73%), and **illegal parallel economy** (65%) are endurable.

Participants noted that the scope of **corruption** has an impact on the severity, as local corruption could be more endurable than more widespread corruption at a higher level. It was also mentioned that it would take a long time to eradicate corruption, once it has spread. **Cybercrime** was considered to come down to a race between cyber criminals finding digital vulnerabilities and the development of technological means to mitigate them. There should also be a distinction between 'distributed' cybercrime with many small actors trying to heist money and cybercrime organised at the state-level. **Fixing of market prices** was considered to become more serious if critical goods and services, such as food or health care, are concerned.



The risk cluster **social division** comprises the risks: **economic polarisation**, **migration**, **inability to reach consensus in society**, and **lack of equality**. Among these risks, all were assessed to be globally-catastrophic risks except for **inability to reach consensus in society**, which was considered less serious.

Economic polarisation and **migration** were assessed to be global (36% and 32%, respectively) and trans-generational (44% and 35%) with regards to the scope of who they might affect, but to be risks that are largely endurable (both 70%) in their severity. The **inability to reach consensus in society** and **lack of equality** in society were also assessed to be endurable risks (64% and 60%),

but were judged differently in their scope. Fifty-six per cent (56%) of participants thought that **the inability to reach consensus in society** would impact local communities whereas 41% considered the **lack of equality** to be a pan-generational risk.

Comments pointed out that context and quantities of, and types of risk, for example **migration** (emergency, forced, or voluntary) would play a role on its impacts. Numerous comments reflected on the centuries-long efforts of humanity to achieve hard-won compromises, emphasising that quick agreements are unrealistic, thus the **inability to reach a consensus** will always pose a challenge.



The risk cluster **weakened European Union** comprises the risks: **dominance of private sector in policymaking, powerless European Union institutions, foreign interference, social unrest**, and **civil wars in the European Union**. Among these risks, all were assessed as globally-catastrophic risks except for **social unrest**, which was assessed as being less serious.

Most of the risks associated with this risk cluster were assessed to have a global scope with the exception of **civil wars in the European Union** within or between Member States (49% of participants assessed this risk to have a trans-generational scope). The majority of participants of the survey considered the severity of most of the risks as endurable. The only exception was again **civil war in the European Union**, which was assessed as having a crushing severity (65%).

Participants mentioned that **dominance of the private sector in policymaking** can already be observed in the US, where it seems to be endurable, but the severity is a function of the scope of this domination. Regarding the **lack power of European Union institutions**, it was mentioned

that even if there is a lack of power, influence could also be indirect. Foreign interference was perceived to be already happening at local level, but is not visible to the wider public. If this interference is focused on key economic sectors, the result could be drastic. Regarding **social unrest**, there were opposing views on whether the scope is local, or whether it would have a global scope.

Conclusions

The risk landscape has become increasingly complex due to the rapid pace of change in the world today, ongoing polycrisis, uncertain geopolitics, climate emergency, and threatened democracy. Policymakers need new anticipation, assessment, and management strategies to deal with risks in today's complex environment. With cascading impacts of risks, anticipation requires broader sets of approaches that can capture complexities and systemic elements. An overarching purpose of any foresight study is to facilitate early discussions on the consequences of change. Foresight can support better-informed decision making, by applying techniques that can help navigate the uncertainty of the future and explore alternatives in a structured way. This foresight project aims to meet this need and provide snapshots of potential futures, and an assessment of risks to help develop long-term future risk anticipation strategies. The study presents a foresight approach to complement more traditional and analytical risk management approaches, broaden perspectives, and increase preparedness for unexpected developments and the risks they could lead to.

There is no crystal ball, and no single future.

Biased assumptions about the future must be challenged to better prepare us for the shocks that unexpected developments can cause. Foresight can be used as part of a risk management approach, particularly in anticipation for very early preparedness work. It adds to the existing body of knowledge about risks and warns that change is happening all around us. Policymakers should monitor emerging developments, take stock of them, analyse what they mean for specific areas of interest, and explore and plan for what they potentially mean for the future. Foresight can help policy makers to spot risks and develop strategies to steer away from them and at the same time realise opportunities. It can also steer research and attention to other areas to focus on certain risks where there are gaps (for example some risks identified in this report are already being monitored, whereas others are not¹⁴⁴).

Using horizon scanning to analyse future risks:

This project looks at how developments could lead to risks and opportunities. By identifying pathways towards risks, this study helps policy makers to try to steer away from them. Foresight

144 E.g. European Commission (2024c), European Environment Agency (2024)

aims to bring in a diverse range of viewpoints, to look at uncomfortable possibilities, longer-term horizons and to avoid bias by challenging false or rigid assumptions. While grounded in evidence, they have a creative speculative side, and both are presented in this report.

Potential pathways to risks: This study identified 44 different potential future developments that could drive individual risks and opportunities using a forward-looking foresight approach. A novel element of the study was that it linked developments in the long-term future to risks and opportunities, and showed which developments could lead to the ten identified risk clusters. This insight can help policy makers by flagging potential pathways to certain risks. The three orders of (cause-and-effect) impacts explored in the participatory futures wheels exercises encourage discussions about longer-term impacts, also in a nonlinear fashion. Therefore, policy makers are forced to think about potential developments that are usually not discussed, and thus can increase their ability to react to unforeseen new challenges.

Future developments also lead to opportunities: Development pathways can have positive and negative impacts. As developments lead to risks, they also create opportunities, and policy makers face the challenge to mitigate potential adverse effects of risks while reaping the benefits of potential opportunities. This report presents an approach that could be used by decision makers to develop the policies needed to reap the benefits of the opportunities that lie in future developments. With regards to mitigating specific risks, it would be interesting to explore further what it would mean in practice. If interventions are put in place to mitigate a risk, are opportunities lost?

In mitigating risks, decision makers will face trade-offs: For example **Environmental degradation** and **environmental disasters** are two risks that were assessed as potentially existential. Protecting the environment would necessitate that animals and natural habitats are better protected. However, one impact of rights for nature would be that it will be much harder to produce the food for a growing human population, build houses to live in, or travel. In other words, it might come at the cost of a **loss of power by humans**, which is another

existential risk. Future research could examine in detail the potential implications of those compromises and trade-offs.

Systemic risks and cascading elements: Many risks were assessed as manageable when materialising on their own. However, in an interconnected, fast-paced world, if several risks are realised and turn into crises at the same time, they can become a polycrisis. A second conclusion is that developments in one STEEP area (**S**ociety, **T**echnology, **E**nvironment, **E**conomy, and (**G**eo) **P**olitics) could lead to risks in another area, emphasising the need for holistic approaches when thinking about risks and challenges ahead. This confirms conclusions from life and research¹⁴⁵ that their cascading effects can spread out towards other areas, where they have impacts and feedback loops. It follows that risks should not be examined in isolation, nor in policy silos because of the transboundary nature of the risks, crises, and the interrelations and interdependencies between them. Today's crises' cascading effects extend to all parts of society, the economy, and the environment, which is why STEEP is important in anticipatory exercises and in preparedness work. For policy makers, this means that transdisciplinary forums are needed to be able coordinate actions to mitigate risks in different areas. Collaboration across administrations is necessary to prepare, address, and react to them.

Using this report: In order to be useful, conclusions and outputs from a foresight process need to be operationalised and used. In other words, they should be applied and tailored to a specific policy area, goal, problem, and context. One goal is to use the insights gained to develop a risk implications foresight tool that provides a framework for policy makers to think about how future developments and risks could impact their policy field. Such a tool could be used to discuss trade-offs of mitigating risks, look at key actors, unveil blind spots, and increase preparedness for dealing with risks in strategic decision making. Another way forward could be to share the methodology with new audiences in capacity-building exercises to increase futures literacy. The EU Policy Lab aims to use the results of the study in future foresight exercises to support policymaking in the European Union.

145 E.g. Aven and Renn (2010)

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Appendices

8.1. Foresight approach

Identification of ‘weak signals’

This study builds on the outputs of a horizon scanning approach that has been established across the institutions of the European Union. The process was established in 2021 under the umbrella of the European Strategy and Policy Analysis System (ESPAS) network¹⁴⁶ and relies upon a network of over 150 Scanners that send in scans, so called ‘signs of new’, which point to potential future developments, but sit at the margins of current thinking and planning.

‘Weak signals’ are substantiated indications of change and developments that might be impactful for the future. They are developed by screening the signs of new sent in by scanners and discussing them in sense-making workshops. In these sense-making workshops, the signs of new collected are considered through new lenses, and links and interconnections between them are identified. In an expert discussion, several of the signs of new can be clustered (i.e. they are recognised as new, interesting and linked somehow) and it can be agreed that a real weak signal of change has been identified, which may, or may not lead to impactful future developments.

Once a weak signal has been identified, the EU Policy Lab conducts additional research to

investigate the plausibility of the signal and provide further background information. The ‘weak signals’ represent emerging issues or things that get adopted by society and could become (for example) innovations, products or services, different behaviours, or possible systemic shifts in society. They might be novelty items, or early warnings. They can be considered positive or negative, depending on the context and for whom. Validated weak signals from the ESPAS Horizon Scanning process were the starting point for this study, which aimed to look for risks. The ‘weak signals’ identified using the ESPAS system are publicly available.¹⁴⁷

Creation of snapshots of the future

The process of building snapshots of the future was a participatory, speculative, and iterative approach. The authors organised workshops to build the first ideas of the snapshots of the future, and they were finalised later. The first ideas were developed using two weak signals as a starting point. Participants were asked to think about a possible future where the signals have become a reality.

The participants of the workshops, professionals in the domain of disaster risk management, were divided into groups of 4-6 members each. First, each group had to choose a long-term weak signal from a set prepared by the coordinators.

¹⁴⁶ European Strategy and Policy Analysis System (2023a)

¹⁴⁷ European Strategy and Policy Analysis System (2022a), European Strategy and Policy Analysis System (2022b), European Strategy and Policy Analysis System (2023b)

They were given a second signal randomly by the coordinators. The future cannot be predicted, it is neither simple nor straightforward, and to mirror this, to merge these two signals was also challenging by design. The groups were asked to think about a future where the developments in the two weak signals have happened, and turned into real developments occurring at the same time, and that must be dealt with. Some were notably more straightforward than others. They had to come up with a headline for a future newspaper article that reported on events from this future and to select a picture from a provided set of images that also matched somewhat. They then had to think about the reaction of two different types of personas (enthusiastic and opposing) to this development (the mini personas are not included in the report).

Based on the ideas collected during the workshops, the authors then drafted newspaper articles of the imagined futures. These aim to display realistic representations of life in the future: human experiences that can be easily understood. The authors also replaced the images post workshop with illustrations to better represent the final articles.

Development of futures wheels

A futures wheel is a method to brainstorm several orders of knock-on effects from an initial development.¹⁴⁸ Futures wheels are the production of mental maps of impacts based on a holistic analysis of Societal, Technological, Economic, Environmental, and (Geo)Political (STEEP) issues. Futures wheels are an exploratory method to identify and collect future possibilities. They aim to think about a multitude of possibilities in contrast to one consistent plausible future.¹⁴⁹ This method was chosen for this report as one of its particular strengths is to think in a non-linear way about causes and their impacts, and this can help to identify unlikely and unforeseen future developments that would not be uncovered using probabilistic approaches or linear thinking.¹⁵⁰

Using this method, the workshop participants started with snapshots of the future they had developed in the first step (see above). From there, they identified first and second order impacts, and then derived risks and opportunities from the second order impacts (see Figure 24). Thus, a certain identified risk or opportunity could be linked back through a chain of developments to a certain starting point. This study refers to such a chain as 'cause-and-effect chain', which includes the starting point, a first order impact, a second order impact, and a risk or opportunity (3rd order). In total, more than 60 workshop participants developed ten futures wheels and more than 350 cause-and-effect chains.

The research team at the EU Policy Lab then reviewed the ten futures wheels to make sure that each of the impacts, risks, or opportunities, have direct cause-and-effect links to a previous impact or the starting point. It also organised subsequent brainstorming exercises to fill gaps, if any, and ensure the language used in the futures wheels is easily understandable. In doing so, the research team ensured that the ideas collected in the workshops were not altered. As the ten futures wheels are rather comprehensive, the research team then simplified them by rearranging the cause-and-effect-chains for each of the futures wheels to group them into potential future developments triggered by the ten snapshots of the future. To ensure robustness of the derived potential future developments and aiming to reduce bias, the rearrangement was undertaken in groups of at least two researchers.

Identification of clusters of future risks

This study uses the Grounded Theory approach to develop a framework of how potential future developments can lead to certain kinds of risks. Grounded Theory is a well-suited approach for topics that are still relatively new and allows gaining new insights without narrowing the scope through formulating research questions or

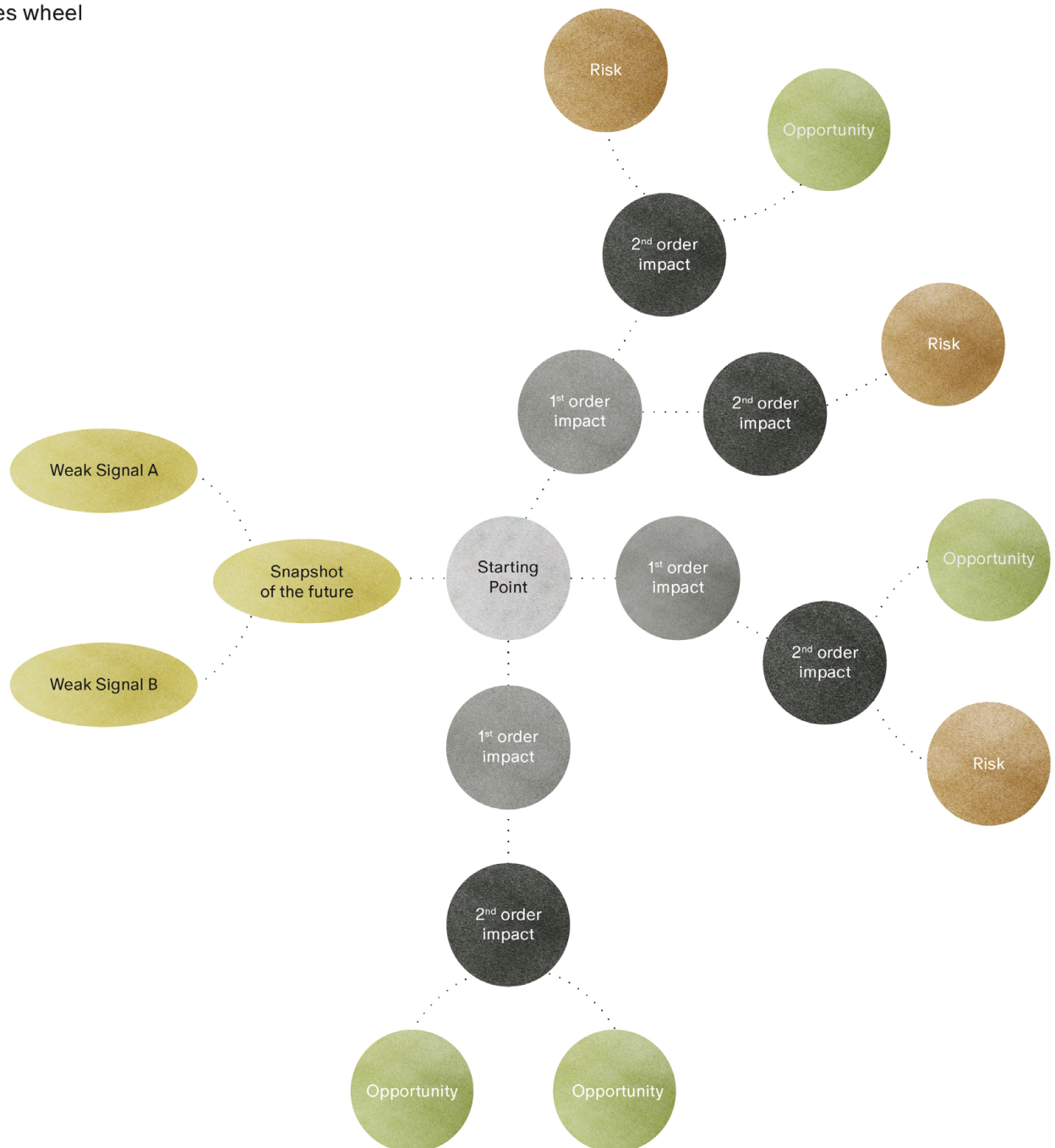
148 Glenn (2021)

149 Defila, Di Giulio, and Ruesch Schweizer (2018)

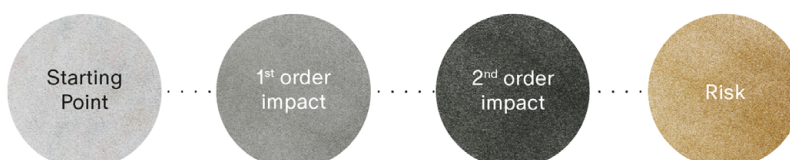
150 Bengston (2016)

Figure 24: Development of snapshot scenario and futures wheel and illustration of a cause-and-effect chain (Source: Own illustration)

Futures wheel



Cause-and-effect chain



hypotheses.¹⁵¹ Throughout the research process, we followed a bottom-up analysis approach.¹⁵² We first developed case studies in the form of futures wheels (see Chapter 8.1.3 above). We then analysed the information of the case studies, which in Grounded Theory, is referred to as coding. First, we transferred the cause-and-effect chains into a database that we used as a basis for our analysis. We then conducted a process of clustering termed coding in Grounded Theory analyses. First, we performed *open coding* by analysing the case studies and deriving categories of information. In this step, we looked at the outputs from the futures wheels (135 indications of risks that were mentioned during the workshops) and combined similar ones into 40 actual, substantiated risks. Lastly, we performed *theoretical coding* to combine different risks into ten bigger risk clusters (see Figure 25). This step also involved the analysis of all cause-and-effect-chains to inquire which and how potential future developments could trigger a certain risk cluster.¹⁵³

As commonly advised, developing case studies, open coding, and theoretical coding was an iterative process.¹⁵⁴ Therefore, our resulting framework of how potential future developments can lead to certain risks was substantiated by developing additional case studies and revising the initial set of risks until new case studies did not lead to additional new insights. As a last step, we contrasted our framework with existing literature to ensure that we did not overlook any relevant issues. While the present report builds on a case-study approach and cannot claim full comprehensiveness, we did not find any major gaps between the framework we derived from the case studies and the existing research literature. However, we did further amend the names of some of our risks to reflect nuances of information found in existing research.

Evaluation of seriousness of risks

In order to evaluate the seriousness of risks, we conducted a Delphi survey. Delphi surveys, in addition to classic surveys, make use of the ‘wisdom of the crowd’.¹⁵⁵ The real-time Delphi method applied in this research process enabled experts to assess different items and re-assess their own assessments later after being informed of the assessments and comments given by the other participants, thereby facilitating consensus building.

The survey design aimed to comprehensively cover relevant aspects of this study while limiting the length to encourage a high response rate.¹⁵⁶ The survey built on the risks identified in the previous step of this research project. We derived the scales for the questionnaire from an already existing framework by Bostrom,¹⁵⁷ which is widely used to identify globally-catastrophic and existential risks. We did not ask participants to assess how likely or probable it was whether a certain risk could turn into a crises, as for very serious risks, preparedness is needed no matter the probability. For the same reason, we did not inquire into a possible timeline of when a risk could turn into a crisis, as we have seen that a crisis can develop unexpectedly and it is import to be prepared and react fast to it nevertheless.

The survey questionnaire underwent comprehensive pre-tests with pre-testers from different backgrounds to ensure a common understanding of the questionnaire items by a diverse group of participants.¹⁵⁸ We used cognitive approaches to pre-test the questionnaire, in particular think aloud interviewing and paraphrasing¹⁵⁹. The insights gained from the pre-tests led to refining the wording of questionnaire items and ensuring clarity across diverse expert domains.

The survey was distributed to a broad range of

151 Glaser and Strauss (1967), Timonen, Foley, and Conlon (2018)

152 See Makri and Neely (2021) for a description of Grounded Theory approaches to coding

153 Grounded Theory analyses how different contexts (potential future developments) lead to different phenomena (risks and risk clusters)

154 Corbin and Strauss (2015)

155 Shariff (2015)

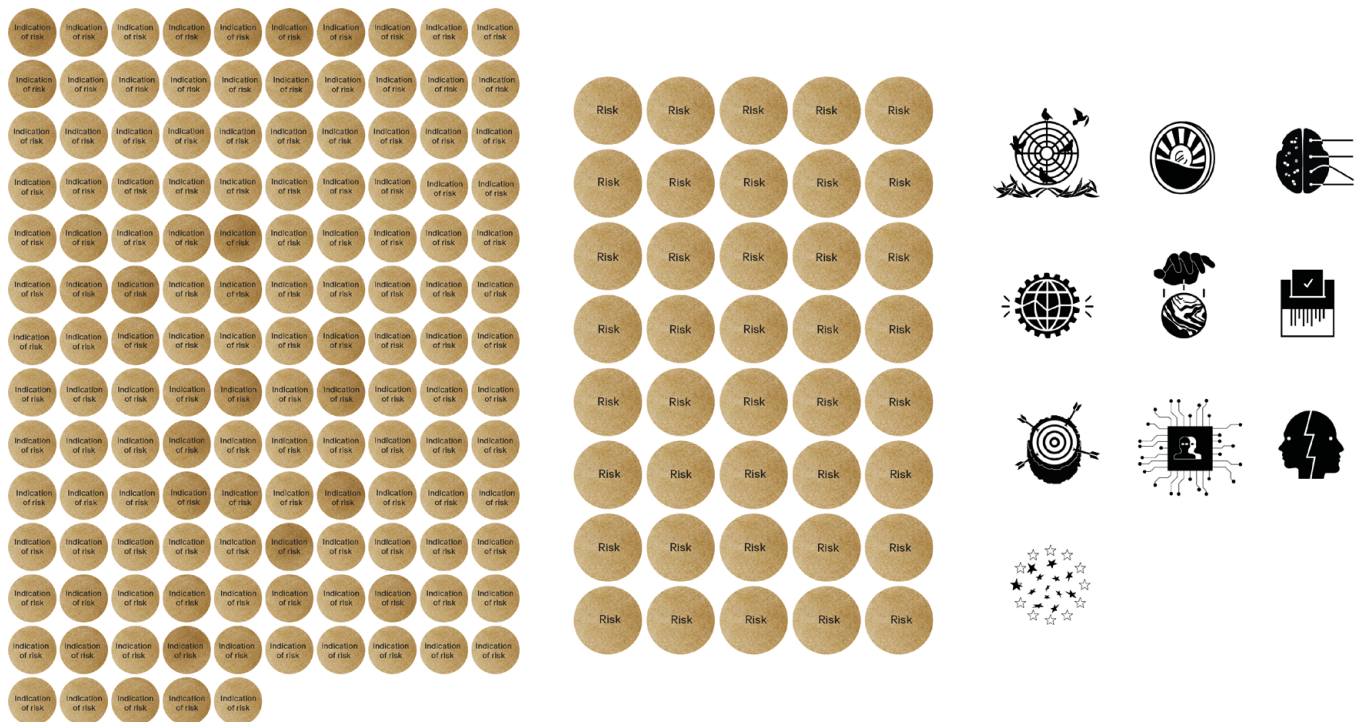
156 We applied the Tailored Design Method in the design of the survey Dillman (2007)

157 Bostrom (2013)

158 As recommended by Beiderbeck et al. (2021)

159 Collins (2003)

Figure 25: Identification of risk clusters (Source: Own illustration)



experts, networks, and organisations to ensure a wide range of participants with different backgrounds and expertise. The number of participants was 92 of which 68 answered all questions. Among the participants 45% work in the public sector, 28% in the academic sector, 12% in the private sector and 14% in non-governmental organisations or other organisations. In terms of experience, 62% had at least five years of experience in dealing with the topic of risks.

Lessons learned

We tried out a new approach to identify future risks in this pilot foresight research project, which worked well for the most part. However, there were some elements which could be fine-tuned. For example, in developing the snapshots of the future, workshop participants had to combine two random weak signals, which in some cases proved challenging, and some logic in the snapshots of the future is a stretch. However, as a foresight process it was for the first part ‘art meets science’, and designed to encourage participants to deal with a challenging and ‘unplanned future’, to reflect the reality that

real life is complicated. Similar to a crisis, it simply has to be dealt with. Workshop participants rose to the creativity challenge, thinking outside of the box. An alternative approach could be to use a more ‘selected future’ that is more easily managed and allow participants to select topics that more easily merge, or address a particular topic area. But this could be a less useful foresight exercise (the possible, probable, and preferable futures).

In the Delphi survey, participants reported difficulties not having more context on each risk to assess scope and severity as in other different lines of work and types of surveys. The Delphi survey was designed in this way precisely so as not to guide, or suggest a specific risk, but we could add more context in a future iteration to make it easier for participants to answer the survey. Also the method is somewhat biased because it asked participants to think about and focus on the risks that are perceived catastrophic or existential.

8.2. Weak signals used to develop snapshots of the future

TRANSPOL's transparency revolution gets cloudy

Primary weak signal: Radical transparency	The decreasing levels of trust and social capital in societies, together with the availability of a large amount of information, have increased calls for “radical transparency”. Radical transparency means being explicit about values, open processes, information for examination (publishing contracts, sharing salary information, etc.), offering “raw content”, often provided through new technologies (live streaming the revolution, body cameras, etc.). Currently, radical transparency is a result of strong external pressures on organisations, but it could become the new normal.
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Secondary weak signal: Public digital infrastructure	The concept of public digital infrastructure linked to public digital goods sees the role of governments as much more than enablers and enforcers – but as co-designers and moderators of public digital spaces. India has been particularly active with digital interventions, setting up platforms, and building digital ecosystems aiming for digital disintermediation. In Europe, the Next Generation Internet initiative, in its report, 'Towards Public Digital Infrastructure' encourages the European Union to “redistribute power over the internet by building a more vibrant, diverse and resilient ecosystem of trustworthy open solutions, on top of a shared set of rules and open protocols and standards.” This includes the move from a platform to a protocol-based economy of smaller collaborative ecosystems, collective decision-making on rules and protocols, and opening up data and identity. The growing govtech ecosystem in Europe can support this role.
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Fungi revolution: farmers and fungi fight

Primary weak signal: Rights-based approach to resources and environment	In October 2021, the UN Human Rights Council passed a resolution recognising access to a healthy and sustainable environment as a universal right. Also, at the climate conference COP26, civil society organisations have pushed strongly for rights-based approaches to climate change. Similar approaches have been proposed for food, energy, and water but also technology governance. Rights-based approaches focus on the human dimension of governance of resources, acknowledge the human rights obligations of states and private parties in the governance, and give access to judicial or administrative recourse. Another trend relates to giving rights to nature by assigning a legal personality to natural entities, such as rivers.
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**Secondary weak signal:
The fungi economy**

Although fungi have long been mostly associated with pathogens and diseases, they are now emerging as an important way to sustainably produce resilient sources of food, feed, chemicals, fuels, and textiles. They are also used to produce materials for construction, automotive and transportation, and furniture. As the field and the industry grows and becomes more consolidated, mushroom and mycelium production and downstream industries will develop further – also creating potential for rural areas and developing countries.

Animals SA ignites a non-human rights revolution

**Primary weak signal:
Technologies for human-animal relations**

With research in animal cognition and behaviour, there are more tools and technologies emerging to interact and communicate with companion and farm animals. From wearable technologies to smart accessories, video connections, and augmented and virtual reality – interspecies information systems are emerging. The new field of animal-computer interaction research introduces user-centred design from the animal's point of view. It allows to understand how animals conceive the world and can improve welfare and conservation of species.

**Secondary weak signal:
Artificial photosynthesis**

The commercial viability of “fuel from the Sun”, generated through artificial photosynthesis is advancing due to recent developments. Artificial photosynthesis is considered to be among the most promising new technologies to deliver sustainable alternatives to current fuel supplies. This process involves combining sunlight, water, and carbon from the air to produce hydrogen or carbon-based fuels. These fuels are collectively referred to as solar fuels and offer a transportable means of storage of solar energy. In 2021, artificial photosynthesis has been a subject of an EIC prize.

The KIKKO empire bows out and kindness takes its place

**Primary weak signal:
Generalised population decline**

After a long spell of fast population growth, the world is entering a new phase of slowing down. While the UN 2019 World Population Prospects project world population to increase to 9.7 billion in 2050 and peak at 11 billion at the end of the century, other reports suggest that the peak may come earlier (around 2070–2080). A slowdown in population growth and reaching peak numbers is consistent with earlier projections on the matter. US and China 2020 census data showed historically low population growth level and India's fertility rate dropped for the first time below replacement levels. Population decline, once limited mostly to Europe and parts of Asia, is thus likely to become a global challenge. This will have an effect on global economy, social systems, immigration, or the environment. How societies will cope with and adapt to declining numbers of population (or reaching the stage of a stable population) is unclear.

**Secondary weak signal:
Consumer-traders**

Consumers are not only becoming producers (or prosumers) in a more do-it-yourself, circular, and side-job economy, but they increasingly take on the role of traders. Second-hand resale has been increasing significantly on sharing-economy platforms and social marketplaces with sustainability objectives and particularly concerning second-hand fashion. Investment trading apps have opened the possibility of trading stocks, currencies, and crypto assets at a small scale to a broad group of people. Finally, new business models are created based on the resale of energy: for example, Vehicle-to-Grid (V2G) systems allow the feeding of the energy stored in the electric car's battery back to the electricity network.

While you were sleeping: sweet dreams or digital nightmare?

**Primary weak signal:
Dream shaping**

Influencing and inducing dreams has long attracted interest. A series of new technologies and approaches are being developed that could make it possible in the future. In the stage of sleep called hypnagogia – the transition from wakefulness to sleep – the brain is most suggestible to external prompts. Targeted Dream Incubation uses sensory stimulation to induce specific prompts at the sleep onset with the use of a glove-like device. Another approach is to use pre-sleep stimuli, such as virtual reality tasks, to influence dream content, while a transcranial alternating current stimulation is being used to induce lucid dreams. While it can be used in therapies to interrupt nightmares and address anxiety disorders, brands have started to experiment with inducing advertising prompts into the dreams of their consumers.

**Secondary weak signal:
Embedded finance**

As online commerce and digital payment methods become the norm, many production and service companies and platform ecosystems are including financial services as part of their offering. These services include accounts or wallets, payments, lending – to serve their customers (both businesses and consumers). The process has been made relatively easy with banking as a service (BaaS) provided by fintech companies and can include 'buy now pay later' models of lending money or providing embedded insurance. It is projected to grow fivefold over the next five years, from 200 million USD to 1.3 billion USD. This new model is exemplified by Starbucks, which could be considered to be a neobank with its mobile app, where over 24 million members load over 10 billion USD annually, and of that, over 1 billion USD are stored credits not spent.

Moon sand: a cosmic solution to Earth's sand crisis

Primary weak signal: Lunar economy

Beyond the Low Earth Orbit, the Moon is the main target for space activities. A lunar economy encompasses all general economic activity associated with the production, use, and exchange of lunar resources on the Moon's surface, in lunar orbit, and on Earth. It has been estimated that the lunar economy will be worth 170 billion USD by 2040. Alongside space resource utilisation and transportation markets (resource prospecting mining, processing, cargo transportation), this potential also includes in-space manufacturing and data markets. Economic opportunities feature highly in both US NASA Artemis' and China's CNSA missions to develop base camps on the Moon. In July this year, the European Space Agency created the European Centre for Space Economy and Commerce.

Secondary weak signal: The sand crisis

In April, United National Environment Programme (UNEP) released a report warning that the current extraction of sand exceeds the replenishment rates, leading to shortages, socio-economic conflicts and environmental degradation. With a yearly use of 50 billion tons, it is the second most used resource after water. The UNEP report calls for the recognition of sand as a strategic resource and to create strategies for regenerative and circular approaches, establish ownership and access rights, source responsibly, and restore ecosystems. Modelling exercises show a 45% increase in global building sand use from 2020 to 2060, with a threefold increase in low- and lower-middle income regions.

AI-generated modular farms: smart stable solutions or mounting problems

Primary weak signal: Modular manufacturing

The reorganisation of supply chains and increasing volatility of the business environment have led companies to develop increasingly agile strategies of production and distribution. Modular manufacturing, where production can be divided into modules and easily rearranged, is part of that trend, following the path of the fast-growing modular construction sector. Rather than realising economies of scale through building large production plants with high investment needs and operational costs, a modular approach favours starting at a smaller scale that allows testing and demonstration and then building hundreds or thousands of modules in distributed systems. Nestle Foods expects to operate modular food processing factories in Africa and Asia, while Nokia has developed a factory-in-a-box concept – a manufacturing space in large cargo containers.

Secondary weak signal: Crashing of the internet

COVID-19 has shown us that we can continue operating without physical presence, but there are increasing threats to the Internet. 2021 saw a series of events which has created large-scale Internet outages or black-outs, from glitches in the network infrastructure (e.g. content distribution network problem, a fire at a cloud service company), problems at large scale platforms (e.g. Facebook outage), natural disasters (e.g. Tonga volcanic eruption), social unrests (e.g. in Kazakhstan) or geopolitical strife (e.g. Russian submarine activity threatening underwater cables).

Second self avatars: a boon or a bane?

Primary weak signal: Metaverse

A combination of Augmented/Extended/Virtual Reality technologies will increasingly be shaping our digital realities and redefining interactions. The metaverse, spatial internet, or phygital world are some of the terms used to describe it. The technology allows the creation of exclusive immersive experiences around the products, services, and activities – from virtual tours of factories or farms to virtual events, or by altering reality around us through projections, which can be offered to anyone. Following the pandemic, people have heightened needs for meaningful encounters. New types of online spaces that are more social, interactive, and engaging are proliferating.

Secondary weak signal: Age of complex and diverse emotions

Emotion is an integral part of human decisions, complementing and sustaining the reasoning mechanisms. As we cannot separate the two, in terms of policymaking we should account for the emotions of policy makers in their decision-making but also the emotional needs of citizens. Sentiment analysis and emotion detection has also been applied to large data sets (mostly social media). Most of the current approaches focus on simple emotions. However, the role of more complex and diverse emotions is increasingly explored. Emodiversity (richness of emotional experience) and complex emotions (mixed emotions, meta-emotions) are associated with integrating complex information, producing new ways of expression and wiser reasoning. As we understand them better, future policy narratives are likely to be based on more complex and diverse emotions.

Longevity-induced challenges: who wants to live forever?

Primary weak signal: Individual longevity

Longevity and anti-ageing research is growing very quickly as the COVID-19 pandemic reinforced consumer interest in health and wellbeing. Ageing tech billionaires are financing research in the area, attracting further venture capital. The focus is on biotech, with recent breakthroughs in the reprogramming of cells for rejuvenation, organ regeneration with stem cell therapies, or reversing the epigenetic clock. The conferences on the topic (such as Copenhagen's Aging Research and Drug Discovery Meeting) are attracting more participants and specific interest groups are forming, such as the US Alliance for Longevity Initiatives or the European Union's European Longevity Initiative. At the same time, the UN Human Development Report shows that with COVID-19 in 2020, life expectancy at birth has fallen in 70% of countries.

**Secondary weak signal:
Nuclear goes forward**

The use of nuclear technologies is progressing and will spark bigger controversies. After rapid growth from the 1970s to the 1990s, global nuclear electricity generation slowed significantly after the 2011 Fukushima tsunami in Japan, as countries took plants offline due to safety concerns. However, after a low in 2012, global production has started to increase again, with some countries (especially China and Russia) investing heavily in increasing their nuclear energy supply, while others are taking their plants offline (especially Germany and France). China's investment is particularly spectacular, increasing from almost 16 TWh of nuclear electricity production in 2000 to more than 366 TWh in 2020 (compared to 355 TWh in France in 2020). Research & Development investment in Small Modular Reactors (SMR) is booming, opening new perspectives for the future of nuclear fission with most of the small reactors intended either for electricity generation or as an energy source for high temperature industrial processes.

Future-oriented actions are manipulated

**Primary weak signal:
Dealing with future
selves**

There is increasing importance of intertemporal choices (the ones we make not for us but for the future selves and society – especially regarding climate change and environmental degradation) and related new ways of trying to connect with our future selves and future societies. Various initiatives are emerging, from the government commissioners for future generations to “climate black boxes” as messages to “future us”. With so much at stake, the citizens will want to involve the future selves in political decisions more and increasingly specific institutions for “future generations” are being created.

**Secondary weak signal:
Chines narratives in
international politics**

As part of China's assertiveness on the global stage, it has been introducing its terms and narratives into international agreements, thus making the Chinese narrative a part of the global legal system. The future interpretations of international law will become more problematic. In the context of legal warfare or “the strategy of using or misusing the law as a substitute for traditional military means to achieve an operational goal.” A broader brand-marking as “non-Western terminology” may become more present in international politics. An example for this development is the term “ecological civilization”, which was adopted by the Chinese Communist Party and provides an alternative framing of a shift to more bio-holistic worldviews.

8.3. Results from Delphi survey

Results for scope (% of total answers)

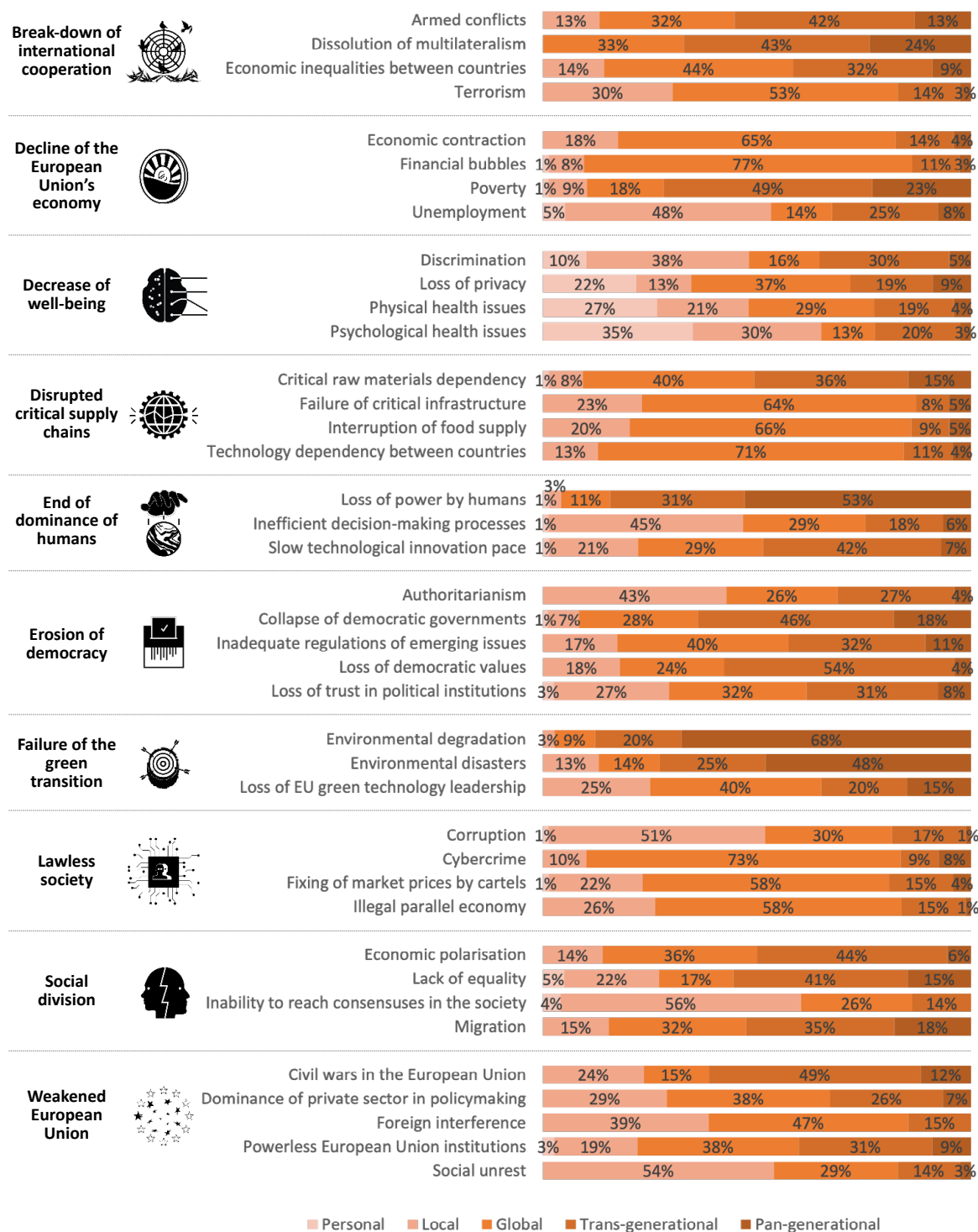


Figure 26: Delphi results for scope of risks (Source: Own illustration)

Results for severity (% of total answers)

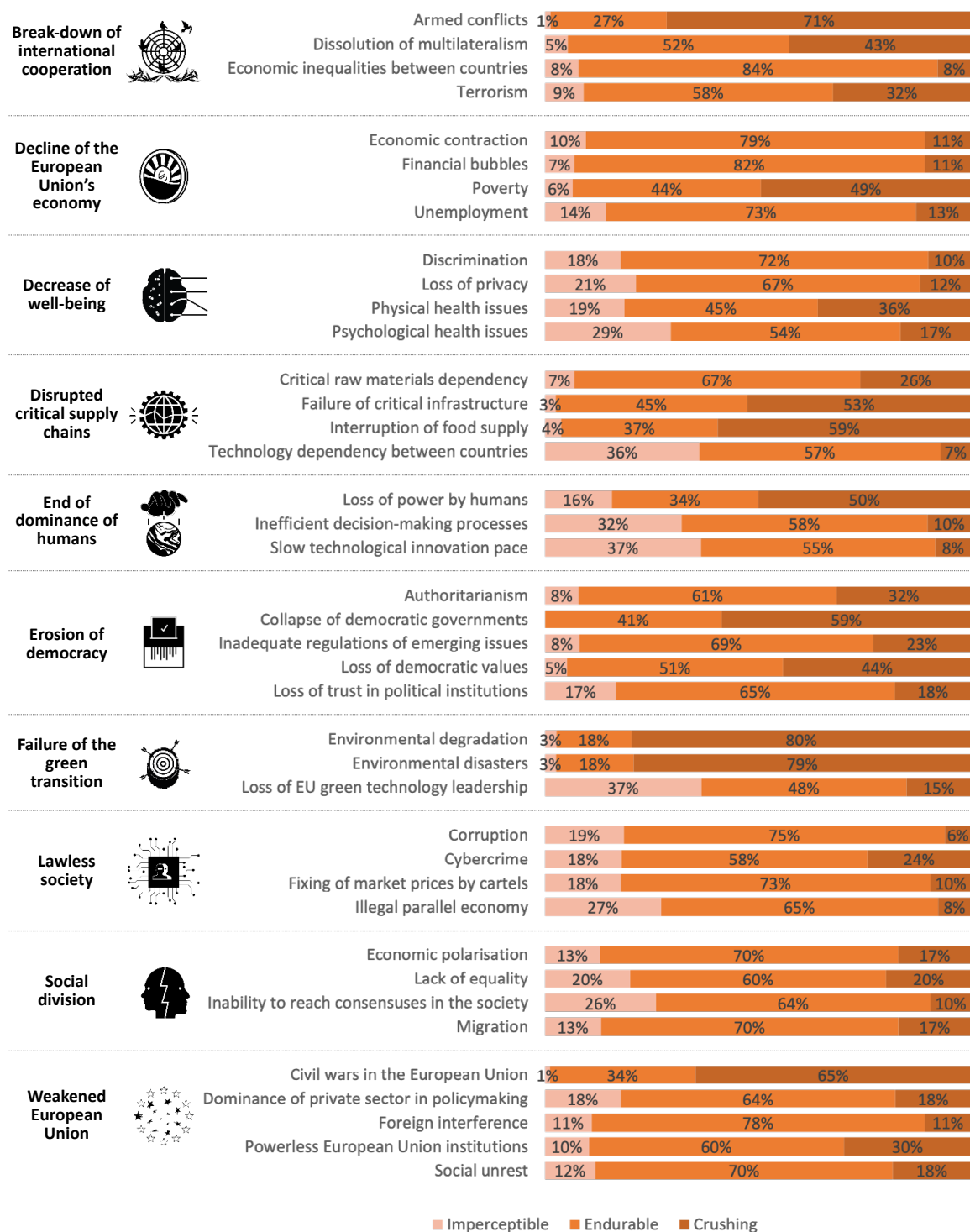


Figure 27: Delphi results for severity (Source: Own illustration)

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