SHERPA
Rural Science-Society-Policy Interfaces

D3.4 FORESIGHT PROSPECTS FOR THE FUTURE OF EU RURAL AREAS

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DELIVERABLE 3.4 FORESIGHT PROSPECTS FOR THE FUTURE OF EU RURAL AREAS

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Executive Summary

The term 'foresight' refers to a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at enabling present-day decisions and mobilising joint actions (European Commission, 2020).

This report provides an overview of a sample of existing foresight studies, carried out at EU and global level, which identify sets of drivers of change and plausible scenarios that are relevant for the future of European rural areas. It provides an extended update (post-2020) of the SHERPA Working Document 'Overview of a sample of existing foresight and scenario studies carried out at EU and global levels' (Brunori and Mazzocchi, 2020), which encompassed a set of foresight studies from approximately between 2009-2019.

Two important elements differentiate this report from the previous version of the document: the COVID-19 outbreak, with related crises and impacts, and the centrality of foresight as a policy instrument during the current European Commission mandate, an example of which is the consultation, launch and implementation of the Long-Term Vision for Rural Areas.

The report discusses foresight studies from European and international research (e.g. the World Economic Forum report on Global Risks, Report of the 5th SCAR Foresight exercise, …) and the results of EU-funded projects under the 7th Framework Programme (TRANSMANGO, VOLANTE) and Horizon 2020 (SALSA, DESIRA, RURALIZATION, …). Although some of the reviewed studies and projects are not exclusively covering rural areas but revolve around a variety of themes – from land use to small farming or the twin transition –, their appraisal highlighted plausible scenarios, potential drivers, and future challenges and issues that may affect, and be relevant to, rural areas.

Overall, key-take away messages from the report emphasise the importance of recognising the diversity and specific needs of rural areas, leveraging their assets for development, fostering rural-urban connections, and adopting forward-thinking approaches to address the challenges they face:

- Rural areas are diverse and have specific needs: the average age in rural areas is higher than in urban areas, and the gap in GDP per capita and service delivery between rural and urban areas has widened since the global financial crisis in 2008. Some rural regions perform well economically and in terms of well-being, while others lag behind.
- The diversity of rural areas reflects opportunities and constraints: rural areas contribute significantly to national economies and provide essential ecosystem services. Their competitive advantage lies in natural, social, and cultural capital, which need to be maintained and enhanced. Different typologies of rural areas have different needs and problems, ranging from urban sprawl to demographics.
- Rural-urban connections are essential for thriving rural areas: recognising the value of services provided by rural areas to urban areas is important, and rural areas with a higher quality of life can attract residents if adequate services and infrastructure are in place.
- Foresight and scenarios are valuable for future-oriented policies: foresight exercises and scenarios can help decision-makers anticipate and understand potential changes and implications. Rural areas face multiple challenges related to climate change, ecological collapse, food security, and digital exclusion, and these challenges are interconnected with global drivers. It is crucial to consider trade-offs, avoid exacerbating future risks, and prepare for different future scenarios.
- Careful consideration of interconnected drivers and systemic approaches is necessary: the choices made today will impact the challenges faced by rural areas in the future. It is important to adopt a systemic approach to analyse drivers and prevent the risk of polycrises.

1 Introduction

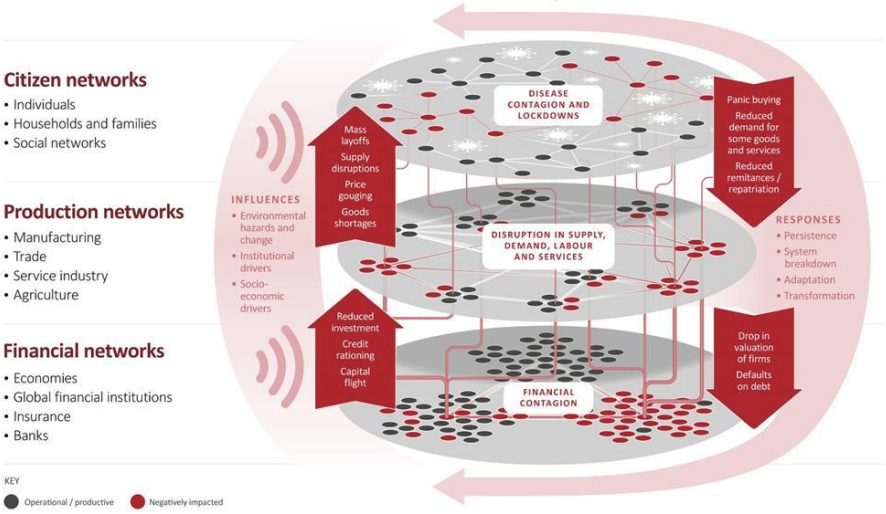
This report is an overview of a sample of existing foresight and scenarios studies carried out at European and global level to identify plausible futures and scenarios for rural areas for time periods up to 2050. It provides an extended update of the SHERPA Working Document 'Overview of a sample of existing foresight and scenario studies carried out at EU and global levels' (Brunori and Mazzocchi, 2020), which encompassed a set of foresight studies from approximately between 2009-2019. Though not exclusively focused on rural areas, the potential for significant impacts on the latter was acknowledged in these studies and the report provided important insights in view to the then forthcoming process of the Long-Term Vision for Rural Areas of the EU. A most recent set of studies have been appraised, carried out in the period from 2020 onwards. Amongst them, we pay specific attention to the Long-Term Vision for Rural Areas of the European Union – and H2020 projects contributing to this consultation –, the JRC 'Scenarios for EU Rural Areas 2040', as well as other foresight studies not exclusively targeting rural areas, but addressing mega-trends and delivering outcomes *of relevance to* the future of rural areas.

There are at least two reasons why this document had to be updated from its first version (see Brunori and Mazzocchi, 2020), which entail differentiating between pre- and post-2020 foresight literature.

First, the COVID-19 outbreak. COVID-19 and related crises had a dramatic impact on all aspects of life and societal systems – education, trade, food, technology, governance – besides on our individual health and well-being. While worsening existing threats and exposing fragilities in any sector, it has at the same time led to think from a global perspective, to consider variables once unthinkable for the most, and to reflect in terms of resilience-oriented recovery ('build back better'). The very phrase 'Post-COVID-19 world' should make us reflect on how we live under constant threats and should prepare for the next crisis, though this will not necessarily come in the form of a virus (European Commission, 2022). But how will we make sure we build-in enough resilience – redundancy and diversity – for the next crises? (European Commission, SCAR, 2021).

In a world that is more interconnected and complex than ever, acknowledging the vulnerability to systemic risks is therefore one major lesson of the COVID-19 pandemic according to Van der Hurk and colleagues from CASCADE project. They warn that, like COVID-19, the impacts of climate change can disrupt society through interconnected global networks. Therefore, for designing policies meant to reduce and manage the risks, "*governments, businesses and large organisations trying to anticipate future disruption must take a 'systemic" perspective*", and scenarios are useful tools to support these processes (Van der Hurk et al., 2020, p. 3).

Figure 1 - How impacts of a crisis can cascade globally through interconnected networks: the Covid-19 example.



Source 1 - Van der Hurk et al. (2020), p.6.

The second, and related, reason is the actual timing of the COVID-19 crisis considering the EU policies context. The European Commission has recently developed a 'Better Regulation Toolbox' and 'Better Regulation Guidelines' (SWD (2017)350), by which they recognised the possibilities arising from foresight and forward-looking tools for generating 'evidence-based better regulation' (Störmer et al., 2020). Considering the emphasis on EU Foresight[1] and the policy – and societal – impact of the Long-Term Vision for Rural Areas (LTVRA) by the European Commission, it cannot be excluded that stressing priorities such as recovery and resilience may have finally gained a rightful position to foresight approaches and techniques as policy tools, at the EU level.

As Bisoffi et al. (2021, p.2) mention: *"[T]he outbreak of COVID-19 occurred at the beginning of the new European Commission mandate. It has encouraged the Commission and Member States to revise principles of intervention, policy priorities and governance rules. Not only has COVID-19 affected the planning of Horizon Europe, as part of the key policies and budget chapters of the European Union: it has also generated a broad debate on the relation between science, policy, and society. The outbreak of COVID occurred also in the middle of a Foresight exercise launched by the European Commission and its Standing Committee on Agricultural Research (SCAR) to advise the Commission and Member States on the "transitions" in food systems and food governance that would lead to a 'safe and just operating space'".*

The remainder of the report is organised as follows: in sections 1.1 we clarify the terminology used in relation to foresight approaches within the SHERPA project and acknowledge the terminology used by the EU, while section 1.2 focuses on drivers of change and makes an appraisal of the most recent inventories of trends and megatrends, addressing primarily their relevance for rural areas. In addition to foresight and scenario-based projects which have direct implications for rural areas, we draw from foresight studies that identify scenarios with some relevance to rural areas, in that they address society as a whole (e.g. smart working, technological advancement, ...) or drivers that cannot be ignored (e.g. resource depletion, ecological collapse, etc.) when considering the future of rural areas. In section 2, a set of most recent (post-2020) foresight studies and projects are reviewed, while in section 3 we resume the foresight studies from pre-

[1] https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/shaping-eu-research-and-innovation-policy/foresight_en

2020 projects assessed in the earlier version of this report, by Brunori and Mazzocchi (2020). Section 4 brings the report to a close, with concluding remarks on the foresight prospects for the future of rural areas.

1.1. Background

SHERPA has engaged in foresight approaches on several occasions. In 2020, SHERPA's multi-actor platforms (MAPs) contributed to the European Commission's Long-Term Vision for Rural Areas (LTVRA), published in June 2021 (European Commission, 2021). Again, a year later, several MAPs decided to undertake the foresight exercise as a follow-up to the visioning work (Salle et al., 2021). The details of these processes are outlined in Section 2. Here we aim to define the essential terminology needed to navigate this report, referring, among other sources, to the European Commission's Competence Centre on Foresight (European Commission, 2020) and the SHERPA discussion paper "Foresight exercise - Alternative rural futures: how to get there?" (Arcuri and Brunori, 2021).

What is foresight?

The term 'foresight' refers to a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at enabling present-day decisions and mobilising joint actions (European Commission, 2020). We can distinguish between two main categories of foresight, according to their purpose: *for enquiry*, mainly aimed at generating knowledge, and *for change*, to establish new interactions and eventually bring about action (Bourgeois et al., 2012).

Action-oriented or strategic foresight is a deliberate attempt to broaden the "boundaries of perception" and expand the awareness of emerging issues and situations (Major et al., 2001). Its objective is to assist decision-makers in strategic thinking and promote future-oriented policies by exploring a range of potential scenarios for how the future might unfold (Habegger, 2010; Vervoort et al., 2015).

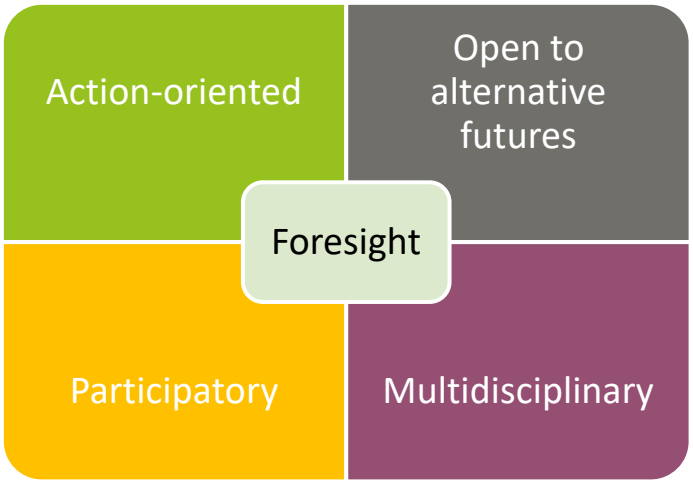
Used as a supporting tool for decision-making in different domains and contexts, foresight is undertaken when a region, country or organisation faces a challenge. To ensure its effectiveness, foresight must be participatory and involve a wide range of actors who are directly impacted by the phenomena under observation, extending beyond a limited group of experts. Actors' engagement is expected to lead to enhanced communication, extended networks, better coordinated preferences, and even changes in thinking that raise the strategic decision-making capabilities of governments (Könnölä et al 2011).

Among the many ways in which foresight can assist the policy process (Da Costa et al. 2008; Könnölä et al 2011), six main functions have been identified in particular:

1. Informing policy by generating new insights;
2. Facilitating policy implementation, i.e., enhancing awareness of challenges to be addressed;
3. Embedding participation in policy-making;
4. Supporting policy definition i.e., translating outcomes into specific policy options;
5. Reconfiguring policy systems (so that they are more capable of addressing long-term issues);
6. Having a symbolic function, e.g. signalling the need for an integrated regional approach.

To serve these purposes, foresight must be multidisciplinary, to acknowledge the complexity of the issues at stake and encompass many variables of different nature (both qualitative and quantitative), while considering critical uncertainties and how they may unfold. In addition, far from predicting or unveiling a pre-determined future, foresight is open to alternative futures, that can evolve in different directions and that, to some extent, actors can influence and shape with the decisions taken today.

Figure 2 – Authors' own elaboration from European Commission (2020).



Foresight entails a process of envisioning, inventing, and constructing scenarios and scenarios are one such method of exploring the future (Pérez-Soba and Maas, 2015). They serve to test and inform the feasibility of a strategy, plan, or policy and support better decisions, to facilitate the identification of critical uncertainties and to enhance the understanding of external and internal drivers and how they affect or are affected by a specific initiative, area or organisation.

Like foresight, scenarios do not predict the future: they rather make clear than we cannot either predict nor ignore the future. Scenarios do not, per se, provide a direction for action: they serve as contexts for decision-making, as for planning the future it is necessary to be aware of the contexts in which the plans are made (Vervoort et al., 2015; Gordon, 2008).

Foresight exercises and scenario planning can be done in many ways, adopting either quantitative or qualitative approaches or a mix of both. One main categorisation distinguishes between *exploratory* and *normative* scenarios, where exploratory scenarios are used to describe uncertainty and answer questions on *what could happen* in the future in a given context, while normative scenarios are meant to answer questions on *what should happen* in the future. Whatever the approach and goals of the exercise, one initial step in foresight will most likely entail the identification of the factors that may have a role in shaping the future, that is: the drivers of change, from mega-trends to factors influencing to a varying extent the specific context of analysis.

Drivers of change

A trend is 'the direction in which something is developing or changing' and is 'more or less predictable depending on the inertia of the system, the degree of dependence of a future state from the past' (Bisoffi, 2019, p. 7). Mega-trends are defined as 'long-term driving forces that are observable now and will most likely have significant influence on the future' (European Commission, 2020). Mega-trends operate at a large, overarching scale, affecting large shares of the population and a significant number of countries or regions. Their impacts can be global and span over long-term timescales. Trends affect specific regions or activities. A certain degree of uncertainty characterises both trends and mega-trends.

Trends and mega-trends can act as drivers of change, that is: in complex dynamic systems, they constitute the driving forces which influence and determine the direction of change (Bisoffi, 2019). In addition, drivers of change often interact, making it more difficult to analyse them and their potential effects separately.

Among drivers of change, the role of 'game-changers' and 'weak signals' has also been recognised by several H2020 projects, like DESIRA[2] and RURALIZATION[3]. A game changer is an entity – a person, product, policy, idea, etc. – that brings about disruption (Rijswijk et al., 2020), while a weak signal is the symptom of a change occurring in a specific region or activity. Below, an appraisal of existing inventories and studies on drivers of change is made starting from high-level mega-trends to factors addressing rural areas more directly.

2. Review of Foresight and Scenario Exercises (post 2020)

2.1. Analysis of drivers of change

The Mega-trends Hub of the Competence Centre on Foresight (JRC)

The Competence Centre on Foresight of the European Commission has created a Mega-trends hub[4], currently listing 14 mega-trends which will most likely have a significant influence on the future (**Error! Reference source not found.**).

The list includes:

1. *Accelerating technological change and hyperconnectivity:* there is a growing impact of technology and digital connectivity on how we live, from how we socialize and work, to production and governance.
2. *Worsening resource scarcity:* demand for water, food, energy, land and minerals is rising substantially, making natural resources increasingly scarce and more expensive.
3. *Changing nature of work:* new generations entering the workforce and older generations working longer are changing employment, career models, and organisational structures.
4. *Changing security paradigm:* the diversification of threats, and the people behind them, are generating new challenges for the defence and security communities, and to society as a whole.
5. *Climate change and environmental degradation:* continued unabated, anthropogenic pollution and greenhouse gas emissions will further increase changing climate patterns.
6. *Continuing urbanisation:* people in search of better opportunities – such as jobs, services and education – have been moving from rural to urban areas across the world, and this accelerating trend is likely to continue in the future.
7. *Diversification of education and learning:* new generations and hyperconnectivity are rapidly changing both educational needs and modes of delivery.
8. *Widening inequalities:* the absolute number of people living in extreme poverty has been declining. But the gap between the wealthiest and poorest of the population is widening.
9. *Expanding influence of East and South:* the shift of economic power from the established Western economies and Japan towards the emerging economies in the East and South is set to continue.
10. *Growing consumption:* by 2030, the consumer class is expected to reach almost 5 billion people. This means 1.3 billion more people with increased purchasing power than today.

[2] https://desira2020.eu
[3] https://ruralization.eu
[4] More information on the megatrends can be found in the JRC Megatrend Hub (https://ec.europa.eu/knowledge4policy/foresight/tool/megatrends-hub_en)

11. *Increasing demographic imbalances:* the world's population will reach 9.7 billion by 2050, with rapid growth mainly in Sub-Saharan Africa and stagnating numbers of residents in the majority of developed countries.
12. *Increasing influence of new governing systems:* non-state actors, global conscientiousness, social media and the internationalisation of decision-making are forming new, multi-layered governing systems.
13. *Increasing significance of migration:* the societal and political significance of migration has increased. Migration dynamics have become more complex in an interconnected world.
14. *Shifting health challenges:* science and better living standards have reduced infectious diseases. Unhealthy lifestyles, pollution and other anthropogenic causes are turning into health burdens.

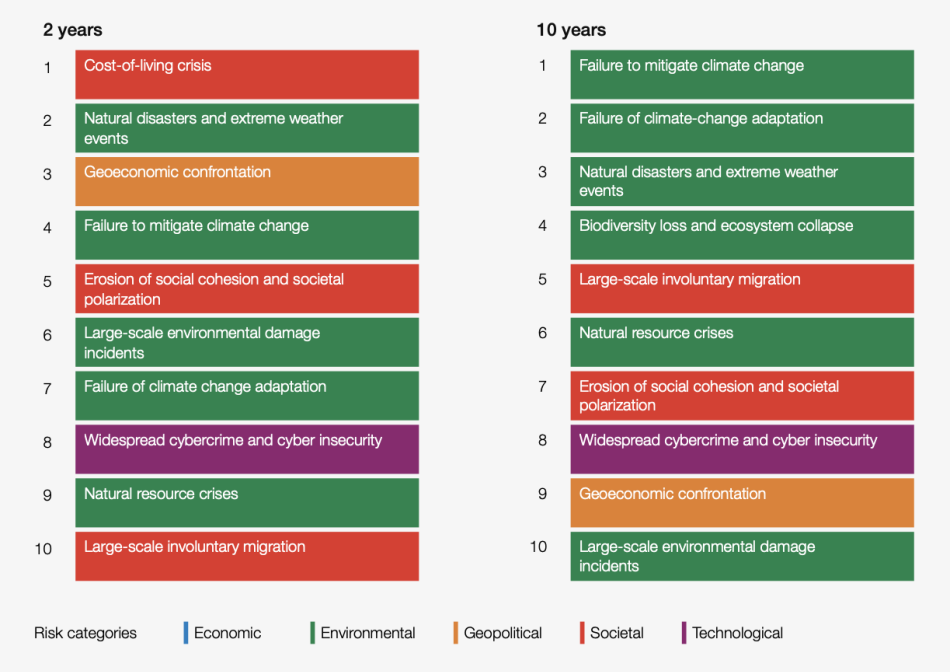
Figure 3 – Website page of the Mega-trends hub

Source: Competence Centre on Foresight of the European Commission

Global Risks Report

A Global Risks Perception Survey is carried out every year by the World Economic Forum (WEF) and addresses members from across academia, business, government, the international community, and civil society. A global risk is defined as 'the possibility of the occurrence of an event or condition which, if it occurs, would negatively impact a significant proportion of global GDP, population or natural resources' (WEF, 2023, p. 5). For the 18th Global Risks Report (WEF, 2023) respondents were invited to provide context to the evolution of the global risks landscape and to assess the perceived impact likelihood, consequences, and interrelations of global risks over a 2-year and a 10-year horizon. Figure 4 shows that societal and environmental risks are the major concerns and that the 'Cost of living crisis' dominates the shorter horizon, while climate action failure dominates the next decade.

Figure 4 - Global risks ranked by severity over the short and long term: "Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period".

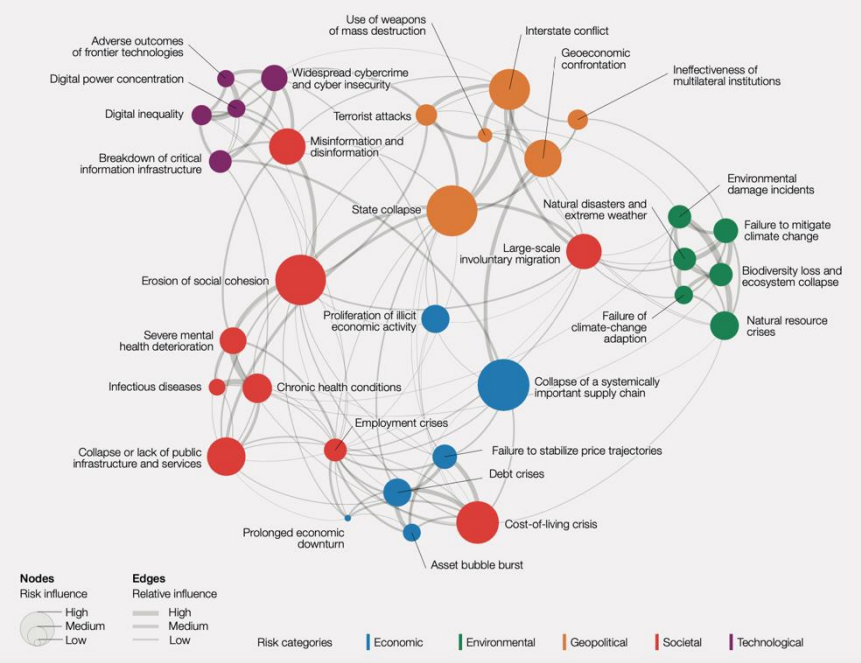


Source: WEF (2023)

A closer look at the interconnections among global risks (Figure 5) allows a deeper understanding of – and opportunities for anticipating – the risk of polycrises, that is: clusters of related global risks with compounding effects, such that the overall impact exceeds the sum of each part (WEF, 2023, p. 57). In addition, the report calls for a systemic view of, and approach to, global risks. It highlights how those risks that are most influenced by, or exposed to, other risks are the hardest to mitigate, while those with the greatest influence on the outcome of these interconnections can be prioritised as key intervention points (WEF, 2023). While each of these risks deserves specific efforts, four principles for preparedness have been identified to address 'this new era of concurrent shocks':

1) strengthening risk identification and foresight,
2) recalibrating the present value of "future" risks,
3) investing in multi-domain risk preparedness, and
4) strengthening preparedness and response cooperation' (WEF, 2023, 69).

Figure 5 – Map of interconnected global risks.



Source: WEF (2023)

A STEEPV Inventory of Drivers of Change

When conducting an analysis of drivers, one risk is to focus excessively on certain types of drivers to the detriment of others. The STEEP, or PESTE, analysis is a tool meant to prevent this misrepresentation of driving forces. STEEP stands for Social, Technological, Environmental, Economic and Political. It provides a simple checklist method to ensure that drivers are selected across multiple domains. Both SHERPA and DESIRA projects encouraged the use of the STEEP analysis in their foresight guidelines (Arcuri and Brunori, 2021; Duckett et al., 2021).

H2020 PoliRural[5] developed an inventory of drivers of change based on the STEEP analysis, but with a novelty: it integrates 'Values' as a further, separate domain (VV.AA, 2021). The resulting inventory (available here) includes 64 drivers across 6 categories (Table 1), and for each item an in-depth analysis and justification is provided. It does not aim at providing an exhaustive list of drivers but is meant to trigger strategic discussions about the "drivers of change" within the teams/groups involved in the foresight process. These dialogues will facilitate a deeper comprehension of the effects of the observed phenomenon/issue and ultimately result in improved insights in relation to:

- how change happens in the reference region;
- the changes that are happening right now;
- the changes that are likely to happen in the future;
- their order of importance and local actors' ability to influence those changes (VV.AA, 2021).

[5] https://polirural.eu

Table 1 – Results of the analysis of drivers of change developed by H2020 PoliRural.

Social	Technological	Economic	Environmental	Political and Policy	Values
Rural Demographics	Rural Broadband	Employment Opportunities	Climate Change	Regional Policy	Concern for the Planet, the Climate and the Environment
Population Flows	Remote Working and Teleworking	Entrepreneurship and New Business Development	Greenhouse Gas Emissions	The Common Agricultural Policy	Interest in Personal Health, Self-Care and Wellness
New Entrants	Digital Transformation	Diversification of Rural Economies	Tipping Points	Policies for the Environment and Biodiversity	Food Movements for Vegetarians, Vegans, Flexitarians and Climatarians
Rural Employment Opportunities	The Internet of Things	Sustainable Circular Economy and Bioeconomy	Food Security	Energy and Carbon Policies	Concern for Natural Resource Scarcity
Transition to a Rural Society 5.0	Big Data, AI, Automation and Robotics	Digital Agriculture	Crop Loss due to Disease and Pests	The European Green Deal	Attitudes Towards Car Ownership, Personal Mobility and Convenience
Public Services and Security	Earth Observation and the Copernicus Programme	Accessibility and Mobility	Crop Loss due to Exceptional Weather Conditions	Rural Tourism Policy	Political Apathy and Loss of Trust
Professionalization and Technology Intensification of Farming	Precision Agriculture	Public Investment	Property Damage due to Flooding	Industry and Enterprise Policy	Activitism by Young People, Employees, Shareholders and Voters
Access to Knowledge, Education and Training	Electric and Autonomous Vehicles	Technical Support Services	Water Scarcity	Trade Policy and the Rise of China	Solidarity and Sense of Community
Growth in Services and Tourism	Renewable Rural Energy Systems	Financial Support Services	Heat Waves	Pandemic Policies	Social Entrepreneurship
Drive for Sustainability	Genetics and Molecular Biology	Education, Research, and Innovation	Wildfires		Civic Engagement
		Disaster Relief and Crisis Recovery Schemes			NIMBYISM
		Climate Change Risk Mitigation			The Impact of Covid-19 on Society and its Values
					Glocalization

Source: Source: authors' own elaboration from VV.AA (2021).

Weak signals for the future of rural areas

Horizon scanning and scenarios are useful tools that can assess 'weak signals' from qualitative and quantitative data sources. These tools help in the proactive identification and interpretation of emerging trends, allowing for a better anticipation of future developments.

H2020 RURALIZATION carried out an extensive trend analysis, eventually released in the form of a set of 60 Trend cards[6], each with a preliminary assessment of potential impacts on rural areas and other domains of interest for the project (social capital, access to land, gender parity, etc.), supported by statistical data. The cards feature 10 megatrends, 20 trends and 30 weak signals. The latter, defined as factors that represent symptoms of change occurring in specific activities or regions, are illustrated in Figure 6:

[6] The Rural Trends card are available online at https://ruraltrends.eu.

Figure 6 – Weak signals for the future of rural areas.

Source: authors' own elaboration from H2020 RURALIZATION.

2.3 The Long-Term Vision for Rural Areas of the EU

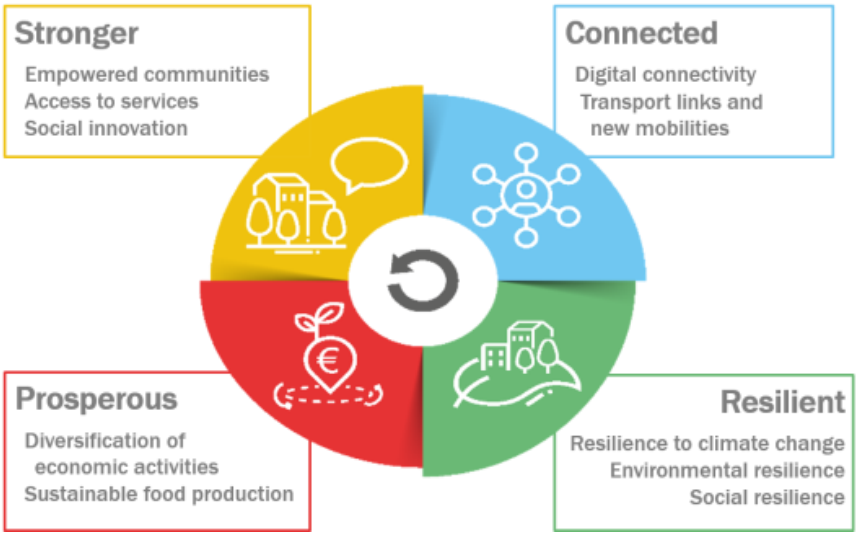
In 2019 the European Commission launched an initiative to develop a shared European vision for rural areas in 2040. This Long-Term Vision for Rural Areas (LTVRA) acknowledges the diversity of rural territories throughout Europe, while also highlighting the common challenges and opportunities they face. With the consultation, the Commission actively sought the input of rural communities and businesses through public consultations and stakeholder-led events, eventually formulating a broad-ranging vision and a comprehensive rural action plan.

The LTVRA recognises the fundamental role that rural areas play in the European way of life. With a population of 137 million people, they encompass nearly 30% of the total population and cover over 80% of the land area, encompassing all communes and municipalities across Europe with low population size or density (European Commission, 2021). These areas are highly valued and recognised for their contributions to food production, natural resource management, preservation of landscapes, and recreational activities and tourism, besides their role in maintaining traditions and culture (European Commission, 2021). Nevertheless, the social and economic transformations witnessed in recent decades, driven by factors like globalisation and urbanisation, have brought about changes to the nature and role of rural areas. These regions are grappling with issues such as a declining and ageing population. Concerns have been raised by many Europeans regarding the deterioration of rural infrastructure and essential services, including basic access to healthcare, social services, education, but also postal and banking facilities. In addition, limited employment opportunities, potential income decline, and inadequate transportation and digital connectivity in rural areas constitute major concerns (European Commission, 2021).

The Consultation revealed that almost 40% of respondents felt left behind by society and policy-makers (European Commission, 2021). It also made clear that the value and contributions of rural areas have been underappreciated and insufficiently acknowledged and that it is necessary to address this issue and its driving factors. For a detailed account of results of the Consultation,

The vision and the Rural Action Plan set ten shared goals in four complementary areas of action, supported by flagship initiatives, epitomised as stronger, connected, resilient and prosperous rural areas by 2040 (Figure 7).

Figure 7 – Four blocks of action for the LTVRA.



Source: European Commission (2021)

The implementation of the EU Rural Action Plan will be supported, monitored and updated by the European Commission. The Rural Observatory and a *rural proofing* mechanism are further outcomes of the LTVRA, which will support, monitor and update the implementation of the Rural Action Plan. The former is meant to provide evidence to inform policymaking in the context of rural development, while rural proofing entails reviewing EU policies through a rural lens. In addition, through the Rural Pact, the Commission provides a framework to maintain a dialogue on rural issues with Member States and rural actors.

The contribution of H2020 projects to the LTVRA

Among the projects funded by the EU research and innovation (R&I) framework programme (FP) under the Horizon 2020 work programme, SHERPA, DESIRA, RURALIZATION and POLIRURAL[7] have provided useful insight for the development of the LTVRA. Both projects contributed to the consultation by undertaking participatory foresight exercises involving visioning and scenario/trend analysis.

H2020 DESIRA gathered a group of experts – ranging from partners of the project, members of the Rural Digitalisation Forum, coordinators and partners in other relevant Horizon 2020 projects and external scholars and local developers – to discuss the state of the art of digitalisation as well as potential threats and opportunities for the future of rural areas. The experts agreed upon a range of positive pathways offered by digitalisation, summarised into three main categories: (i) improve access to information and availability of services, (ii) support new ways of working, diversification and promote businesses development in rural areas, and (iii) foster new interconnections between urban and rural areas, as well as relationship among different thematic areas (Tisenkopfs et al., 2021). Rural areas benefit from digitalisation through expanded access to data, information, and public administration services; connectivity to public and private digital services encompassing healthcare, distance learning, housing, transportation, online cultural activities, and various other opportunities. However, the same experts warned about the risks or negative consequences posed to rural areas by digitalisation, distinguishing between more visible, or explicit, risks, and hidden, or implicit risks. The former is related to issues concerning digital infrastructure and connectivity specific to rural areas (e.g. financial burden on rural municipalities, less coverage and slower broadband connections), while the latter are linked to the lack of digital skills and the risks of exclusion of certain segments of the

[7] Some of the results from these H2020 projects were illustrated above.

rural population. Among the set of digital game-changers identified by experts[8], the three main technologies expected to influence the future of (life in) rural areas are:

(i) data and analytics (Big data);
(ii) artificial Intelligence (AI);
(iii) websites and online platforms.

Application scenarios were then identified for these game changing technologies, in relation to their capacity to target/affect: farm management and consequent potential impact on rural areas; the provision of public goods and services; new business models and practices; a more efficient interaction across sectors and spaces.

H2020 RURALIZATION is focused on generational renewal and rural newcomers. By contributing to the consultation on the LTVRA, the project's perspective involved shifting the narrative of rural decline and embracing a "ruralisation" process that brings about a paradigm shift in rural society, economy, and culture. This transformation was driven by a renewed focus on the countryside during a time of multiple crises. RURALIZATION built an inventory of future dreams, by carrying out an extensive study in 20 regions of 10 countries. The focus was on young people (18-30) living in these regions, which were invited to describe their personal dream future for the year 2035. The dreams encompassed aspects such as livelihood, accommodation, lifestyle, and the obstacles they perceived in realising their dreams. More than 2200 responses were collected and analysed according to the types of dream areas, enabling the comparison of dream area profiles, namely: city centres, areas outside of urban centres, suburbs, rural areas close to cities, rural villages and remote rural areas. The methodology employed in the dream inventory acknowledges the diversity of young people living in various contexts and recognises that the inventory does not aim to capture a fully representative set of dreams to define the future of rural Europe. However, the methodology applied in this study ensures the observation of the diverse young population in a practical manner. The dreams expressed by youth exhibit diversity and variation across different contexts, while also containing elements of universality at an appropriate level of abstraction. At the highest level of abstraction, dreams targeting city centres were associated with younger individuals who envisioned mobile, dynamic, international, creative, and successful urban lives with a balance of regularity. Dreams for areas outside city centres highlighted communal, cozy, and stable urban living that allowed for mobility, international exposure, and personal growth in diverse ways. Dreams for suburbs in city areas reflected a flexible, responsible, peaceful, and home-centric lifestyle on the outskirts of a city. Dream futures for rural areas close to cities were characterised by a strong preference for a countryside living environment, which included elements like water, animals, private space, and gardening – a vision of family life where rural lifestyle took precedence over work life. Dreams for rural villages represented manifestations of the local paradigm within a rural fabric. Finally, dreams for remote rural areas were influenced by the ideal of living in and with nature, with a strong sense of agency (Kuhmonen et al. (2021).

During the same period, **H2020 SHERPA** released a position paper (Chartier et al., 2021), summarising the results of a participatory process conducted between April and December 2020, involving the contribution of 20 regional and national Multi-Actor Platforms (MAPs) and one EU-level MAP to the LTVRA consultation. Each platform consisted of 10-15 representatives from civil society, policy, and science. At the start of the envisioning process, SHERPA MAPs were invited to reflect on the challenges and opportunities that their rural territories would face through to 2040. Participants were then invited to articulate their vision for an ideal future and to identify key enabling factors. The resulting position paper consolidates common elements

[8] For the complete list see Tisenkopfs et al 2021 available online at https://desira2020.eu/wp-content/uploads/2021/02/DESIRA_LTVRA_Rural_fv.pdf

derived from the 21 individual visions, outlining the key characteristics that would define a desirable future for rural areas by 2040. Figure 8 summarises the results from the DELPHI process[9].

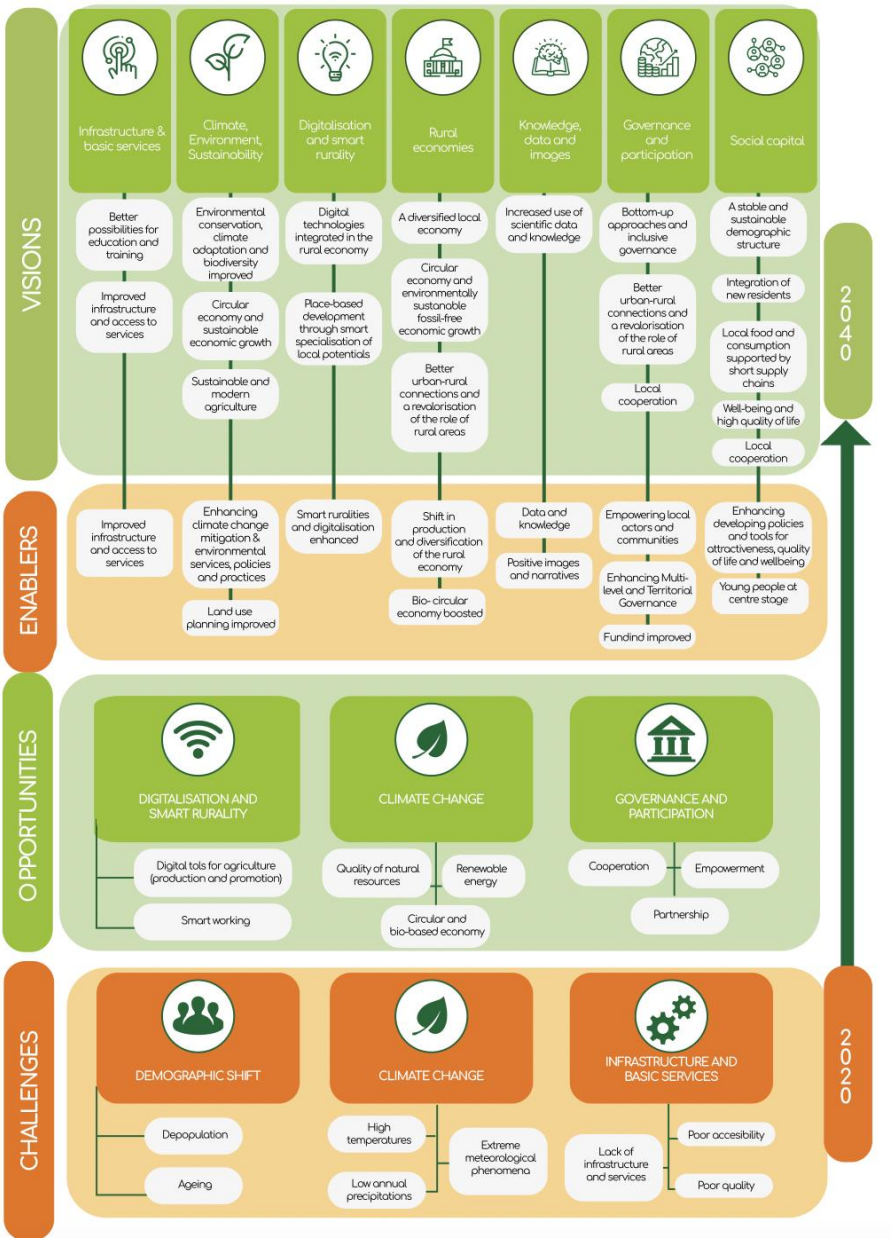
SHERPA vision for rural areas in 2040 is symbolised by an evocative image of areas attractive as places to live, work and visit, characterised by opportunity, innovation, modernity, liveliness, resilience and equality, along with sustainability and multi-functionality. Acknowledging the main challenges represented by depopulation, climate change and limited access to basic services, especially in remote rural areas, the MAPs call for urgent mechanisms to ensure policy coherence and coordination when addressing rural matters. The key enablers identified are:

(i) Enhancing smart rurality and digitalisation;
(ii) Empowering local actors and communities; and
(iii) Enhancing multi-level and territorial governance.

In 2021, SHERPA decided to undertake a further stage of the work on the Long-Term Vision and carried out a foresight exercise, aimed at enriching the dialogue on the future of rural areas among civil society, researchers, and policy-makers involved in the MAPs. Participating MAPs began with their envisioned desirable future for 2040 and then worked backward to assess the goals, targets, and necessary pathways for achieving their desired future. This involved identifying – and discussing the implications of – potential interventions, instruments, processes, and responsible actors who would take action to bring about the envisioned changes. The results of the foresight exercise carried out by 5 MAPs are summarised in Salle et al. (2022). The scenario analysis entailed the use of exploratory scenarios developed by the European Commission's Competence Centre on Foresight (Bock and Krzysztofowicz, 2021).

[9] A Delphi process was carried out, which was based on desk research, appraisal of quantitative data, interviews with key informants, and the design, implementation and analysis of online surveys. The process led to the development of 19 MAP Position Papers, eventually synthesised in one Final SHERPA Position Paper on the Long-Term Vision for Rural Areas (Chartier et al., 2021).

Figure 8 – Summary of the results of the Delphi process by SHERPA MAPs



Source: Chartier et al. (2021)

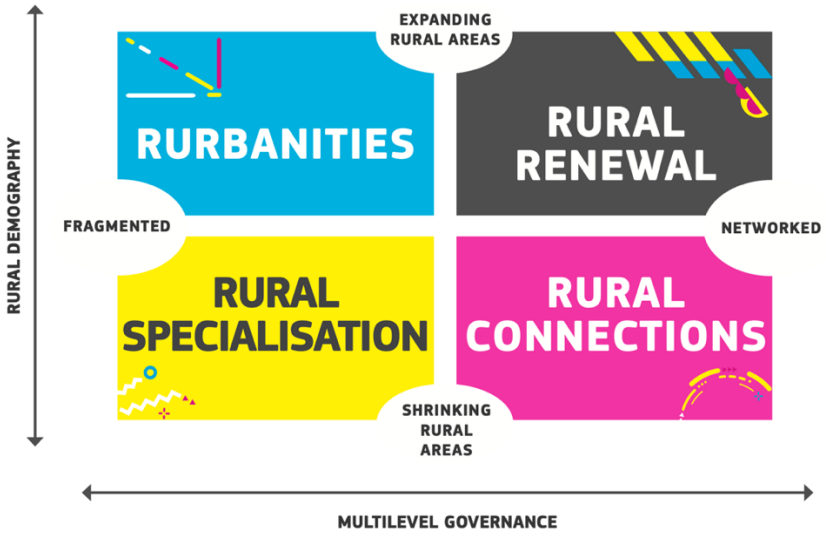
Scenarios for EU Rural Areas 2040

A foresight study was conducted by the European Commission's Competence Centre on Foresight, a part of the Joint Research Centre, to explore the future of EU rural areas in 2040. In collaboration with the European Network for Rural Development (ENRD) Thematic Group on the Long-Term Rural Vision, a participatory process took place from September to December 2020, resulting in the development of four scenarios. These scenarios depict potential alternative futures for rural areas within the EU, encompassing a range of possibilities, from depopulation and specialised land use to diversified and expanding rural regions. The objective of this exercise was to create a series of future scenarios that outline various trajectories for rural

areas leading up to 2040. By undertaking this exercise, the aim was to enhance the ongoing discussions regarding possible developments and policy approaches for these regions. The participatory process undertaken to develop the four Rural Scenarios is described in detail by Bock and Krzysztofowicz (2021).

A set of drivers (Table 2) were identified through a participatory brainstorming exercise, where participants were invited to reflect upon a standard day in the life of five rural actors. Amongst them, 'Multilevel governance' and 'Rural demography' were identified in the process as the two most impactful and uncertain drivers for the future of rural areas of Europe. The resulting scenario logic is organised along two axes, combining different demographic developments with different governance approaches (Figure 9). Multilevel governance moves between the two extremes of 'fragmented multilevel governance' (where there is limited coordination and no collaboration between the different types of actors, resulting in low policy coherence. There is a poor direct participation of citizens in the decision-making processes) and 'networked multilevel governance' (which describes a dominance of well-coordinated, collaborative and often collective decision-making processes, with high levels of direct citizen participation). On the second axis, the two extremes see either 'expanding rural areas' (where the rural population increases due to in-migration primarily from urban centres, with reduced out-migration) and 'shrinking rural areas' (declining rural population due to ageing and continued out-migration to urban centres. Four main scenarios with related narratives were therefore developed from the 2x2 matrix.

Figure 9 – The scenario logic



Source: Bock and Krzysztofowicz (2021)

The four scenarios (illustrated in Table 2 and briefly summarised below) describe plausible developments in a generalised manner, with a focus on issues of mutual interest in a European perspective. None of them represents preferred development pathways for rural areas; rather, showcasing plausible future developments in rural areas based on different combinations of driving factors, the analysis provides an opportunity to reflect on crucial elements for building a long-term vision and identifies policy issues to address. Some general considerations can be made in relation to factors emerging across all scenarios:

- the role and importance of digital infrastructure and services in rural areas, regardless of the direction of development, is cross-cutting;
- rural areas continue to play a vital role in food, energy, environmental protection, and leisure activities, even when the social importance of rural areas decreases;
- demographic change requires management, both in case of shrinking and expanding population, and community building may be necessary to integrate diverse populations in rural areas;

- while climate change mitigation, along biodiversity protection, are present and relevant across all scenarios, land use management gains importance.

Table 2 – Summary of drivers and respective characteristics across the four scenarios.

Drivers	RURBANITIES	RURAL RENEWAL	RURAL CONNECTIONS	RURAL SPECIALISATION
Multilevel governance	Common objectives but uncoordinated initiatives and investments	Closely networked and integrated transition management	Strong coordination and collaboration at local and regional level, including cross-border	Competing, disconnected initiatives for specific interests
Rural demography	Migration to rural areas for a higher quality of life	Migration to rural areas for a change in lifestyle, counter-urbanisation movement	Migration from rural areas to urban economic centres, convergence in rural hubs	Migration from rural areas to urban economic centres, depopulation of rural areas
Diversity of rural economy	Very diverse, opportunities for entrepreneurs and small and medium enterprises	Very diverse, circular and local, short supply chains	Importance of agriculture as part of a circular bioeconomy	Specialised, consolidated large-scale bioeconomy
Rural-urban relationships	Close links and competition	Rural-rural relationships gain importance	Rural-rural-urban networks, interdependence recognised	Urban-centric perspective
Access to public services	Complex regulatory and social e-service systems, fragmentation	Close, frequent interaction and integration	Lean services, fully digitalised	Seamless, customer-oriented online service delivery
Digital infrastructure and services	Well-developed access, but higher quality services more costly	Well-developed access, community-owned local networks	Well-developed access, priority for managed transition	Well-developed access - enabling economic activities
Civic engagement	Private-interest-driven engagement, volatile and temporary pressure groups	Deliberative democracy, collective decision-making	Liquid, deliberative democracy	Disengaged citizens
Rural communities	Individualised society, local-oriented communities, weak social cohesion	Strong community spirit, consciously building and maintaining local com-munities	Strong local community spirit and bottom-up do-it-yourself engage- ment	Largely urban society, dispersed, unorganised rural population
Land management and agriculture	Multifunctional land-use focused on production and living functions (rural sprawl). Diverse agriculture but increased tensions	Multifunctional land-use focused on living and ecological functions. Smaller scale farming, diversified with focus on agro-ecology	Specialised land use – compromise between regional and local needs. Large scale agriculture plus few smaller local initiatives	Specialised land use, zoned and optimised for benefits of the city. Large scale farming focused on sustainable intensification
Climate change policies	Reactive and technology-driven, using economic incentives and voluntary approaches. Slow sustainability transition	Proactive with regulatory approaches and focus on behaviour and lifestyle changes	Proactive combining focus on environmental standards, local, short supply chains, encouraging sufficiency with climate diplomacy	Proactive with focus on few large corporate actors (regulations, eco- nomic incentives), large-scale technological interventions
Transport & mobility	Primarily road transport, advanced individual transport prevails	Distributed and varied mobility net- works, community-owned	Collaborative and collective approaches to mobility	Centralised, geared towards needs of industry and urban tourists

Source: authors' own elaboration from Bock and Krzysztofowicz (2021)

RURBANITIES – fragmented multi-level governance, expanding rural areas

In 2040, in the EU, the pandemic prompts a rise in teleworking, allowing individuals to choose their place of residence independently from their workplace. Rural areas become appealing due to lower costs, reduced pollution, and increased security, attracting those who could afford remote work. The population in rural areas grows substantially, but social cohesion diminishes, and a lack of community engagement prevails. A "not-in-my-backyard" attitude and tensions between newcomers and existing residents emerges. Rural areas develop close connections with urban centres, with many residents having personal and work relations in cities. The availability of digital infrastructure and transportation technology advances, yet public transport infrastructure remains underdeveloped. Administrative e-services are widespread but lack coordination, while e-healthcare and personalised education become the norm. Rural areas experience expansion, leading to land-use challenges and compromising protected natural areas. Agriculture adapts to local demands and sustainable practices, with smaller farms focusing on direct sales and additional services. Climate change

policy mainly relies on economic incentives and voluntary measures, emphasising technological innovations and business-driven environmental advancements. The lack of coordination and sharing of experiences hinders effective collaboration and eventually slows down the sustainability transition.

RURAL RENEWAL – networked multi-level governance, expanding rural areas

In 2040, the European Union (EU) is heavily focused on the green transition, aiming to achieve climate neutrality by 2050. The EU has invested in green and digital technologies through initiatives like the Green Deal and Next Generation EU funds. Rural areas have seen an increase in population as more people choose to move away from high-density cities for a more sustainable lifestyle. The EU has implemented governance structures that promote cooperation and citizen engagement, blurring the lines between governmental and non-governmental actors. Nature-based solutions, circular economy practices, and sustainable infrastructure have been easier to implement in rural areas. Smaller scale farming, regenerative practices, and community-supported models dominate agriculture. Climate change adaptation and mitigation measures involve behavioural changes, collaborative community solutions, and regulatory frameworks.

RURAL CONNECTIONS – networked multi-level governance, shrinking rural areas

The European Union faces challenges related to economic and environmental crises. Member States' high levels of debt from post-COVID economic recovery efforts have led to reduced government spending, social policies, and public services. Climate change impacts and environmental degradation have increased the focus on resilience and crisis response. The EU has seen strengthened integration, with additional powers shifting from national to EU levels. Digitalisation has compensated for cuts in public services, while citizen participation is facilitated through virtual communication channels. Rural areas experience population decline but have become hubs of community self-organisation, with close links to urban centres. Infrastructure prioritises digital connectivity and sustainability. Agriculture is consolidated, with large farms adhering to stricter environmental standards, while small-scale agriculture supports local food production. The EU emphasises comprehensive environmental standards, climate change measures, and the circular bioeconomy.

RURAL SPECIALISATION – fragmented multi-level governance, shrinking rural areas

In 2040, the EU's focus is on recovery and economic restructuring through green and digital transition. The population is decreasing, with rural areas experiencing a decline due to limited opportunities and support. Most rural residents have moved to urban centres, while those remaining are dispersed. Rural policies are now determined in urban areas, considering needs for food, resources, and leisure. Land management is primarily in the hands of private actors, who have established large, automated facilities and manage extensive land areas. Cities are transforming to secure resources and collaborate with private companies. Governance is fragmented, leading to inconsistencies and shifting of blame. Efforts are made to regain public trust through efficient public services and targeted applications. Infrastructure is centralised, connecting cities and specific facilities. Land-use has been consolidated, with large-scale agriculture and forestry practices emphasising sustainability. Climate mitigation and adaptation focus on regulatory and economic solutions, including large-scale technology interventions and geoengineering ideas.

2.3 Other foresight studies of relevance to rural areas

Towards a green and digital future

The recent study developed by the JRC (Muench et al., 2022) is the result of an eight-month participatory foresight process. It takes the goals of the twin transitions as a starting point and examines technologies that could be developed and combined to get there, while also looking at the obstacles that might arise. This foresight process included a thorough literature review and continuous expert engagement in discussions

and workshops. The results of the process have been validated through further workshops and conferences with a wide range of stakeholders from academia, civil society, public administration, and industry. In total, over 200 experts participated in the foresight process (Muench et al., 2022).

The starting point is the focus, for the European Union (EU), on achieving sustainability, fairness, and competitiveness through the twin transitions of green and digital. The green transition aims to combat climate change and environmental degradation, while the digital transition seeks to leverage digital technologies for sustainability and prosperity. The EU recognises the need to manage these transitions together and ensure they reinforce each other. The analysis by Muench et al. (2022) addresses how digital technologies can enable the green transition by 2050, particularly in five sectors: agriculture, buildings and construction, energy, energy-intensive industries, and transport and mobility. They identify key requirements for successful management, such as monitoring, simulation, virtualisation, and data analysis. Among the challenges identified, potential tensions between the green and digital transitions and the impact that Russia's military aggression may have on food prices, construction, energy security, and transport are highlighted. Peculiar challenges (and potential advantages and opportunities) for rural areas are underlined in the report, e.g. in relation to the digital divide or the distinct transport and mobility needs for rural and urban areas).

Overall, the study emphasises the importance of a just transition through promoting social awareness, facilitating new skills, internalising environmental costs, supporting small and medium-sized companies, ensuring policy coherence, and increasing investments in green-digital solutions. Overcoming economic, social, and political barriers is also crucial for the effective implementation of the twin transitions. Contextual factors like costs, economic opportunities, job shifts, acceptance, fairness, regulations, and standards need to be considered.

Natural resources and food systems: Transitions towards a 'safe and just' operating space – Report of the 5th SCAR Foresight exercise expert group

The 5th SCAR Foresight group[10], composed of six specialists in foresight processes and eight experts in various sectors of the agriculture and food system, was assembled in late 2018 to analyse the best available knowledge from scientific literature and engage in workshops with other experts. The aim was to determine how to get to "a safe and just operating space" for society, through better management of natural resources and food systems? The study report into the complex nature of food system and raises the need for research and innovation to act as catalysts for transformative changes in food systems worldwide.

In its position as a link between – and advisor on agri-food research – European countries and the Commission, SCAR made it very clear that the current status is not a viable option, as it is neither "safe" from an environmental point of view nor "just" from a social point of view. The imperative for transitioning toward a "safe and just operating space" is absolute and non-negotiable.

To drive societal progress, both within and outside the EU, towards a "safe and just operating space", the report highlights three main transitions, exemplified in Figure 10 and explained below.

[10] This initiative was initiated under the European Commission's Standing Committee on Agricultural Research (SCAR), established in 1974 by EU Council regulation to provide advice to member states and the Commission.

Figure 10 - 3 pathways to a 'safe and just operating space'.

Source: European Commission, SCAR (2021)

1. We need to ensure that everyone has access to nutritious diets. This necessitates empowering consumers to make informed food choices, encouraging growers to adopt practices that enhance the availability of healthier food options, and enabling distributors and retailers, often with the aid of digital tools, to facilitate improved interactions between producers and consumers.
2. We must strive towards establishing a circular bioeconomy. This entails reimagining the relationships between producers, processors, distributors, and retailers to minimise waste, enhance efficiency, promote diversity, and increase abundance. Additionally, consumers should be encouraged to consider the environmental impact of their food choices.
3. We need to foster a more diverse world, both ecologically and socially. This requires re-evaluating farming practices to harness the inherent diversity found in nature rather than depleting it. Moreover, it necessitates restructuring the connections between the beginning and end of the food supply chain. Particularly in rapidly expanding urban areas, where the risk of adverse health impacts is greatest if we fail to take action, it should be made convenient for individuals to maintain a varied, healthy, and affordable diet.

By making explicit reference to the seminal work of Rockström et al. (2009) and Raworth (2014), and through a review of available research, SCAR experts proposed 11 targets, focused on 6 main physical boundaries, and 5 social boundaries, to chart the progress, or decline, in the food and agriculture system. Partly overlapping with the 17 SDGs, these targets range from biodiversity, CO2 concentration and land use, to gender equality and access to Internet for all in rural areas. With regard to the latter, the report recognises the critical role of rural areas in the transformation of food systems and calls for targeted policies, investments, and innovations to support the sustainable development and revitalization of rural communities.

Results and recommendations from the 5th SCAR Foresight intend to support the implementation of implement the Green Deal and corresponding EU Farm to Fork and Biodiversity strategies, while also providing inspiration for research and innovation in the (then forthcoming) framework programme Horizon Europe. The role of research is crucial for achieving a safe and just living environment while respecting the planetary boundaries, and therefore the report highlights the urgency to – and provide recommendations for – establish appropriate research policy frameworks and align them at both European and national levels.

Farmers of the future

This report (Bock and Krzysztofowicz, 2020) takes a people-centered approach to explore the future roles of farmers in the European Union (EU) up to the year 2040. The study aims to raise awareness and facilitate

discussions regarding the future of farming and the necessary policies to shape it. It acknowledges the significance of a resilient food system in light of the COVID-19 pandemic and the EU's overarching frameworks such as the European Green Deal, Farm to Fork Strategy, and Biodiversity Strategy.

The study employs foresight and design methodologies, involving farmers, academia, civil society organisations, and industry representatives in a participatory process. It develops twelve farmer profiles (Table 3) representing current and emerging realities in European agriculture. These profiles are used to analyse the potential impact of 14 megatrends on farming in the coming decades (see 2.1 Analysis of drivers of change).

Key trends identified include a shift towards more environmentally sustainable farming practices such as agroecology and alternative production methods like cell farming. Consumer expectations for healthier and ethically conscious diets, along with considerations of environmental impact, are expected to increase. The digitalisation of agriculture, including precision farming and automation, are expected to shape farming practices, while data availability and transparency will play a significant role.

The report emphasises the diversity of future farming and the need for coherent policies to address the evolving food system. The main challenges identified are related to environmental sustainability, transformative resilience, network dynamics, consumer connections, evolving farmer identities, and the interdependence between farmers and rural areas.

Table 3 – Summary of farmers' profile in 2040.

PROFILE NAME	2040 FARMER	FARM DESCRIPTION	VALUE PROPOSITION	ENVIRONMENTAL APPROACH
ADAPTIVE THEMES AND NETWORKS	Creative, curious, open, resourceful, agile, networked	Multifunctional but coherent farm run by independent business partners	A package of goods and services connected to a theme	Agroecology
CORPORATE BRANCH OPERATIONS MANAGER	Manager, career prospects in a large corporation	Business unit contributing to functioning of the corporation – providing ingredients for production of final products	Low-cost combined with good standards for the final product	Organic or private label certification
INTENSIVE PRECISION FARMING	Innovative, efficiency-driven, technophile, autonomous	Large, efficient and specialised farm holding	High technical quality, low-cost products for the global supply chains	Precision farming, climate change, resource scarcity
PATRIMONIAL ON THE FENCE	Conservative, traditional, surviving	Varying business models, locked-in due to past investments, reliance on subsidies/off-farm income	Various - strategy to maintain activity, survive, pass to next generation	Minimum compliance with rules, but sensitive to heritage (buildings, landscapes)
CONTROLLED ENVIRONMENT SOIL-LESS HIGH-TECH	Technophile entrepreneur	Vertical farming in the cities and on outskirts (soilless)	Local, circular, reliable produce, flexible to adapt to changing demands	Circular economy
CELL ALTERNATIVE FOODS	Biotech entrepreneur	Creating synthetic protein-based food/ingredients	Alternative to agriculture with less environmental and animal welfare issues; alternative ingredients for food processors	Circular economy, alternative to livestock production
SOCIAL CARE HEALTH AND PEOPLE	Service- and society-oriented, empathy, open-minded	Farms providing food and social/ healthcare services	Nature and manual meaningful work as a way of care and health.	Agroecology
LIFESTYLE CHANGE FOR A NEW LIFE	Quality of life, self-actualisation, cross-cultural competence, flexibility	Migrants from urban areas starting (part-time) agricultural activity in 'farm as a service' context	Urban-rural translators - providing rural experience to urban and urban to rural	Agroforestry, organic
REGENERATIVE A BIGGER ECOSYSTEM	Strong environmental and social motivation, holistic approach to agriculture	Environmental sustainability is the guiding principle, going beyond the sustainability mainstream	Providing maximum ecosystem services	Scaled regenerative
URBAN ON URBAN SOIL	Entrepreneur, social responsibility	Soil based farming in urban environment, open field and greenhouses, on the ground or roof-top	Enriching/building urban ecosystems, local food, special crops, social services	Organic or permaculture
SERIOUS HOBBY PASSION FOR LEISURE	Persistent, focused on mastery of activity,	Small farms, the objectives focus on occupation rather than profitability	Not relying on farming income, the value is in the activity itself	Agroecology
COMMUNITY PROVISIONING GROWING AND SHARING	Care-giver, nurturer oriented to small, tight networks	Small farms, plots, gardens or home installations in urban or rural settings	Producing and processing food for pleasure in offering, sharing, maintaining networks	Permaculture

Source: Bock and Krzysztofowicz (2020)

Resource rivalries: four emerging futures

A potential cluster of interrelated environmental, geopolitical, and socioeconomic risks relating to the availability and demand of natural resources has been explored in the 18th Global Risks Report (WEF, 2023).

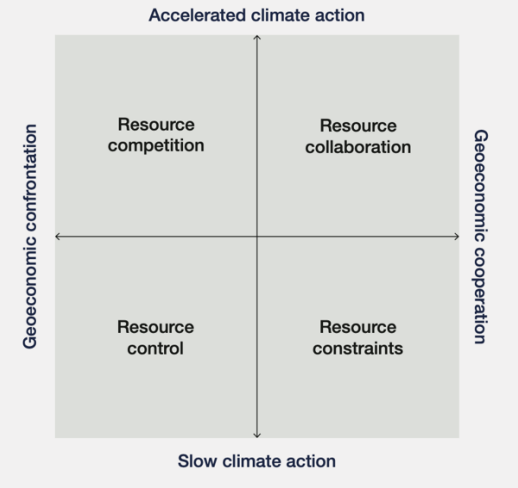
Global population growth and improving socio-economic conditions, as well as the need to expand renewable energy production, are expected to drive a sharp increase in demand for food, water and critical metals and minerals in the coming decades. Recent supply chain crises have underscored the importance of resilience in these traditional strategic sectors and the risks related to food insecurity, political destabilisation, migration, violence and general reversal of recent achievements, e.g. in meeting the SDGs targets.

To identify potential futures, enhance preparedness and mitigate risks in the face of a polycrisis, a scenario analysis has identified two factors which, by 2030, will have a key role in determining the world's capacity to manage resource rivalries and related polycrises:

1) the degree of global cooperation that allows the international movement of resources;
2) the impact of climate change on the supply of natural resources and pace of the low-carbon transition.

Taking these factors into account, four potential scenarios have been envisioned for the year 2030, briefly summarised below and illustrated in Figure 11 (WEF, 2023, 58-59).

Figure 11 – Natural resource polycrisis: futures framework



Source: World Economic Forum (2023)

Resource collaboration – the danger of natural scarcity. Effective climate action measures and flexible supply chains enabled by global cooperation largely absorb the impacts of climate change on food production. However, shortages in water and metals and minerals cannot be avoided. Persistently high commodity prices slow climate mitigation – despite ambitions – and add to inflationary pressures in broader value chains, while water stress leads to a growing, but comparatively contained, health and humanitarian crisis in developing nations.

Resource constraints – the danger of divergent distress. Current crises draw focus and slow climate action, exposing the most vulnerable countries to hunger and energy shocks, even as countries cooperate to partially address constraints. In the absence of intervention, the water and mineral shortages experienced in the Resource collaboration scenario act as a multiplier to broader risks. A multi-resource, humanitarian crisis emerges in developing markets as food and water resources are impacted by the physical consequences of climate change, alongside global disruptions to trade, political stability, and economic growth.

Resource competition – the danger of resource autarkies. Distrust drives a push for self-sufficiency in high-income countries, limiting the need for rivalry over food and water to a degree, but widening divides

between countries. State intervention is centred on the resources most exposed to a concentration in supply – critical metals and minerals – leading to shortages, price wars and the transformation of business models across industries. Resource power shifts, driving the formation of new blocs as well as wedges in existing alliances between mineral-rich and -poor countries, while the potential for accidental or intentional conflict escalates.

Resource control – the danger of resource wars. Alongside the weaponisation of metals and minerals explored in Resource competition, geopolitical dynamics exacerbate climate-induced shortages in food and water. This results in a truly global, multi-resource crisis, with widespread socioeconomic impacts that exceed those faced in other futures in both scope and scale, including famine and water scarcity refugees. Geo-economic warfare is widespread, but more aggressive clashes between states become one of the few means to ensure supply of basic necessities for populations.

3. Review of scenarios and projects (pre-2020)

The studies reported used: i) foresight approaches, to analyse thinking about the future, and exploring factors that could give rise to possible and probable future characteristics, events and behaviours (UK Government, 2017). They gather intelligence from a range of sources, systematically, to come to a fuller understanding of the forces shaping the long-term future which should be taken into account in policy formulation, planning and decision making (Coates, 1985); and ii) scenarios, "plausible descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key relationships and driving forces" (Nakicenovic, 2000). They are not forecasts, predictions, projections or plans of the future for a given time period. They can be described in terms of destinies because current state and development pathways set limits on possible futures, and choices, which will influence the differences between potential futures (Ringland, 1998).

One study, by Janssen and Terluin (2009), undertook a comparative analysis of scenarios of alternative futures for Europe, developed in EU projects. They note that disruptive events such as a global financial crisis should be considered in a set of possible rural futures. One such disruptive event is the outbreak of COVID-19.

The set of projects with foresight or scenario exercises reviewed, and their main trends and dimensions, is summarised in Table 4. The rows represent the main trends and dimensions considered by the foresight exercises, and the columns refer to the foresight exercises reviewed and the time periods covered ("N/A" refers to "not available"). The level of significance each report attributed to the individual trend topic is shown in the cells of the table.

Table 4 - Overview of projects with foresight or scenario exercises reviewed

	Foresights from EU and international research					EU-Funded projects				
	WEF (2020>2030)	**ESPAS (2019>2030)**	**OECD Regional Outlook (2019>N/A)**	**OECD Rural 3.0 (2019a>N/A)**	**LEI (2009>2035)**	**SOILCARE* (2019>2050)**	**SALSA (2018>2050)**	**EDORA (2012>2030)**	**TRANSMANGO (2016>2050)**	**VOLANTE (2012>2040)**
Environmental										
Climate change	++	++	+	+++	+	+++		++	++	++
Energy consumption	+	++		+	+			+		+
Natural resources use	+	++		+		++	++	+		++
Land use change and soil					+	+++		+		+++
Food systems and agriculture	+	+				++	+++		+++	++
Social										
Demography	+	+		++	+++			++		++
Ageing	+	+	+++		++					
Migrations	+	++	+++	++	++	+		+		
Poverty and inequalities	++	++	+++	+				+	++	
Economic										
Economic growth	+++	+++			+++		+	++		
Markets			++				+	+	+	
Employment	+++	++	++	+		+	+	++		
Finance and tax	++	+	+	++				+		

Technological										
Connectivity	+++	+++		+++	+		+	++	+	
Digitalization	++	+	++	+++	+			++	+	
Access to ICTs	+	++		+++	+				+	
Political										
Geopolitics	++	+++								
Domestic politics	+	++				+	+	++		
Democracy	++	+++						+		
Conflicts management	++	+++								
Territorial										
Urban-rural relationships	++	+++	+++	++	+	+		+++	+	++
Urbanization	+	++	++					++		
Rural settlements		+	+	+++	+++	++	+	+++	+	++

Source: authors' own elaboration. Note*: scenarios in the H2020 SOILCARE project are in the middle of development as of June 2020.

Overview of scenarios identified

In the EU funded projects reviewed up to 2020, and the meta-analysis of LEI, 17 scenarios were identified, with two of a baseline or Business as Usual (SALSA). These scenarios are listed in Table 5 - Scenarios identified by selected projects.

Table 5 - Scenarios identified by selected projects

Projects	Scenarios
SALSA	Business as Usual
	Mirror
	Enabling
	Disrupting
Transmango	Fed-up Europe
	The price of health
	Retrotopia
	The Protein Union
EDORA	Gradual response to climate change – low levels of State/EU supports (divestment)
	Gradual response to climate change – high levels of State/EU supports (investment)
	Rapid response to climate change – low levels of State/EU supports (divestment)
	Rapid response to climate change – high levels of State/EU supports (investment)
LEI study of EU projects	Baseline
	Competitiveness
	Cohesion
	Clustered Networks
	Lettuce surprise U
	Big Crisis

In addition, four scenarios are currently being developed in the H2020 SOILCARE project which are: Local Sustainability, Under Pressure, Race to the Bottom, and caring and Sharing. A summary of the scenarios developed follow for each of the H2020 SALSA, FP7 TRANSMANGO, FP7 VOLANTE, H2020 SOILCARE and the cross-project comparison carried out by LEI.

H2020 SALSA (Arnalte-Mur *et al.*, 2019) considered 4 scenarios, with a particular focus on assessing the role of Small Farmers (SF) and Small Food Businesses (SFB) in regional food systems, summarised below:

- **Business as Usual (BAU)**: Highly concentrated food chains which operate in liberalised world markets and facilitate both food imports and exports. Public policies in the agri-food sector are pervasive through strong public regulations despite low public sector budgets and expenditure. Environmental degradation continues, exacerbating difficulties of access to natural resources. Managerial and technical innovations (research outcomes, knowledge) are accessible by Small Farmers and Small Food Businesses. Depopulation continues in rural areas, and poverty (although

at low levels) tends to concentrate in urban areas. Consumers are aware of nutritional and environmental implications of their food habits, but do not demonstrate great social values in terms of solidarity and awareness about the problems of small farms.

- **Mirror**: Low level of concentration of food chains, together with a low level of openness of international markets. Higher public expenditure in the agri-food sector and legal requirements conditioning the activities of Small Farmers and Small Food Businesses are relatively weak and flexible. Good access to natural assets but difficulties for small farms to access managerial and technical innovations. The population has high levels of poverty, with an increase in population in rural areas. Collective action and advocacy of social values are common and practised throughout the society, but consumers are not aware about the nutritional and environmental implications of their food habits. The impact in rural areas is growing rural poverty and food insecurity. In some cases, rural population inflows are motivated by the impact of climate change in urban areas or higher urban poverty and unemployment due to the dismantling of export-oriented industry.
- **Enabling**: Low level of concentration of food chains and a low degree of openness of international markets. There is high public expenditure in the agri-food sector, with weak legal requirements for Small Farmers and Small Food Businesses. In some cases, this weak regulation is understood as a risk for the environment. Access by Small Farmers and Small Food Businesses to natural assets and managerial and technical innovations is very good. In comparison to the BAU and Mirror scenarios, the population in rural areas increases and overall levels of poverty decrease. This is due to a dynamic rural economy and thriving rural communities, in some cases linked to the spread of multi-functional activities in farms, with more people working in rural areas in a diversified agri-food sector. Collective action and advocacy of social values are common and practised throughout society, with consumers being aware of the nutritional and environmental implications of their food habits.
- **Disrupting**: Food chains are highly concentrated, with a high degree of openness of international markets for both exports and imports. Small Farmers and Small Food Businesses are required to adhere to strong legal requirements, with low public expenditure in the agri-food sector. Access to natural resources and to managerial and technical innovations is poor and difficult for Small Farmers and Small Food Businesses. The urban population grows and the rural population declines, with poverty in rural areas. Consumer awareness is low regarding nutritional and environmental implications of food habits, with greater concerns over accessing food. This low level of awareness reflects low levels of solidarity and other social values in respect to the problems faced by small farms, representing a minor concern for society. In some remote rural areas, there is a use of informal or illegal food markets. New forms of small-scale urban and peri-urban agriculture appear, informally, in some areas. However, more farmers are attracted to farming in remoter areas where the effects of climate change are lower and enable production, showing that small farms can be resilient due to their flexibility, adaptive capacity and creativity.

The **FP7 project TRANSMANGO** studied the effects of global drivers of change on European and global food demand and raw material production, using scenario-guided transformation pathways for European food futures (Vervoort *et al.*, 2016; Hebinck *et al.*, 2018). Exploratory scenarios were developed with key EU stakeholders of future food systems that change in the context of global drivers by 2050, and key processes and events were identified that could form part of the pathways from the present day to each hypothetical scenario. The scenarios were framed in terms of eight factors: Consumption patterns, Environmental degradation, Poverty and economic inequality, Social and technical innovation, Urban and rural population dynamics, Power and market concentration, Trade agreements, Basic resource availability (water, energy, raw materials). The overviews of the four scenarios developed are provided below:

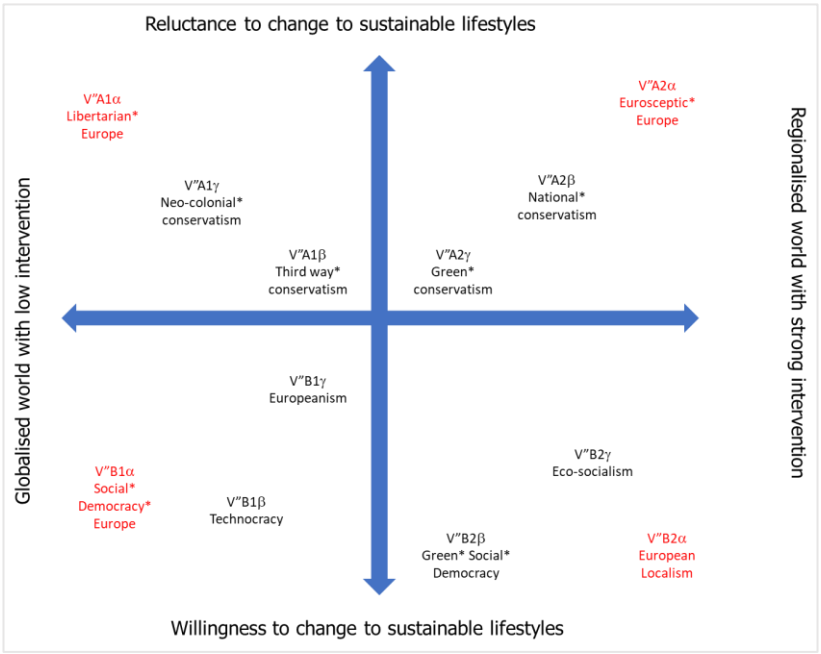
- **Fed-up Europe:** a scenario of inertia in the food system under global pressures. "Fed Up Europe is a story of inertia in the food system under global pressures. Practices and business models leading to unhealthy diets and negative environmental impacts continue. The power of EU and national policy makers to change these trends decreases over time with a combination of decreasing funds and decreasing popular support. There is a lack of leadership in the face of climate and migration crises. Consumers' incomes are enough to avoid food insecurity, but many lack the knowledge,

incentives or budgets for healthy life-styles. In governments and in the private sector, there are minorities interested in changing the trend, but they are fighting an uphill battle." (Vervoort *et al.*, 2016).

- **Retrotopia**: a scenario of waves of immigration, terrorist threats and increasing impacts of climate change trigger social movements and policies that aim to keep global problems out of Europe, along with a nostalgia fuelled sense of natural heritage and rural custodianship. Racism becomes more accepted; migrants are kept out, creating employment problems in greying societies, which are partly solved by robotization of work; fear of migration from Europe's southern to northern countries due to climate change prompts European policymakers to help make Mediterranean countries more climate resilient. Environmental concerns drive down consumption of animal products; otherwise, the improvement of diets is not a priority amid concerns of European security and self-reliance. (Vervoort *et al.*, 2016).
- **The Protein Union**: a scenario of a highly proactive response by the EU and its Member States, led by governments but supported by the private sector and civil society, to the challenge of changing European diets and modes of production. The focus is on creating new sources of protein, including mainstreaming insect consumption and the production of artificial quasi-meats, supported by new, more integrated means of food production and processing, at the expense of the livelihoods of smaller farmers. (Vervoort *et al.*, 2016).
- **The Price of Health**: a scenario that sees many Europeans returning to rural lives, out of necessity due to global pressures, because of changing social norms, and facilitated by technological advances in communications. These changes are supported by strong government policies regarding self-reliance and sustainability. Not everyone, however, is happy to be returning to the land, and the wealthiest do not have to follow suit. (Vervoort *et al.*, 2016).

The FP7 VOLANTE (Visions of Land Use Transitions in Europe) project produced a scenario framework for interpreting and refining storylines for land use change at the European scale obtained from the Special Report on Emissions Scenarios (IPCC, 2000).

Figure 12 – Four main marker storylines (red) and their deviations positioned across global/regional and adoption of sustainable lifestyle axes.



Source: Paterson et al. (2012)

Four of those storylines are relevant to rural areas at 2040:

- **Libertarian Europe:** in a context of global free trade policy with little interventionist or obstructionist trade policy, dramatic consequences for European agricultural models occur: many small farms go out of business and are incorporated into major industries. Increased mechanization, productivity and economies of scale produce larger average field sizes and a reduction in the area of land used for agriculture. In southern Europe, the driver is climate change, while in the north, increased pressure from the farming lobby results in conversion of some semi-natural habitats to large farm units. Rural policy is focused on maintaining food production even if subsidy support is removed. Less strict planning laws in many EU countries result in an increase in housing and of rural industries, even if the rural population is in decline due to lower opportunities for employment. Similar, trends towards intensification affect forest management in Europe.
- Alternative storylines of the scenario are of: i) "Third way conservatism", of a more compromised vision and balance between libertarian free trade principles and government regulation and interference in the market and society, resulting in a Europe where free trade is still the dominant force, but Europe seeks to prevent some imports. Ii) "Neo-colonial conservatism", in which Europe repositions itself as a more aggressive trade partner with less-developed countries around the world. European food production declines in the face of imports from other countries, and the economy is more heavily driven by secondary and tertiary industries. This vision has the highest overseas ecological footprint of all the storylines. Governance has a large paradigm shift too, with far higher influence from the private sector.
- **Eurosceptic Europe**: There is no attention to Research and Development in agriculture and a more sluggish acceptance of technical advancements. Sustainable management strategies are being given more importance as Europe tries to preserve its own land and water supplies. National rural policy determines sustaining food security by grant funding (nation-based) and extension programmes. There is more emphasis on sustainable management techniques as Europe seeks to protect its own soil and water resources. Superfast internet connectivity enables many individuals to work from home or in industrial or commercial sites in rural areas. Tourism is a big force of much of Europe's economies and many regions are overcrowded. Locally produced food for local markets is becomes normal within Europe. Protein from crop-based sources increases at the expense of meat production (which becomes more expensive). More agricultural products are produced in large, climate-controlled poly-tunnels. New areas of outdoor and leisure activity are increasingly being built, and additional recreational areas are created (as a response to climate change).
- Alternative storylines of the scenario are of: i) "National conservatism", with a stronger appreciation of rural traditions that dominate rural land management, and a very different approach to self-sufficiency within each European nation. Respect for traditional, family-based customs is paramount, reflected in the preservation of small, family farms; also, wildlife and biodiversity is respected and maintained under a stewardship ethic. The resultant differences are mainly seen through a more heterogeneous landscape which includes (native species) woodlands as well as mixed farms. Ii) "Green conservatism", in which society is more radical, adopting some trade barriers (mainly to unsustainably produced commodities), is federalist, and tries to sustainably manage rural land through state subsidy and regulation. Agriculture is less family-oriented but adopts technology and sustainable practice to protect the environment.
- **Social Democracy Europe**: This scenario has a regional scope whilst also prioritising economic growth, social justice and the protection of biodiversity. Climate change is a significant concern, and by 2040 climate mitigation and adaptation should be the focus of several policies. An updated Common Agricultural Policy is designed to compensate farmers for the delivery of public goods through a suite of ecosystem services which are location specific. The area of agriculture is declining slightly although productivity is increasing mainly due to improved agronomic practices, animal husbandry, and high yield crops. There is an increase in the area of forestry on land obtained from agriculture.

- Alternative storylines of the scenario are: i) "Technocracy", which presents a radically different system of governance that adopts technocrats and other experts as leading politicians and policy-makers. It is strongly federalist and deliberative in decision making; advancement in society is truly merit-based and based on egalitarian principles. The strong basis in science and education of most aspects of society means that environmental problems are challenged rationally (and hence successfully); the adoption of ecosystem services is fully inherent and contrasts with the overall scenario (e.g. the optimal mix of ecosystem service delivery of a habitat may not necessarily lead to the conservation of all species). Ii) "Europeanism", in which the federalism of Europe is the strongest and most coherent. However, it is also more socialist in outlook, and the government, as well as being large, influences people's lives considerably. Although environmental sustainability is very important, the degree of bureaucracy can sometimes hinder achievement. The ecosystem services concept is practiced in much of rural land management but there is still a bias towards maintaining food security that at times threatens biodiversity conservation and recreation. Because this storyline is more focussed on food security and self-sufficiency than the other two V-B1 storylines, it has kept CAP support for production.
- **European Localism**: There are two major characteristics of the storyline: environmentalism and localism. Agriculture becomes more regionalised and less specialised. Agriculture becomes more regionalised and less specialised; small, mixed farms are more common and sustainable management is a central part of food production. Multifunctional landscapes are a key element of this storyline. Food production is fundamental to the lives of many people. Food travels shorter distances from field to point of sale. Member States are actively implementing measures for preserving soil quality and structure, farmers and foresters recognize the value of soil protection. Biodiversity conservation is an important part of rural life, with people having a strong interest and pride in local wildlife and habitats.
- **Alternative** storylines of the scenario are: i) "Green Social Democracy", which is less locally oriented and more regional than the Localism storyline. Governance and markets work at a regional scale which often crosses old national boundaries (e.g., a pan-country Alpine economic block); this helps to share, promote and focus on regional identity and products. Trade between regions is strong although international trade is lower than the A1 and B1 scenarios. Average farm size is bigger and there is more specialisation. Ii) "Eco-socialism" represents a rise in a new socialism that adopts a green agenda as well as the traditional aspects of socialism. Unlike the Localism storyline, in this, one farms are owned by the workers and everyone shares in the profit. Farms can be much larger and also specialised; however, sustainable techniques and technology are heavily adopted. Land use can be quite homogenous, at least more so than the two V-B2 storylines.

The European Development Opportunities for Rural Areas (EDORA), funded through the ESPON programme, aimed to achieve greater understanding of the possibilities of growth, and problems confronting rural areas in Europe over a 20-year timeframe. It assumed that climate change was the most likely and most powerful potential 'shock' to rural settings, with a further significant shock being the effects of the financial crisis in 2008 and the subsequent credit shortage. The focus of the foresight techniques was to provide a set of alternative scenarios for rural areas in Europe (listed below). These would provide a basis for consideration of how the opportunities, and impacts, of climate change could be accommodated in future Cohesion policy.

The analysis of Future Perspectives noted that the incremental processes of change of the meta-narratives are likely to be subject to exogenous "shocks" of direct and indirect impacts of climate change. These were expected to have effects on the opportunities available to rural Europe, through the rapidity and magnitude of climate change impacts, and model of economic governance used to structure the response. A significant issue identified is the importance of "… local context, resources or assets, in determining the capacity to respond positively to ubiquitous meta-narratives of change, which is the principal determinant of differentiation between regions." (Copus *et al.*, 2012).

Scenarios developed are as follows:

- **S1: gradual response to climate change – low levels of State/EU support (divestment).** A "business as usual" scenario, that brings to a continued increase in regional differentiation and a specialization of agriculture on bioenergies and associated industries.
- **S2: gradual response to climate change – high levels of State/EU support (investment).** Climate change has significant impacts upon economic activity and quality of life in rural Europe, resulting in intensified out-migration from agrarian and sparsely populated regions. Reduced consumer spending and shortage of capital inhibits the expansion of the tertiary sector.
- **S3: rapid response to climate change – low levels of State/EU support (divestment).** Rapid and disruptive climate change attaches a premium to land as a basic resource underpinning both adaptation and mitigation measures. Food prices rise, renewable energy production and bio-technology industries expand rapidly.
- **S4: rapid response to climate change – high levels of State/EU support (investment).** Fossil fuel use is reserved for food production, whilst cropping is also regulated to reduce the production of GHGs. The primary and secondary sectors are reinvigorated by the public policy response focused upon sustainability.

EDORA report also suggests that increasing spatial differentiation is primarily a consequence of micro-scale (localised) differences in the capacity to respond to external drivers. This highlights the need to endow local communities with appropriate intervention tools – starting from an increased strategic capacity – within a coherent European policy framework.

The **H2020 SOILCARE** project has been developing possible scenarios for the future of agriculture in Europe. The framework for the draft scenarios is provided in Figure 13. These scenarios develop along two axes, related to different types of policy instruments: future challenges to mandatory instruments (e.g. regulations) and future challenges to voluntary instruments (e.g. subsidies).

Figure 13 Draft structure of scenarios being developed in the H2020 SOILCARE project

Source: Soilcare project

Scenario narratives are summarised as:

- **Local sustainability,** for those who can afford it represents individual drivers for healthy and sustainable food. It reflects the ever-increasing share of society valuing locally sourced, high quality produce leads to a large share of European food being produced sustainably to cater for the healthy

eating habits of those willing and able to pay for it. This sees a large part of the agricultural sector transforming into a more boutique style of farming with a regional focus, and a reduction in food imports from across the world. Mainstream farmers using conventional practices continue to make up a significant proportion of the sector. Not everyone can afford the premium prices of high-quality food.

- **Under pressure**, represents societal pressure for government action. European citizens are increasingly concerned about climate, environmental and health issues, but feel unable to affect change. Governments are pressurised to play a leading role in finding solutions and take action, agreeing that food standards can only be met by ensuring more sustainable production.
- **Race to the bottom**, represents societal demand for low food prices. Continuation of existing agricultural practices results in further environmental degradation and impacts on profit margins, due to the costs required for the increasing amounts of inputs needed to maintain production levels. Worsening environmental quality requires quick and more structural solutions to meet the ever-increasing demands from internal and external markets.
- **Caring and sharing**, represents a broadly supported resilience approach. Confronted with a series of disasters, such as droughts, floods, pests, and animal and plant diseases, there is widespread societal awareness that an urgent change in behaviour is needed to avoid future food shortages. Strong, visionary leaders step up and propose drastic changes that would not have obtained support until recently.

In 2009, **LEI Wageningen** (Janssen and Terluin, 2009) published a study which aimed at exploring alternative futures of rural areas in the EU. This study produced a comparative analysis of seven scenario studies of rural areas in the EU (ESPON, Eururalis, JRC SCENAR 2020, FP6 SEAMLESS, FP6 SENSOR, European Environment Agency PRELUDE project and "Agriculture in the overall economy").

The comparative analysis considered factors of population, globalisation, climate change, policies, agriculture, agricultural land use, landscape, nature and biodiversity and territorial disparities in rural Europe. From these six alternative futures were identified:

- **Baseline**, in which globalisation has a strong and accelerating influence on the process of job creation and destruction. Metropolitan regions with advanced technologies benefit. Population stabilizes in the EU; however, remote rural regions face depopulation. Drought has led to agricultural abandonment in Southern Europe. The production of biomass and energy crops gives a new impetus to agriculture. Agricultural production in 2020 needs 91% of the agricultural land used in 2000/2002.
- **Competitiveness**, in which all efforts are concentrated on increasing global competitiveness. The economy flourishes with a high level of technological innovation. Territorial disparities increase between metropolitan areas and other areas. There is rapid and radical liberalization of CAP. Agriculture intensifies, becomes high-tech and concentrates in areas that are optimal for production. Agricultural production in 2020 needs 86% of the agricultural land used in 2000/2002.
- **Cohesion Support**, which is directed at technological development and is concentrated to less-favoured regions. Non-metropolitan areas benefit. There is net migration from the most densely populated urban areas towards peripheral regions. Ambitious policies on environmentally sustainable regional development and minor CAP reforms (mainly modulation). Farming is high-tech and increasingly organic. Agricultural production in 2020 needs 96% of the agricultural land used in 2000/2002. As PRELUDE does not start from the degree of policy intervention, we also distinguish three rural futures according to disruptive events:
- **Clustered Networks**, in which migration away from polluted urban areas is encouraged. Fourteen new medium-sized cities outside the main urban centre are created. These generate changes in infrastructure, employment opportunities and activities in peripheral regions. Globalization propels economic growth. Deepened international trade relations lead to marginalisation of agriculture and production continues only in the most favourable areas. Due to large scale land abandonment, the amounts of crop land and grassland have decreased by about one third in 2035.

- **Lettuce Surprise U,** a major food security crisis hits Europe in 2015. As management during this crisis fails, faith in central government and in food security decreases strongly. Political decentralization becomes prominent and policy focuses on enhancing the quality of life. Environmental awareness grows, as does demand for sustainably produced food. Due to technological innovations, new crop varieties are invented that enable higher yields with lower inputs. Agriculture in core production regions becomes high-tech, clean and relatively small scale. Due to increased productivity in agriculture, the amount of crop land (-40%) and grassland (-20%) decreases by 2035.
- **Big Crisis**, in which a series of environmental disasters in 2015 highlights Europe's vulnerability and inability to adapt effectively. After these crises, policies focus on a movement of population from the urban centre of Europe to its periphery. There is a widespread support for sustainable and regionally balanced development at EU level. Agricultural intensity is low. The main focus is on landscape stewardship. The use of crop land and grassland remains more or less stable.

A key observation of the study was of the significance of the role of public policies in shaping the futures of rural areas. It notes that challenges represented by a "dichotomy regional development policies of efficiency versus equity" require new approaches, and that rural Europe "… emerges from the interplay of global market forces and local responses by entrepreneurs, consumers and policy makers." It also echoes an assumption of the PRELUDE project, when referring to the financial crisis of 2008/09 that disruptive events should be considered "among the set of possible rural futures".

In addition to foresight and scenario-based projects which have direct implications for rural areas, the EC BOHEMIA project carried out a foresight exercise in support of the future research and innovation policy of the European Union. The project identified 19 scenarios, all of which have some relevance to rural areas. Some of the scenarios are relevant to rural areas as they are for all society (e.g. organ replacement, precision medicine, reframing work, smart mobility defeating communicable diseases), or have footprints that overlap rural areas (e.g. security and defence). Others are of specific relevance to rural areas, notably those on Nature Valued, towards a More Diverse Food Supply System, the Bioeconomy, Cheap Renewable Energy, and the Low Carbon Economy.

Table 6 – Targeted (2040) scenarios

Targeted Scenario	Summary It is now 2040…
Assisted Living	In the ageing populations of Europe, but also abroad, the demand for assistance in daily living has more than tripled over the last 25 years. New service concepts combining automation, robotic assistance, digital helpers, virtual trainers and small exoskeletons have transformed care, assistance and the relevant industries.
The Bioeconomy	The Bioeconomy promises to be a major contributor to European economic growth and re-invention with impacts on all sectors. Technological advances are set out to replace finite resources and conventional industrial processes, with processes and components that are biologically derived. In the long term, Bioeconomy will be a major contributor to climate mitigation and to the transition to a circular economy.
Cheap Renewable Energy	Renewable Energy is available at competitive prices. More than half the electricity used for transport, housing and industry comes from renewable sources. A pan-European smart grid coupled with local micro-grids, with adequate storage facilities, ensures reliability of electricity supply. Hydrogen and biofuels complement the system. The sector is expanding to novel cultivations, such as algae and bacteria.
Continuous Cyberwar	With the rapid growth of Internet of Things, cybersecurity hacks proliferate, putting citizens and infrastructures at risk. EU governments strengthen collaboration with citizens and industries to build up a response based on both social participation and cutting-edge technologies.
Ubiquitous Expert Systems	There is an abundance of advice based on collected experience, using simulations, data analytics and learning systems. With just-in-time data available all around, expert systems are used routinely in the prediction and management of complex situations, as well as for organizational and individual activity.
Defeating Communicable Diseases	Communicable Diseases (viral infections as well as biotic diseases) that reduce the quality of life of people and cause huge economic losses are being defeated. The number of people dying from Communicable Diseases is steadily decreasing. New

	approaches, including replacing antibiotics and ways to avoid infections have been developed in international collaboration.
Emotional Intelligence Online	With emotional markers from diverse sources widely available, and 'emotionally transparent generation' has been ushered in. The flow of emotions is woven into the social, economic and political fabric. Governments aim to learn continuously from feedback gathered from the flow of emotions – as do corporations and individuals. Techno-pessimistic and techno-optimistic ideologies clash around the question of the future prospects of the 'emotional generation'.
Human Organ Replacement	Most human organs and tissues can be replaced. The majority of organs and tissues are bio-printed, produced by additive manufacturing or breeding (e.g. organoids). Human organ or tissue replacement is accessible and affordable for all European citizens so that the average life expectancy increases.
ICT-Based Security and Defence	Globalisation and ICT solutions have changed the nature of threats faced by the EU. A combination of preventive and response measures are implemented in coordination by security and defence forces with the aid of computers. The role of the anticipatory crime units is rising, together with the diffusion of unmanned aerial vehicles and military robots with Artificial Intelligence features. These are used in external military actions as well as to secure national territories in cooperation with security units.
Low Carbon Economy	The EU has slashed the release of greenhouse gases in the atmosphere, invested heavily in carbon sinks and has become carbon neutral including for energy intensive industries like steelmaking. Energy and transport sectors have radically changed through low carbon electricity, cities' sustainable mobility and CO_2 storage opportunities. Carbon capture technologies, together with renewed environmental actions, enlarge artificial and natural carbon sink, reversing carbon emission trends.

The overall challenge identified is in "making transformative change in Europe through EU R&I policy". To address this challenge, several recommendations are set out, of which the first is to "Step up the ambitions of European R&I policy to become the engine of European and global transitions". It recognises the need for the EU to maintain a strong economic and political role in the world and to be able to co-shape "the future Europeans want", and for EU R&I policy to simultaneously address four transitions that will move the world towards the Sustainable Development Goals. The transitions concern:

- Social needs: Providing for the needs of people;
- The biosphere: Safeguarding a hospitable planet;
- Innovation: Harnessing the forces of change;
- Governance: Joining forces for a better world.

All these transitions have a locus in rural areas. Most of the scenarios presented link to the themes which emerged in the projects reviewed, summarised in Table 7. However, four scenarios do fit easily into those categories, which relate to human health and well-being, biosecurity, medicine, and security and defence. The BOHEMIA reporting notes that the "transitions represent clusters of UN Sustainable Development Goals (SDGs) that respond to sets of challenges posed by the superposition of global megatrends."

Table 7 – A summary of scenarios for rural strategies

Scenario	Project	Description
Enabling	SALSA	Thriving rural communities with high numbers of small farmers and small food business
The price of health	Transmango	Europeans returning to rural lives, encouraged by improved communication technologies
European Localism	Volante	Agriculture more regionalised and less specialised. Multifunctional landscapes as key elements.
Lattuce surprises U	LEI Wageningen	Environmental awareness grows, as does demand for sustainably produced food. Agriculture in core production regions becomes high-tech, clean and relatively small scale.

Clustered networks	LEI Wageningen	Migration away from polluted urban areas is encouraged. New medium-sized cities outside the main urban centre are created.
Local Sustainability	SoilCare	A large part of the agricultural sector transforming into a more boutique style of farming with a regional focus, and a reduction in food imports from across the world. Not everyone can afford the premium prices of high-quality food.
Caring and sharing	SoilCare	Widespread societal awareness that an urgent change in behaviour is needed. Strong, visionary leaders step up and propose drastic changes.

Key take-aways from pre-2020 review

Brunori and Mazzocchi (2020) point out how each of the reviewed scenarios identifies trade-offs and/or synergies between four main variables: nature, growth, welfare, equity. Different rural areas behave differently in relation to these variables and processes of rural change, in turn, affect these variables in different ways. Below, several key take-aways around these variables, as highlighted by Brunori and Mazzocchi (2020) in the Working Document which anticipated the present report.

Rural areas are diverse and have specific needs

- Although population aging is a common occurrence in the OECD, the average age of people living in predominant rural areas of most OECD countries is greater than that of predominant urban ones. According to the OECD, the gap in GDP per capita, productivity levels and service delivery between rural areas and metropolitan cities widened since the 2008 global financial crisis (OECD, 2020).
- Rural areas in Europe have a diversified economic and wellbeing performance. While some rural regions fall within the category of high-performing regions in terms of productivity, many others lag behind.
- Rural areas perform well on a number of dimensions of wellbeing. Rural health is equivalent to urban well-being in some main indices (e.g. housing and environment, see OECD 2018). A high quality of life in rural areas can compensate for lower wages and attract and retain workers and their families.
- Proximity and urban-rural linkages have a very significant effect on rural areas. Such links are in the form of population migration, bi-directional labour market flows, and the provision of public services and access to environmental resources. Integration with urban labour markets is one of the most relevant predictors of economic development of rural areas.
- This raises the question whether the category 'rural' is too generic for policy purposes[11]. OECD (2019) proposes a classification based on integration of rural areas within 'Functional Urban Areas' (FUAs), the boundaries of which are defined by commuting patterns. This classification considers 'rural areas within a FUA', 'rural areas close to a FUA', and 'remote rural regions'.
- While the economic performance of the first two categories is related to the economic performance of related FUAs, remote rural regions have peculiar problems that need specific attention and dedicated resources. They are the most vulnerable to shocks, from climate change to economic crises, and risk being trapped in vicious circles of marginalisation.

The diversity of rural areas is reflected in terms of opportunities and constraints

[11] The H2020 GRANULAR project is currently working on Functional Rural Areas' conceptualisation.

- Rural areas can contribute significantly to national economies stability and well-being throughout OECD countries. They provide most essential ecosystem services to life and are keys to mitigation of climate change.
- The competitive advantage of rural areas relies on some specific assets, such as their natural, social and cultural capital, which need to be properly maintained and enhanced. The most successful development strategies focus on these assets and adopt technologies, business models and governance arrangements that enable their valorisation.
- If, as OECD states, the economy of rural areas depend primarily on their relationship with Functional Urban Areas, the three typologies identified have different needs and different problems. For rural areas integrated within a FUA, urban sprawl is a major issue with profound implications for the quality of life and the environment. In this case, depending on available infrastructures and housing, they may become residential neighbourhoods or marginalised peripheries. Areas of the second category have limited demographic problems, and different conditions depending on mobility, housing, services, social integration, spatial planning. Therefore, the capacity to diversify the local economy and preserve the natural, cultural, and social capital will be important for the local specialisation. Among the appraised scenarios, *'Lattuce surprise U'*, '*Local sustainability for those who can afford it'*, *'The protein Union'* and to a certain extent '*European Localism*' and *'Enabling'* could apply. The third category of 'Remote rural regions' needs a deep rethinking of the models of development. The primary sector is key to this model, but high-tech, high specialisation agriculture-based scenarios can hardly revert the trend to decline. The best examples of successful specialisations of these areas are related to their capacity to find a niche in the global markets, as in the case of food and wine districts. However, as the scenario '*Local sustainability for those who can afford it'* suggests, there is the risk of increasing inequalities and further marginalisation of local people in the transition. Alternative scenarios for these areas could be '*Caring and Sharing'*, focusing on resilience and mobilising local resources, and the '*Enabling'* scenario from H2020 SALSA. Hardly, however, these development models can thrive without a clear commitment of national and regional governments to provide these areas with adequate infrastructures and services.

Rural-urban connections are essential to thriving rural areas

- While the level of integration of rural areas with the FUAs is fundamental to their development, rural development efforts should address the potential of the multiple flows that occur between urban and rural areas. This means beginning to recognise the value of the services that rural areas provide to urban areas and recognising their real cost.
- This principle can be turned into business models based on the virtuous link between ecological, cultural and economic diversity. The higher quality of life that characterise many rural areas can become an attraction and a selling point for new residents, either commuters, retired people, or distant workers, provided that there are adequate services and infrastructures to guarantee a comfortable life.
- This process should be sustained by a set of specific incentives to attract businesses and residents. Moreover, this process would benefit from new urban models that reshape urban metabolism so to give new opportunities to rural products and services, to open new markets for diversified rural products, to encourage innovation through an intensified exchange between rural and urban inhabitants.

5. Concluding remarks: what prospects for the future of rural areas?

The potential of foresight to support decision-makers in thinking ahead strategically and encourage future-oriented policies is increasingly recognised. The wide scope and outreach of the Long-Term Vision initiative, along with other foresight exercises here reviewed, prove that foresight is a tool that has gained full legitimacy in policy at European level to capture specific needs from a plurality of voices across different regions, actors, and sectors.

One of the key messages from the Rural Vision Week (June 2021) is that 'policy will have to anticipate, rather than just react to, changes and trends'. In pursuit of this aim, scenarios are useful tools in that they 'help cope with uncertainty, not by eliminating it, but by framing it and understanding the range of associated implications' (Wollenberg et al., 2000, 71). Considering the 'wicked' nature of current challenges and global risks, research has been calling for more ambitious and imaginative scenarios, able to engage more with controversies and dilemmas and less with the 'business-as-usual' (Rotmans et al. 2000).

Key policies and strategies such as the Common Agricultural Policy (CAP), the Long-Term Vision for Rural Areas (LTVRA), and the Territorial Agenda 2030 play a significant role in shaping the future of rural areas in the EU. By considering multiple scenarios and alternative futures, foresight exercises enable policymakers and other stakeholders to envision a range of development pathways that are relevant and applicable to diverse rural contexts, with different characteristics, needs and potentials.

Building upon the updated list of reviewed documents and key takeaways outlined earlier, it is essential to include a range of additional considerations in future foresight exercises. These considerations are important for enhancing the depth and breadth of analysis, ensuring a more comprehensive exploration of potential futures:

- While being highly diverse, rural areas share significant challenges such as **climate change, ecological collapse, food security problems, social conflicts, and digital exclusion.** These factors, individually and through their interconnections, contribute to the vulnerability and exposure of rural communities.
- The challenges faced by specific rural areas may appear localised, but they are intricately interconnected with major global drivers. This requires careful consideration of **trade-offs that may arise between local and global goals**, as well as potential unintended impacts on different areas of concern.
- As we address urgent issues, it is crucial that **the actions taken today do not inadvertently worsen future risks**. How we address *current* challenges and emergencies (e.g. food security) should not come at the expense of exacerbating *future* ones (e.g., resource depletion or climate change impacts).
- While there is wide consideration of the many opportunities that will arise for rural areas in the next decades, it is also true that how the challenges will unfold in the future depends on the choices made today. It is therefore crucial that, **alongside desirable futures, adequate attention is paid to build preparedness to undesirable futures.**
- The interconnections among drivers and trade-offs between different envisioned goals should be carefully considered, adopting **a systemic approach to the analysis of drivers, to prevent the risk of polycrises.**

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