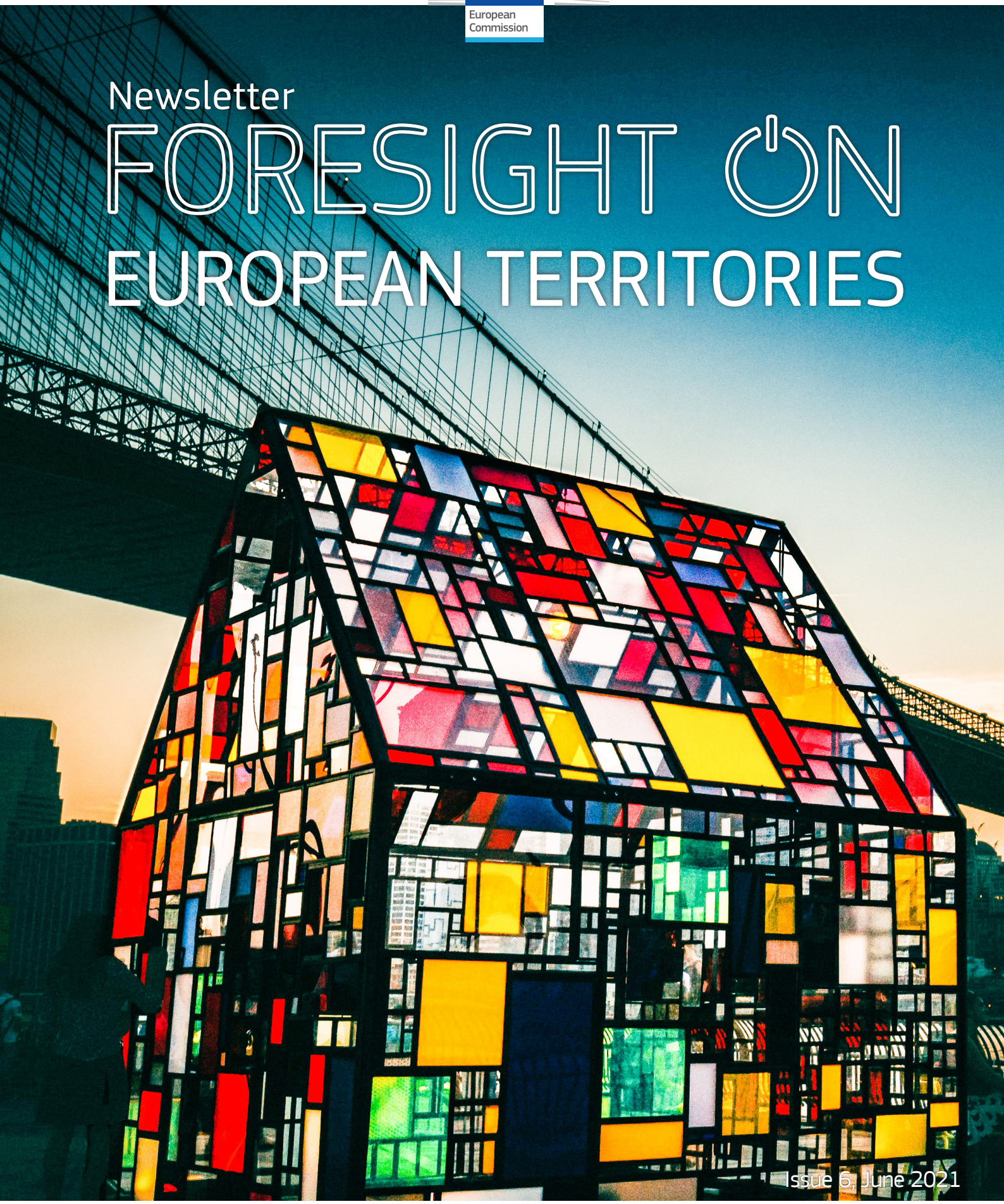
European Commission

Newsletter

FORESIGHT ON EUROPEAN TERRITORIES



Issue 6, June 2021

Joint research centre

WHY A FORESIGHT NEWSLETTER?

The objective of the 'Foresight ON' Newsletters is mainly to raise awareness of long-term trends, and to stimulate strategic thinking in the College of Commissioners and among the Commission's senior management about important emerging issues for the EU.

The newsletters aim to support 'future thinking' among policy makers and to concretely inform and shape the debate of major policy initiatives and strategies.

Newsletters are made publicly available on the Commission's website (https://ec.europa.eu/info/publications/foresight-newsletter_en).

This Newsletter Foresight ON European Territories is linked to the upcoming Communication on the 'Long term vision for rural areas', due on 30 June 2021. It aims to enrich the discussions and takes into consideration that some of the issues for urban, peri-urban and remote areas of Europe will impact the rural areas in the future too. The diverse short stories are backed by facts and figures and look at key, forward-looking issues related to European territories, highlighting future implications and potential solutions.

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WHAT HAPPENS IN THE ARCTIC WILL NOT STAY IN THE ARCTIC

Three of the eight Arctic States are in the EU[1] and because Norway and Iceland are closely associated, it is thus part European, North American and Russian. **The Arctic increasingly features in international relations due to its increasing environmental, economic, social and strategic importance,[2] and is subject to multilateral governance[3].**

It is the fastest warming region on Earth[4]. The permafrost (frozen ground) is melting and there are increasing emissions of greenhouse gases (CO_2[5]and CH_4[6]). The Arctic Ocean is losing its summer sea ice and could be ice-free by 2035[7] and the Greenland ice sheet is melting - causing rising sea levels[8].

These rapid changes are creating problems for the entire Arctic socio-ecological system, including Europe's only indigenous people, the Sami, while at the same time opening up double-edged opportunities for development. The region is rich in resources including fossil fuels and minerals[9,10], which are increasingly exploitable[11]. The Northern sea route may become economically viable by 2040[12], saving 30-40% of travel time compared to the Suez Canal, but at a cost to the environment.

Through enhanced international cooperation with like-minded partners, the EU can play an important role in making the Arctic safe, prosperous and more stable - striking a balance between exploitation and sustainable development. EU efforts to preserve the Arctic as a region of peaceful cooperation, to slow the effects of climate change and support the sustainable development of Arctic regions for the benefit of future generations, can contribute to reducing the impacts of a changing Arctic on the rest of Europe and the world.

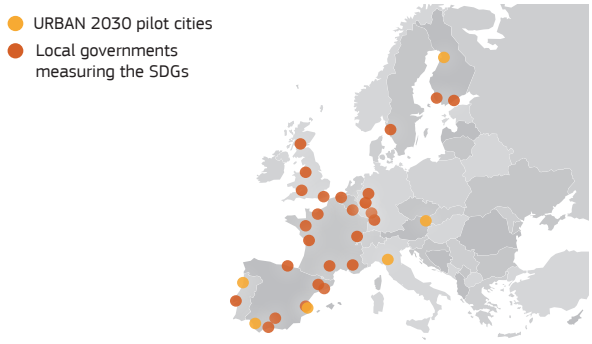
Figure 1: Arctic States and the Northern Route

Source: Info based on Arctic Centre map, University of University of Lapland

INTEGRATING SUSTAINABLE DEVELOPMENT GOALS (SDGs) INTO CITIES' STRATEGIES

The UN 2030 Agenda for SDGs and the 17 SDGs are a coordinated effort to achieve a better future for everyone. A bottom-up movement is spreading globally, highlighting the **critical role of local governments and communities in shaping a sustainable future.** More than 30 cities, provinces and regions of the EU have developed local 2030 Agendas and published the SDG Voluntary Local Reviews (VLRs), integrating SDG monitoring into their strategic plans and recovery actions (also with the support of the Commission)[13]. However, the EU's overall consolidated leadership in 'place-based' regional and urban policy is not well-reflected in a similar leading role in SDG localisation yet.

Figure 2: Local Governments measuring the SDGs and URBAN 2030 Pilot cities (EU and UK)



Source: EC JRC[14]

The next generation of VLRs should take a broader territorial vision and be able to consider different territorial challenges, potential and visions, especially considering the **institutional and technical path-dependency on pre-existing policy planning frameworks**[15]. Looking to the future, Europe could lean towards VSRs (Voluntary Subnational Reviews) too, based on multi-level coordination and multi-stakeholder involvement – real SDG Ecosystems[16]. The successful implementation of the SDGs will be instrumental in 'building back better' from the COVID-19 crisis, strengthening resilience and transforming regions, leaving no one behind.

QUALITY OF GOVERNMENT AND REGIONAL TRADE

Quality of government is crucial for socio-economic prosperity and for the well-being of individuals and groups at all levels. While the EU relies on a single market and trade is part of the EU's common policies, the way trade flows throughout the EU depends heavily on 'territorial realities'. A recent analysis[17] of EU regional trade data[18] shows that **regional trade performance depends on the quality of government** (as described in the European Quality of government index (EQI))[19,20]. It shows that better quality of government facilitates trade flow across EU regions. The greatest trade volumes happen between regions with a high and similar institutional quality.

The quality of government has a higher impact on trade flows going from less developed regions to richer ones. This implies that 'place-based' territorial **policies targeting improvements in regional institutional quality,** such as Cohesion policy and other EU programmes, **can affect the future gains from trade across regions.** Improving local government quality can therefore promote a greater integration of EU regions into the European economy and a better external position of the EU.

1. FI, SE and DK, even though Greenland & the Faeroes are not part of the EU.
2. https://eeas.europa.eu/arctic-policy/eu-arctic-policy/20954/international-cooperation-arctic-matters_en
3. 2008 COM(2008) 763 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL THE EUROPEAN UNION AND THE ARCTIC REGION
4. https://www.amap.no/documents/download/6730/inline.
5. https://www.nature.com/articles/s41558-019-0592-8
6. https://publications.jrc.ec.europa.eu/repository/handle/JRC109379
7. https://www.nature.com/articles/s41558-020-0865-2
8. https://www.amap.no/documents/download/6730/inline.
9. https://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf
10. https://www.mdpi.com/journal/minerals/special_issues/Arctic_mineral
11. https://www.scmp.com/business/article/3008335/russias-plans-artic-gas-may-be-alternate-source-chinas-energy-needs-sate
12. https://services-webdav.cbs.dk/doc/CBS.dk/Arctic%20Shipping%20-%20Commercial%20Opportunities%20and%20Challenges.pdf
13. For more details: https://urban.jrc.ec.europa.eu/sdgs/en/
14. https://urban.jrc.ec.europa.eu/sdgs/en/
15. Ciambra, A., European SDG Voluntary Local Reviews: A comparative analysis of local indicators and data, Siragusa, A. and Proietti, P. editor(s), Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-32321-1 (online), doi:10.2760/9692 (online), JRC124580. https://publications.jrc.ec.europa.eu/reposit Voluntary Subnational Reviews ory/handle/JRC124580
16. Hidalgo Simón, A., SDG localisation and multi-level governance: lessons from the Basque Country, Siragusa, A. and Proietti, P. editor(s), Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-37769-6, doi:10.2760/20519, JRC124586.
17. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/quality-government-and-regional-trade-eu
18. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-nuts-2-regions-construction-interregional-trade-linked-supply-and-use-tables
19. The EQI measures institutional quality at regional levels. Quality is defined as a multi-dimensional concept consisting of high impartiality and quality of service, with low corruption.
20. https://ec.europa.eu/regional_policy/en/information/maps/quality_of_governance/

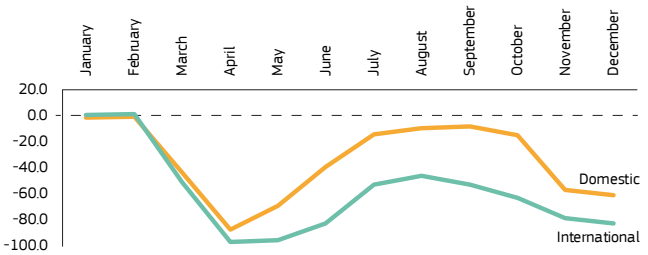
TOURISM: FROM SHOCK TO RECOVERY

Travel and tourism represented over 10% of the EU's economy and employment before the pandemic, and the sector's GDP was growing more than 2% annually[1], though with a large regional variability[2]. Tourism is one of the most affected sectors of the pandemic. Travel restrictions, limited coordination on health protocols, slow vaccination and changes in tourists' behaviour and preferences may slow the recovery of international tourism down. In this context, developing domestic tourism (i.e. holidaying within one's own country), which is increasing, could enhance the sector's resilience and recovery.

To increase 'tourism resilience', Member States and regions should diversify their tourism, building on the varied and unique EU territorial and cultural assets, drawing on new business models and sustainable forms of tourism and taking advantage of evolving consumer patterns[4]. New opportunities could vary across the regions of Europe. For e.g. **the crisis could be an opportunity for rural areas if the trend towards more sustainable and eco-inclusive consumer behaviour strengthens**[3]. Domestic tourism provides gains in terms of carbon footprint, if it replaces long distrance travel.

Other avenues for increasing resilience lie in the development of tourism-related niches less affected by seasonality, such as online entertainment, or industrial tourism[5,6]. Increasing the future resilience of tourist destinations could also come from lowering their dependency on this volatile sector. Smart Specialisation[7] offers a framework for regions to diversify their economy.

Figure 3: Change in number of nights spent in tourist accommodation by origin of guest in 2020 versus 2019 in EU27



Source: Eurostat

BIOECONOMY FORESIGHT

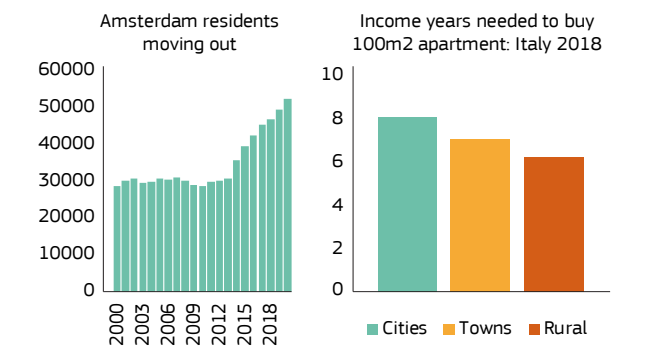
The bioeconomy[8] makes up an important part of the EU economy, generating 4.7% GDP and employing 8.9% of the labour force[9]. **A sustainable bioeconomy has the potential to transform Europe's future agricultural and industrial base**[10,11]**. For rural and coastal communities in particular,** a diversification of supply chains within a sustainable bioeconomy could offer job and growth opportunities, while enhancing natural resources and ecosystems.

Four foresight scenarios describe potential bioeconomies in 2050[11]. One of them aligns closely with the Commission's Bioeconomy Strategy[12]. This scenario is defined by a coherent set of policies and a fundamental societal change towards sustainable consumption. Among the trends observed that drive change in the future is a shift from mass production to local, community-based, high-quality (mainly agroecology)[13] production. Change is enabled by converging digital, lifescience and energy technologies. Land use is more efficient and food prices increase only slightly, compensated by reductions in spending on energy and transport. **The bioeconomy transition described in the scenario leads to positive effects on rural employment and a reduction in the gap between rural and urban areas.** A different model-based study, calculated that total turnover of the EU bioeconomy sector could reach EUR 3 trillion by 2050[11].

HOUSING AFFORDABILITY IN CITIES AND RURAL AREAS

House prices in EU cities have soared, largely due to high demand and low supply. Increasingly investors are driving demand for residential property and tourist accommodation, putting pressure on housing affordability, especially for lower and middle classes[15] and the younger generation of long-term residents. Although investments are most evident in cities, the effects of rising prices go beyond. In Amsterdam a growing share of **residents have been leaving for more affordable places since 2014 and price growth is now higher outside of the capital**[16]**.**

Figure 4: Housing statistics from The Netherlands and Italy



Source: EC JRC

The pandemic may reinforce this trend, having triggered a greater appreciation of space and nature. The prospect of reduced office spaces and more structured remote working arrangements lengthens the acceptable distance between home and a workplace, and will likely lead to an increased conversion of offices into residential buildings.

While urbanisation is expected to continue[17] **we may see an increased value of less densely populated small cities and villages in the future in parallel,** especially if gaps are reduced, for example by (EU) investments in services, digital technologies and connectivity. Such developments could strengthen competition between residential development and agricultural land use. At the same time, real estate investors and developers will likely respond to this housing demand[18]. A key challenge for the future lies in **anticipating this in such a way that housing markets remain inclusive and affordable, both in urban and rural areas,** taking into account the needs of the ageing EU population, while safeguarding that housing becomes more sustainable, for e.g. by repurposing buildings and using climate-neutral construction techniques and materials.

1. World Travel & Tourism Council, https://wttc.org.
2. Barranco et al. (2020) Characterisation of tourism expenditure in EU regions. Joint Research Centre. JRC122857.
3. The current health crisis changed consumer preferences towards a more sustainable and eco-inclusive awareness, according to Santos, AM et al. (2020) Behavioural changes in tourism in times of Covid-19. Joint Research Centre. JRC121262. doi:10.2760/00411.
4. Santos, AM, Edwards, J and Laranja, M (2021) From Digital Innovation to "Smart Tourism Destination": Stakeholders' reflections in times of a pandemic. Joint Research Centre. JRC123390.
5. Industrial tourism offers visitors an experience with regard to products, production processes, applications, and historical backgrounds.
6. The region of East Marmara, Turkey, has chosen industrial tourism as one of its RIS3 priorities.
7. https://s3platform.jrc.ec.europa.eu/what-we-do
8. The bioeconomy covers all sectors of our economy that rely on renewable biological resources, and the ecosystems they come from.
9. https://knowledge4policy.ec.europa.eu/bioeconomy/topic/economy_en
10. https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2020-strategic-foresight-report_en
11. M'Barek R., Philippidis G., Ronzon T., Alternative Global Transition Pathways to 2050: Prospects for the Bioeconomy, Technical Reports, Publications Office of the European Union, 2019. Alternative global transition pathways to 2050: Prospects for the bioeconomy
12. https://ec.europa.eu/jrc/en/publication/future-transitions-bioeconomy-towards-sustainable-development-and-climate-neutral-economy-foresight
13. https://knowledge4policy.ec.europa.eu/publication/updated-bioeconomy-strategy-2018_en
14. Agroecology is sustainable farming that works with nature and applies ecological principles to agricultural practices
15. Who owns the city Exploratory research activity on the financialisation of housing in EU cities, Van Heerden, S., Ribeiro Barranco, R. and Lavalle, C. editor(s), EUR 30224 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-18956-5 (online), doi:10.2760/071168 (online), JRC120776
16. Het Parool 'Weg uit de stad: thuiswerken kan toch overal', 27 March 2021.
17. United Nations (2018). The World's cities in 2018. Department of Economic and Social Affairs, Population Division, World Urbanization Prospects, 1-34.
18. See also: reuters.com/business/pandemic-prompts-european-life-sciences-real-estate-rush-2021-04-20/

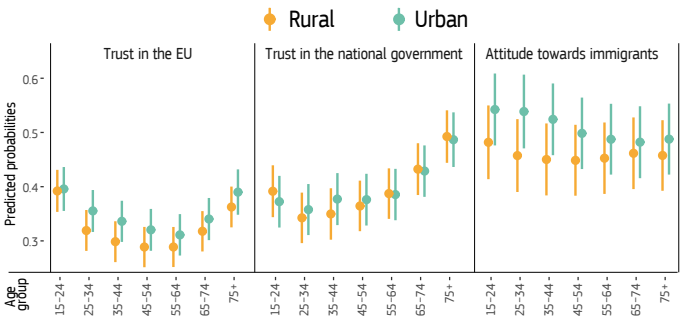
DEMOGRAPHIC CHANGE IN EUROPE AND IMPACT ON TERRITORIAL AND INTERGENERATIONAL DIVIDES

Trust in governing institutions is a key element of functioning democracies. Eurobarometer data shows differences among EU citizens in their level of trust towards the EU, in national governments and in attitudes towards immigration, depending on the combination of age and place of residence[1,2].

As figure five illustrates, **differences in these attitudes between age groups tend to be larger and more systemic than differences between residence in urban or rural settings**. Divides based on place of residence tend to be smaller, with the exception of attitudes towards immigration. These findings suggest that the presence and range of divides in attitudes by age, or place of residence, are mostly issue-dependent.

The ageing process in the EU is associated with residential patterns that may result in an unbalanced mix of generations in the future. If individuals' social networks become increasingly homogenous along age and territorial lines, it will dissolve chances to experience intergenerational interactions and to get in contact with a variety of political views and issues. These dynamics may negatively affect social cohesion and nurture polarisations in the future population, with serious implications for the stability of the EU.

Figure 5: Difference in attitude between age group & location[3]



Source: EC JRC 2021[1]

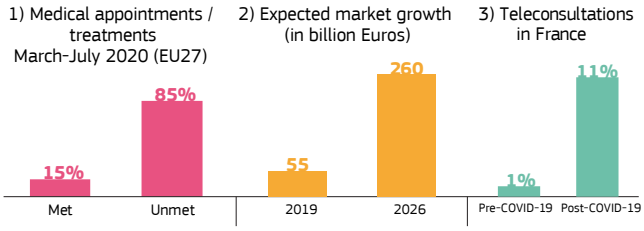
eHEALTH: BRIDGING THE URBAN-RURAL DIVIDE

eHealth encompasses the use of digital technologies to facilitate access to quality, cost-effective health services remotely. eHealth and ePharmacies[4] represent an opportunity to narrow the urban-rural divide through more efficient use of resources. eHealth focuses on prevention and **offers future possibilities for rural areas where a higher proportion of adults have unmet medical needs (2.0 % vs 1.6 % in urban areas[5]).** The surge in eHealth is driven by:

- advancements in Artificial Intelligence & Big Data,
- the increasing prevalence of chronic diseases,
- the growth of the elderly population, and
- a lack of medical services - an inequality particularly felt in rural areas.

eHealth offers advantages such as remote patient consultation, better adherence to treatments, improved psychological support[6], reduced costs[7] and inequalities[8]. However, challenges for wider rollout remain, such as an adequate legal framework and reimbursement, acceptance by the rural population, cybersecurity and connectivity, and digital skills. Advancing some services in remote regions comes at a higher cost. Moreover, hospitals and face-to-face consultations are still needed. But eHealth can address some unmet needs during times of pressure, as shown in the pandemic[9,10]. The EU has recognised the importance of eHealth for the future by its inclusion in the new Recovery and Resilience Facility[11].

Figure 6: EU eHealth data



Source: 1) Eurofound[12] 2) PitchBook 3) Healthadvancesblog.com[13]

EXPANDING URBANISATION AND SHRINKING CITIES: URBAN PERIPHERIES

New territorial patterns of urban development are challenging the common perceptions of urban expansion. High population growth has not always translated into higher urbanisation rates, for e.g. Africa[14,15]. Urban expansion in China is expected to decrease sharply after 2050[16]. In Europe, about a quarter of the cities shrank in recent decades[17] and this will continue, with an expected population decline in inland areas. Nevertheless, for the majority of cities urban growth will go on and soil sealing[18] is slowly continuing, along with internal migrations[19].

Peripheral areas of large and medium cities have a higher concentration of children and adolescents,[20] and there is a higher share of older people in centres. City centres will continue to attract activities (culture, high-level education and economic activities), and other peaks of activity will occur further away (outdoor pursuits[21]). The post-COVID-19 reality will intensify polycentric urban geographies (i.e. multiple centres) and urban-rural interlinkages.

Some cities will not be able to keep up with the pace of transformation and will shrink, while others will exhibit their successes. The achievements of ambitious targets related to urbanisation (e.g. housing, climate change and so on) will possibly smooth future conflicts between centres and peripheries, with participatory mechanisms favoured by new technologies and innovative governance.

1. Scipioni M., Tintori G., Political attitudes and behaviours: do age and territory count?, in The Demographic Landscape of EU Territories, Goujon, A., Jacobs, C., Natale, F. and Lavalle, C. editor(s), EUR 30498 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-27239-7 (online),978-92-76-27238-0 (print), doi:10.2760/658945 (online),10.2760/49621 (print), JRC123046
2. Scipioni, M., Tintori, G., Alessandrini, A., Migali, S. and Natale, F., Immigration and trust in the EU. A territorial analysis of voting behaviour and attitudes, EUR 30042 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-14661-2 (online), doi:10.2760/76114 (online), JRC118855.
3. Predicted probabilities of trusting the EU, trusting the national government, and thinking that immigrants contributed to the country, associated with age and place of living
4. E-pharmacies use automation technology to deliver lower-cost prescriptions to consumers (PitchBook).
5. Eurostat regional yearbook 2020
6. https://www.vodafone.com/sites/default/files/2020-11/EuropeConnected_eHEALTH.pdf
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7605980/
8. https://www.euro.who.int/__data/assets/pdf_file/0013/303322/fact-sheet-status-of-ehealth-in-who-european-region.pdf
9. https://www.eurofound.europa.eu/nb/publications/blog/protecting-access-to-healthcare-during-covid-19-and-beyond
10. Telehealth services experiencing an explosion of demand due to the coronavirus (healtheuropa.eu)
11. https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en
12. https://www.eurofound.europa.eu/nb/publications/blog/protecting-access-to-healthcare-during-covid-19-and-beyond
13. https://healthadvancesblog.com/2020/05/06/the-changing-fortunes-of-telemedicine-in-europe/
14. Based on JRC calculations (Project foCUSAfrica, 2021).
15. National Enablers for Infrastructure Investment and Economic Development in Secondary Cities in Ghana and Uganda report produced by the United Nations Capital Development Fund (UNCDF) for Cities (2021).
16. Global projections of future urban land expansion under shared socioeconomic pathways. Nat Commun 11, 537 (2020).
17. The Future of Cities https://urban.jrc.ec.europa.eu/thefutureofcities/
18. Soil sealing is the (irreversible) covering of soils with impermeable materials, for e.g. concrete
19. EUROSTAT Statistics on regional population projections, March 2021
20. The demographic landscape of EU territories: challenges and opportunities in diversely ageing regions (2021)
21. Batista e Silva, F et al. (2020) Uncovering temporal changes in Europe's population density patterns using a data fusion approach. Nature Communications 11: 4631. doi:10.1038/s41467-020-18344-5

BIODIVERSE AND DIGITAL RURAL AREAS, ADAPTING TO LOCAL-TO-GLOBAL CLIMATE CHANGE

Farmers will play a key role in building a biodiverse and climate-resilient agricultural sector in Europe for the future[1]. Farmers need to transform agriculture substantially, while being exposed to climate change, its direct effects at local level (shifting climate zones, larger production variability) and indirectly facing changing markets due to regional-to-global climate change. Changes will include carbon farming[2] and conservation of biodiversity[3]. Strategic planning and effective, tailored actions are needed, with close monitoring, testing and adjustments along the way.

The 'Earth Digital Twins'[4,5], highly accurate models of the Earth based on novel digital technologies and infrastructure, will help to 'future-proof' farming. The multi-layered Earth system simulations are expected to provide reliable projections of environmental change and its impacts, also at regional scales. They will enable the use of integrated AI-based decision-supporting systems that, together with a smart and flexible agro-management, will be the key to achieving future biodiverse, sustainable and climate resilient farms. **Digitally integrated rural areas and agriculture, and future innovation linked to the new wealth of quality information, will provide the basis for novel services and highly skilled jobs in the sector.**

FUTURE OF LAND ABANDONMENT IN THE EU BY 2030

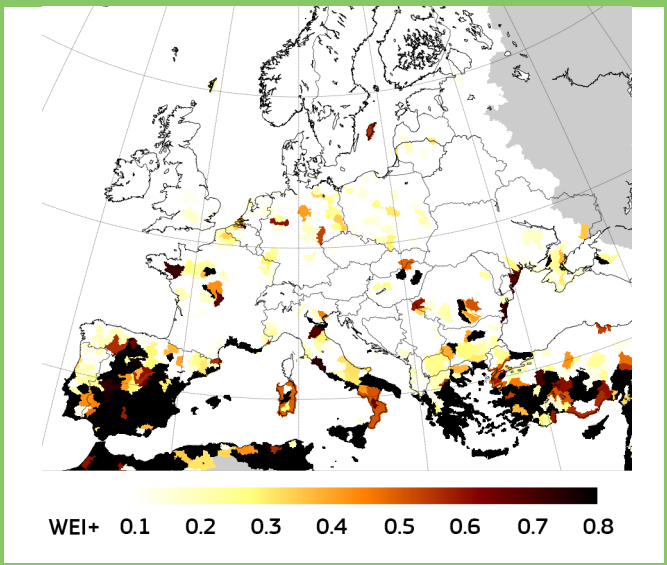
Agricultural land in the EU is decreasing substantially due to land abandonment, urban expansion and afforestation. It is a multidimensional phenomenon driven by a set of interrelated factors, incl. biophysical characteristics (e.g. soil, climate), land-use change, agro-economic and farm structure, market conditions and policies[6]. Beyond the loss of productive land and local incomes, it can have a wide range of consequences, with trade-offs between positive (e.g. natural regrowth) and negative (e.g. biodiversity loss or soil degradation) - impacts that depend on the local context[7].

By 2030[8], agricultural land in the EU is projected to be facing different levels of *abandonment risk*, with around 25% (49 million hectares (ha)) under at least a moderate risk. Agricultural land will continue to decline and is projected to be abandoned at a rate of 373,000 ha per year, reaching 5.6 million ha (3.6% of total). However, **abandonment risks vary considerably across the EU regions, ranging from less than 2% to more than 30%.** Almost one-quarter of all abandonment will occur in mountainous areas, but remote areas, islands, coastal and sparsely populated areas are affected too. **The places that face severe abandonment risk need attention in order to prevent, revert or minimise impacts.** Policy instruments that focus on improvement of farming conditions and rural infrastructures&services are needed to alleviate negative impacts. And should include forestry and measures for vulnerable areas[9].

WATER-ENERGY NEXUS 2050

The scarcity of water resources will be a growing problem towards 2050 and one that is not restricted to the Mediterranean anymore, due to increasing water demands and decreased availability, especially during the summer.

Figure 7: Water Scarcity expressed by Water Exploitation Index (WEI+) (EU and other countries)



Source EC JRC[10] Note: estimated for the end of the 21st century, without climate adaptation. The WEI+ is the ratio of all sectors water consumption vs availability.

The long-term outlook of the EU energy system indicates that thanks to decarbonisation policies, water usage for cooling the EU energy system is expected to decrease to 46 billion m^3 by 2050 (a 38% reduction from 2015). However, **regional cooling water scarcity remains**, in particular for the regions where nuclear power, coal-fired power plants and coalmines will be still operational.

With rainfall amounts expected to decrease by 15-30% around the Mediterranean[11], and water resource availability dropping by up to 40% in the majority of southern Europe[12], **the reduction in water needs from the energy system will not be sufficient to counter the increasing scarcity issues.**

Increased efforts are required to reduce water abstractions for irrigated agriculture, because groundwater resources are already decreasing in the Mediterranean[13] and several central EU countries and the current irrigation efficiency plans are only achieving minor improvements[14]. Furthermore, innovative solutions (re-use, aquifer recharge, desalination, efficiency) are required to ensure sustainable water resources by 2050.

The transition towards a climate-neutral economy holds different challenges for different rural areas. **It will be crucial to have tailor-made and coherent policy responses at the water-energy-agricultural nexus.** EU financial instruments for rural development and agriculture should play a steering role to reach sustainable water resources and zero pollution.

1. Farmers of the Future https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/farmers-future
2. Carbon farming refers to a variety of agricultural methods aimed at sequestering atmospheric carbon into soil, roots, wood and leaves.
3. Conservation of biodiversity refers to the protection, preservation, and management of ecosystems and natural habitats and ensuring that they are healthy and protect species diversity.
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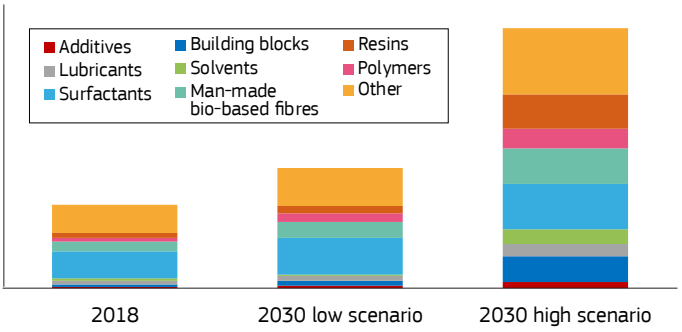
THE BIO-FACILITY OF TOMORROW

Biorefineries could become key in transforming industrial facilities towards a climate-neutral Europe by 2050. They convert biomass to energy, fuels, chemicals and materials, also valorising waste. Giving value to non-food biomass can translate into both **carbon-neutrality and new job opportunities, especially for rural areas** where bio-based feedstock[1] is abundant and biorefineries are usually located.

Figure 8: European Union demand for bio-based products towards 2030



Source : EC DG RTD 2021[3]

Focusing on EU chemical and material-driven biorefineries, about 300 facilities are operational. They use biomass as a substitute for non-renewables, in particular fossil feedstocks[1]. This highly innovative bio-based sector produces: chemicals, composite and fibers, plastics and as a by-product, liquid biofuels.

Europe is already a leader on the global market for bio-based products[2]. **In a favourable future macroeconomic scenario, supported by targeted policies, the demand for bio-based chemicals and materials could grow 10% per year, and reach 16 Mt per year[3]**. But challenges lie ahead. Public and private capital investments will be required, under conditions of technological and economic uncertainty and over long time horizons (e.g. from EU's Recovery and Resilience Plan, or Partnership for a circular bio-based EU). It will provide opportunities for Southern and Eastern EU regions that have high biomass potential, but limited industrial infrastructures. The key for the future will be to make the EU an attractive place to invest, compared to other regions of the world.

THE FUTURE OF MOBILITY

Spatial factors such as density, location and accessibility have a strong impact on an individual's mobility needs and behaviour. Coupled with transport options, the economic and employment situation of a region, behaviour and individual socioeconomic factors, such as age and income, they shape the choices and constraints for personal mobility.[4] **While future mobility scenarios usually have an urban focus, they also have consequences for rural areas.** It is with this lens that we can look at the four future scenarios created in the Mobility4EU project[5].

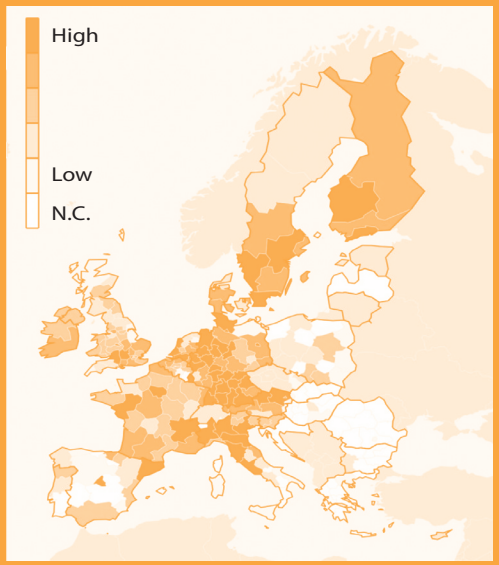
The 'Data world' scenario highlights the convenience of the digital revolution, with connectivity, information and online services aplenty, but data is being collected from users for the management of the transport system. In another scenario, 'Slow is beautiful', people rediscover their local environment and mixed-use developments that aim to decrease the distance between residential areas, jobs, education and services.[6] **Each of the four scenarios imagine different outcomes in terms of distance and access to services, quality and type of infrastructure and structure of transport services.** The implications and conclusions of these scenarios could help to define urban-rural and rural-rural connections, new business models and participatory rural and mobility planning for the future.

REGIONAL TECHNOLOGICAL READINESS FOR COMPETITIVENESS AND GREEN TRANSFORMATION

The Economic Complexity Framework[7] is a novel analysis taking into account the complex dynamics related to the various dimensions of production and innovation systems. The ability to localise capabilities and activities at a regional level and to identify promising new technological combinations (disruptive innovation), may help to identify the most promising areas for technology development for the green transformation. The framework provides forecasts for countries' structural growth. It uses **techniques developed in network science and machine learning and can provide not only information about country-level capabilities, but it can also deep-dive into sectoral and regional levels of analysis[8].**

Better understanding of 'regional technology readiness' can aid policymaking by linking production data with technologies that have future potential on the export market. Regional technology readiness could also encompass innovation in a wider sense, including social innovation and sustainable land management. For the energy transition, the development of renewables (wind, solar and so on) will require the space offered by rural areas. The identification of the capabilities of regions could help to guide the creation and support of industrial hubs and clusters, or the focus of interregional networks. This approach will also help to identify the most promising areas for the green transition.

Figure 9: Technological fitness[9] by region



Source: EC JRC 2019 (Data 2015, EU and UK)[10]

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