



Inspire Policy Making with Territorial Evidence

ESPON TARGETED ANALYSIS

TEVI 2050

Territorial Scenarios for the Danube and Adriatic
Ionian Macro-regions

Final Report, PART II _ Possible territorial scenarios for the
EUSDR // 11 April 2022

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This delivery does not necessarily reflect the opinions of members of the ESPON 2020 Monitoring Committee.

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Disclaimer

This document is a final report.

The information contained herein is subject to change and does not
commit the ESPON EGTC and the countries participating in the
ESPON 2020 Cooperation Programme.

The final version of the report will be published as soon as approved.

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Abbreviations

EGTC	European Groupings of Territorial Cooperation
EU	European Union
EUSAIR	European Union Strategy for the Adriatic Ionian Region
EUSDR	European Union Strategy for the Danube Region
GDP	Gross Domestic Product
PA	Priority Area
R&D	Research and Development
SME	Small and Medium-sized Enterprise

1 Introduction

The ESPON project Territorial Scenarios for the Danube and the Adriatic Ionian macro-regions 2050 (TEVI 2050) belongs to Specific Objective 2 of the ESPON Programme. The project aims to 'develop territorial scenarios for the European Union Strategy for the Danube Region and European Union Strategy for the Adriatic Ionian Region as the means to enhance the territorial dimension of the respective EU Strategies and to embed the territorial evidence in policymaking at relevant levels of the countries involved in their implementation' (ESPON EGTC, 2020).

1.1 Introduction to the study

As stated in the Terms of Reference, the objectives of the project are (ESPON EGTC, 2020):

- Identification of the main processes, factors, obstacles and drivers that will shape the territorial development and spatial integration of the Danube Region and the Adriatic and Ionian Region in 2050. The common challenges identified in the strategic documents for each macro-region (e.g. demography, energy issues, mobility, connectivity, digitalization, innovation and climate change) shall be taken into consideration.
- Identification of synergies and conflicts between the above-mentioned factors, obstacles and drivers (in particular, from the perspective of the key policy processes).
- Formulation of baseline territorial development scenarios for the Danube Region and for the Adriatic and Ionian Region for 2050.
- Production of alternative territorial development scenarios for the Danube Region and for the Adriatic and Ionian Region through a participatory dialogue with the steering committee and possibly involving other stakeholders.
- Development of policy recommendations on possible policy pathways i.e. policy actions requiring joint attention of the European Union Strategy for the Danube Region (EUSDR) and the European Union Strategy for the Adriatic Ionian Region (EUSAIR) governance bodies and other levels of governance in the respective EU macro-regions in order to steer the development towards the chosen scenarios. In this case, soft cooperation and multi-level governance actions shall be taken into consideration.

1.2 Introduction to Part II

What can be possible futures for the EUSDR? How can the different territories of the EUSDR develop by 2050, based on different scenario assumptions? How would these futures differ from today and what can be possible policy recommendations for more informed policy making in the years to come?

Part III of the ESPON TEVI 2050 final report is dedicated to the EUSDR macro-regional strategy findings. The aim of the report is to present in a single document the path from the present to the development of the different futures and scenarios of the Adriatic Ionian Region. The report starts with a short overview of key findings relevant for the EUSDR (Chapter 2). Chapter 3 gives a first aggregated picture of the Danube region today to set the scene for the development of the different scenarios. Chapter 4 presents the baseline scenario developed for the EUSDR, which is based on the same assumptions as for the EUSAIR. The baseline scenario shows what is possible to happen if there are no changes. Chapter 5 presents the first alternative territorial scenario for the Danube region, which is based on the same assumptions as for the Adriatic Ionian region. Chapter 6 gives the concluding reflections of this scenario, presenting its foundations and overall territorial implications. Chapter 7 presents the alternative territorial scenario for the EUSDR, based on EUSDR specific assumptions. This is followed by chapter 8, which gives some concluding reflections of this scenario, presenting its foundations and overall territorial implications. The report concludes with chapter 9 which presents conclusions and policy recommendations. The report has taken the COVID-19 pandemic and the war in Ukraine as important changes into account, to the extent that they do not shape the core of the scenarios and neither alter the results of the co-creation process carried out during the project.

1.3 How to read the scenarios

Baseline scenario: The baseline scenario, or 'business as usual scenario' presents the future of the Adriatic Ionian Region if no major changes happen, i.e. if things continue as today. It is based on four key assumptions for the future, following the trend selection carried out in the desk study and the co-creation process of the project. The scenario also provides the territorial implication, i.e., what territories in the region will be affected by what factors.

Alternative territorial scenarios. The alternative territorial scenarios take the trends to a more extreme version, also giving the territorial implications, i.e., what territories in the region will be affected by what. A few things need to be taken into account when reading the alternative territorial scenarios:

- The green parts at the beginning of the scenario give the theoretical basis for the scenarios, explaining what lies behind each story.
- A short paragraph in *italics* at the end of every thematic focus for each scenario is pinpointing the territorial implications of each focus. This is complemented by an alternative map per scenario to support the key messages and complete the story visually.
- The 'terristories' grey boxes in the alternative scenarios are imaginary stories of the future, to make the storyline more imaginative, creative and vivid.
- The scenarios are written looking back from the future, i.e. as if today were the year 2050. Hence present and past are used where relevant.

All scenarios are built along the desk research and the thorough co-creation process that took place throughout the project and guided the focus of the scenarios. The methodology of how the two scenarios were developed are described in more detail in Part I of the final report, as well as in Scientific Annexes 1, 2 and 3 of the final report.

2 Key findings on EUSDR

What are possible future paths for the Danube Region? The ESPON TEVI 2050 has looked into various territorial scenarios to explore different future pathways for the region. Starting from the present, with current trends, developments and challenges, the project has used a thorough co-creation approach to develop a baseline and two territorial scenarios. These are followed by policy recommendations on possible future actions. The following bullet points give the key findings of the ESPON TEVI 2050 project.

- **A mantra: Scenarios are not future predictions.** Scenarios are useful for preparing for the future and showing how things may develop by looking at different interrelations of trends. Scenarios do not make predictions or accurate prognosis. They allow glimpses into the future, by considering how different trends or developments may interact, looking at how different factors may change and how these changes may affect other factors. They can inform policy makers through more focused thinking about the future and improved understanding of the present, by providing different possible pathways for developing desirable futures and avoiding future dystopias.
- **A view of the Danube Region today.** The Danube Region is a very large and very diverse region. Its rich natural habitat faces environmental risks, while mass outmigration, ageing, income inequalities and a brain drain challenge the population. The digitalisation process remains challenging, despite the big steps taken, with limited employment in information and communication and low spending on research and innovation. Furthermore, there is migration and demographic change between urban and rural areas, while the region is ageing, with direct effects on employment and labour markets. There is a low share in renewables and climate change affects the Danube Region, with temperature increases having severe consequences. The region is exposed to flood risks, while water pollution and infrastructure projects further challenge the ecosystem.
- **Baseline scenario: what happens if nothing changes in the Danube Region by 2050.** The baseline scenario looks at four key assumptions: territories in transition to sustainable economies, dealing with depopulation, the digital divide and EU integration. The baseline scenario indicates that sustainable development, digitalisation and addressing migration will be partial. An incomplete transition to sustainable economies would mean that not all territories will meet the European Green Deal objectives. In the Danube macro-region this implies enhanced biodiversity loss, a lack of energy and reduced competitiveness for industry. By 2050, most territories in the Danube macro-region would have less people and would lack a critical mass to sustain public services for healthcare, education, culture and leisure. Territories that reap the benefits of technological breakthroughs may have positive perspectives by 2050. Early adopters of 4.0 technologies are most visible as islands of innovation and population growth. By 2050, these territorial differences would be even more pronounced due to different levels of European integration.
- **Alternative scenario: Flourishing in green and social wellbeing.** By 2050 the Danube Region has taken a leap to achieve better quality of life. This is ecological, with very good environmental conditions, and social, with trust in government and personal relations. The scenario is driven by the EU taking a new global role and increasing the quality of life for its citizens. The EU has put forward a strategic autonomy goal, which gradually transformed it into a global player, leading in sustainability and ensuring quality of life. Digitalisation has enabled more citizen participation in decision making and safeguarding European values. The transition towards a better quality of life by investing more in environmental and social enablers has affected people's lives to a great extent. It has influenced the way people work and the economy, technological infrastructure, transport and modality, as well as improved health. At the same time, with support from EU's strong regulatory presence and new global role, it enabled more solidarity and more integration across the territories and their people, which played a role in prosperity and wellbeing. People work less and value their free time more, industries have become greener, while society and businesses reap the benefits of digitalisation and sharing cultures are thriving. Alternative energy sources reduce carbon emissions, tourism and agriculture are more responsible and people have a quality of life
- **Alternative scenario: Transforming to a hyper-digital economy.** Hyper-digitalisation has increased economic growth and development in the region. The transition focused on the technological progress and economic growth has affected people's lives to great extends. It has influenced industry, the way people work and live and the economy, adjusted technological infrastructure,

affected transport and improved health. At the same time, strong citizen and civil society participation has ensured a balance between increased growth and ethical development, protecting peoples' rights and safety and improving prosperity. People are more educated, industries have moved from industry 4.0 to industry 5.0 with industrial symbiosis greening their businesses, there is robotisation in the region, manufacturing has adjusted to the technological developments and transport along the Danube River has increased. All this has led to high economic growth, turning the region into a pole of attraction for businesses, while technological advancements have ensured that EU environmental standards are maintained. People's lives have been become more virtual and intense, however a strong civil society safeguards people's rights and freedoms.

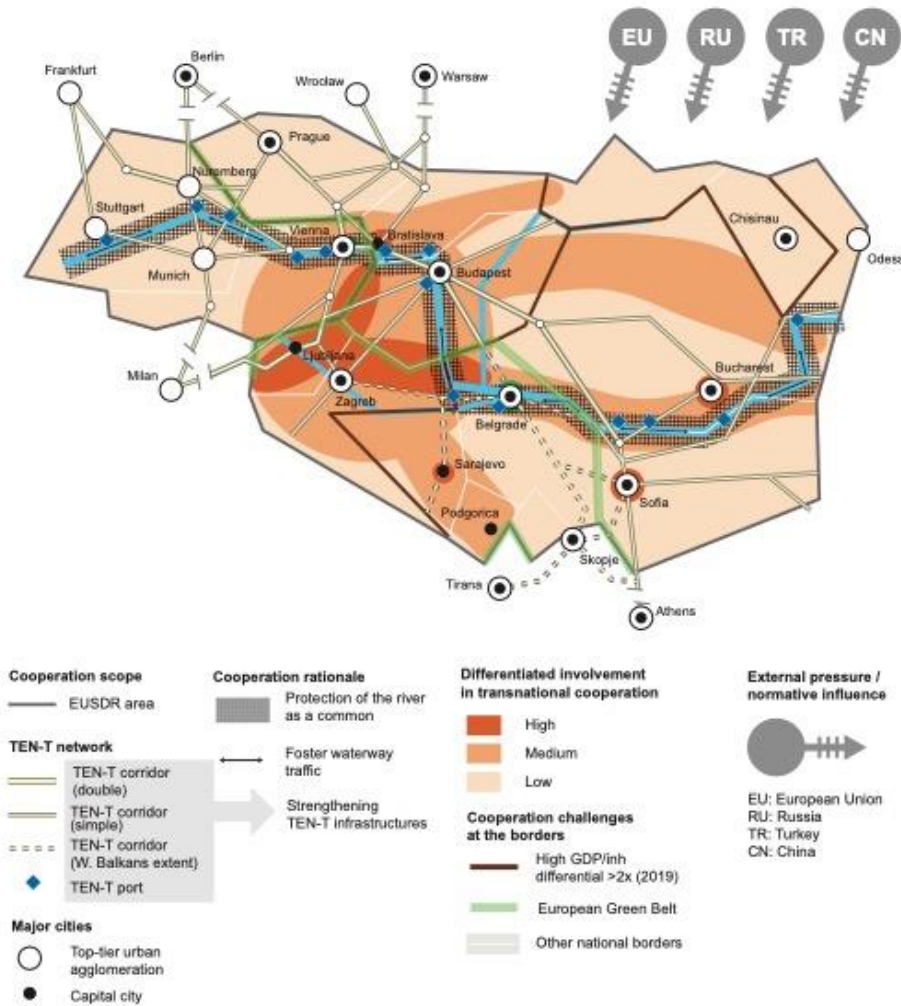
- **Pointers for the future.** Regardless which scenario one considers more desirable or likely, demographic decline and ageing, climate change, biodiversity loss, digitalisation, energy demands and growing global tensions will need to be addressed in the region. Potential policy recommendations concern green mobility, lower border barriers, the green transformation of transport, valorising ecosystem services, increased education and more people-to-people and local level cooperation. At a macro-regional level, policy could promote future-oriented debates, new thinking on macro-regional plans and strategies, and new transnational bodies and agreements. Last but not least, ESPON could focus on building repositories of national and regional plans and strategies, supporting the development of macro-regional masterplans and sector strategies as well as strengthening macro-regional monitoring.

3 Setting the scene

Understanding the present and current territorial development with, its challenges and opportunities is useful when discussing and developing a baseline and alternative territorial scenarios. This section sets the scene by taking key topics identified in the terms of reference as the most relevant ones for the future. For EUSDR these are digitalisation, migration and demographic change as well as climate change and sustainable development. Key topics for EUSAIR are the blue economy and innovation, mobility and connectivity, the green deal and sustainable development. The chapter (and the project) do not take stock of every possible development, challenge or characteristics, nor focus on any changes deriving from the COVID-19 pandemic. This chapter aims to give an overview and basic ideas of the present situation.

The Danube region is a large and very diverse territory, home to several capital and top-tier urban agglomerations, with the Danube River being the common denominator for cooperation (Map 3-1). The region is home to 115 million people from nine EU member states, three EU candidate countries and two neighbour countries. The Danube river is the longest and most international river in the EU (European Commission, 2020d). The following aggregated picture does not detail considerable differences between regions and places in the area.

Map 3-1 EUSDR mapshot



Source: ESPON TEVI 2050, 2022

Despite increasing cooperation over the years, there are persistent regional disparities, relatively slow economic restructuring and a weak Small and Medium-sized Enterprise (SME) and innovation ecosystem. In

addition, the Danube region's rich natural habitat, with shared water catchment areas, faces environmental risks, especially the quality and quantity of water sources, negative climate change impacts, mass outmigration from the region, migration from rural to urban areas, ageing, weak integration of immigrant and minority groups, weak institutionalisation, high income inequalities and a brain drain, to name a few (CESCI, 2020). Navigation and improved accessibility and multi-modal transport are also deemed important and require intervention, with ports along the Danube playing an important role in freight transport and in fostering waterway transport (Map 3-1). Although there are TEN-T networks and connections in the area, network connections in the Western Balkans are not yet finished (Map 3-1). Energy scarcity, centralisation, strong urbanisation and limited innovation are only a few examples of trends specific to the Danube region (Institute for Regional Studies, Research Centre for Economic and Regional Studies, Hungarian Academy of Sciences, 2013). At the same time, the region has potential to valorise its shared heritage, natural environment and labour forces.

The economic picture of the Danube macro-region is heterogeneous. Although GDP has increased overall, several regions are still catching up, particularly in the eastern part of the region, while in the western part, growth has been moderate (Map 3-1). There is a gradual decline in GDP per capita from the Western to the Eastern regions, with the exception of capital regions (ESPON, 2020b). To address current fragmentation, increase integration and balanced territorial development, cooperation and stronger multi-level governance with the involvement of local actors seems necessary. Already today, the Danube Region shows a high degree of cooperation, which appears greater in the mid-west part of the region, around Slovenia, Croatia, Austria and Hungary. At the same time, global power developments including from the EU, Russia, Turkey and China seem to play a role in the region's development (Map 3-1).

Zooming into the three key topics from the terms of reference, the following points give some background.

Digitalisation: still challenging despite the big steps. Digitalisation is a versatile topic, covering connectivity, as well as the digital transformation of services and businesses through different technologies, such as cloud computing and artificial intelligence. Digitalisation affects many aspects of life, work and businesses and is linked to competitiveness (European Commission, 2020d). Overall, the Danube region has relatively few people employed in information and communication, mainly due to limited progress by non-EU countries. The region has innovation leaders and followers, with the former mainly in Austria and Germany and the latter in Bosnia Herzegovina, Ukraine, Montenegro, Romania and Serbia. Only five regions in the Danube region (Mittelfranken, Wien, Oberösterreich, Kärnten and Tirol) spend 3-4% of their GDP on research and innovation, while four (Praha, Jihovýchod, Zahodna Slovenija, Freiburg and Unterfranken) were close to 2-3% in 2015 (CESCI, 2020). In addition, there is limited access to digital and remote learning, increasing social inequality. Minorities, people with disabilities and the elderly tend to be excluded from many forms of education and employment because of digital illiteracy, weak skills, low income and digital poverty, as well as a lack of infrastructure and service provision (CESCI, 2020).

Digitalisation is also particularly relevant for SMEs in the region. Although the SME density is low, SMEs will need to take into account changes resulting from digitalisation. There is a general lack in innovation in the region and slow take-up of industry 4.0 and innovation. A lack of skilled human capital contributes to this challenge. In addition, the digital divide for broadband access between East and West persists in the region, and noticeable changes in regions quickly increasing broadband access (CESCI, 2020).

Migration and demographic change – urban-rural and East-West divides. Migration is a key topic for the Danube macro-region, with migration from lagging rural areas to more developed urban areas, both within countries, as well as from the East to the West of the region. At the same time, there is high outmigration from the region, especially young and highly educated people. The region has a strong urban-rural divide and the high degree of urbanisation has large implications on migration. Positive migration is mainly to the western part of the region, while the east suffers emigration. However, there is positive migration in regions such as Győr-Moson-Sopron County in Hungary, Timis County in Romania and Istria County in Croatia, as well as to capital cities in both the West and the East of the macro-region.

In addition to migration, ageing is a further challenge in the Danube region due to low fertility, increasing life expectation and high emigration in large areas of the region. This has direct effects on the labour market, with some regions facing a brain drain and others high unemployment (European Commission, 2020d).

Climate change and sustainable development. Climate change is a key challenge in the region, affecting its flora and fauna. Temperature increases may cause severe consequences, but also increased greenhouse gases pose threats to the natural environment. There is a low share of renewables in the area, resulting in

a heavy reliance on fossil fuels (CESCI, 2020) and negative impacts for sustainable development. Furthermore, the Danube region is heavily exposed to flood risks, especially in regions in the north-east of the macro-region, catchment areas of the Upper Tisa and the Diester rivers. These are in border areas between Ukraine, Romania, Slovakia, Hungary and Moldova (CESCI, 2020). Nevertheless, the region has low climate change adaptation, making environmental protection even more challenging.

The Danube macro-region also has a rich natural habitat and biodiversity, with European Green Belts (Map 3-1). In addition to the river basin areas, the region is also home to large forests. The region has about 30% forest and 33% arable land (CESCI, 2020). Protected areas along the Danube region are a valuable source of biodiversity, with many being categorised as Natura 2000 designated areas. However, river quality varies, with the Tisza river being more challenged. Of particular importance are the groundwater bodies, which are the main sources for drinking water, agriculture and industry (CESCI, 2020). Water pollution is a key challenge for the Danube river, with pollution from nutrients, organic material and hazardous substances (ICPDR, 2002). In addition to pollution, different kinds of infrastructure, such as transport projects, as well as canalisation of the river, put floodplains, wetlands and biodiversity in the region at risk. Sustainable development is key to protect and improve the situation for the river.

Concluding points

There is a diverse picture of possible developments for the Danube macro-region. Digitalisation may bring both challenges and opportunities. Improvement is needed to bridge the digital gap and explore possibilities such as smart cities. This could include using digital and technological solutions to improve the quality of life in urban areas (CESCI, 2020). More cooperation is needed to support the circular economy, sustainable energy and to address climate change, air and water pollution. There are still East and West divides with borders becoming more and more important and increased labour migration from east to the west. These call for long-term governance structures (CESCI, 2020). All in all, to address existing fragmentation, increase integration and balance territorial development, cooperation and stronger multi-level governance with the involvement of local actors seems to be necessary.

3.1 What is in it for cooperation?

Existing cooperation frameworks in the Danube macro-region to address challenges and tap potential. The Danube macro-region is home to several cooperation frameworks. These range from Interreg transnational programmes, such as the Interreg Danube Transnational Programme, to Interreg cross-border cooperation programmes between EU member states and Interreg IPA programmes in the region. In addition to these are European Groupings of Territorial Cooperation (EGTCs), the International Commission for the Protection of the Danube River, Euroregions and others. The EUSDR is a cooperation platform to support addressing challenges in the macro-region through cooperation, also serving serve as an example of EU integration for non-EU member states.

EUSDR is an important element in the macro-region Macro-regional strategies are coordination and cooperation frameworks that implement shared priorities through processes and projects. Macro-regional strategies require cooperation across national and regional borders, at transnational level. EUSDR is a flexible cooperation framework with its own priorities to address challenges and untap potential in the macro-region. Cooperation is key. Through its four pillars (connect the region, protect the environment, build prosperity and strengthen the region) and 12 priority areas, the EUSDR works on five strategic objectives: counteracting climate change, stimulating sustainable development, establishing and enforcing a knowledge society, stimulating the economy and fighting poverty, improving mobility and connectivity, enhancing democracy, sound administration and strong involvement of civil society and youth¹. The strategic objectives, pillars and priority areas of the EUSDR encompass actions and objectives on topics ranging from rail-road and air mobility, to sustainable energy resources, the valorisation of cultural and natural heritage, water quality, ecosystem preservation, education and others.

EUSDR supporting territorial development and European integration. Cooperation under EUSDR has helped improve the water status of the Danube region and navigability of the river (Council of the European Union, 2019). EUSDR supports EU integration and contributes to EU enlargement as it includes both EU

¹ <https://danube-region.eu/>

and non-EU members, with enlargement countries participating on an equal footing. Non-EU countries gain recognition through coordinating with other organisation, countries and initiatives. They can capitalise on cooperation and projects to improve their capacity. Such approaches shall further be enhanced in future (Council of the European Union, 2019).

Challenges still remain. Despite the progress and increased cooperation that contribute to territorial development, further cooperation potential and challenges exist. These mainly regard existing divides, particularly between the EU and non-EU member states and East and West, as well as the persistent importance of borders in the two macro-regions. Governance plays a key role in enabling the cooperation environment and openings to new opportunities. In addition, civil society has become more involved over time, it shall be further encouraged (European Commission, 2020g). The co-creation process of the project has identified the following points, which played a key role in developing the scenarios:

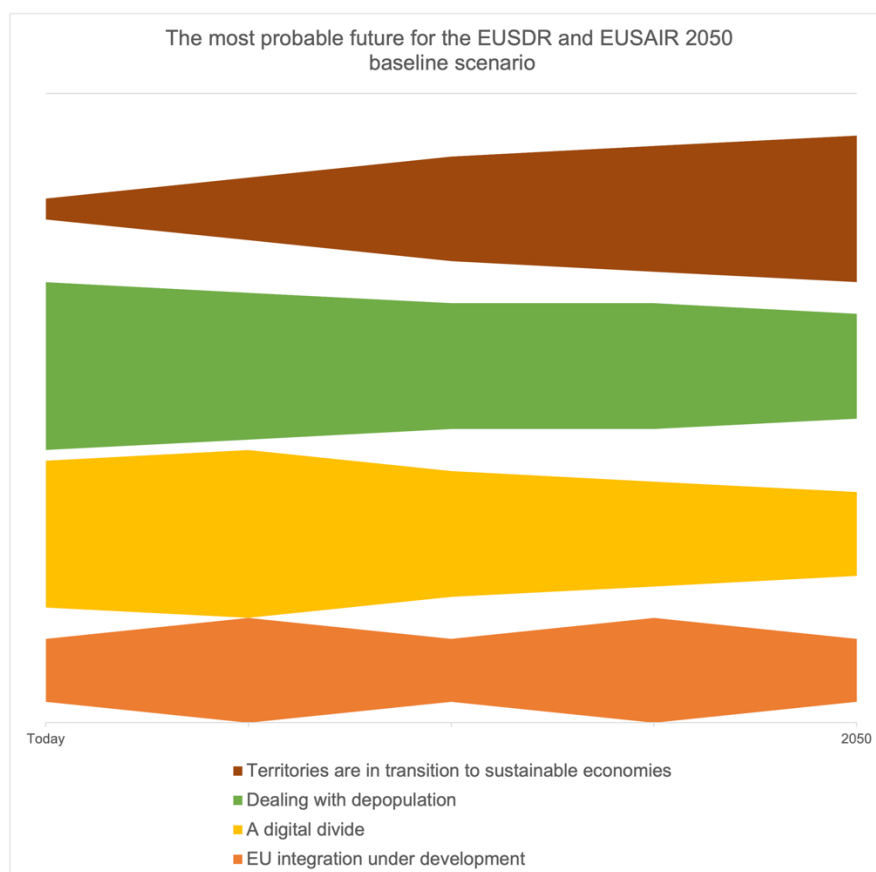
- The development and extent of EU integration and EU enlargement are important for both macro-regions. Macro-regional strategies play a major role in contributing to further EU integration and facilitating cooperation between EU member states and other countries, specifically to help them access EU Membership. The influence of external powers puts a new dimension to the EU enlargement process, as well as continued integration of existing member states. The outcome of the integration process is very relevant for development. In that respect, stronger links and cooperation is key to territorial development.
- Sustainable development is another important element for both macro-regions. While already in action plans, more actions are necessary to address climate change challenges.
- Digitalisation is of utmost importance for the Danube macro-region. Challenges persist for digital accessibility and business digitalisation, however, this is a future opportunity for territorial development of the macro-region. Coordinated actions on cyber-security and improved connectivity needs to be taken into account. Digitalisation to support sustainable development is another important factor for the region.
- The valorisation of cultural heritage and cultural diversity in both macro-regions is an important topic and is incorporated in the priorities and objectives of the two macro-regional strategies. Both macro-regions are very multicultural and sustainable tourism and natural heritage actions can contribute to a higher quality of life. This cultural diversity can be an asset for local and regional development, as well as a challenge to integration at the same time.
- There are still physical and mental borders in both areas, hampering further integration. Together with external influence and cross-border obstacles, more cooperation need to be considered.

4 EUSDR baseline scenario

A territorial baseline scenario describes a 'business as usual' future for the Adriatic Ionian macro-region. The scenario builds on trends that will most likely define territorial development in the Danube macro-region. More information on the development of the baseline scenario can be found in Part I of the final report, as well as in Annex 2 of the Scientific Annexes of the final report.

The following assumptions shape the baseline scenario, as shown in the Figure below.

Figure 4-1 EUSDR and EUSAIR baseline scenario assumptions



Source: authors' own

- Territories are in transition to sustainable economies.** The trend analysis shows close relationships between economic and environmental trends. Many economic trends are driving or hampering factors for environmental trends and vice-versa. Objectives for the European Green Deal have similar links between environmental and economic aspects. The trend analysis however shows challenges to achieving objectives of the European Green Deal. Ongoing pollution for example affects fresh air, clean water, healthy soil and biodiversity. Also, the reliance on fossil fuel and importance of this industry for employment hampers cutting CO₂ emissions. At the same time, the bioeconomy demands high quality resources and net-zero societies need 100% renewable energy production. By 2050, the Danube and Adriatic Ionian regions are thus in transition to sustainable economies. The transition to sustainable economies starts slowly in the 2020s, and the green transition is not fully implemented by 2050 (Figure 4-1).
- Dealing with depopulation.** Societal trends highlight a continuation of existing ageing and migration tendencies in the Danube and Adriatic Ionian macro-regions. Ageing is mainly driven by natural forces and economic prosperity as well as by a brain drain. Migration is driven by economic opportunities elsewhere, predominantly in capital cities or beyond the two macro-regions. Economic trends, such as the local economy or bioeconomy, as well as technological trends, such as digitalisation, provide opportunities for rural places to deal with depopulation. However, these trends remain incomplete by 2050

and thus cannot fully address the negative effects of migration and ageing. As a result, societal trends accelerate depopulation by 2050. Depopulation seems to be a continuing challenge highlighting that ageing and outmigration lead to even more uneven development (Figure 4-1).

- **A digital divide.** The trend analysis highlights the uncertainty of technological trends and their possible regional applicability in societies up to 2050. Technological breakthroughs advance transitions to sustainable economies, making production and consumption more resource efficient. As such more investments in skills and infrastructure are likely. In these places, technological advancements are part of a positive feedback loop. At the same time, a lack of infrastructure, skilled labour, and cautious attitudes to digital solutions and robotisation slow the adoption of technological breakthroughs in societies. This applies particularly to depopulated areas. As a result, the macro-regions have a digital divide by 2050, where a few places reap the benefits of technological breakthroughs due to adequate infrastructure and a well-trained labour force. The picture improves slightly after the 2030s, with policies driving digital transformation in the regions, but inequalities remain, though to a lesser extent (Figure 4-1).
- **EU integration under development.** Economic advancement as well as increasing interconnectedness and territorial cooperation facilitate European integration in the Danube and Adriatic-Ionian macro-regions. This implies the accession of countries to the European Free Trade Area, the EU, Schengen Area and Eurozone. The level of integration is however very different for each country due to volatile hampering factors. For example, building institutional capacity and diffusing powers to lower administrative levels or to non-state actors is a bumpy road. Such aspects require long-term approaches but are often interrupted by political, economic and societal changes. As a result, EU integration continues to develop in 2050. This is a path that changes over the years, with ups and downs, with countries being in favour of EU integration or not, also largely influenced by external factors and pressure from external forces, beyond the EU (Figure 4-1).

Territorial consequences as well as different topics, as formulated in the Terms of Reference, differentiate the narratives of the baseline scenario. The narrative is accompanied by a creative alternative map, depicting key features of possibilities for 2050.

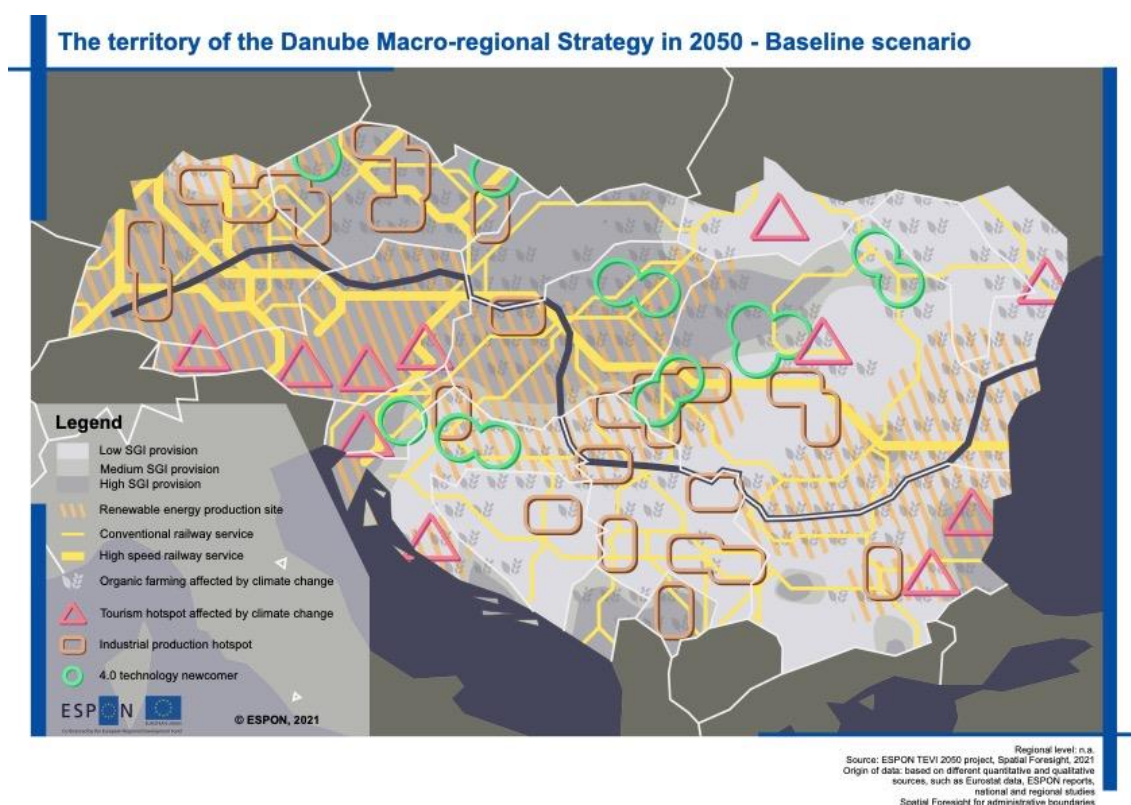
4.1 The Danube macro-region by 2050

Territorial characteristics are key to determining possible futures for the Danube macro-region in 2050. In particular driving and hampering factors (Chapter 3) play out differently by territorial type, such as landscape, settlement patterns, population characteristics or economic profile. Key territorial characteristics were discussed during a Steering Committee meeting in July 2021. Applying such features to the baseline assumptions outlined above and considering the three focus topics - sustainable development and climate change, migration and demographic change, as well as digitalisation - provide a possible territorial future for the macro-region in 2050.

In short, the Danube macro-region is polarised by 2050. There are places that adapted early to climate change, transformed their economy and society, and which reap the benefits of digitalisation. At the same time, diverse factors hindered many territories to realise their full potential. An incomplete transition to the sustainable economy, depopulation, a digital divide and incomplete EU integration result in great disparities in the macro-region by 2050.

Natural, tourism, agricultural and industrial areas are among those most negatively impacted in the baseline scenario (Map 4.1). Applying the assumptions introduced above shows that natural areas are challenged by biodiversity loss and an increased need for space for clean energy. Tourism areas are challenged by reduced travel opportunities and attractiveness as a result of lower environmental quality. Agricultural areas are challenged by biodiversity loss and an increasing need for space for clean energy. Industrial areas, mostly in EU countries, are challenged by energy issues and access to clean transportation corridors. Moreover, population dynamics reinforce these challenges in several territories. In particular territories with low levels of service provision (Map 4.1) risk entering a vicious circle of development. Only territories that adopt clean technologies and reap the benefits from digitalisation early on, including technological newcomers, will thrive in this scenario. The following paragraphs detail territorial consequences of the baseline scenario.

Map 4-1 The 'business as usual' future for the EUSDR in 2050 – Baseline scenario



Source: ESPON TEVI 2050, 2022

In more detail, an incomplete transition to a sustainable economy implies that not all territories meet the objectives of the European Green Deal. In the Danube macro-region this could mean enhanced biodiversity loss, a lack of energy and reduced competitiveness for industry.

Enhanced biodiversity loss. By 2050, key driving factors for biodiversity, such as climate change and pollution are intensified due to an incomplete transition to a sustainable economy and failing to achieve European Green Deal objectives. Industry, transport and energy production remain contributors to greenhouse gas emissions and pollution. As such they continue to threaten environmental quality including plant and animal lives. In addition, the effects of climate change are not mitigated. Instead, ongoing emissions of greenhouse gasses accelerate the frequency of droughts and wildfires as well as heavy rainfall and floods. Although the consequences of an incomplete transition to a sustainable economy is felt across Europe, specific territories in the Danube macro-region are hit worse than others.

Biodiversity loss is more evident in territories most vulnerable to climate change. In the Danube macro-region mountain areas and river valleys are particularly vulnerable. Mountain regions in Austria and Slovakia as well as the Danube valley on the border between Romania and Bulgaria and the Danube delta on the Black Sea are among those most negatively impacted by climate change (ESPON, 2014). Also, the Ukrainian regions as well as Moldova are vulnerable and in recent years these areas experienced regular floods (CESCI, 2020).

Natural as well as tourism and agricultural areas experience biodiversity loss most negatively;

- Biodiversity loss limits ecosystem performance in natural areas. Examples of natural areas also vulnerable to climate change include the High Tauern in Austria, Istria in Croatia, Montenegro and the Pirin and Rhodope mountain ranges in Bulgaria (BBSR & ESPON, 2020), as well as the Danube Delta.
- Tourism destination areas lose part of their attractiveness due to biodiversity loss. Examples of such areas also vulnerable to climate change are Bulgarian and Croatian coastal areas as well as northern Bohemia in Czechia (Eurostat, 2020a).

- Agriculture, particularly organic farming, requires high ecosystem performance to thrive. Examples of areas with high shares organic farming vulnerable to climate change are most Austrian regions as well as northern Bohemia in Czechia and the Slovak Košic region (Eurostat, 2020a).

On the contrary, territories with severely reduced populations (see also below) may see increased nature development and rewilding. To 2050, population decline may make economic functions impossible to sustain in some places, including agriculture, renewable energy sources, or tourism. Outmigration from these places would lead to rewilding, which may stimulate biodiversity.

Issues for reliable delivery of energy. By 2050, sustainable transport and digitalisation increase the demand for electricity (Fehér & Měrő, 2019). Energy demand increases globally by 30% to 2040 (National Intelligence council, 2021). At the same time, the shift to sustainable economies demands the phasing-out of fossil fuel-based energy production and the uptake of clean energies. All of this impacts reliable delivery of energy in several areas of the Danube macro-region.

Regions in Serbia, Bosnia and Herzegovina, Montenegro, Czechia, Slovenia, and Bulgaria are among those most reliant on fossil fuel energy production (Alves Dias, Patricia, Kanellopoulos, Konstantinos, Medarac, Hrvoje, Kapteaki, Zoi, Miranda Barbosa, Edesio, Shortall, Ruth, & Czako, Veronika, 2018). These territories require a substantial transition of their energy production to become sustainable economies, as presented in this scenario's assumptions. Exploiting unutilised potential for solar and wind power counterbalances some losses due to phasing out fossil fuel energy. In addition, more energy can be produced from biomass. Biomass is regarded as an energy source with high potential in the Danube region, particularly compared to other energy sources (Hujber & et al, 2014). Utilising this potential by 2050 is however hampered by several factors. Although the amount agricultural land increases until 2030 (Bock & Krysztowicz, 2021), the number of farmers significantly decreases (Fritsche, Brunori, Chiaramonti, Galanakis, Matthews, & Panoutsou, 2021). Indeed, population decline, particularly in rural areas, hampers the production of biomass for energy production. In addition, by 2050 climate change reduces the reliability of water accessibility.

Industrial areas, transport hubs and natural areas experience the energy transition most negatively;

- Industrial processes and transportation, particularly by air and sea, rely on fossil fuels. Electricity from wind or solar is often insufficient to provide sufficient energy (ESPON, 2018c). Areas in Czechia, eastern Romania and Serbia are particularly negatively impacted due to their high share of industry (BBSR & ESPON, 2020) and issues of reliable energy provision as discussed above. Romanian and Bulgarian regions along the Black Sea and the Danube are particularly negatively impacted due to the importance of water borne transport (ESPON, 2018c).
- Clean energy production, by solar, wind and biomass, requires land as highlighted by survey respondents. Hence, using unexploited potential implies increased land-take at the cost of natural areas. As such clean energy production hampers EU biodiversity objectives (COM(2020) 380 final, 2020). The northern part of the Pannonian basin between Budapest, Vienna and Bratislava up to Moravia in Czechia have the most unutilised potential for wind power (ESPON, 2018e). Croatian coastal regions, regions of the Pannonian basin as well as those in the lower Danube river valley and the Danube have the most unutilised potential for solar power (ESPON, 2018e).

Reduced competitiveness of industry. By 2050, a shift to a sustainable economy requires major investment for industrial processes, to reduce greenhouse gas emissions and to improve the efficient use of resources. The same shift makes transportation more expensive. Ideas of a net-zero society mean sustainable transport options such as trains, trucks and ships fuelled by electric power or hydrogen pass on part of their investment costs to users. Using non-sustainable transport implies paying for carbon emissions. Industrial production is thus costlier in the Danube macro-regions by 2050 and less competitive against production in places with less strict environmental laws or cheap labour.

Reduced industrial competitiveness is most evident in territories with high employment in industry. Non-competitive industry is more likely to lay off people or go out of business. The share of people working in industry is particularly high in Baden-Württemberg, Germany, regions in Czechia, including Northern Bohemia, Plzeň and Zlín, as well as regions in eastern Romania and southern and western Serbia (BBSR & ESPON, 2020).

Territories with low accessibility by rail as well as areas with few green innovations have the most negative impact on competitiveness for industry:

- Rail transport is a relatively cheap and sustainable option, while interoperable hydrogen systems for trucks, inland shipping or flights are still being set up. This scenario assumes that territories are

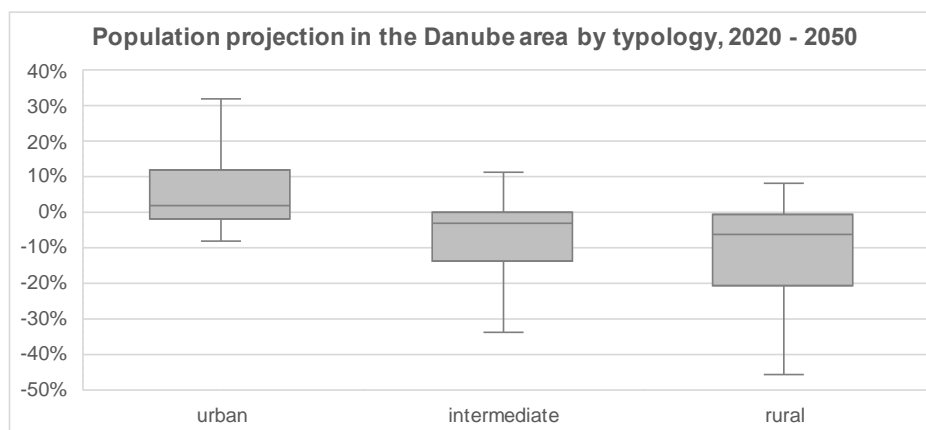
still in transition to being sustainable economies. Assuming realisation of the European transport network, rail infrastructure covers all parts of the Danube macro-region by 2050 and regions in Germany, Austria, Czechia and Hungary are best connected to high-speed lines. Regions in other parts of the macro-region are predominantly connected by conventional railways (DG MOVE, 2020). So, industrial regions in Romania (e.g. Banat), Bulgaria (e.g. Stara Zagora), Serbia (Southern and Eastern Serbia and Western Serbia) are less competitive in European and global markets.

- Green innovation enhances regional competitiveness through a more sustainable use of resources, preservation of environmental capital and external shocks such as climate change (ESPON, 2018a). A lack of such innovation makes production processes costlier in a society transitioning to a sustainable economy. The number of green patents is concentrated in Europe and mostly lacking in Eastern European countries, especially outside capital regions (ESPON, 2013). Industrial areas outside capital regions and in eastern parts of the macro-region are the least competitive by 2050.

Challenging public service provision. By 2050, most territories in the Danube macro-region are declining in population. These places lack a critical mass to sustain public services for health care, education, culture and leisure (OECD/EC-JRC, 2021). Moreover, decreased access to public services and better economic opportunities elsewhere are key driving factors for people to leave these places (Noguera, Mar Ortega-Reig, Hector del Alcazar, Copus Andres, Francesco Martino, & Barbara Forcina, 2017). Access to public services in rural places is part of a negative spiral leading to depopulation.

Challenges for public service provision are most evident in territories with a declining population. By 2050, urban and rural territories experience population decline (Figure 4.2). Shrinking cities include Bratislava, Karlovy Vary, Oradea, Satu Mare and Burgas. 75% of rural areas will decline, especially in the Carpathians, Sava River valley, the Danube valley between Romania and Bulgaria as well as in the Dinaric Alps. Many of these territories already have a low population density (Eurostat, 2020a).

Figure 4-2 Population projections 2020-2050 in the Danube area by typology



Source: own elaboration based on Eurostat 2020 population projections

Digital solutions provide opportunities to overcome population decline, such as digital health care or education services as well as robotics for agriculture (Territorial Agenda, 2020). However, the digital divide as assumed in this scenario hampers the use of digital solutions, meaning:

- Public authorities favour trusted providers for digital connectivity. Universal solutions for satellite internet as developed by Elon Musk's Starlink or the Chinese government are available by 2050 but mostly used by private persons. Public authorities prefer other providers for public services which requires infrastructure.
- Digital solutions are available in areas with the necessary infrastructure. A lack of income as a result of population decline, hampers investments in digital connectivity by local authorities. In this case, the pressures of population decline hinder technological advancement and regional and local economies (European Commission Directorate General for Research and Innovation, 2012).

Territories with low rural broadband coverage have the most difficulties to provide public services by 2050. Regions in Bosnia Herzegovina have among the lowest coverage of broadband internet (Tech4i2, Time.lex, & Jurjevic, 2019). In addition, the region of Moldova in Romania and rural regions in Bulgaria and Croatia (e.g. Slavonia) have the lowest share of next generation internet access (BBSR & ESPON, 2020).

Islands of innovation and population growth. The transition to sustainable economies, population changes and a digital divide provides positive perspectives for a few territories in the Danube macro-region. In particular these are territories that reap the benefits of technological breakthroughs. The application of technological breakthroughs is a driving factor for a sustainable economy, such as a net-zero society, circular economy and sustainable transport. In addition, they help with the adoption of clean energy and mitigate negative effects of climate change. This makes these places attractive for people from places with less positive perspectives, for example places that deal with biodiversity loss, a lack of energy, non-competitive industries, or a lack of service provision. Hence, application of the baseline assumption depicts these places as islands of innovation and population growth by 2050.

Early adopters of 4.0 technologies are most visible as islands innovation and population growth. The 4th industrial revolution leads to technological fusion and the lines between physical, digital and biological systems becoming blurred, transforming the labour market significantly. Moreover, new technical solutions rapidly rolled out across the world increasingly create ‘winner takes all’ economies. This gives an additional relevance to regions and urban agglomerations in economic transition (Territorial Agenda, 2020). German and Austrian regions as well as Budapest are technology leaders. Budapest, Vienna and areas around Munich focus on digitalisation and robotisation in the service sector, the remaining regions focus on digitalisation and robotisation of industry (BBSR & ESPON, 2020). Other regions could leapfrog on technological breakthroughs. Creative capacity and low entry barriers for new technology facilitate uptake in these regions without full application of preceding technological transformations (Capello, Lenzi, Nausedaite, & Romanainen, 2020). Eastern Slovenia, Eastern Croatia, Prague and Northern Bohemia in Czechia, Northern Hungary and the Northern Great Plain in Hungary as well regions in Northwest Romania are examples of such regions (BBSR & ESPON, 2020). These can be islands of innovation by 2050, if other territorial consequences do not hinder this.

Partial sustainable development, digitalisation and mitigation of negative consequences from migration. The possible future for the Danube macro-region based on today’s situation as described in Chapter 2 indicates mostly negative outlooks for the key topics from the terms of reference (Table 4.1).

- Enhanced biodiversity losses challenge sustainable development and intensify climate change and its effects.
- A lack of energy challenges the realisation of net-zero societies and uptake of digital solutions.
- Reduced competitiveness for industry challenges the uptake of sustainable and digital solutions, hampering sustainable development and digitalisation. Moreover, uncertain outlooks for growth and jobs stimulate migration to places with positive outlooks.
- A lack of service provision is a key driver for migration and demographic decline, which in turn hampers the uptake of digital solutions.
- Islands of innovation stimulate sustainable development, mitigate climate change, and advance digital solutions. At the same time, they are attractive centres reinforcing migration patterns and demographic change.

Table 4.1 Territorial consequences impact opportunities of today’s key topics in the Danube macro-region

	Sustainable development and climate change	Digitalisation	Migration and demographic change
Enhanced biodiversity loss			
Lack of energy			
Reduced competitive levels of industry			
Challenging public service provision			
Islands of innovation and population growth			

Source: authors' own

By 2050, these territorial differences are even more pronounced due to different levels of European integration in the Danube macro-region. EU Member States must contribute to European policy objectives as spelled out in the European Green Deal, Social Pillar, and Digital Strategy. Moreover, they make use of resources for their contributions. In addition, cross-border cooperation and the flow of people is easier between EU Member States that are part of Schengen. EU accession states have similar obligations but often fewer capacities to deliver results. At the same time, they are more susceptible to influence from foreign powers, who have different socio-economic and environmental objectives. By 2050, the Danube macro-region includes more EU Member States than today. However, different rates of EU accession have widened gaps to achieving European Green Deal, Digital Strategy and Social Pillar objectives and thus accentuated the impacts of sustainable development, digitalisation, migration and demographic change.

4.2 Conclusions

The territorial baseline mainly shows negative territorial developments for the Danube macro-region. Natural, tourism and agricultural areas are among those facing the most negative challenges as a result of climate change, biodiversity loss, increased transportation costs and depopulation.

The benefits of technological advancement and digitalisation are likely to be concentrated in a few territories. This includes territories that started investing and adopting clean and green technological solutions early as well as territories with creative capacities and low entry barriers to applying new technology. These territories can leapfrog stages of technological advancement and are shown as technological newcomers in map 4-1.

At the same time, the common baseline assumptions – territories in transition to sustainable economies, dealing with depopulation, a digital divide and incomplete EU integration– have different territorial consequences. In the Danube macro-region, challenges for industrial areas, mostly in EU countries, become noticeable. Imbalanced clean energy across the region challenges industrial production. As such, industry in Czechia, central Romania and Serbia must be innovative or pay more for carbon emissions. In addition, reliance on road or maritime transport to import or export production material challenges industrial areas as these means of transport are likely to become more costly. As such industrial areas in Croatia, Bosnia-Herzegovina, Serbia and Bulgaria risk losing competitive advantage.

Overall, the baseline scenario depicts increasing challenges for many types of territories in the Danube macro-region. Only a few territories will thrive as islands of innovation. An incomplete transition to sustainable economies indicates great disparities between territories in the two macro-regions.

5 Flourishing in green and social wellbeing

For the *summum bonum*²: Getting a good life. By 2050 the Danube Region and its citizens have taken a big leap towards achieving the ‘greatest good’, i.e., a better quality of life. The COVID-19 pandemic of the early 2020’s was a trigger for increasing the importance of wellbeing. Restrictions and social distancing measures greatly affected social life, contacts and the mental health of citizens, which directly affects their personal wellbeing. Citizens have realised that it is not only economic progress that brings joy. In fact, in addition to economic factors like income or wealth, other factors, such as personal relations, improved social life and contacts have been proven pivotal for a good quality of life (Hanell, 2018; Kahneman & Krueger, 2006). Beyond that, the pandemic also highlighted more than ever the link of good environmental conditions, good governance and good health with the quality of life. During the lockdowns of the early 2020s, CO₂ emissions reduced to decade-long lows (Tollefson, 2021), improving air and noise quality, while some first seeds of nature revival in many places were sowed (Barbiroglio, 2020). In addition, public trust, e.g. trust in services, in the legal system etc., has been boosted since the 2020s, building a new paradigm for governments which have won trust over the pandemic crisis years, as an important wellbeing component (OECD, 2021b, 2021a). The war in Ukraine also highlighted the need for trust in democratic governments. These triggers made it clear that green environments and flourishing ecology, as well as institutional trust and thriving communities are important enablers for a good life (ESPON, 2020a). By 2050, prosperity in the Danube Region is not only defined by good material conditions, education, economic and physical safety, employment and job satisfaction, but also health, leisure and social interactions, a good living environment and good governance (Hanell, 2018), as people start to value their personal lives more.

In strategic autonomy: EU as a global player. By 2050 the EU has become more strategically autonomous, which has greatly influenced the integration of its territories and macro-regions, by also becoming more resilient. The COVID-19 pandemic exposed several vulnerabilities, dependencies and gradual disempowerment across Europe and its neighbourhood. To counter that, the EU has aimed at more resilience, where mutual interdependencies are well managed and there is relative power across the EU (Joint Research Centre, 2021c). Critical dependencies such as increased competition in geopolitics, digital technology, economic dependence on foreign powers, the green and digital transitions, polarisation due to populism and climate change consequences that need coordinated action have prompted a more active role for the EU in the world (Joint Research Centre, 2021c). Although the idea initially focused on security and defence, over the years, strategic autonomy evolved towards further policies. As a result, by 2050, the EU has become more proactive, being true to its interest and values, and has taken a leading role in geopolitics, the environment and society. This strategic autonomy over the decades has been step for the EU project, evolving from an economic and social union to a ‘governance of governance’. This has not only had implications for EU member states, but particularly for EU enlargement, with the latter becoming a key influence and priority tool in its wider territory. Enlargement countries have mainly become EU member states. Through its strategic autonomy, the EU has become a strong regulatory player functioning as a large umbrella organisation, safeguarding its sustainability rules and social charter through legislation. At the same time, this overarching autonomy of the EU strengthened the subsidiarity principle in member states and allowed the EU to have more global influence.

Fit for digital transformations. Discussions in the 2020s initiated the digital transformation across the EU. This is transforming people’s lives, bringing people closer together no matter where they are located, as was proved during the COVID-19 pandemic, enabling people to organise themselves, interact, work and reach out in a fast, easy and economical way. The EU digital compass of the 2020s launched four key aspects for digital transformation, which have evolved by 2050 and peaked in the Danube Region. Increased digital skills, more secure and sustainable digital infrastructure, the transformation of businesses and public services now highlight the digital profile of the macro-region (European Commission, 2021b). In addition, the digital agenda for the Western Balkans has been a cornerstone for a gradual digital revolution with better broadband connectivity, increased cybersecurity and industry digitalisation, a stronger digital economy and society as well as research and innovation (European Commission, 2018a). These developments have

² Summum bonum: latin for the greatest good.

fostered new opportunities in the region, not only in connectivity and business, but especially in developing an open and democratic society, green solutions and personal interactions, which were necessary for the wellbeing of Danube Region citizens.

The transition towards a better quality of life by investing more in environmental and social enablers has affected people's lives to a great extent. It has influenced the way people work, the economy, technological infrastructure, transport and health. At the same time, with support from the EU's strong regulatory presence and new global role, it enabled more solidarity and integration across the territories and their people which played a role in their prosperity and wellbeing.

Green is the colour of wellbeing. By 2050 the Danube Region has invested in improving ecological enablers in its territories. As good environmental conditions are closely connected to better health, not only being closer to nature, but also living in healthy environments are recognised as key prerequisites for a better quality of life (ESPON, 2020a). Possible enablers are green infrastructure and protected areas that are available and maintained, i.e. access to green places rich in biodiversity and nature increase opportunities for relaxation, health, sport and leisure. At the same time, good air and water quality, little soil contamination, reduced CO₂ emissions and decarbonisation of the economy, all contribute to reducing climate change risks and make territories more resilient and more sustainable (ESPON, 2020a).

Places with ecological enablers, such as green infrastructure and protected areas, are where green wellbeing can flourish. This is, for instance to be seen in the regions of Vorarlberg and East Austria, in Central Slovakia, most parts of the Czechia and Slovenia, as well as the regions of Caras-Severin, Hunedoara and Maramures in Romania. (ESPON, 2020a). Furthermore, places with protected areas or large natural parks, such as the Danube Delta biosphere reserve, Iron Gates natural park in Romania, Lower Prut nature reserve in Moldova, Duna-Ipoly national park and the Duna-Drava national parks in Hungary, the Zahorie protected landscape area in Slovakia, Gornje Podunavlje nature reserve in Serbia, Donau-Auen national park and the Wachau protected landscape area, as well as the narrow valley of the Danube in the Passau district and Donauwald Neuburg Ingolstand in Germany (DanubeParks, 2020), are some examples of places that by 2050 thrive in ecological wellbeing. (Map 5-1)

Achieving the Green Deal 2.0. Climate change has been the greatest long-term challenge of recent decades. Nevertheless, a good environment and connection to nature would not have been possible without the EU Green Deal 2.0. Implementing the Green Deal has transformed the Danube Region, taking it to the next level, where a net-zero society has been largely achieved across Europe. CO₂ emissions have been reduced and most of the Green Deal goals achieved which have improved the quality of life for citizens over the years as have actions for fresh air, clean water, healthy soil, biodiversity, healthy and affordable food. With better public transport, renovated and energy efficient buildings, cleaner energy, long lasting products and circular economy approaches (European Commission, 2019b) the Green Deal has been an overarching umbrella for the Danube Region to achieve a better ecological status and gradually become a net-zero society. This has not only affected EU member states, but also those who were non-EU members at the beginning of the policy, such as the Balkan states. More specifically, dedicated policies for them supported their green transition with measures on decarbonisation focusing on energy, mobility, climate, the circular economy, depollution, sustainable food systems and biodiversity protection. The efforts have largely paid off with many places showing an improvement by 2050 (European Commission, 2020e).

An improvement in CO₂ emissions per capita has resulted from the climate neutrality policy. This is particularly to be seen in eastern regions of Romania, the city of Vienna and East Austria region, the eastern part of Bulgaria and north west Czechia (European Committee of the Regions, 2019). In addition, regions that were formerly 'coal regions', such as Trencin in Slovakia, Valea Jiului in Romania, Karlovarsky, Ustecky, Moravskoslezsky in Czechia, as well as the Donets'k, Luhans'k, Lviv and Volyn regions in Ukraine have by 2050 been transformed. (European Commission, n.d.-a, n.d.-b)

Prosperity as a matter of trust. The years before the 2020s were marked by discourse around 'places that don't matter' and the 'geography of discontent', which referred to regions with persistent poverty, economic decay, lack of opportunities and decline (Dijkstra, Poelman, & Rodríguez-Pose, 2018; Rodríguez-Pose, 2020). These brought an avalanche of developments especially a rise in populism across Europe and a fall in trust of governance, services and institutions. This phenomenon started to reverse following the COVID-19 pandemic. In fact, the quick and remarkable response of governments to the pandemic has been a lesson for reinforcing democracy and hence increasing trust in governance, services and institutions (OECD, 2021b). More than 50% of people trusted their government in 2020 (OECD, 2021b), this gradually increased by 2050 with stronger environmental and social policies, as well as more citizen participation in decision

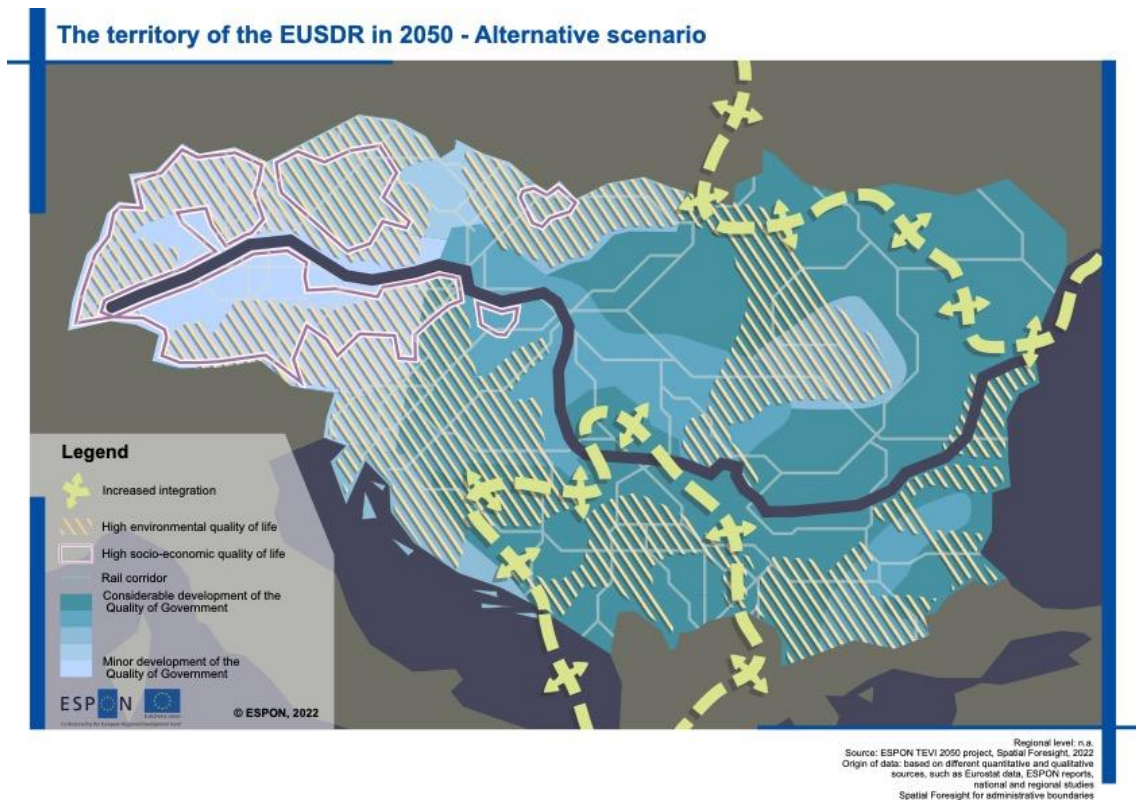
making, especially where trust in government was low or challenged earlier. This shift has improved the social wellbeing of citizens which is affected by interpersonal and institutional trust.

Regions where the quality of governance was low have shown substantial leaps in increasing trust and governance quality by 2050. These include most regions in Romania, particularly the metropolitan region of Bucharest, coastal Bulgaria regions such as Severozitochen and Yogoistochen, the regions of Eszak-Alfold and Eszak-Magyarország in Hungary, as well as most regions in Serbia. (Charron, Lapuente, & Bauhr, 2021).

Economy: Is this the end of GDP? Wellbeing is not always linked to GDP indicators, as the latter often fail to show what brings people joy. There were discussions about going beyond GDP before the 2020's. Nevertheless, the increased focus on ecological and social wellbeing in the Danube Region by 2050 has gradually restructured the economic measurement of GDP to encompass other aspects of peoples' wellbeing. Elements covering environmental and social dimensions have been necessary particularly redefining prosperity by embracing social fairness. This means paying particular attention to leaving 'no one behind', building resilient societies, as well as decoupling prosperity from natural resource use, supporting a fair green transition and exploitation of natural resources. Talks about 'beyond GDP' were often linked to 'de-growth'. This meant reducing production and consumption and understanding environmental issues as ethical issues involving social transformation. In the Danube region, efforts have been made towards more sustainability and social fairness for increased wellbeing by 2050.

Regions which were characterised earlier as 'left behind', opposing EU integration, such as regions in Hungary, south Austria, parts of central and west of Slovakia and most regions in Czechia, have leapt towards increased trust and stronger social wellbeing (Dijkstra et al., 2018). In addition, places investing in ecological enablers and green infrastructure such as most regions of Slovenia and central, western and southern Austria, most parts of Serbia, South East Romania and Burgas in Bulgaria, most regions of Slovakia and central Czechia will be the first regions getting a better quality of life due to their improved ecological status (ESPON, 2020a).

Map 5-1 Flourishing in green and social wellbeing – Danube Region 2050



Source: ESPON TEVI 2050, 2022

E-services and e-governance bring people together. The digital transformations across the Danube Region increased the use of digital e-services. This is not only reflected in people's lives when it comes to the

way people work or shop but has also contributed to greater citizen engagement in decision making. Online platforms allow citizens to participate in online assemblies, i.e. the virtual version of the citizens assemblies that was existing in some countries already decades ago, discussing regulations, important matters and plans for their territories among others. In addition, digital government services have also increased by 2050, facilitating interaction with public authorities. With future generations becoming digital nomads, public policies need to keep up and ensure their engagement. Such digital participation has brought governance close to citizens, involving the co-creation of public services and redesigning them for citizens' needs. Greater inclusion has also brought stronger social cohesion, ensuring services for people, designed by citizens.

When it comes to online citizen participation, digital connectivity plays an important role. Although this has widely expanded to include most households, places with high household digital connectivity seem to be front-runners. This transition was first in urban areas, followed by rural areas, which transitioned slowly. In addition, the mobile revolution during the 2030s reshaped connectivity especially in less accessible territories and rural areas, bridging former digital divides. Early adopters were citizens in capital cities, such as Bucharest, Budapest, Vienna and Prague, as well as the regions of Friuli Venezia and Lombardia. North west and west Romania, the western part of Hungary and Central Slovakia had to make greater efforts to eventually take big leaps towards higher digital connectivity and invest more in digital infrastructure, as well as mobile broadband connectivity. (Eurostat, 2020b) (Map 5-1)

Our work: digitalisation and automation. The digital revolution of recent decades with 'fit for the digital age' policies and increased digital connectivity across the Danube Region has also largely transformed the way people work. It has created many new jobs, as in the 2010s, where in one decade more than 2 million jobs were created in the EU (European Commission, 2019a). Although new technologies may make some jobs obsolete, especially artisan jobs that have been sacrificed in the name of robotisation, it has also improved the quality of existing jobs and created new ones. Particularly very standard and predictable jobs can be automated. At the same time, digital technologies have changed what and how people work, adapting to new methods (Joint Research Centre, 2019). All these bring substantial market changes across the regions. Of course, social support is necessary to manage labour market transitions, especially through education and well-designed policies. (European Commission, 2019a) Such developments may also create new types of job, such as 'explainers', i.e. workers interpreting Artificial Intelligence system outcomes or 'ethicists', i.e. setting guidelines and making sure they are followed so Artificial Intelligence systems are accountable (Joint Research Centre, 2019). These developments have improved peoples' lives in the long run, as it made people focus on more important and personally gratifying tasks. In an indirect way, digitalising work has given people the flexibility to take more control of their lives.

Regions with high manufacturing employment will have to adjust and change their profiles and ways of working by 2050. This includes most regions in Czechia, Trenčín region in Slovakia, Upper Austria, large parts of western and central Romania, parts of western and central Hungary and the South of Bulgaria. (ESPON, 2018b)

Regions with a high share of employment in industry will be first that need to adapt to the new trends and developments. This is particularly relevant for the regions of Plzeň, Liberec, Hradec Králové, Pardubice, Vysočina and Zlín in Czechia, the region of Komárom-Esztergom in Hungary, the Carinthia region in Slovenia, the regions of Timiș, Arad, Hunedoara, Sibiu and Argeș in Romania, Zagora and Gabrovo in Bulgaria, Zenica Dobož canton in Bosnia-Herzegovina, as well as Moravica, Zlatibor, Jablanica, Pcinj and, Pirot, among other regions in Serbia. (BBSR & ESPON, 2020)

Regions that already during the 2010s were implementing industry 4.0, such as Niederbayern and Oberpfalz in Germany, Upper Austria and Kärnten, Western and Central Slovakia, the north west and eastern part of Hungary, as well as regions that were robotising traditional manufacturing like west and central regions in Romania, Severozapaden, Severentsentralen and Yogoiztovchen in Bulgaria, all of Slovenia and the southern part of Hungary were already a step ahead in adapting to the new developments.

Jobs go where skills are. Digital and non-cognitive skills are important for digital-related jobs. Digital literacy is a prerequisite for employment in highly skilled jobs and positions with more responsibilities and more tasks (Joint Research Centre, 2019). The skills demand has increased by 2050, transforming the nature of work and making it more specialised. Non-cognitive skills, such as people skills, emotional intelligence and social interaction (Joint Research Centre, 2019) have also expanded over the decades, highlighting their importance for people-to-people work relations. Workers who fail to adjust or lack these skills may risk having less well-paying employment chances.

Although it is difficult to pinpoint places where people have high cognitive skills, places where citizens regularly used the internet earlier than 2030 indicate high digital skills and possible attraction poles for employment in related fields. For instance, the east part of the Danube Region, e.g. regions in Romania, Bulgaria, central and south Serbia, north Croatia and Slovenia used to seldomly use the internet, while in the western part, such as in Prague, Austria, Germany, Slovakia and Hungary as well as north part of Serbia very low share of population has not used the internet. (BBSR & ESPON, 2020).

How do we work? New rules to count. The increasing focus on wellbeing and increasing digitalisation has provoked a change in peoples' attitudes towards work. By 2050, citizens of the Danube Region talk about the 'end of ambition', where employees quit their jobs for better or less stressful ones, or for working environments where their efforts seem more appreciated. Job productivity has been increasing for a long time, unlike wages which have remained stable (Malone, 2022). The previous working culture of 'Thank God Its Friday' that caused burnouts, extra pressure and depression has seen large scale resignations (Malone, 2022). The pandemic of the early 2020s made people realise the importance of free time and changed presumptions that their jobs are the most important things in their lives (Malone, 2022). This not only affected workers on the lower rungs of the ladder, but also elite lawyers, finance CEOs, or high ranking executives who quit their jobs to spend more time with their families or take up new adventures (Gelles, 2022). In addition, the COVID-19 pandemic accelerated 'working from home', which increased up to 60% in spring 2020, a trend that stayed and increased to 2050, as employees choose to work nearly half from home as it increases their happiness and productivity (The Economist, 2021d). Being busy is no longer trendy and employers strive for less working hours and less demanding schedules. Putting workers' wellbeing first, companies have gradually adjusted to offering meditation and therapy sessions. In addition, making business calls illegal after working hours has only been the beginning of this new shift. This is also supported by the Millennial generation employees who, especially after the pandemic, started valuing their free time and wellbeing more, abandoning cushy and stable jobs to start new businesses, requesting more flexible timing, or experimenting with new professions (Roose, 2021).

These developments have particularly affected regions with a large share of employment in services already in the 2020s which gradually moved towards adjusted working styles. These are mainly urban areas across the Danube Region, such as Beograd, Ljubljana, Vienna, Salzburg, Bratislava, Zagreb, Sarajevo, Sofia, Cluj and Bucharest. (BBSR & ESPON, 2020)

In addition, by 2050, citizens moved from urban areas to nearby small and medium-sized cities or rural areas to benefit from a better quality of life. This has affected urban settlements, small and medium-sized cities and rural areas all over the Danube Region.

Greening and digitalising industry. With the increase in automation and in the importance of peoples' free time industry could not remain unaffected. Digitalisation has sparked a boom of e-commerce and online warehouses, which increased even more after the COVID-19 pandemic. Online shopping has become more tailored and personalised, while online retailer warehouses quickly and efficiently accommodate any shopping need (European Commission, 2019a). This has had direct implications on smaller bricks-and-mortar retailers and local shops, as they had to adjust to these new developments or close. Digital platforms have allowed consumers to buy things faster and easier and have them delivered. At the same time by 2050, technology serves the sustainability values of people in the Danube Region. Greening production through circular economy practices and improved better waste management have become the norm. Certainly green-washing is unavoidable, putting at risk all the environmental efforts that have been taken place so far. For this, Pigouvian taxes³ have been applied to avoid tricking the system.

Internet use for purchases is a good indication of places that lead the shift towards e-commerce and online shopping. This can relate to both purchasing and selling goods or services. For regions already used to purchasing online from the 2010s, the shift has been easy by 2050, e.g. most regions in Austria, south Germany, east Hungary and the Budapest area, as well as regions in Slovenia. At the same time, regions with low internet sales were mainly in the east part of the Danube Region, in Romania and Bulgaria, while parts of Serbia could leapfrog by 2050 with adequate policies. (BBSR & ESPON, 2020)

³ Taxes on a market transaction that creates a negative externality, or an additional cost, borne by individuals not directly involved in the transaction.

Territory: Upskilling for a European industry – Vojvodina 2050

Vojvodina had reached its limits in work-intensive growth. Policymakers have realised the need for a shift -- from quantitative growth and economic figures to smart, inclusive and sustainable growth and social fabric. More attention is now paid on the new engines of industrial growth: the people and the improvement of their skills and well-being. In order to gain a new impetus middle-sized towns have been developed in a comprehensive way. A more polycentric network of industry has been formulating involving cities such as Subotica or Sombor. These urban centres now have the potentials and the economic will to shift to a knowledge-intensive industry. Gradual shift has occurred: instead of just waiting for FDI for assembly plants complex actions are taken to support upskilling to reach a European-level smarter industry.

Share, repair and care. This shift towards more sustainability is not only reflected in the way businesses operate, but also in the way people behave. People's mindset in the Danube Region has gradually shifted towards abandoning the linear economic system of 'take-make-waste' towards a more circular approach of reuse-recycle-repair. This has been supported by stronger policies but also by citizens themselves, who have seen the benefits of the circular economy over time. In addition, increased digitalisation has allowed people to organise themselves in online platforms for car, tool and expertise sharing. Exchanging, particularly at neighbourhood and local level has led to a more mindful use of resources and a stronger community feeling among citizens.

The use of collaborative economy platforms where people can organise themselves is an indication of a sharing economy. Regions already aware of such platforms in the 2010s could already move to a more sharing economy. In the Danube Region, these included regions in Austria, Czechia and Hungary. (European Commission DG COMM, 2016)

Carbon neutrality: zero emissions possible. External factors, such as increased tensions in the neighbourhood of the Danube Region in 2022 has rung the alarm bell for the need for a new, more efficient and less dependent energy system. Having the Green Deal as an overall policy compass and building on the EU's strategic economy, resulted in the EU leading the way towards carbon neutrality, the new 'REPowerEU' plan of the 2020s has borne fruit (European Commission, 2022). The long-lasting dependency of the EU on Russian oil and gas has been replaced with a rapid transition towards clean energy and less coal dependency. Uncertainties posed by fluctuating and high energy prices during the 2020s spurred the green transition. The EU has revived its gas storage policy through infrastructure and phased out its dependence on fossil fuels, in most cases before 2030 (European Commission, 2022). By diversifying gas supplies and reducing this dependence it was possible to realise the Green Deal goals faster. At the same time, strategic autonomy allowed the EU to easily diversify its gas supplies and accelerate hydrogen power. Increased investments in renewable energies were also put in place during the 2030s, further diversifying energy sources. (European Commission, 2022)

In addition, until around the 2030s, energy production in the Danube Region was largely based on hydropower. In the 2020s, 59 dams used to produce about 60% of the region's electricity (Bachmann, 2010). Although hydropower has long been considered a climate friendly energy source, as it produces limited CO2 emissions, discussions during the 2020s were raised about its sustainability. The dams interrupt the river, while new hydropower plants may cause hydromorphological alterations with negative consequences to river habitats, disconnecting wetlands and floodplains or even altering the river's characteristics and influencing fish migration routes (Bachmann, 2010). In addition to EU level initiatives, Danube Region initiatives included constructing green energy and logistic belts across the region (Interreg Danube, 2017), focusing on bioenergy, which has been a major renewable energy source.

Regions with many hydropower plants have been most challenged as they have been in transition to greening and reducing their environmental consequences, or shifting to more renewable energy resources. Such examples are the Djerdap Gorge (Iron Gate I and II) which is the largest in the Region, operated jointly by Serbia and Romania, the Gabčíkovo close to Bratislava, as well as several dams in Upper Austria and Lower Bavaria, Croatia, Hungary, Bosnia and Herzegovina, Serbia (UNDP GEF Danube Regional Project, n.d.) and Albania, which is totally dependent on hydropower. Hydropower plants that were in the pipeline in the 2020s, such as in Montenegro, Croatia, Slovenia, all had to shift towards smaller infrastructure to avoid major consequences. (Schwartz, 2015)

On the other hand, regions that invested in renewable energy, and especially biomass biny the forestry sector, the Danube Region's biggest potential, could take bigger steps by 2050 to a green transition. A

potential threat has been deforestation due to the biomass production in many places in Bosnia and Herzegovina, Moldova and Ukraine, where additional measures need to be put in place. (REKK, 2020)

Logistics: it's a long way. The new shopping habits of people linked mainly to online shopping and on demand services has resulted in a need for more and better-connected logistics services. However, the scarcity of resources and increase in energy prices, accompanied by a higher environmental consciousness has made logistics services even more expensive by 2050. Production remains global and with the strategic role of the EU expanding, such globalisation increases. Although there are sharing and repairing elements in small urban and rural areas, larger metropolitan areas are substantially dependent on online shopping. Interregional freight transport connections and key transport hubs remain important for logistics. Technological advancements have increased the use of cleaner energy in transport, reducing costs and environmental footprint.

Rail is back on track. A key characteristic for mobility in the Danube Region by 2050 has been the shift towards more sustainable transport and less carbon emissions. The Green Deal has encouraged green mobility. An efficient and interconnected multimodal transport system has been gradually implemented, while affordable and high-speed rail networks are on track (European Commission, 2020a). Further to that, night trains have been in fashion again, reducing unproductive travel time and flights which have the highest share of carbon emissions. Rail freight traffic has also doubled, while high speed rail traffic has tripled and the TEN-T has been largely electrified and expanded towards the Western Balkans (European Commission, 2020a). Stricter pollution standards and stronger regulations defend sustainability.

Bespoke multimodality. Transport in the different regions of the Danube Region has gradually turned into 'mobility as a service', with bespoke and tailored mobility designed for citizens. This is particularly relevant in urban areas, where the demand for innovative mobility solutions is high. Here, digitalisation facilitates these services. Increasing multi-modality in urban centres as well as good quality and green public transport, increases its use. Furthermore, collective transport, walking and cycling infrastructure, as well as car-sharing and other micro-mobility forms (European Commission, 2020a), reduce the need for car use with the attendant congestion, air pollution and noise which hamper people's wellbeing.

Connectivity infrastructure plays a key role in logistics and travel. EU infrastructure projects such as the TEN-T network. Also, projects funded by external powers, such as the One Belt One Road initiative already completed by 2030 have played a key role in improved connectivity in the area. Nevertheless, with the stronger autonomous role of the EU over the years, the influence of other powers has reduced, with the EU taking a more leading role in its territory and neighbourhood.

The transport gaps between the Upper Danube and the Middle and Lower Danube have over the years been reduced by more rail connections and infrastructure. The TEN-T Core Network has been completed while the TEN-T Comprehensive Network has to a large extent also materialised by 2050. Key rail nodes such as Vienna, Innsbruck, Salzburg, Sarajevo, Dobož, Novi Grad, Sofia, Plovdiv, Karnobat, Zagreb, Vinkivci, Prague, Brno, Ostrava, Munich, Nuremberg, Chisinau, Balti, Bucharest, Belgrade, Bratislava, Divaca, Koper and Odessa, are key connecting points in the region (Interreg Danube Transnational Programme & Danube Region Strategy Mobility, 2021). Last but not least, night trains connect key urban areas across the EU, bringing cities and citizens closer. (Map 5-1)

Large intermodal rail, road and river terminals across the Danube region are increasingly important for logistics services. These include Budapest and Torokbalint (Hungary), Bratislava and Sladkovicovo (Slovakia), Vienna, Graz, Lambach and Enns (Austria), Munich and Burghausen (Germany), Beograd, Pancevo and Novi Sad (Serbia), Bar (Montenegro), Banja Luka, Sarajevo and, Tuzla (Bosnia Herzegovina), Ljubljana and Celje (Slovenia), Odessa (Ukraine), Oknica and Kisinjev (Moldavia), Bucarest and Arad Curtici (Romania) and Stara Zagora (Bulgaria).

Territory: The 5-minute city: Ljubljana 2050

While the COVID-19 pandemic brought the transition to digital and the final blending between work and leisure it simultaneously also incited the resurrection of the personal contacts. From the growing awareness about the dangers of excessive screen time and socially damaging effects of ever more pervasive digital social networks the 'back to people' movement was born. It has been compared to the environment movement and dubbed also 'The New Humanism'. In Ljubljana, like in most cities and smaller towns, the movement offered an umbrella term for a variety of civil society organization from the fields such as culture, elderly and immigrant care, youth and homeless organizations, but also local businesses and the creative sector, working to bring people together. Focusing on the role and functions of public space by 2040 it facilitated

the transformation of the city into a network of 5-minute neighbourhoods, in which all basic and social needs could be fulfilled within a 5-minute walk. It turned out that more frequent personal contacts contributed not only to better quality of life, but also to more effective tackling the effects of climate change.

Tourism – travel responsibly. The steady green and digital transitions have also affected the tourism industry in the region. The quality of life is closely tied with leisure activities and holidays. In addition, being closer to nature increases wellbeing. Hence, by 2050, less crowded rural destinations, national parks and nature-related places, even close to cities have been key destinations for people in the Danube Region (European Commission, 2021d). The COVID-19 pandemic raised the importance of domestic tourism and closer destinations do not require flights or long drives. This has increased the bonding people feel with their tourism destinations, exploring their natural and cultural heritage without being part of harmful mass tourism (European Commission, 2021d). Sustainability has also affected tourism services, namely accommodation and catering with eco-hotels, less use of plastics, recycling and vegan meals in many tourism hotspots. This increases respect towards the territories and local communities. (European Commission, 2021d) Digitalisation has also improved services.

Regions where employment largely depends on tourism that have been resilient after the COVID-19 pandemic implemented dedicated policies or focused their Regional Innovations Strategies on tourism. These were pioneers of 'getting back to normal' and also invested in sustainable tourism. Such regions include south and west Austria, Slovenia and the north of Italy, unlike regions in Slovakia, Hungary, west of Romania, and most of Bulgaria. There are challenges for Severoiztochen in Bulgaria where tourism is key to employment, but no Regional Innovation Strategy provides any support. (European Commission, 2021d)

From Farm to Fork. Good quality food, sustainable production, reduced loss and waste prevention, all contribute indirectly to people's wellbeing in the Danube Region. In this case, the strong focus on sustainability and Green Deal implementation has supported sustainable food systems and their links to healthy people and the planet (European Commission, 2020f). The stronger autonomous role of the EU has enabled more resilient food systems within the EU and also reduced global dependencies. The Danube Region, with large agricultural areas has pioneered the field. Following the Farm to Fork policy, by 2050 food chains have zero environmental footprint, there is high food security and food is affordable and fair (European Commission, 2020f). Certainly, technological developments in agriculture have further supported these goals, making the Danube Region a frontrunner in their application. Smart farming, using special sensors, cloud computing, precision agriculture, automation, new breeding technologies, and crops resistant to climate change are all part of agriculture practices by 2050.

Technology has led to more controlled environment 'indoor' farms by 2050. These contribute to food security, are locally sourced, independent from weather conditions and able to produce all year long. Farmers are more technology developers, using automation and artificial intelligence to run farms (Joint Research Centre, 2021a). Urban farming has also gained importance over the decades, as small-scale farming has proven to reduce stress and increase a community feeling. Urban farming combines social care with the urban environment. More specifically, social care farming involves sustainable approaches to farming and eco-services with meaningful manual labour as therapy (Joint Research Centre, 2021a). The approach increases group work, empathy and communication skills, while the combination of being in nature and increased social responsibility contributes to peoples' wellbeing. For people in urban areas, urban farming combines an urban lifestyle with their agricultural interests. In accordance with the Green Deal and a focus on wellbeing, more and more people in urban areas have increased the sustainability of cities and now contribute to food production (Joint Research Centre, 2021a). This makes places and people even more self-sustained, while bio-production is promoted as much as possible.

Although all territories are affected by the transition in agricultural practices by 2050, they mainly affect places with agricultural land and rural areas. Areas with extensive and intensive use of arable land have been primarily affected by the changes in agricultural practices. These include most regions in Hungary, such as Del-Dunantul, Del-Alfold, Eszak-Alfold and Nyugat-Dunantul, as well as Zlapadne Slovensko in Slovakia, south west Oltenia, Sud-Muntenia Sud-Est, Nord-Est, Nord-Vest and Vest in Romania, most regions in central Czechia and the east of Slovenia. Places with high innovation and R&D are also important to developing relevant technology and those with know-how can transmit smart farming ideas to rural areas. (EEA, 2017)

Living the good life. The challenges that Europe faced during the 2020s made people in the Danube Region realise that their wellbeing and happiness is of utmost importance. Hence, the focus on environmental and social quality of life by implementing policies such as the Green Deal along with strong trust in

governance and EU institutions has been pivotal. This approach follows the Aristotelian '*eudaimonia*', 'good spirit', where people's happiness is the highest good and achieved only after major effort. In the Danube Region, people are finding good life purposes in good environmental and social conditions.

Living well with our neighbours: Together we stand, divided we fall. The third decade of the 20th century saw not only a pandemic but also with a war at the eastern border of the Danube Region. Those challenges have been acknowledged and the strategic autonomous role of the EU increased by 2050, reducing such challenges. The key message has been that cooperation, integration and solidarity are key for the wellbeing of people in the Danube Region and their neighbours. Over the years, the integration of countries from the Western Balkans has taken shape, as well as stronger cooperation with Ukraine and neighbours. Stronger together has been a motto for territories in the Danube Region and integration has been a beacon for future policy developments. The more strategic role of the EU has allowed it to become more extrovert and play a more global role, at the same time strengthening subsidiarity within member states. Hand in hand with the Global Gateway initiative, the EU is now a key player in big infrastructure projects across its neighbourhood and around the world, supporting physical and digital infrastructure projects, spreading democratic values and good governance, speeding up sustainable development around the world, focusing on security and health (European Commission, 2021a).

From the macro-regional, to a European culture. In its new global profile, the EU has focused on ensuring and promoting core European values. These shape both old and new members of the union. Citizen exchanges through different platforms, with more interactions and engagement has increased trust in the EU. This has helped further develop, cultivate and share EU values, also creating an overall EU culture and citizenship. The EUSDR has been a microcosm of the development of such a common culture. Core values such as human dignity, democracy, freedom, equality, rule of law and respect for human rights have been foundations for the European way of life and incorporated in the Danube Region citizens' way of life.

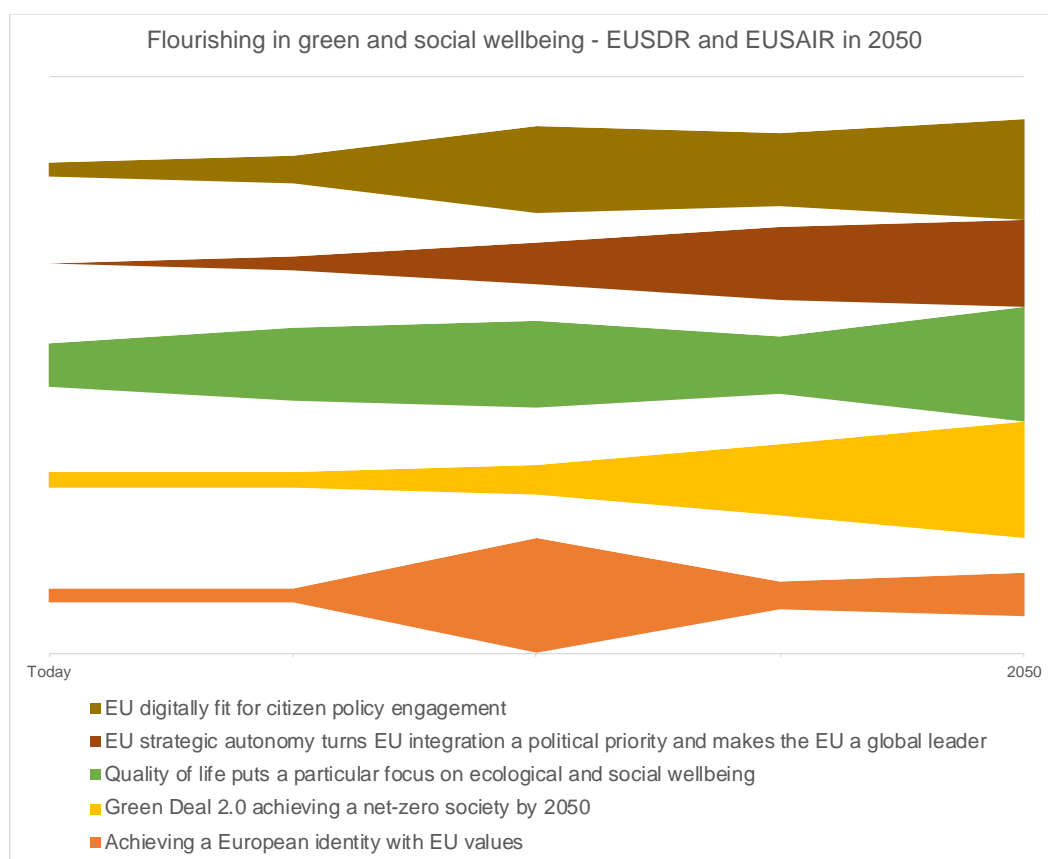
6 Concluding reflections

What can we draw from the alternative territorial scenario ‘Flourishing in green and social wellbeing’? The alternative territorial scenario has capitalised on the work carried out through the desk research and the co-creation process to develop the core foundations upon it has been developed. Those core foundations of the scenario have been the basis for the further development of the scenario and unfolding the key storylines and elements, as well as identifying their territorial implications. The following sections present first shortly those core foundations of the scenario. Second, they show the links of the key foundations to the storylines and elements of the scenarios, as well as overall territorial implications the scenario has.

6.1 What are the foundations of the scenario?

The alternative territorial scenario ‘Flourishing in green and social wellbeing’ is a highly policy driven scenario, focusing on the green, digital and just transitions and their possible implications. The scenario has been built along five core foundations, as shown in the figure below.

Figure 6-1 Flourishing in green and social wellbeing foundations – EUSDR and EUSAIR in 2050



Source: authors' own

By 2050, the citizens of the Danube and the Adriatic Ionian Region have taken big leaps to achieve a better quality of life. By 2050, quality of life puts a particular focus on ecological and social wellbeing, as good environmental conditions, being close to nature, living in healthy environments are parts of a good life. Furthermore, the social sphere also plays a key role, as by 2050, prosperity is also a matter of trust in government and services. This development starts slowly in the 2020s and increase steadily, with the adoption of increased policy measures around green and social elements.

In addition, the new role of the EU which capitalises in its strategic economy, making the EU a global grand chessboard player, and the EU integration a political priority. By 2050 the EU has become more strategic autonomous, a development that has largely influenced the integration of its territories and macro-regions,

by becoming more self-ruled and more resilient. Through its strategic autonomy, the EU has become a strong regulatory player in the EU functioning as a large umbrella organisation, safeguarding its sustainability rules and social charter through its legislation. At the same time, this overarching autonomy of the EU strengthened the subsidiarity principle of the member states and allowed the EU to play a more global influence role. This development started very slowly in the 2020 and very slowly increased over the years by 2050, as such developments need substantial time to take shape (Figure 6-1).

To this increased trust has also contributed the digital revolution that has taken place by 2050, with the EU and its citizens becoming digitally fit have increased not only digital infrastructures and digital literacy in the region, but have also been enablers for developing an open and democratic societies, that bring and organises people together. This development took small steps in the 2020s until almost the 2030s, but with technological advancements being unavoidable in the future, it substantially increased by 2050 (Figure 6-1).

Furthermore, additional efforts have been put to implement the EU Green Deal Moving towards a Green Deal 2.0, i.e. taking the policy a step further helped to achieve a better ecological status, not only for the EU member states, but also expanded to the non-EU member states. The process has started gradually in the 2020s, influenced by external developments and energy crises, to then take up over the decades (Figure 6-1).

All these developments, the increased citizen engagement in decision making, the new EU global role and the increase importance to wellbeing have all been brought together to gradually develop a European common culture, with strong core values, such as human dignity, democracy, freedom, equality, rule of law, respect to the human rights have been the foundations for the European way of life. This is something that started very slowly over the 2030s to further increase, especially driven by external factors, to then stabilise over time (Figure 6-1).

All in all, these developments show the directions that different developments have taken in this scenario, influenced by the choices people have done. For the project, this guidance and direction has been given through the participatory approach. All these play, however, differently in the different territories.

6.2 What are the territorial implications of the scenario foundations?

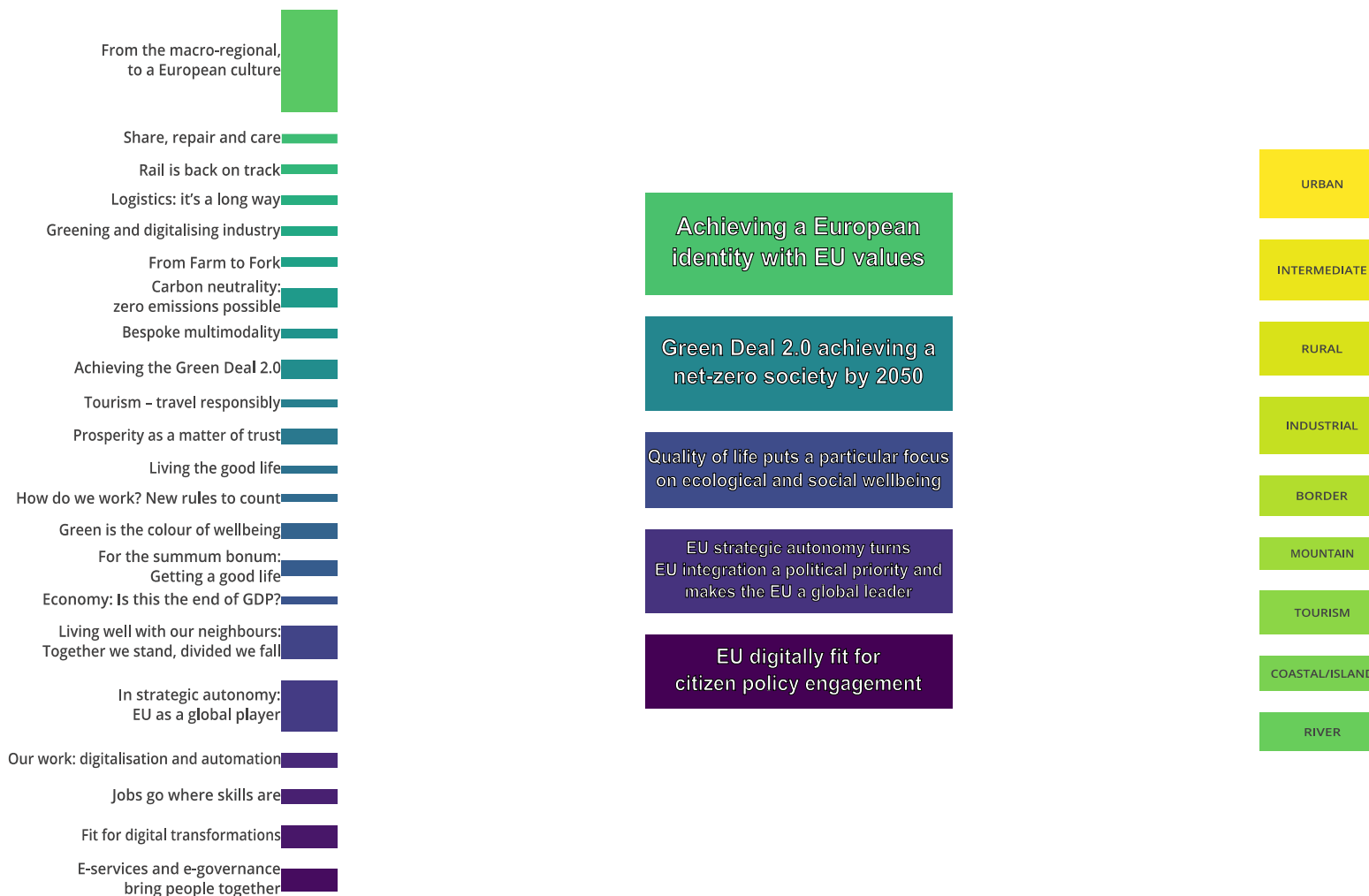
The scenario foundations summarise the different elements that build the whole scenario storyline. This is graphically shown in Figure 6-2 below. The Figure shows how thematically linked the story is with the core elements that have shaped the development of the scenario. In addition, the figure synthesises what types of territories are most affected by the scenario. Although more specific territorial implications are given in the scenario stories, the figure below gives an overview glimpse of types of territories most affected. Certainly, such big changes have implications on all territories. Nevertheless, mountain, coastal and river areas are primarily affected by the shift to quality of life, as they provide ecological enablers. In addition, industrial areas are highly affected by the digital transition, affecting the way industries are organised, with green and digital approaches being implemented, as well as transport and logistics. Urban and rural areas are largely affected by most developments and especially as drivers for the green transition and higher quality of life. This is particularly linked to the increase in social wellbeing and the increased digital citizen participation, which has been higher in cities. Same holds for the intermediate areas. Rural areas play a key role when it comes to Green Deal achievements and quality of life, especially by being green hotspots. All territories, are differently affected by the Green Deal developments, as urban, intermediate and rural areas notice reduced pollution over the decades, industrial areas transform their model, while mountain, river, coastal areas improve the environmental condition of their habitat.

Besides highlighting territorial implications of the alternative territorial scenario, Figure 6-2 pinpoints at the complexity that territorial scenarios deal with. The elements that constitute the scenario are highly linked not only, in one way or the other, to each other, but also to the core foundations of the scenario, building a coherent and solid story. At the same time, they influence different territories to different extends, counting on the specific details of each scenario element. The territorial implications also depend on the sensitivity and resilience capacity of different regions to adapt to changes and transitions. The figure does not aim to detail every possible territorial implication, but rather to reduce complexity and emphasise that interdependencies of territories are unavoidable.

The figure was constructed taking into consideration that all drivers have at least one component, that each driver has different effect intensities on each of the type of territories, and finally that each component has a

different importance (proportion) inside each driver (i.e. the height of the components). The territorial effect intensity was calculated based on the particular weight that each driver was considered to have on each type of territory and the importance of the component for each driver. The different heights of the drivers (middle) are a result of the sum of their intensity for all territories. On the right side, the intensity of each component is translated to each territory based on the basic calculation of driver intensity x component importance (the latter which sum up to 100% for each driver). As a result, the height of each type of territory is proportional to the intensity of the effects of all drivers together. This means that at a general level all types of territories are impacted, however, the intensity of the effects differ significantly for each driver based on the effects of their components.

Figure 6-2 What territories are affected by the ‘Flourishing in green and social wellbeing’ alternative scenario?



Source: authors' own

7 Transforming to a hyper-digital economy

2050: The hyper-digitalisation odyssey. By 2050 the Danube Region has taken big steps to profit from the new global digital era and became the first macro-regional strategy with a clear digital focus. The long-lasting digital divides in the Region (CESCI, 2020) have been bridged through the commitment of the macro-regional players. By 2050, the digital transformation of the Danube Region has become a key priority with direct effects on businesses, employment, infrastructure and public policies, as well as people since it has changed their lifestyles, leisure and work. The COVID-19 pandemic of the early 2020s triggered an increase in digitalisation, technological advances and the use of technology which sped up innovation. This went hand in hand with the progress of industry 4.0, which included cyber-physical systems, Internet of Things, cloud computing, cognitive computing and artificial intelligence (European Parliament, 2016). Robotics, autonomous automobile systems and additive manufacturing are not only well established, but also shape production and consumption patterns. By 2050, industry 4.0 has not only become a reality, but is moving towards the industry 5.0. Technological progress has revolutionised industry, economy and social life by 2050 and led to 'hyper-digitalisation' in the Danube Region. The Danube Region built on the EU policies and priorities of the 2020s, i.e. to become digitally fit for 2055, as well as the Green Deal which supports the use of technology for sustainability. At the same time it has kept up with global innovation and technology and focused on capitalising on innovation and developing innovation that works for people. For this, it has invested in digital skills, cybercrime protection and balancing technology with people's rights. It has also developed a fair and competitive digital economy by supporting start-ups, online platforms and high quality technology, as well as invested in an open, democratic and sustainable society, by greening digitalisation and using technology for climate neutrality (European Commission, 2020b).

Re-grow and prosper: Getting back to growth. In addition to the acceleration of technological progress, the COVID-19 pandemic has brought back attention to the importance of economic growth and development for people's prosperity. Economic growth saw a sharp decline back in 2020, with GDP falling by 6% on the previous year despite the low GDP of most Danube Region countries (Eurostat, 2021). Although the numbers gradually returned to pre-pandemic levels, further crises, such as the Ukraine war, high inflation and global competition highlighted the need for greater preparedness with more focus on the economy and growth for prosperity. Recovering from the economic consequences of the pandemic and getting back on a growth path has made the Danube Region a leader by example. In addition, the ageing population in the Region encouraged smarter solutions to get back to growth mode. Economic growth has been coupled with technological development in the macro-region, as the latter has fundamentally changed the way economies and society function. In fact, digitalisation and the technological changes are responsible for the accelerated growth and development in the Region over the decades. (European Strategy and Policy Analysis System, 2015) The approach has not only been relevant for EU member states, but also for the non-EU members of the EUSDR, as they also focused on 'business first' to boost economic recovery and invest in multilateral cooperation (European Commission. DG Research and Innovation, 2021). Hyper-digitalisation and economic growth, together with uptake of Regional Innovation Strategies in the Western Balkans contributed to making a U-turn in economic development, opening up new economic activities.

Fair and social: People in the limelight. Although the key focus has been on the duo of digitalisation and economic development, the importance of civil society and people remains. The steep digital and economic progress over the decades to 2050 also saw concerns over safety and increasing uncertainties, as well as rising inequality among different societal groups in the Danube Region. To ensure that developments serve people and respect peoples' rights and safety, as well as to address inequalities from these major developments, governments and citizens pushed for more civil society and citizen participation in the Region. This was also to avoid places and people being 'left behind', which would also eventually have political consequences (Rodríguez-Pose, 2020). In their Joint Statement back in 2021, the ministers responsible for innovation and digitalisation in EUSDR countries highlighted that the sustainable digital transformation could increase the quality of life for citizens, boost industrial and SME competitiveness and sustainability and accelerate trade and environmental objectives (EUSDR, 2021). Deepening democratisation, the rule of law and EU values over the years, in combination with widespread access to technology and information for everyone, 'people power' has increased, for self-development and safety, stimulating bottom-up political decision-making, ensuring that social needs are embedded in innovative solutions and democratic values are well established, putting the individual at the centre of attention and increasing stability (European Strategy and Policy Analysis System, 2015).

The transition towards a digital economy with a key focus on technological progress and economic growth has affected people's lives to a great extent. It has influenced industry, the way people work and live and the economy, adjusted technological infrastructure, affected transport and improved health. At the same time, strong citizen and civil society involvement has ensured a balance between increased growth and ethical development, protecting peoples' rights and safety while playing a role in the overall prosperity.

Industry 4.0: From revolution to status quo. Already in the 2010s, industry 4.0 was revolutionising innovation, technology and industries, bringing an enormous shift in consumption, work and personal communication. Technological breakthroughs such as the Internet of Things, big data and data mining, brain machine interfaces, super calculators, smart devices and cloud computing transformed IT platforms, reducing costs and having an economic impact of around EUR 1.2 to EUR 4.5 trillion by 2025 already. Smart mobility, sensors, additive transformation and 3D printers, synthetic biology, the combination of nano-, bio- and information technology in healthcare, and of course virtual reality becoming mainstream are all examples of the technological revolution that by 2050 was a 'status quo' in the Danube Region (European Strategy and Policy Analysis System, 2015). Companies have kept up with global players and accelerating global developments so technological progress has contributed to fast-forward economic progress (European Strategy and Policy Analysis System, 2015). On the contrary, ill-equipped companies which cannot keep pace with the changes are unable to use or develop digital applications or lack big data management seriously lag behind in economic and industrial competitiveness and are cut off from global markets. (European Strategy and Policy Analysis System, 2015).

Innovation and research are at the epicentre of technological breakthroughs. Places with high innovation, as well as places with a high research profile play an important role by 2050 and had a smoother transition. At the same time, places that were earlier lagging behind, leapfrogged by adjusting quickly to the changes and became global innovation trend-setters. (Map 7-1)

Places that had strong innovation profiles already in the 2020s had a faster transition to industry 4.0, including regions in Germany like Oberbayern, Tübingen, Freiburg, Schwaben, Mittelfranken, Karlsruhe and Stuttgart, all regions in Austria and Prague. These were already strong innovators or innovation leaders and a step forward in the process. Some moderate innovators in the 2020s took important steps to adjust, such as all other regions in Czechia, Slovenia, North Croatia and Pannonian Croatia, as well as Belgrade and the region of Yugozapaden in Bulgaria (European Commission, 2021). (Map 7-1)

Regions with a strong research profile had skilled employees and offered further developments to be applied in innovation leading industries. Such regions include capital cities all over the Danube Region, but also smaller places such as Iasi, Timis and Cluj-Napoca in Romania, Maribor in Slovenia, Zadar in Croatia, Novi Sad in Serbia, Szeged and Debrecen in Hungary and Brno in Czechia to name a few.

Regions in the east part of the Danube Region and regions in Romania, Hungary, Croatia, Slovenia and Czechia were also characterised as new islands of innovation already from 2020 (BBSR & ESPON, 2020).

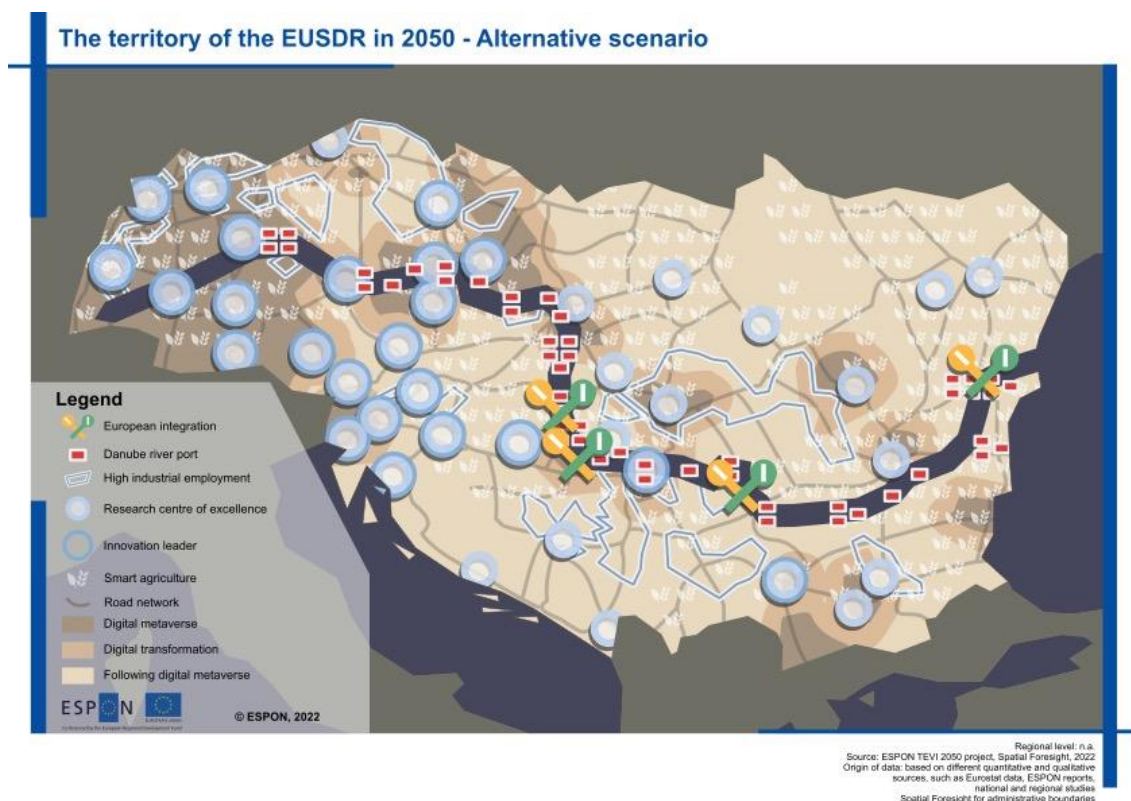
Walking the industry 5.0 path in symbiosis. Hyper-digitalisation has allowed entrepreneurs to further innovate and grow their businesses, also indirectly supporting the green transition. There was a paradigm shift in industrial policy. Although digitalisation brought several economic benefits, it also brought challenges such as fragile value chains for critical supplies, overuse of natural resources, increased inequalities and social change. There are also environmental pressures that do not match the Green Deal and sustainable development values of society by 2050. Industry 5.0 will alleviate these challenges by promoting digitalisation, technological development, artificial intelligence and automation, adapting it to workers as well as to sustainability and circularity (European Commission, 2021e). This has resulted in businesses in the Danube region redefining their business model, applying more circular approaches and sustainable production while investing in social sustainability. This approach has created a more resilient, robust, sustainable and human-centric industry in the macro-region, putting people and the environment first, and at the same time increasing economic growth in the macro-region.

The shift towards industry 5.0 is also coupled with sustainable solutions. Sustainable use of resources and waste management and other circular approaches are all part of this green transition. By 2050 industrial symbiosis means waste or by-products become raw material for other companies, with a circular economy and resource security (European Commission, 2018b). This creates interconnected industries, where no waste is produced, less raw materials are needed and value is created from materials that would otherwise be wasted (European Commission, 2018b). Therefore, the environmental footprint is reduced, making it possible to increase production with less environmental cost.

Regions with a strong industrial profile and high share of employment in industry have been the first to shift to industry 5.0 in slow and gradual steps (Map 7-1). This is particularly relevant for the regions of Plzen, Liberec, Hradec Kralove, Prardubice, Vysocina and Zlin in Czechia, Komarom-Esztergom in Hungary, the Carinthia region in Slovenia, Timis, Arad, Hunedoara, Sibiu and Arges in Romania, Zagora and Gabrovo in Bulgaria, the Zenica Doboij canton in Bosnia-Herzegovina, and Moravica, Zlatibor, Jablanica, Pcinja and Piroi, among other regions in Serbia. (BBSR & ESPON, 2020)

Industrial symbiosis examples from the region pioneered by 2050 had already in earlier decades invested in industrial symbiosis. Examples are networks such as e-simbiosa in Slovenia, Green Tech Valley, Styria R.N and Ökopark Hartberg Steiermark in Austria, ECOERG in Romania, NISP and REPOWIS in Hungary, as well as the region of Pecs-Kokeny Waste Management centre in Pecs which has reduced waste challenges for 313 municipalities, improving resource efficiency in the region. (Domenech, Bleischwitz, Doranova, Panayotopoulos, & Roman, 2019; European Commission, 2018b)

Map 7-1 Transforming into a hyper-digital economy – Danube Region 2050



Source: ESPON TEVI 2050, 2022

Catching more EUunicorns. In the light of the hyper-digital transition, technology unicorns, i.e. technology companies with high market capitalisation, have boomed in the Danube Region. Such IT centric companies, supply the market with innovative and affordable services and products, including services relying on connectivity or new devices. EU unicorns have grown organically by 2050, i.e. they were not a result of mergers or acquisitions but have a high R&D expenditure and depend on the entrepreneurial profile of their founders. These are often serial entrepreneurs, i.e. founders who created other businesses before and who have strong academic backgrounds establish the majority of unicorns in the Danube region by 2050 (Joint Research Centre, 2016). By 2050 they have become mainstream, developing niche sophisticated products based mainly on artificial intelligence, digital health and cyber security, offering consumers new, often cheap products and services (The Economist, 2021c). Unicorns rely largely on venture capital for their seed funding, which comes from business angels, i.e. investors who fund small start-ups (Joint Research Centre, 2016). As venture capital entails both high risk and high rewards, the Danube Region has foreign investors and has also capitalised on EU financial opportunities, including European Funds for Regional Development.

Foreign direct investment shows how attractive different places may be globally. Places that attract foreign direct investment attract private investors and venture capitalists for Danube Region unicorns. More and more regions in the Danube Region have become more attractive for foreign direct investment, already by 2015. These include most regions in Czechia, the Budapest wider region, Split Dalmatia county in Croatia, most regions of Slovakia, regions around Sofia in Bulgaria, most of Austria and Slovenia and the regions of Centru, South Muntenia, West and South East in Romania (ESPON, 2018g).

New employment mode: I am robot. The hyper-digitalisation shift in the Danube Region has brought substantial changes in the way people work and businesses operate. Artificial intelligence and robotisation have made some jobs redundant but also created new ones. Estimates of that impact and the jobs at risk was already in the 2010s varying between 14%-47% (European Commission, 2019a). To counterbalance displaced workers new jobs have been created. Automation has created more niche and high-skilled jobs. Middle-income jobs requiring at most a secondary education have been significantly displaced by automation, these include truck drivers, office clerks and repetitive manual jobs. At the same time, many jobs have been transformed, requiring specific and high skills, such as social and cognitive intelligence, in healthcare, technology and creative industries, but also data experts, ethics officers, etc. (European Commission, 2019a)

Manufacturing levelling up. Manufacturing has also been adjusting to the digital transition in the region. Some places have not yet realised a full digital transition by 2050. Here manufacturing and artisan jobs are still necessary. In many cases manufacturing has become niche or relates to high end innovation. Following industry 5.0, robotisation has become part of manufacturing sector, where robots work together with people. An example is the automotive industry in Germany which has introduced small scale robots to cooperate with humans (European Commission, 2019a). Gradually, manufacturing has been levelling up, with additive manufacturing playing a key role and 3D printers and automation taking over traditional work positions. Again, some jobs have been replaced permanently by automation, while new jobs have also been created for skilled employees. (ESPON, 2018b, 2019a). Keeping up with technological developments and increasing innovation capacity across the Danube Region is key to more high-paid jobs (Joint Research Centre, 2019).

On the one hand places with a high share of populations employed in different industries would be affected by these developments (see also paragraph above). On the other, also regions with a high Gross Value Added in manufacturing are those with an easier transition towards shifting their practices to more innovation driven focus. Looking already at data coming from 2014, they point out that most region in the Czechia, central and east of Romania, central-west and north of Bulgaria, the central and east of Slovenia and north of Croatia and most of Hungary, Slovakia, Austria and Germany are in that direction (ESPON, 2018b). Foreign direct investments in the manufacturing sector are an additional indicator for regions moving to that direction, such as Ljubljana in Slovenia, Zagreb in Croatia, Niederösterreich in Austria, Eszak-Magyarország and Eszak-Alfold in Hungary, South East Region in Romania, Jihozápad in Czechia and Northern Bosnia (ESPON, 2018g). Places that have had worked on robotisation of the traditional manufacturing already from the 2020s would be a step ahead, such as West and Centre in Romania, Del -Dunantul, Del-Alfold and Eszak-Alfold in Hungary, most of Slovenia, north of Croatia, the wider Prague region and Severozápad in the Czechia and the north and east part of Bulgaria (BBSR & ESPON, 2020).

In addition, employees in SMEs need to adjust to these developments, particularly affecting most areas in the Danube Region and especially Bucharest and South Muntenia regions in Romania, Ljubljana in Slovenia the County of Dubrovnik-Neretva and most parts of Pannonian Croatia (ESPON, 2018d).

Territory: The old-new heart of manufacturing in the Danube Region – Střední Čechy 2050

The heart of Bohemia has been regarded as a 'new traditional' centre of manufacturing. With the help of the digital transition the region around Prague has been able to reinvent itself moving from mass production and heavy industry to high added value production. Digitisation and robotisation mean people lost their jobs and need to be reintegrated. Skilled, qualified people work at large multinational companies but many regional SMEs have been flourishing as well. Small businesses are successful in technology transfer and product development, finding niche markets and attracting employees for their hi-tech activities. The Bohemian tradition of craftsmanship has been reborn - this time using 3D printers and highly automated electronics.

Territory: Automotive industry as the macro-regional economy engine – Bratislavský Region, Trnava Region, Győr-Moson-Sopron County, Komárom-Esztergom County 2050

These regions have solidified their role in the European automotive industry with increased production and sales. A wide range of passenger cars and other vehicles are being produced by 2050. With industry

innovations such as electric motors, hydrogen and other alternative fuels, the demand for new and hi-tech products from the region has remained high. The introduction of industry 4.0 and 5.0 in product development as well as manufacturing technology has increased competitiveness compared to other regions in Europe. Economic development led to an extensive and solid supplier network. The increased share of electronic parts and devices with higher added value increased the agglomeration of hi-tech manufacturers around assembly plants. There are new and innovative SMEs as well as new large companies in the cross-border region. Employees of highly competitive SMEs and large companies have more income to spend in regional markets. Consequently, increased production and purchasing power help develop other sectors.

New employment mode 2: Never stop learning. Cognitive and non-cognitive skills and high-level education are two key components for employment in the Danube Region by 2050. Digital and data skills are essential for the new jobs created by hyper-digitalisation. ICT and data specialists, high-performance computing, artificial intelligence machine learning, engineers, artificial intelligence trainers and experts as well as data and systems experts are just a few examples (Joint Research Centre, 2019). In addition to cognitive skills, non-cognitive skills are fundamental for a work environment where artificial intelligence mingles with humans. Such skills include critical thinking, creativity, flexibility, good communication and people skills, resilience, sociability, empathy, initiative and teamwork (Joint Research Centre, 2019). People need to be able, more resilient and also adaptable to the speedy changes resulting from technological advances.

An important role in this is education, as by 2050 education systems have expanded and become more flexible towards incorporating digital and non-cognitive skills, helping people to anticipate change and explore their critical thinking. In addition, employees need to be open to continuous learning. Lifelong learning with continuous improvement and learning new skills is a prerequisite to be able to cope with change (Joint Research Centre, 2019). Massive open online courses have made learning widespread.

Skills and education play an important role in the new employment profile for 2050 in the Danube Region. Places with better educated people could capitalise on hyper-digitalisation. Examples are Budapest, Ljubljana and Sofia which have a high share of people in higher education. An interesting combination is where regions are home to skilled people and are also sending regions, i.e. regions sending skilled people to other regions. Examples include Centru, Sud-Vest Oltenia, Sud-Muntenia, Bucharest and Sud-Est in Romania, all other regions in Bulgaria, most regions in south and east Hungary, most of Croatia, Severozapad, Stredni Morava and Moravskoslezsko regions in Czechia and central and east Slovakia (ESPON, 2018f).

Regions which invest in R&D also invest in educating and training people, especially the Sofia region in Bulgaria, Ljubljana in Slovakia, Budapest and North West region in Romania or Jihovýchod in Czechia (ESPON, 2018f).

Danube pole of attraction. The shift to digitalisation has shifted the industrial focus of the Danube Region, creating new innovation and digitalisation hubs. This shift has brought changes in human capital with the knowledge economy increasing requiring different skills. (ESPON, 2018f). The knowledge economy is part of high tech manufacturing, financial and business services, creative industries and high-level scientific institutions, higher education and innovation (ESPON, 2018f). As a result, the Danube region has become a pole of attraction not only for business angels and investments, but also for skilled and educated people who move to the region by 2050. This counterbalances population decline in the region with migration from other countries in Europe, as well as from shrinking regions to places where 'innovation happens'. Smart shrinking approaches are applied where possible, changing the profile of regions and using them to facilitate the digital transition by storing data and servers.

With the Danube Region increasingly being a pole of attraction for human capital, regions with high shares of people in the technology and knowledge businesses continue to lead by 2050. Examples are the Sofia region in Bulgaria, Nord-Vest region in Romania, parts of Slovenia, Jihovýchod, Severovychod and Prague in Czechia, Budapest and Eszak-Magyarország in Hungary, south Germany, north of Croatia and Niederösterreich and Vienna in Austria (ESPON, 2018f).

Growth, trade and consumerism. The enthronement of hyper-digitalisation in the Danube Region by 2050 has brought rapid production increases, increasing trade and growth. The wide use of artificial intelligence has shaped product design, enabling companies to move to personalised mass manufacturing. Products are specifically designed to match peoples' needs based on big data analytics. Each product is tailor-made to the preferences and earlier purchases of customers, making customised production a norm by 2050. Consumers are willing to pay more for personalised products, freely sharing their personal data with big companies for this purpose (Luke, 2017). Putting the consumer more in charge of tailor-made products and

services has resulted in an apogee of consumerism (Devarajan, 2017). Certainly, that comes with challenges such as overexploitation of resources and pollution. To counter this, Pigouvian taxes⁴ have been raised for companies. Also, a stronger circular economy and policies have been implemented in different places, as recycling has become more important.

Regions that produced a lot of municipal waste, but recycled little faced the biggest challenge to guilt-free consumerism, such as Tirol, Salzburg, Oberösterreich, Niederösterreich and Vienna in Austria, Kozep-Dunantul and Eszak-Alfold in Hungary, Jadranska region in Croatia and Severoiztochen and Yugoiztochen in Bulgaria. (ESPON, 2018b).

Consumerism is often linked to GDP where Slovakia, Austria, Slovenia and Croatia do best (ESPON, 2018b).

Keeping the environment clean and tidy. Technological advancements have been pivotal in keeping to EU environmental standards as much as possible. Technologies such as carbon capture, use and storage and better use of digital centres have been tested in the Danube region by 2050. Investing in green technology and supporting recycling processes helps reduce CO₂ emissions and waste. Nevertheless, as economic objectives prevail, sustainable development is not always a priority, with frequent greenwashing. EU policies to reduce single use plastics, as well as circular economy approaches reduce pollution and waste. Also, new technological discoveries support recycling and waste reduction. The discovery of recyclable thermoset plastics, for instance, where polymers can be reformed multiple times and turned into new products can reduce landfill substantially (World Economic Forum, 2015).

Digital decarbonisation has also been a priority, including recycling electronic waste, as well as encouraging robust, longer lasting and better quality products (European Commission, 2020c). In addition, increasing compatibility across devices, including chargers has also gradually reduced waste, while tracking emissions and using clean energy also contribute (Hughes, 2021).

Places that have invested in green technology can be frontrunners in climate change adaptation. At the same time, industrial regions, highly dependent on coal with little transition to cleaner environmental policies may face more challenges in the future. Green infrastructure could be found already in 2013 in most regions in Slovenia and Croatia, north and central Romania, eastern, central and southern parts of Bulgaria, in Montenegro and Bosnia and Herzegovina, in Vienna, parts of south-east Germany and central and east Slovakia (ESPON, 2019b).

Welcome to meta(verse). Caught in virtual reality. Hyper-digitalisation has also affected peoples' social lives. By 2050 the Danube Region has become a pioneer in using the metaverse, whose first steps date back to the 2020s. Over the next decades this evolved into a major tool for social communication. The metaverse is a digital environment platform mingling with real life built on two key ideas, virtual reality and digital second life (Chen, 2022). In the metaverse, access is not through a computer, but rather through virtual reality glasses and special sensors, as a virtual avatar (Chen, 2022).

The metaverse has been used for telepresence working (World Economic Forum, 2019). There are fewer business trips, as people to meet in virtual offices and meeting rooms. Most services have become e-services, most people are digital natives and new job opportunities have emerged in the metaverse. People travel less for work and despite different incentives to return to the office, employees work mainly from home in their virtual work environment, which allows some real-time interaction.

This technological shift has greatly influenced social life. Augmented and virtual reality has become mainstream allowing people to meet in virtual homes or bars, to play games in a virtual reality format, participate in global e-sports events, as well as attend virtual concerts. Real and virtual lives are blended with people socialising in multiple ways.

Nevertheless, the metaverse has not only influenced social life. It is also a place for trade, investment and leisure. First indications of such a change were already popping up in the 2020s regarding buying property and land in the metaverse through virtual estate agencies. This new virtual world has also affected

⁴ Taxes on a market transaction that creates a negative externality, or an additional cost, borne by individuals not directly involved in the transaction.

blockchain technology, which increased over the years and in some case has been legitimised. The trend of non-fungible tokens (NFTs) which is also based on blockchain technology, has become more commonplace, changing trade relations (The Economist, 2021a).

Living the life of an avatar has taken social media to a new level. Increasing use by 2050 has turned them into the key source of free, uncensored information by 2050. Although this allows for more exchanges, open source applications and collective shared knowledge, it is often accompanied with consequences. Fake news and cyber-attacks are frequent. In addition, personal data is often at risk and with limited protection, often being sequestered international digital behemoths.

Broadband access and high-speed internet coverage are important for the metaverse experience. Although back in the 2020s there were broadband connectivity divides, especially between the east and west of the Danube Region, by 2050 with speedy global technological developments most of these divides have been bridged. Regions which already had high broadband access, such as regions in Austria, Bratislava, western part of Hungary, Nord-Vest and Vest in Romania, most of Czechia, Croatia and Slovenia as well as Bucharest. In addition, regions with both high broadband access and high ultrafast broadband or next generation coverage, like Bucharest, Nord-Vest and Vest in Romania, Austria, Bratislava, west of Hungary and Slovenia were a further step ahead (ESPON, 2019b).

In addition, the share of people using the internet for participating in social media gives an indication of where this could increase by 2050. This share is above average in most regions in the Danube Region, especially the east of Austria and regions in Hungary, Serbia, Bulgaria and Romania (BBSR & ESPON, 2020).

Territory: The digital walk of life – Danube Region 2050

In 2050, Bucharest is a highly digitalised metropolis. However, it had to play catch up with other cities, so digitalisation was abrupt and covered almost all walks of life during the 2020s and 30s. Young digital natives thrived and easily jumped from one service provider to another on a daily basis. Still, the older and less technologically inclined had to be helped in the transition so almost no one was left behind. With more R&D funding, services and digital products became more innovative, leaner and affordable. Governance was the biggest winner, as all citizens can now see and understand local decisions through specialised apps. The virtual reality version of the City is a meeting place for all citizens, where they can take part in council meetings. General voting on projects, legislature and referendums are common since organisational costs are close to zero making decision-making more democratic. Old housing projects are now more cost-effective because IoT devices evaluate energy and water use to ensure low costs and a high quality of life.

Energy needs: achievement unlocked. Increased production and the use of digital devices, as well as the use of blockchain technology and mining have also increased energy demand. Already data from the 2010s pointed out that energy consumption would increase even by about 50% by 2035, with natural gas playing a bigger role replacing coal and possibly oil (European Strategy and Policy Analysis System, 2015). The energy crisis due to the war in Ukraine accelerated the exploration of alternative resources that could support the increasing demand. Although Liquefied Natural Gas and nuclear energy were early solutions to cope with the crisis they did not prove sufficient. The EU even labelled the gas and nuclear 'green' to speed up investments until the Green Deal kicked in (Abnett & Jessop, 2022). Discussions about nuclear energy and renewables emerged, which were expected to account for 24% of production and 40% of growth in energy demand by 2035 (European Strategy and Policy Analysis System, 2015). Nevertheless, nuclear energy has been often seen with scepticism, while energy savings and renewable energy have not been enough to address needs and limit CO₂ emissions. Instead, breakthroughs in nuclear fusion technology changed the energy landscape and could cover needs, as well as be environmentally friendly enough to halt global warming. (European Strategy and Policy Analysis System, 2015). Another energy source, hydrogen is mainly used for clean transport, as it can be produced at large scale and has low carbon emissions (World Economic Forum, 2015).

Hydrogen networks have to be further expanded and are not fully operational by 2050. Nevertheless, an interesting indication would be to look at hydrogen and fuel cell networks in 2020 across Europe. Those were mainly in south Germany, central Europe and Romania (S3Platform, n.d.). Nuclear plants, like the Krsko Nuclear Power Plant, co-owned by Slovenian and Croatian state owned companies gradually faded in importance by 2050 (SITA-SOGES & Osservatorio Balcani Caucaso Transeuropa, 2020).

Territory: The no-more coal rule – Danube Region 2050

Energy and energy storage markets are still surging as more businesses start rely on electricity. Czechia was hit by this surge, beginning in the 2030s when its measures to phase out coal-based energy kicked in. Energy costs started to rise in the 2020s but coal-based energy was not feasible anymore in Czechia. This encouraged wind farms and micro-nuclear plants across the country. Early investments and sustained R&D in nuclear fusion and energy storage made the micro-nuclear plants possible. These were built in partnership with Germany, Slovakia and Hungary. The current mesh of micro-power plants can self-manage and load-balance themselves, based on international agreements so no one overloads the production capacity, costs are minimised and risks reduced. The Czech government also introduced and promoted an energy cooperative model to counterbalance large energy producers and reduce reliance on external actors.

A new Danube transport era – down by the river. The Danube River has for years been a key waterway for cargo transport. Data from 2014 indicate that more than 40 million tons of goods were carried, with 14 million tons on the Romanian-Black Sea channel. The largest transport volumes were in Lower Danube, followed by Upper Danube (ProDanube International, 2016). The increase in industrial production up to 2050, required more and faster connections across the river. In addition, ports have been made more sustainable by 2050. Therefore, the Danube Region decided to increase its focus and investments on waterway transport possibilities instead of rail. By 2050, increased integration across the EUSDR has reduced administrative transport barriers and increased the use of inland river waterways all across the region. The river has become a key trade transport node in the region, increasing carriage and the importance of port cities (Map 7-1). Bottlenecks have been resolved and sustainable solutions, such as hydrogen, implemented. An enhanced network of multi-modal ports has been gradually developed and more agreements between countries have made transportation easier. Harmonising the administrative procedure, following the concept of ‘same river-same rules’ along the river has decreased costs and time (ProDanube International, 2016).

Flying logistics. Digitalisation, e-services and especially e-commerce stimulated during the COVID-19 pandemic have entered into a new era (DHL, 2020). Although many things are available virtually in the metaverse, logistics play a major role and have adjusted to the new needs. Drones and other autonomous robots mean the delivery of goods home has never been faster or easier.

People’s travels. Hyper-digitalisation has reduced travel and people transport in a major way. Physical meetings have been largely replaced by digital ones. Nevertheless, people can use electric self-driving cars with lower CO₂ emissions. Public transport has also been modernised, using clean energy and technology. Improved road connections, especially cross-border, along with a multimodal TEN-T core and extended network have by 2050 gradually facilitated trade, logistics and travel (Interreg Danube Transnational Programme & EUSDR, 2018).

Transport hubs play an important role by 2050 and ports on the Danube River have taken over this role. Serbia, Romania and Hungary have the majority of ports and port cities are more important, serving key transport corridors and connections.

Territory: River of Internet of Things – Danube 2050

The Danube River is one of the most high-tech transport routes in the EU, linking inland-EU territories and the Black Sea. Several checkpoints along the river ensure that boats move in the most efficient manner, and automated response mechanisms can stop or speed up their movement. All the ports along the river are almost entirely automated, with robots loading and unloading with surgical precision while keeping very tight schedules. All boats and docks have multiple sensors that record a plethora of data points, which along with waterbed data, are fed into digital twin models powered by artificial intelligence. These models process vast amounts of data to ensure that supply chains run efficiently while considering the complexity of warehouses, transport routes, delivery companies and end-users.

Niche and virtual tourism. By 2050, virtual tourism has increased offering tailored tourism solutions with virtual reality tours in places and cultural sites. Tourism products are tailored to the new users. Smart solutions and alternative sustainable tourism make places and activities more ‘instagramable’. Virtual tours decrease inequalities and cater to a wider range of people. There are new solutions and approaches to long distance travel (European Commission, 2021d). Hyper-digitalisation has not only increased tourism products, but also the need for upskilling personnel and adjusting businesses to cope with the changes. At the same time, richer people still travel physically to pristine tourism hotspots in the Danube region and beyond, or experiment with commercial tourism space travel.

Regions offering high quality tourism products and tourism hotspots in the region welcoming the most tourists. Urban tourism also gains ground with many digital tourism offers in urban areas, while other tourism regions also adapt to the changing tourism profile.

Although digital connectivity has largely improved by 2050, including in rural areas, the tourism profile in the macro-region had to undergo substantial changes. Tourism remains mainly rural and mountain / nature tourism, e.g. in most of Romania, east and south of Hungary, most of Slovakia. Places where digital access has long been higher, i.e. in cities, would profit more from this shift in tourism. These are places like capital cities in the region, as well as Botosani or Timisoara in Romania. (European Commission, 2021d)

Territory: Digi-Green Iron Gate cross border tourism – Danube Region 2050

By the end of 2050 the cross-border area of Danube Iron Gate is offering eco-friendly tourism products. Tourism niches are hiking, camping, sailing, cycling, rural, eco and work-tourism. The region capitalised on hyper-digitalisation using smart solutions to sustain eco-friendly on-site tourism and offering 3D virtual tours of historical, cultural and natural sites. Transport between towns and villages in the region uses electric and hydrogen vehicles, and most cruise ships are powered by hydrogen. As the population declines, most production and services are digitalised and robotised. Food, drinks and other goods are delivered to tourists by drone, and preparation is robotised except in households offering rural tourism experiences. The region became an oasis for digital nomads and as a result of hyper-digitalisation, the region's energy demand increased.

Territory: Delta3.0 – Danube Delta 2050

The Danube Delta has become a centre of attention due to its remoteness and early technology adoption. VR start-ups, encouraged by environmental NGOs, created virtual tours of the Danube Delta to promote its natural wonders to the world while protecting it from excessive tourism. The creation of the Virtual Danube Delta required drones and robots that flew and walked around the area scanning every inch, every plant and all wildlife. Today travelling to the Danube Delta is relatively expensive since it involves several means of transport and still takes almost a full day from Bucharest Airport. This is mainly because speedboats were banned, and large ships move slowly to protect wildlife. As a result, real-life tours of the Delta are still outstanding but also costly experiences. However, VR tours are a significant innovation for visiting the Delta without long-distance travel. Several surreal options are available, such as underwater swimming in the canals (impossible in real life due to the vegetation) or flying over the Delta with a birds-eye view, making it a more entertaining experience.

Agriculture getting from smart to intelligent. Intelligent agriculture has been the outcome of digitalisation for agricultural practices (Map 7-1). Agriculture has long been a key sector responsible for pollution and carbon emissions. By 2050 the Danube Region, with a long experience of agriculture and the support of digitalisation have changed food production, adapting to technological developments and new food trends. Precision agriculture, automation and robots, virtual services, new breeding technologies, alternative protein sources as well as challenges from a lack of natural resources have shaped the changes in agriculture (Joint Research Centre, 2021a). By 2050 farming is a highly qualified profession where profit is the key driver. Intensive farming prevails, being technology intensive, with high automation and technical skills, facilitating certification and as the basis for harvesting or livestock care (Joint Research Centre, 2021a). There is sustainable intensification, reducing environmental consequences where possible, while production is certified to meet market requirements. (Joint Research Centre, 2021a) In addition, smart fertilisers reduce pollution and become more sustainable (World Economic Forum, 2019).

Nevertheless, given the increasing demand for food, changing dietary habits and opportunities that digitalisation offers, new, alternative foods are introduced by 2050. Cellular agriculture, where cell cultures from animals or micro-organisms are grown in bioreactors, are important. As a result, there is more 'animal-free' food production, respecting both animal welfare and vegan diets. Combining biotechnology with food technology skills, farmers have by 2050 been able to produce synthetic animal protein, cultured meat and other synthetic dairy products, all tailored to consumer needs, opening up new market opportunities of the 'beyond meat' business. (Joint Research Centre, 2021a) Agricultural production is largely developed based on personal habits, beliefs about food, nurture and sustainability. People decide the person they want to be and food production is based on this (The Economist, 2021b).

Although all territories are affected by the transition in agricultural practices by 2050, they mainly concern places with agricultural land and rural areas. Areas, with extensive and intensive use of arable land have been primarily affected by the changes in agricultural practices. These include most regions in Hungary, like

Del-Dunantul, Del-Alfold, Eszak-Alfold, Nyugat-Dunantul, the region Zlapadne Slovensko in Slovakia, south west Oltenia, Sud-Muntenia Sud-Est, Nord-Est, Nord-Vest and Vest in Romania, most regions in central Czechia and eastern Slovenia. Places with high innovation and R&D are also important to develop the relevant technologies as are those with the know-how to transmitting smart farming to rural areas. (EEA, 2017)

It's always been the digital-economy. Hyper-digitalisation in the Danube region has brought tectonic shifts in the way the economy has developed. Hyper-digitalisation in the Danube region has led to industry 5.0, focusing on the human factor. It brings a paradigm shift in industrial policy as it refers to people working alongside smart machines and robots, deploying better technologies in the service of people. GDP has increased over the decades, and the Danube Region is a leader in digitalisation and trade, as well as in promoting an economy that works for people. Intensive growth consequences have been addressed with strong policies and an involved civil society.

The shift to hyper-digitalisation has gradually happened in the Danube Region by 2050 and the economic effects have been visible. In principle, the key aim of this shift has been for economic growth across the macro-region and an increase in GDP. Over the years, regions with had relatively low regional GDP in purchasing power standards, like most regions in the east part of Danube Region and the Western Balkans have seen an increase in GDP by 2050. In addition, places that already had high regional GDP, such as Bucharest, Bratislava, most parts of Austria and particularly Salzburg, and southern parts of Germany, particularly Oberbayern, saw an even bigger increase by 2050 (BBSR & ESPON, 2020).

Lives in fast forward. Fast-paced developments have led to fast paced lives. Although economic growth across the Danube Region is visible in most regions, people have been challenged by the rapid changes. Keeping up with new professional and social technological developments added pressure. Phenomena of 'Fear Of Missing Out', the 'hustle culture', overworking and burnouts have increased, especially among young people who struggle to keep up. High stress levels due to digital addiction and falsified messages on social media have increased attention on mental health and wellbeing. At the same time, lack of human interaction has challenged people sometimes leading to depression. This particularly affects disconnected youth in the region who may feel more lonely and distanced from human interactions (Griffith, 2019), which has become even more pronounced especially after the COVID-19 pandemic. Last but not least, new 'virtual values' raise dilemmas regarding ethical and societal values and questions on what is 'right' or 'wrong', ranging from the virtual assistant technology devices, to smart home appliances and self-driving cars.

Civil society: the guardian angel. Digital transformation also goes beyond material wealth. It has brought several societal challenges, from social inequalities between haves and have nots, well connected people and those not and between skilled and unskilled personnel. The inequalities vary, while at the same time risks such as cyber threats and digital disruptions, as well as ethical dilemmas on automation in everyday life, health and security are around the corner. In 2050, the technological developments need to be coupled with societal adaptation (World Economic Forum, 2018). Here is where civil society can play a leading role.

E-governance, digital and more agile governments have been a focus of the Danube Region with an increased role for civil society and NGOs playing an important role in decision making. The state is no longer the key player, there is network governance. NGOs contribute actively to addressing societal challenges, traditional lines between the state, people and civil society are blurred and there are new cooperation frameworks (World Economic Forum, 2013). Citizens have direct access to decision making and influence policy making, as the nation state is weakened. Networked communications facilitate the shift from traditional mass media to 'mass self-communication' through social media, strengthening social movements (European Union Institute for Security Studies, 2012). This network society does not recognise borders, but empowers individuals and their sense of belonging to a community, also encouraging a stronger civil society (European Union Institute for Security Studies, 2012).

Civil society organisations are the key structures for building trust, the foundation of interactions and information exchange, ensuring high quality internet access for all places and people, making business work for people through responsible models, building safe digital identities for people, safeguarding their rights and personal data, keeping people safe and secure through cyber security mechanisms (World Economic Forum, 2018).

Regions with a high quality on government were those with the biggest potential to initiate civil society organisations' participation in government decision making and in stronger citizen protection. Such frontrunners, were regions in Austria, southern Germany, parts of Czechia, Slovenia and Croatia, and the Centru region in Romania. Regions where the quality of governance was low have shown substantial leaps in civil

society participation, increasing trust in governance and governance quality by 2050. These include most regions in Romania and particularly the metropolitan region of Bucharest, coastal Bulgaria regions such as Severoiztochen and Yogoistochen, Eszak-Alfold and Eszak-Magyarország in Hungary, as well as most regions in Serbia. (Charron, Lapuente, & Bauhr, 2021)

Another indication reflecting the involvement of people and civil society is e-government interactions, i.e. the share of people who interacted in the 2010s with public authorities, like most regions in Austria, Slovakia, Budapest, most of Slovenia and parts of Czechia, which could lead by example in online interactions and exchanges with government institutions (ESPON, 2019b).

Integration relationship – it's complicated. Given the focus on the new digital economy and industrial profile of the Danube region for economically driven progress, European integration is an inevitable enabling tool. Cooperation with regions which may offer an economic benefit is a must for stronger economic and trade integration in the region (Map 7-1). Therefore, integration is furthered and supported particularly where economic integration is promoted. The more politically and economically integrated the EU is and the more capacity it has to deal with political and economic crises, the more it can guarantee its own security and lead in globalisation (European Strategy and Policy Analysis System, 2015). Last but not least, cooperation at macro-regional and civil society levels, is needed to address cyber security issues and data protection. EU enlargement continues especially for economic integration with more and more countries from the Western Balkans joining the EU. Equality, equity, fairness and cohesion 'as a value' safeguard that no region is left behind. Economic borders are open and seamless customs services contribute to cooperation, simplified rules, data exchange and common standards (Ghiran, Hakami, Bontoux, & Scapolo, 2020).

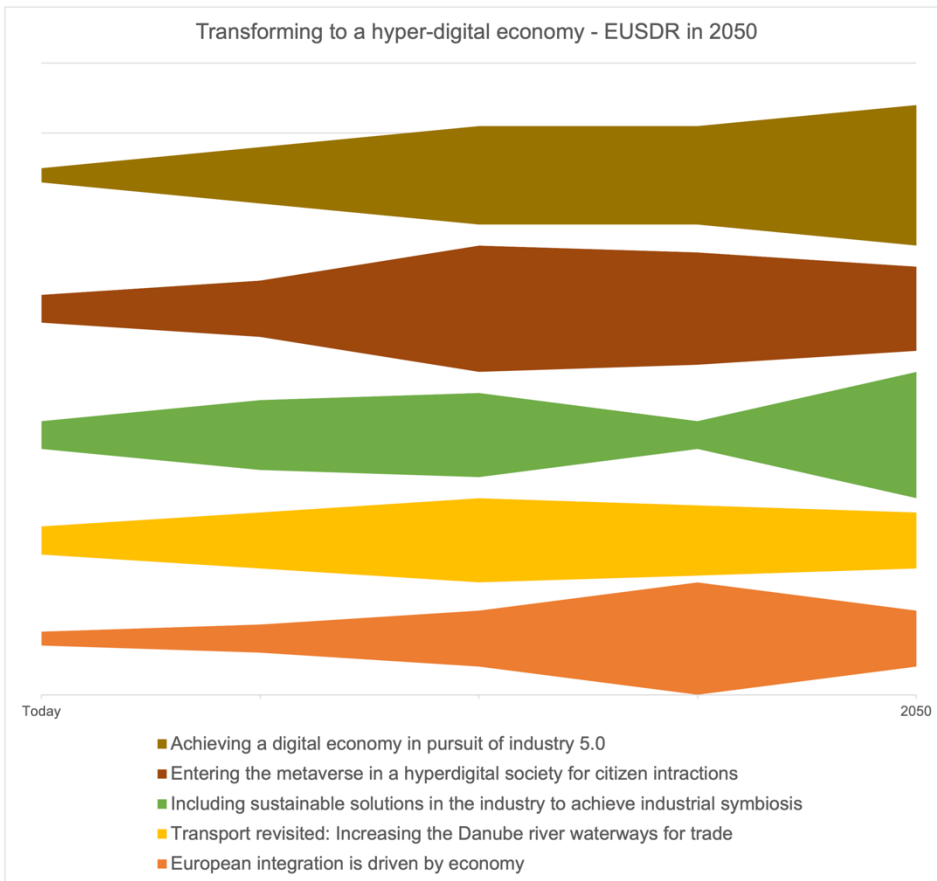
8 Concluding reflections

What can we draw from the alternative territorial scenario ‘Transforming to a hyper-digital economy’? The alternative territorial scenario has capitalised on the work carried out through the desk research and the co-creation process to develop the core foundations upon it has been developed. Those core foundations of the scenario have been the basis for the further development of the scenario and unfolding the key storylines and elements, as well as identifying their territorial implications. The following sections present first shortly those core foundations of the scenario. Second, they show the links of the key foundations to the storylines and elements of the scenarios, as well as overall territorial implications the scenario has.

8.1 What are the foundations of the scenario?

The alternative territorial scenario ‘Transforming to a hyper-digital economy’ has been built along five core foundations, as shown in the figure below.

Figure 8-1 Transforming to a hyper-digital economy foundations – EUSDR in 2050



Source: authors' own

In this strongly digitally driven scenario, businesses and people’s lives change and adjust to immense shifts in digital transformations. By 2050, the Danube Region has taken big steps to profit from the dawn of the new global digital era and became the first macro-regional strategy with a clear digital focus. By 2050, the digital transformation and transition of the Danube Region has become a key priority with direct effects to the transformation of businesses, employment, infrastructures, public policies, as well as to people, as it has changed their lifestyles, leisure and work. By 2050, achieving a digital economy in pursuit of industry 5.0, is a key priority for the Danube Region, which takes time, however, towards the 2030s it takes a big leap, with support of the overall EU digital transformation and a gradual uprising in industry 5.0. The Danube Region has transitioned from the 4th industrial revolution towards the industry 5.0 path. Industry 5.0 introduces a paradigm shift in the industrial policy, by alleviating environmental pressures and social inequalities

stemming from hyper-digitalisation, adopting an industrial symbiosis, that creates a more resilient, robust, sustainable and human-centric industry. The industrial symbiosis path has started gradually over the 2020s and 2030s, showing different fluctuations until it takes an increase by 2050 (Figure 8-1). The shift to hyper-digitalisation has not only affected the industrial models in the region, but also people's social lives, as the region has become a pioneer in using the metaverse. These changes started gradually but went quickly high after the 2030s, as technological shifts are inevitable and happen at great speed (Figure 8-1).

Another important shift coming with the hyper-digitalisation is a new Danube transport era, where the Danube River has become the transport means for goods in the region, with faster connections across the river. In addition, efforts to make ports more sustainable have been initiated by 2050. Ports and port cities have gained importance over the years increasing their roles as key transport hubs. Such transition had a gradual shift over the years, as it is continuously increasing development (Figure 8-1).

Given the focus on the new digital economy and industrial profile of the Danube region and the economically driven progress, the European integration is an inevitable tool for improving these relations. Cooperation with those regions which may result in an economic benefit is a must to have a stronger economic and trade integration in the region. Therefore, integration is furthered and supported in those cases where particularly economic integration is promoted (Figure 8-1).

All in all, these developments show the directions that different developments have taken in this scenario, influenced by the choices people have done. For the project, this guidance and direction has been given through the participatory approach. All these, play, however, differently in the different territories.

8.2 What are the territorial implications of the scenario foundations?

The scenario foundations summarise the different elements that build the whole scenario storyline. This is graphically shown in Figure 8-2 below. The Figure shows how thematically linked the story is with the core elements that have shaped the development of the scenario. In addition, the figure synthesises what types of territories are most affected by the scenario. Although more specific territorial implications are given in the scenario stories, the figure below gives an overview glimpse of types of territories most affected. Certainly, such big changes have implications on all territories. Nevertheless, urban intermediate and industrial areas are highly affected by the pursuit of digital economy, as changes in this domain would first affect these places. In addition, the shift to metaverse and hyper-digitalisation in society also largely affects urban, intermediate and industrial places, as they have had higher potential for increasing connectivity. Industrial symbiosis affects largely industrial and border regions, given the effects that sustainable solutions have on industry and their neighbouring territories. Although most territories are affected by the Danube River increasing in importance and becoming the key transport node, this is more relevant for river places and their ports, as they are the highest affected. Achieving European integration driven by economy is highly linked to all types of territories and mainly for border regions, as based on the different economic relations European integration is influenced.

Besides highlighting territorial implications of the alternative territorial scenario, Figure 8-2 pinpoints at the complexity that territorial scenarios deal with. The elements that constitute the scenario are highly linked not only, in one way or the other, to each other, but also to the core foundations of the scenario, building a coherent and solid story. At the same time, they influence different territories to different extends, counting on the specific details of each scenario element. The territorial implications also depend on the sensitivity and resilience capacity of different regions to adapt to changes and transitions. The figure does not aim to detail every possible territorial implication, but rather to reduce complexity and emphasise that interdependencies of territories are unavoidable.

The figure was constructed taking into consideration that all drivers have at least one component, that each driver has different effect intensities on each of the type of territories, and finally that each component has a different importance (proportion) inside each driver (i.e. the height of the components). The territorial effect intensity was calculated based on the particular weight that each driver was considered to have on each type of territory and the importance of the component for each driver. The different heights of the drivers (middle) are a result of the sum of their intensity for all territories. On the right side, the intensity of each component is translated to each territory based on the basic calculation of driver intensity x component importance (the latter which sum up to 100% for each driver). As a result, the height of each type of territory is proportional to the intensity of the effects of all drivers together. This means that at a general level all types

of territories are impacted, however, the intensity of the effects differs significantly for each driver based on the effects of their components.

Figure 8-2 What territories are affected by the ‘Transforming into a hyper-digital economy’ alternative scenario?



Source: authors' own

9 Policy recommendations

The following sections present policy recommendations. Section 9.1 focuses on policy recommendations for EUSDR, while the section 9.2 provides cross-cutting recommendations.

9.1 Policy recommendations for the EUSDR

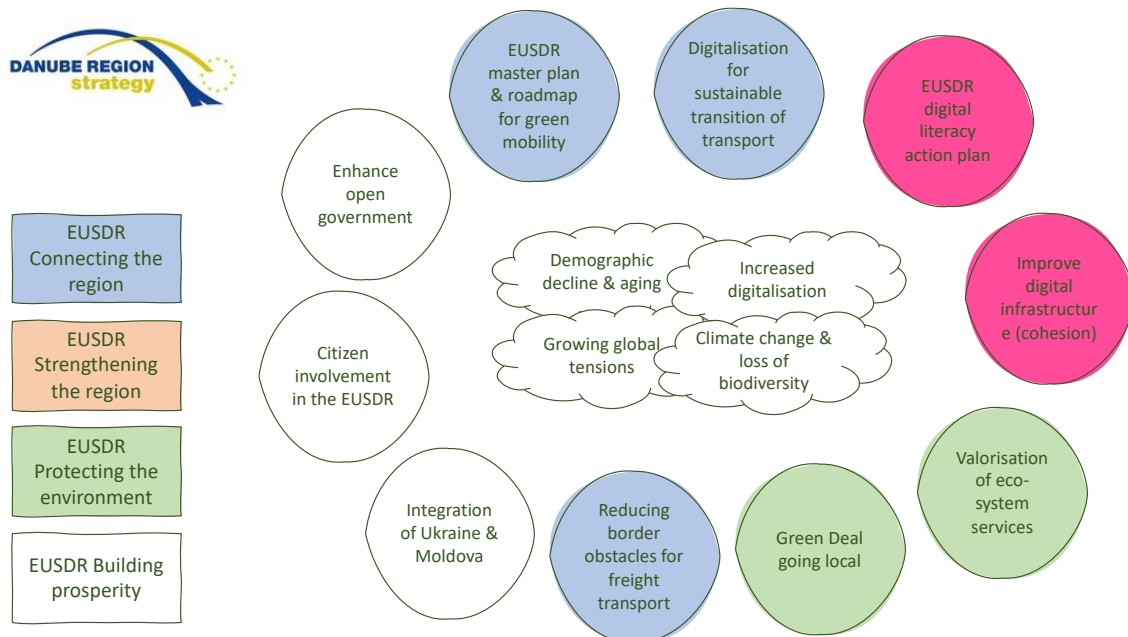
The three scenarios for EUSDR point to overarching challenges and potential to be addressed.

Regardless of which scenario seems more desirable or likely, issues such as demographic decline and ageing, climate change, biodiversity loss, digitalisation, energy demand, and growing global tensions will need to be addressed in the region.

Based on these, different strands of policy recommendations can be developed. Each could be linked to the four EUSDR pillars. Developing policy recommendations means shifting from a general discussion of possible futures to definite ideas about a desirable future. What outlooks in the scenarios do we want to avoid or would we like to see? This means policy recommendations are subjective and a matter of (personal) choice. The following provides a teaser of possible policy recommendations which can be drawn from the scenarios, based on a co-creation workshop with the Steering Group. The recommendations do not necessarily represent the opinion of the Steering Group or its members.

There are 10 fields for policy action (see figure) which range from a masterplan for a macro-regional shift to green mobility, via increased digital infrastructure and the EU Green Deal going local to the integration of Ukraine and Moldova. The vast spectrum shows the diversity of possible policy recommendations prompted by the scenario work, as well as various levels of detail.

Figure 9-1 Possible fields for policy recommendations



Source: authors' own

Taking the discussion a step further, we would like to highlight five potential policy recommendations.

EUSDR master plan and road map for green mobility

Idea

The pressure of climate change, the EU Green Deal and not least concerns about rising energy prices raised by the war in Ukraine increase the pressure to accelerate the shift to green energy. This is not only for the transport sector. The shift towards green mobility needs to be realised at macro-regional or European level to not jeopardise integration in the Danube region due to different technical solutions and standards in different parts of the region.

Rationale	Many countries and regions in the Danube region are already working on policies to strengthen green or sustainable mobility. In some places major transport infrastructure is due in the coming decades. The region is also home to a wide range of research into sustainable energy and transport. Connecting these dots and creating a supplementary network holds considerable potential.
Concrete actions	Concrete actions should build on what already exists in the region including what is already done under EUSDR, and take this one step further. This may include: <ul style="list-style-type: none"> • Collecting existing green mobility activities (especially on long-distance transport) in the Danube region. • Bring existing experience on national and regional sustainable transport plans and green transition policies into a macro-regional framework, building a green mobility masterplan for the region. • Create a landscape for green mobility which all countries can access, including a platform for stakeholders to push the transition. • Develop a roadmap for green mobility in the EUSDR showing what needs to be done, when, where and by whom, to allow green transport of goods and people to flow seamlessly between countries in the Region. • Appoint a coordinator to ensure all players are kept on board and contribute to progress, e.g. linked to the priority area coordinators
Players	EUSDR PA 1B, PA 1A and PA 2, alongside national transport ministries and DG MOVE.
Time line	To ensure carbon neutrality by 2050, the work needs to be implemented before then, but it is very likely that pressure on energy prices will force a faster transition. This implies that collecting examples needs to start now, to ensure a coordinated EUSDR masterplan before 2027. This would also build on the 2021-27 Multiannual Financial Framework with its Cohesion Policy. In an ideal case first actions can be implemented earlier using Next Generation EU funding. ⁵
Expected effects	The effect would be to have smooth, sustainable and carbon free transport in the EUSDR by 2050. Goods and people can roam smoothly within the region without being disrupted by different green mobility solutions or poor green mobility infrastructure.
EUSDR link	EUSDR Pillar 'Connecting the region' and especially PA 1B 'Rail-Road-Air Mobility', PA 1A 'Waterways Mobility' and PA 2 'Sustainable Energy' is strongly linked.

EUSDR transnational body to reduce border barriers

Idea	National borders remain barriers to macro-regional cohesion, development and in particular to the seamless transport of goods and people. This is true for EU internal borders e.g. related to different national regulations. It is especially true for EU external borders which are crossed by the Danube. These barriers hinder integration and economic development.
Rationale	The Danube region has several national borders with various permeability. For instance, the Danube river runs from EU territory into non-EU territory, back into EU territory and then again into non-EU territory. Although a lot has been done to improve transport flows on the river and on land in the region, long-distance freight transport is still cumbersome and there is no institutional body tasked with continuously reducing administrative border barriers.
Concrete actions	Concrete actions should build on what already exists in the region including what is already done under EUSDR, and take this one step further. This may include: <ul style="list-style-type: none"> • Establish a permanent transnational body to continuously reduce cross-border barriers and the administrative burdens that come with them.

⁵ See e.g. <https://www.iea.org/reports/a-10-point-plan-to-cut-oil-use>

- Establish continuous monitoring of cross-border barriers in particular between EU and non-EU member states concerning transport on the Danube river and land-transport in the Balkans, especially freight transport.

Players	EUSDR PA 1B and PA 1A, DG MOVE, transport ministries and possibly ESPON for territorial monitoring.
Time line	Building on ongoing work including the Darwin Papers and analysis of cross-border barriers, a continuous monitoring system could be developed and be operational by 2025. Establishing a permanent transnational body will probably take more time and could be envisaged for 2035.
Expected effects	Reduced cross-border barriers would make freight transport more seamless. This will increase integration and economic development in the region.
EUSDR link	This links strongly with the EUSDR Pillar 'Connecting the region' and especially with PA 1B 'Rail-Road-Air Mobility', PA 1A 'Waterways Mobility'. It also links to the Pillar 'Building Prosperity' and PA 10 'Institutional Capacity & Cooperation'.

EUSDR digitalisation in green transformation of transport

Idea	Over the next decade digital and green transitions will be unavoidable. In many regards these will reinforce each other. This includes the shift towards sustainable transport and attempts to reduce transport flows without reducing people's mobility or quality of life. Digital transport platforms and mobility services can play a crucial role, ranging from ride sharing platforms to services showing how to get from one place to another.
Rationale	Further integration of the Danube region will also generate more intra-region transport of goods and people. To guide these towards more sustainable transport and in particular towards public transport or shared mobility will require joint efforts. This can range from templates or platforms to convincing mobility information providers to display the sustainability each transport option and/or give priority to the most sustainable alternative, e.g. promoting options with the least environmental/CO ₂ impact.
Concrete actions	Concrete actions should build on what already exists in the region including what is already done under EUSDR, and take this one step further. This may include: <ul style="list-style-type: none"> • Development of a template for digitalisation in sustainable transformation of transport. • Selection criteria on digital transport platforms for the most sustainable transport alternative. • Cooperate with the European Commission so global digital service providers apply sustainability criteria to transport alternatives.
Players	EUSDR PA 1B, along with national transport ministries and DG MOVE, and possibly also environmental pressure groups.
Time line	The work can probably start on a small scale via Interreg projects to build a strong conceptual foundation and sensitise stakeholders. Around 2030, more large scale pilots could test selection criteria. This would also intensify cooperation with the European Commission to convince global players to apply these criteria.
Expected effects	Smooth sustainable and carbon free transport and less transport in the EUSDR by 2050. People have mobility information with the most sustainable alternatives.
EUSDR link	This links strongly to the EUSDR Pillar 'Connecting the region' and especially PA 1B 'Rail-Road-Air Mobility'.

EUSDR concept and pilot actions on valorisation of eco-system services

Idea	Ecosystem services directly and indirectly contribute to human well-being. They provide fresh air, clean water and biodiversity, regulate disease and climate, support crop pollination and soil formation, and provide recreational, cultural and spiritual benefits. It is essential to nourish them. At the same time, they often have no immediate price tag, and are not accounted for when it comes to development potential in terms of GDP or jobs.
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Mitigating climate change and ensuring no net loss of ecosystem services and biodiversity might change the focus of thinking on regional development potential including the division of labour between places. Places with high biodiversity or with significant ecosystem services (e.g. clean air or clean water) could develop these into an economic specialisation. This does not imply lower ambitions for a healthy living environment for citizens in other places. To some degree existing approaches, including the Common Agricultural Policy could adapt from a compensation logic to a regional development logic. This would mean delivering ecosystem services generates income for a local and regional economy rather than compensating rural areas and burdening them with taking care of the environment while others do not.

Rationale	The Danube region has many areas with very rich and diverse ecosystems. This ranges from Alpine ecosystems which provide essential freshwater to large parts of Europe to the extremely rich Danube Delta which is important for Europe's biodiversity. These ecosystems are important beyond the borders of individual countries. Therefore, it should be a common task to ensure they flourish and that regions nourishing ecosystems do not miss out on economic development. Finding joint solutions for valorisation of ecosystem services and piloting projects on how to use them as development assets could be done at macro-regional level.
Concrete actions	Concrete actions should build on what already exists in the region including what is already done under EUSDR, and take this one step further. This may include: <ul style="list-style-type: none"> • Detailed macro-regional mapping of ecosystem services and risks, e.g. building on the Mapping and Assessment of Ecosystems and their Services analytical framework (DG Environment, 2018). • Develop concepts to monetise ecosystem services and understand them as 'tradables' e.g. giving a value to protecting and enhancing forestry, biodiversity, including reducing water and soil pollution. Pilots could build on experience from the CAP, EIB or national initiatives e.g. in France. • Develop concepts and pilots for investments in ecosystem services. This could imply public investment in systems which ensure large areas that are important for the ecosystem can turn their contribution into income which could potentially help counterbalance spatial inequality.
Players	EUSDR PA 6, ministries of the environment as well as EAFRD and ERDF programmes, the LIFE programme, DG Environment, the European Environmental Agency and EIB.
Time line	The work can probably start on a small scale via Interreg projects in the 2020-2027 period to build a strong foundation and sensitise stakeholders. Around 2030, more large scale EUSDR wide pilots could be initiated.
Expected effects	This would ensure that rich biodiversity in the Danube region is maintained and even increased. Places with ecosystem services of wider spatial importance can develop these without jeopardising their economic development.
EUSDR link	This strongly links to the EUSDR Pillar 'Protecting the environment' and especially PA 6 'Biodiversity, Landscapes and Air & Soil Quality'. It also links to the Pillar 'Building prosperity'.

Boost educational, people-to-people and local level cooperation

Idea	Integration and place-based development is not limited to cooperation between regional and national authorities or to trade. It also involves cooperation at local level and at interpersonal level. To sensitise young people to macro-regional issues, cooperation between schools and other education and training centres is important. As with efforts to bring Europe closer to citizens, EUSDR should also be brought closer to citizens.
Rationale	In recent decades, cooperation between national and regional authorities and also between economic players has intensified in the Danube region. Considering the social and cultural diversity of the Danube region there is still scope for further strengthening cooperation at people-to-people and local levels. This would help strengthen civil society and integration in the region. A good starting point for this might be the education sector.

	With considerable refugee flows from Ukraine, strengthening people-to-people co-operation might help to welcome and integrate migrants in local societies.
Concrete actions	Concrete actions should build on what already exists in the region including what is already done under EUSDR, and take this one step further. This may include: <ul style="list-style-type: none"> • Initiate and support cooperation projects in schools. • Involve citizens in EUSDR activities and integration processes, with a particular emphasis on younger people. • Boost cooperation between cities and small municipalities in the Danube region. • Boost cooperation to welcome and integrate refugees from Ukraine.
Players	PA 9 and PA 10, ministries of educations, schools, local authorities, youth organisations and civil society organisations.
Time line	This should start as soon as possible to ensure the EUSDR spirit grows at local level and helps support the integration of migrants and refugees.
Expected effects	A stronger macro-regional spirit, inter-connectedness and identity among citizens in the Danube region. This would help integration in the region and probably also strengthen civil society.
EUSDR link	This links strongly with the EUSDR Pillar 'Building prosperity', especially PA 9 'People & Skill', and EUSDR Pillar 'Strengthening the region', especially PA 10 'Institutional Capacity & Cooperation'.

9.2 Cross-cutting recommendations

The scenario work for the Danube and Adriatic-Ionian macro-regions raises conclusions and recommendations going beyond the individual strategies, while recognising territorial overlaps. The scenarios highlight that many future development issues concern a wider geographical context than the nation state. This leads to discussions about shared strategies, masterplans or action plans for issues which are addressed more effectively or efficiently at transnational level. It also leads to considerations concerning responsible macro-regional or transnational bodies to drive such processes beyond single projects.

9.2.1 Cooperation between macro-regional strategies

Many of the points identified in the scenario work might be relevant for all macro-regional strategies and thus relevant for the European Commission or for cooperation and coordination between macro-regional strategies.

Drive future-oriented debates. Managing the challenges and transitions ahead also requires societal discourses and finding answers beyond local and regional development. Examples include debates on:

- Internalising external costs across sectors to achieve Green Deal objectives.
- Quality of life and beyond GDP, including testing alternatives at the level of macro-regional strategies.
- Improved EU data, including data security, privacy, governance, blockchain technology, digital hazard resilience, etc.
- Citizen engagement in governance processes and macro-regional cooperation.

Think macro-regional sector plans and strategies. Given high spatial interdependencies new formats are needed to develop macro-regional strategies, plans or roadmaps for particular sectors. Examples include:

- transition plans on green, digital and just transitions.
- biodiversity plans and strategies.
- plans for carbon-neutral long-distance mobility.
- strategies on changing settlement patterns given demographic decline and ageing.

Consider transnational bodies and agreements. In many cases plans and strategies will not be sufficient to move forward. Binding agreements between countries will be needed, and in some cases even transnational bodies to ensure continuity over time. Examples include discussing:

- multinational agreements on taxation of digital nomads, workcation and alike.
- multinational agreements reducing border obstacles, between EU member states and especially between EU and non-EU member states.
- establishing transnational bodies to monitor (and reduce) border obstacles.

These are just a few examples for possible actions which go beyond individual macro-regional strategies.

9.2.2 ESPON

ESPON is highly committed to supporting macro-regional strategies and could consider actions to further support this work with territorial evidence:

- **Build repositories of national and regional plans and strategies** to consolidate them in joint macro-regional plans or strategies. This could include green and digital transitions, biodiversity strategies and spatial development plans.
- **Support the development of macro-regional masterplans and sector strategies**, which help to better coordinate sector policies with wider territorial implications. This could include thematic studies providing territorial evidence or targeted cross-analysis of sector policies, as well as opening up the data from projects. Possible topics are green and digital transitions, green and blue growth, demographic change, biodiversity, tourism and quality of life.
- **Strengthen continuous macro-regional monitoring**, e.g. related to spatial inequalities, quality of life or cross-border obstacles. This could be an opportunity to establish databases or evidence on aspects for the Western Balkans in both macro-regions.

These are just a few examples for possible actions which go beyond individual macro-regional strategies.

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