

ESPON



EUROPEAN UNION

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Inspire Policy Making with Territorial Evidence

TOPIC PAPER

Sustainable development and climate change resilience: ESPON evidences

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This ESPON topic paper focuses on urbanisation processes and resilience to climate change, summarising the evidence of recent ESPON studies and reflecting research findings. Despite making progress on several indicators of sustainable development and climate mitigation, the evidence underlines frictions between holistic sustainability concepts, territorial trends and urban planning. Advancing sustainability goals calls for integrity and as well as a transformative approach in multi-scalar territorial governance, in particular in tension-ridden regions affected by climate disasters or the energy transition. The policy questions on territorial disparities that are raised in this paper are intended to inform a debate among researchers, governments and institutions, helping them to set priorities, implement better policies, and ensure the long-term future of Europe.

MAIN POLICY QUESTIONS

- How can European cities and regions empower and implement holistic sustainability concepts, such as: making full use of the energy transition, decarbonisation of national economies, green innovation, green infrastructure, and ecosystem services?
- How to elaborate and implement EU cohesion policies to prevent climate policy packages from increasing territorial disparities? What climate change adaptation measures could be put in place as part of an integrated, place-based urban strategy?
- How should regions and cities cooperate to ensure the efficiency and coordination of adaptation and mitigation measures at wider geographic scales and territorial governance models?
- How to reinforce sustainable urbanisation in multiple, sometimes contradictory goals and planning complexities at all urban and regional scales?
- How to match the sustainability concept and smart cities

MAIN POLICIES/POLICY DOCUMENTS

- A European Green Deal and related policy documents
- Territorial Agenda 2030
- European Union Urban Agenda

1. Introduction

Sustainable development and climate change have multiple inter-linkages, and this is reflected in two historic transformative agreements adopted at a global scale in 2015: [the 2030 Agenda for Sustainable Development](#) and the [Paris Climate Change Agreement](#). This ESPON topic paper summarises the evidence of recent [ESPON studies](#) and discusses the consequences of sustainability and climate change in relation to urbanisation processes and risks of territorial disparities due to climate policy driving restructuring in European regions and cities.

The [ESPON SDG tool](#) enables the localisation of the sustainable development goals (SDGs), to measure progress of the SDGs in various regions and reflect differences across them. The ESPON approach entails a territorial approach promoting integrated policy making among all levels of governments and places, including multi-level and multi-stakeholder approaches that are at the heart of sustainable urban development. The potential benefits and challenges are varied for different types of towns, cities and regions, underlining the potential for territorial inequality through sustainability. The territorial evidence presented and questions raised in this paper are intended to inform a debate among researchers, governments and institutions, helping them to set priorities, implement better policies, and ensure the long-term future of Europe.

The SDGs were developed and introduced to continue the international agreement on sustainable development, titled as the 2030 Agenda for Sustainable Development. Compared to the previous global strategy, the approach adopted towards sustainability was strengthened, in that environmental sustainability was also supplemented by social and economic sustainability. Indeed, the tagline people, planet, prosperity includes economic growth, environmental sustainability and social inclusion (United Nations, 2015).

Adopted in 2015, the SDGs are a holistic concept and benchmarking instrument that have spread to many strategic arenas to promote development and growth. They encompass a total of 17 goals “to transform our world”, starting with no poverty and zero hunger, and ending with the world peace and partnership (Figure 1) – altogether, they contain 169 targets. Though relationships emerge between North and South, developed and developing countries, the global strategy targets the developing world through global tiers. Therefore, the operationalisation and foci of the SDGs differ in regard to the sector focus and territorial scale, as the European welfare states perform well by a majority of indicators. A set of 100 indicators was developed to monitor the SDGs specifically in the context of European Union (EU) policies (Eurostat, 2019).

Figure 1

Sustainable development goal (United Nations, 2015)



The urgent need for policies tackling the climate crisis and implementing the Paris Agreement has been closely and inseparably related to the SDGs. Climate change is already disrupting national economies and affecting local well-being. The concept of resilience - not just being able to adapt to changes, but being able to withstand and quickly recover from various unforeseen challenges - has become increasingly common and practical. It is vital to safeguard climate-vulnerable sectors such as water, agriculture, and public health, as well as to articulate specific actions to empower and support more vulnerable areas and groups.

Measures to mitigate, adopt and reduce the impact of climate change should strengthen and promote sustainable development. In Europe, climate action (SDG 13) is a challenge with significant implications for all aspects of our modern life and society. The success of SDG 13 depends on the efforts taken in the implementation of other SDGs. This paper targets sustainable cities (SDG 11) with green innovation and infrastructure (SDG 9), as well energy (SDG 7). Climate and urban goals not only contribute to healthy lives and well-being (SDG 3), but also to green economies (SDG 8) with responsible production and consumption (SDG 12). Protecting biodiversity (SDG 15) and water resources (SDG 6, SDG 14) is equally related to both sustainable urbanisation and climate change.

Creating stronger links with the SDGs, as well as aligning them with development and sectoral plans, is needed for territorial strategy-making at both regional and local scales. The key policy areas and public interventions in Europe include: the restructuring of economies due to the

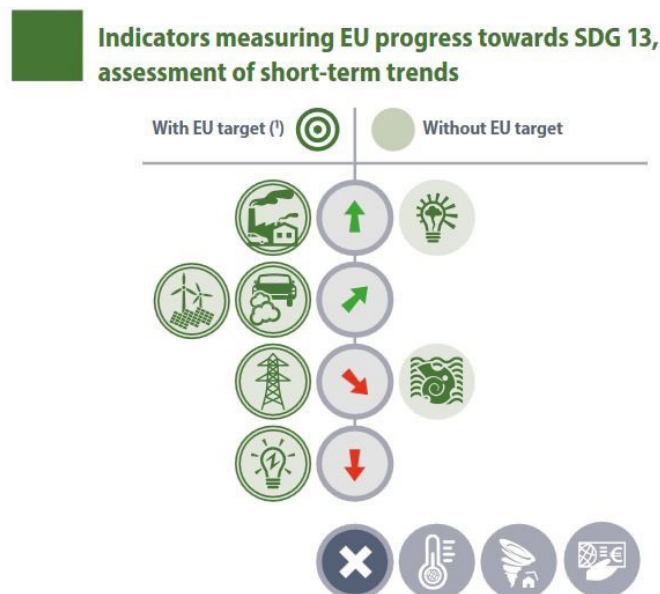
energy transition; ensuring a just transition; adjusting forestry and agriculture to climate realities; and providing services of general interest, including timely and efficient disaster management. By nature, all of these issues are highly territorial and require place-based plans. However, the key indicators of SDG climate actions are not available at a regional scale, and monitoring is based on proxies or evaluated case-by-case.

A “[Green Deal for Europe](#)” outlines a long-term plan to make Europe the first climate-neutral continent by 2050. The plan is labelled as “the greatest challenge of our time”, and a new EU growth strategy. Already in the 2020s, the European Union needs to cut greenhouse gas emissions by at least 40 percent below 1990 levels by 2030, though much tougher goals are negotiated. Fast-forward climate change requires both strong territorial policy making and localised adaptation measures.

In order to achieve carbon neutrality in the EU, all sectors of the economy need to be involved. However, this does not mean that each individual sector must achieve net zero emissions on its own – it requires achieving a balance among the sectors as a whole. Balancing the emissions should consider land use, energy generation and consumption patterns at a larger territorial scale. Mitigation efforts reducing CO₂ emissions need to be boosted, increasing the share of renewable energy and reducing the emissions of new cars through energy consumption. In contrary to the mitigation indicators, there are no targets on adaptation (e.g., deviation of temperature, climate-related economic losses, and financial support to adaptation, as shown in Figure 2 (Eurostat, 2019).

Figure 2

Short-term trends of SDG 13 on climate action (Eurostat 2019)

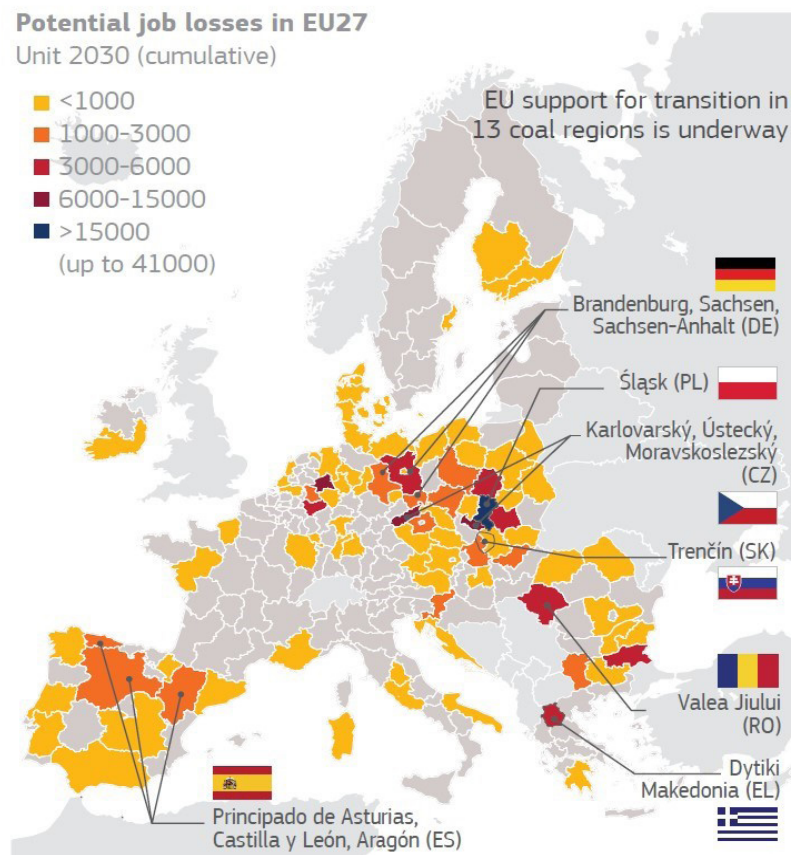


As the Green Deal aims to ensure a just and inclusive transition, both regions dependent upon coal and those with high energy-consumption require special attention. While EU coal regions share many commonalities, their paths towards decarbonisation differ widely. To ensure softer structural change, the European Commission (EC) launched the '[Platform for Coal Regions in Transition](#)' in 2017. It is estimated that by 2030, around 160,000 direct

jobs may be lost in the coal sector alone (Alves et al, 2018) (Figure 3). Development based on a regionally-adjusted restructuring process is supposed to create new employment opportunities, though the effects are so far limited. In addition, the energy sector's induced restructuring creates a multiplying effect, fundamentally impacting both regional and local economies, and further rearranging many European geographies.

Figure 3

Potential cumulative job losses in coal regions (European Commission DG JRC, DG REGIO).



In addition to massive mitigation efforts, climate adaptation will require systemic policies across Europe, so as to ensure resilience to climate change and disaster risk reduction, in particular in the central and southern European metropolitan and urban areas. Risks and uncertainties are related to sustainability considerations, trade-offs of mitigation and adaptation that need to be properly addressed. The EU's next budget cycle, the Multiannual Financial Framework (MFF 2021-2027), plays a critical role in the fight against climate change (Runkel et al 2019).

In 2020, a number of events presenting ESPON evidence on the SDGs will take place. These events concentrate on

two themes: climate adaptation and sustainable urbanisation. Both themes have been targeted by a policy needs assessment carried out by the ESPON programme in all 27 member states of the EU, as well as four partner states: Iceland, Liechtenstein, Norway and Switzerland. This methodology enables to collect local evidence needs from territorial and structural stakeholders and highlights relevant national and local policy processes in each country.

During the assessment procedure, information about the present and planned policy processes were collected.

This resulted in an extensive amount of data consisting of ongoing and planned policy documents and programmes (development strategies, spatial plans, visions, etc.). The collected data was analysed with a content analysis method (frequency analysis) and resulted in the identification of several thematic clusters across Europe where ESPON evidence support is most needed. The results of the need assessment show that climate, environment and energy is one of the top themes to which policy processes were targeted to. This is the starting

point for ESPON outreach activities on the topic of SDGs, for which this present topic paper sets the ground. Considering that within the cluster of climate, environment and energy a large number of ongoing policy processes were targeted to climate adaptation and sustainable urbanisation, this topic paper for 2020 includes the state-of-the-art ESPON and academic evidences on these issues. The energy theme will be a focus for the year 2021.

2. ESPON evidences

2.1. Sustainable urbanisation

ESPON resources: [GRETA](#), [SUPER](#), [LOCATE](#), [ESPON TIA Tool](#), [RESSI](#), [ENSURE](#)

Policy questions

- How can European cities and regions empower the sustainability concept of the Green Deal, making full use of the energy transition, decarbonisation of national economies, green infrastructure and ecosystem services?
- How can urban planners manage the densification of cities, including both the positive and negative impacts of production intensity and economics, functional tiers, mobility and social life?
- How to implement EU cohesion policies to prevent climate policy packages from increasing territorial disparities?
- How can green infrastructure and ecosystem services support both sustainable urbanisation and regional growth and welfare?

Urbanisation in terms of speed, trajectories, amount and consequences is one of the predominant phenomena determining the future of the planet, including Europe. Urban growth and renewal, combining the historic and old with what is innovative and new, plays a significant role in achieving sustainability and balancing the trilemma of the environmental, economic and social spheres. This follows the United Nations' 2030 Agenda for Sustainable Development and the Sustainable Development Goals (UN 2015), in particular Goal 11, which calls for governments to make cities and human settlements inclusive, safe, resilient and sustainable.

To make urbanisation more sustainable, governments, municipalities, civil society, and businesses attempt to address the multiple complex, sometimes wicked urban challenges. However, a number of these challenges have been undertaken in an ad hoc manner rather than systematically. In general, urban policy for sustainability takes a strategic view and tackles a broader and more diverse range of challenges.

The EU has, on various occasions, expressed environmental targets regarding sustainable urbanisation and land use (EC, 2012), which can be implemented by mainly non-spatial EU policies. Following territorial approaches, national governance and spatial planning

systems co-act in urbanisation through a variety of policy interventions. The policy context is highly heterogeneous and complex. Turning to the land economy and real estate market, the combination of supply and demand factors will determine the magnitude of urbanisation pressures, which could be constrained by spatial restrictions and zoning.

Rapid urbanisation, agglomeration and population growth are usually outpacing the infrastructure and service provision, and environmental quality declines. In too many European cities, air pollution has become an unavoidable health hazard (EEA, 2019). Open public spaces make cities more inclusive, but many residents are not within easy walking distance of them. Increasing volumes of traffic, waste and water highlight the growing need for investment in urban infrastructure. In relation to territorial sensitivities, regions showing greater concentrations of NO₂ are expected to benefit more from policies intended to reduce air pollution (Territorial Impact Assessment (TIA) tool).

Multiple local factors play a crucial role in urban land use decisions that seek to balance public and private interests. The trend is to densify within the already-built urban structure, but even then, nearby green areas, or those of significant value, are at risk. It is important to consider

compensation mechanisms for greenery or significant green areas.

Considering policy contexts and territorial realities, urbanisation and land-use can be sustainable, such as using brownfields instead of greenfields, giving land back by de-urbanising settlement patterns, or creating durable, future-proof urban form. Sustainable land use relates to a long-term approach to urbanisation, infrastructure and policies. A final consideration with respect to temporal sustainability is the durability of policies (e.g., stability of funding, vulnerability to political/economic cycles). In other words, to effectively steer long-term processes such as urbanisation, measures should themselves have a degree of longevity.

Using the **ESPON TIA tool**, the annual land use per inhabitant, built-up areas per inhabitant, green infrastructure per capita and economic growth (gross value added per capita) can indicate the degree of resilience in terms of changes. As much as 14% of the functional urban areas would experience a very high impact from climate change, and 18% a moderate impact, as in these regions the current annual land use per capita is fairly high. These regions are located in the metropolitan areas of Sweden, Finland, Belgium, Hungary and Ireland (TIA urban agenda, 2018). Regions with a higher surface area of built-up areas per inhabitant are expected to be more sensitive to the implementation of a policy that aims to reduce land consumption.

The **SUPER** (Sustainable Urbanisation and land-use Practices in European Regions) project explores the drivers behind and the mechanisms of land-use changes, particularly towards urban uses in Europe, and the extent to which these changes are affected by territorial governance and spatial planning interventions.

An important basis for sustainability is a compact settlement structure. This can be achieved by urban planning at a city-region scale, which prevents urban sprawl by strong control of land supply and speculative development. The aim should be to facilitate mixed uses when planning urban environments. The mixing of housing, business, educational, and recreational use in urban neighbourhoods follows the multiple sustainability criteria. New infrastructure in renewal districts and new developments are being built, freeing cities from path dependencies and allowing for novel, climate-proof

solutions. Investing in high-quality urban structures and an efficient built environment are closely interlinked. For this reason, it is necessary to improve existing building stock in their design, physical conditions and energy efficiency. Improvements in housing standards in new buildings, as well as in the existing, large, prefabricated, old and low-quality buildings, bear the biggest potential for increasing energy efficiency within the EU, and thereby combating climate change.

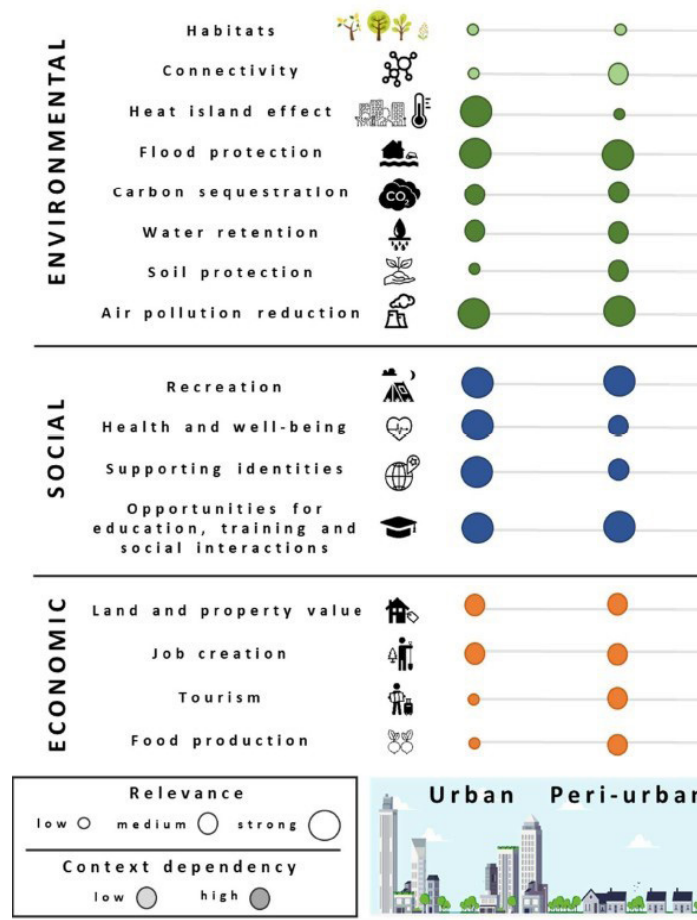
Monofunctional urban settlements do not facilitate sustainable urban environments. It is not enough to reduce energy demand in buildings by making them energy efficient. Another main driving force for the transition towards a clean, resource-efficient and carbon-neutral future is urban mobility. Transport generates multiple externalities - air pollution, noise, congestion and road accidents. Sustainable, clean and affordable alternatives tackle listed issues, organising transport in a manner that will better integrate urban districts and city regions as a whole. It also promotes pedestrian and cycle traffic. Higher urban densities and reduced urban sprawl make it possible to provide attractive and efficient public transport.

The transition to sustainable urban growth can only be successful if the quality of life of the entire urban community is improved. Sustainability measures should encompass an inclusive approach.

The **GRETA** (Green infrastructure: Enhancing biodiversity and ecosystem services for territorial development) project analysed the spatial distribution of green infrastructure (GI) by connectivity, multifunctionality and spatial planning. GI plays a multidimensional and multisectoral role in urbanisation processes. It improves quality of life, directly turning natural assets to environmental, social and economic uses and benefits. The GRETA project explored multiple objectives of green infrastructure and positioned them across EU, national and local policies through the following topics: biodiversity, water, climate, agriculture and rural development, forestry, transport and energy, health and spatial planning (Figure 4). The highly-positive input of green infrastructure should be balanced by the negative implications of green gentrification of land use, cost-efficiency and feasibility of green infrastructure, as well as the risk of allergies and invasions by alien species. Trade-offs occur more often in Eastern countries (GRETA, 2018).

Figure 4

Services of green infrastructure in urban areas (modified from GRETA, 2018)



The GRETA project also identified territorial mismatch between the green infrastructure supply and demand for flood regulation, reducing soil erosion, water purification and recreation. Naturally, the pattern primarily follows the population, urban and infrastructure density. Regionally, the potential GI network has a lower coverage for the regions in north-western France and Germany, south-eastern UK and Ireland, and Denmark. The coverage of potential GI is higher for Nordic countries, the Balkan countries along the Adriatic Sea, and the eastern Alpine region. The GRETA project contributed to green infrastructure in three main policy domains: biodiversity, climate change and disaster risk reduction, and water management. The range of services delivered by GI and the number of policies benefiting from it are considerably higher in Central European regions, as compared to north-eastern and south-western regions. The supply and demand of ecosystem services occurs predominantly in northern Europe. The highest deficit is registered in Hungary.

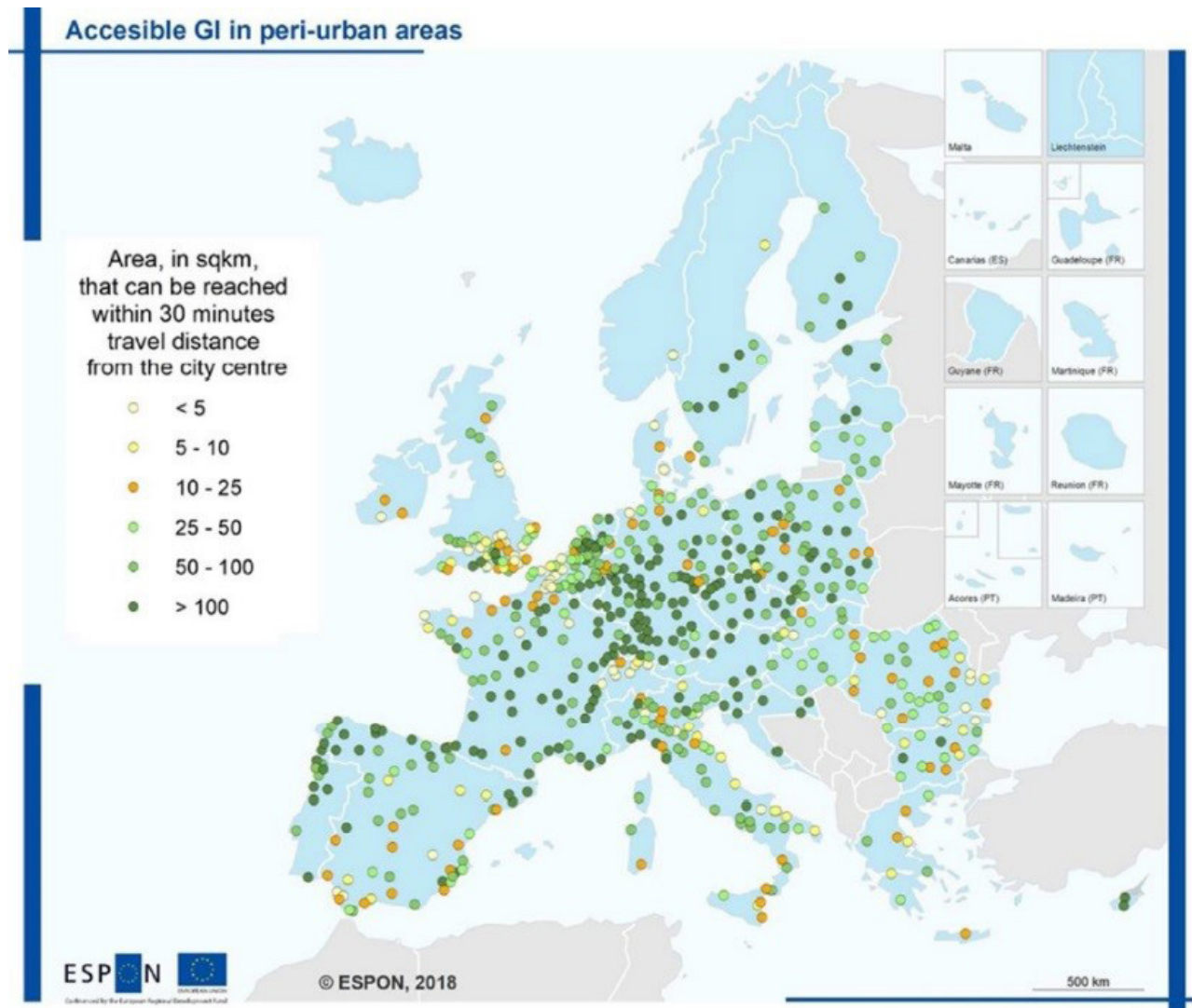
At an urban scale, European cities are relatively green, with many possessing more than 80% green areas. There

is a concentration of core cities with lower values in a corridor stretching from the UK to the Benelux countries, and another one stretching from Germany to the north-eastern part of Europe (Poland and the Baltic countries). In the majority of European cities, green spaces have been either stable or decreasing between 2006 and 2012 (GRETA, 2018). As reduced land consumption for built-up land reduces the pressure on green infrastructure, a reduced land intake indicator would contribute to strengthening the green networks of urban regions.

As a rule, the accessible green infrastructure area is greater in the peri-urban area than it is in the inner city (Figure 5). The accessible area inside the city is quite limited in Italy, Spain, the UK, Belgium and Bulgaria, as cities in these countries have certain limitations on the capacity to provide accessible green infrastructure, regardless if it is inner-city or considered the first rings of a peri-urban area. In contrast, cities in Sweden and Finland have high accessibility to green infrastructure areas, both inside and outside the city (GRETA, 2018).

Figure 5

Accessible green infrastructure in peri-urban areas (GRETA, 2018)



Source: ESPON GRETA, 2018
 Origin of data: The Global Roads Inventory Project (GRIP) dataset, 2018, Potential GI network (ESPON GRETA), 2018
 © UMS RIATE for administrative boundaries

2.2. Climate adaptation and resilience

ESPON resources: [TITAN](#), [SDG localizing tool](#), [TIA tool](#), [BT2050](#), [Alps2050](#)

Policy questions

- What are the economic and societal impacts of climate change and climate disasters across European regions and cities?
- Which climate change adaptation measures could be put in place as part of an integrated, place-based development strategy?
- How should regions and cities cooperate to ensure the efficiency and coordination of adaptation and mitigation measures at wider geographical scales?

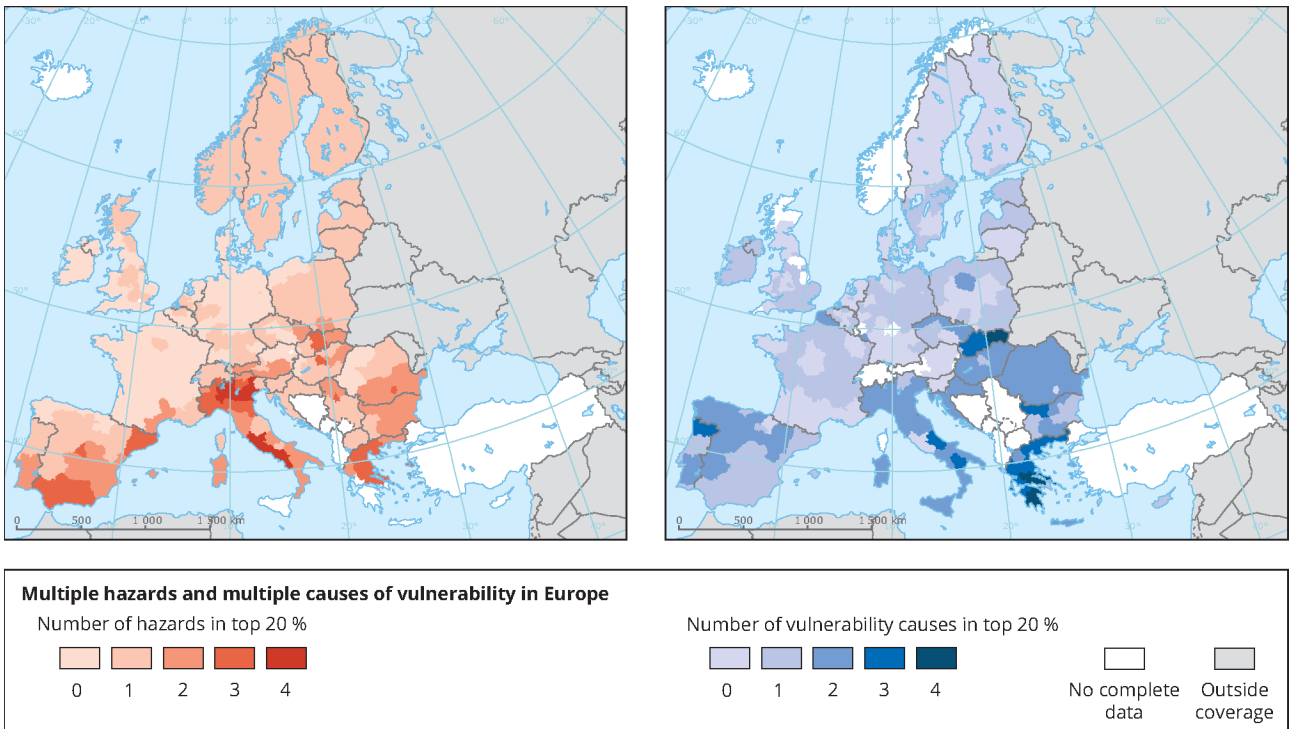
Impact of climate change increases territorial gaps.

No European region is protected from the consequences of climate change, though the impacts of climate change vary considerably across Europe in terms of geographical regions, with different types of impacts and different degrees of vulnerability depending on the socioeconomic conditions, services, governance and awareness. ESPON-TITAN elaborates a novel approach and methodology to provide evidence of the economic and societal impacts of natural hazards in a disaster risk management and climate change context. The increased risk of sea-level rise, drought, desertification, floods and other natural hazards calls for place-specific responses.

In the future, climate impacts will be even stronger and unequally distributed across Europe (Forzieri et al, 2018). While regional variations have a wide territorial context, Southern Europe and the Mediterranean basin, mountainous areas, coastal zones, and floodplains are particularly vulnerable to climate change. The vulnerability to climate risks will be higher in the Mediterranean area, which is predicted to suffer more from the effects of heat-related human mortality, fundamental water deficiency, significant habitat loss, and a much higher energy demand due to cooling and enlarged areas of forest fires (EC, 2018b) (Figure 6).

Figure 6

The number of hazards and number of vulnerability causes in the top 20% of exposure in Europe (EEA, 2018)



Social vulnerability to climate risks. The underlying objective of climate adaptation is to avoid the decline of citizens' well-being and quality of life due to climate change and disasters, including related but unintended

consequences. Maladaptation and insufficient partially delayed solutions cause widening social and economic disparities in Europe.

Special attention should be paid to the poorer regions, as poverty risk increases vulnerability to climate risks (Figure 7). Heatwaves, which expose higher risks to socially-vulnerable groups sensitive to climate risks, are expected to occur more frequently in Southern Europe. As such,

regions with a higher risk of poverty, such as southern Italy, southern Spain, Greece, Bulgaria and Romania, are critically exposed to the heatwaves (Figure 8).

Figure 7

At Risk of Poverty rate in 2015, an indicator of social vulnerability (Nordregion, 2016)

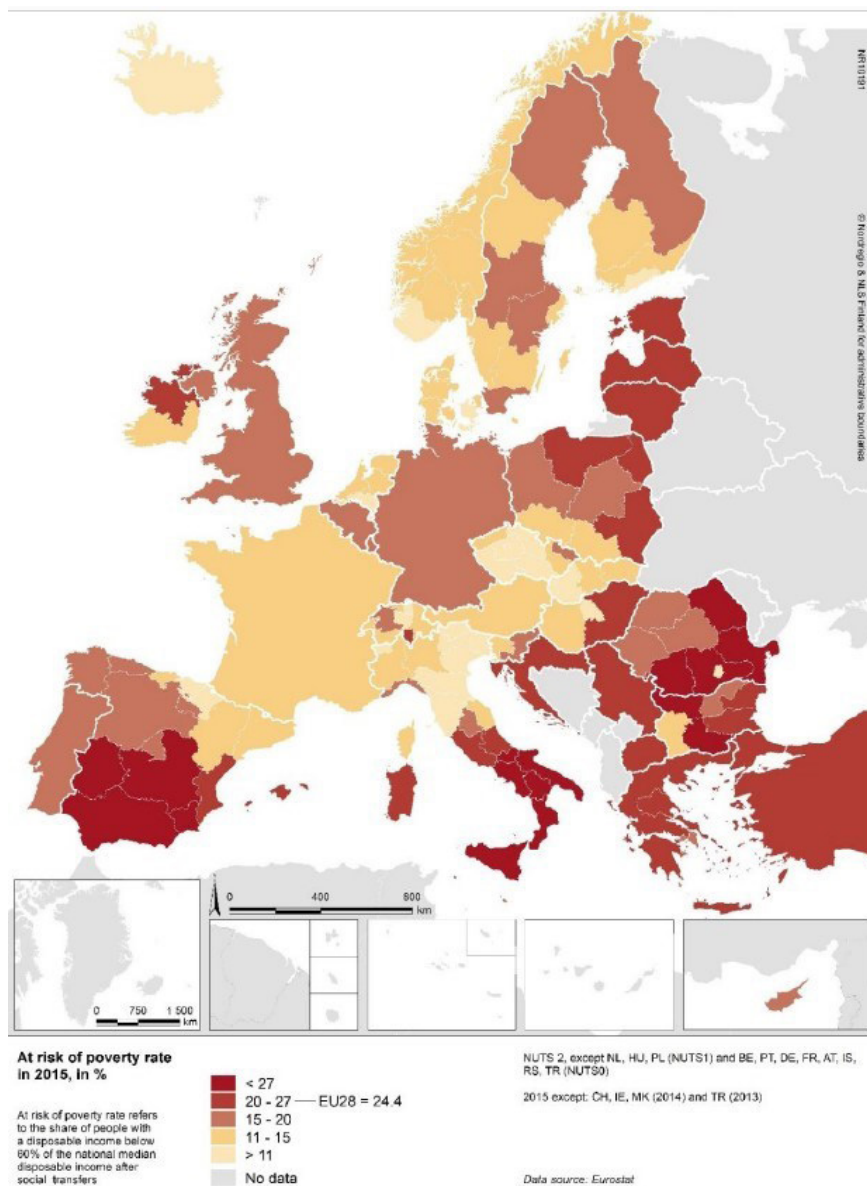
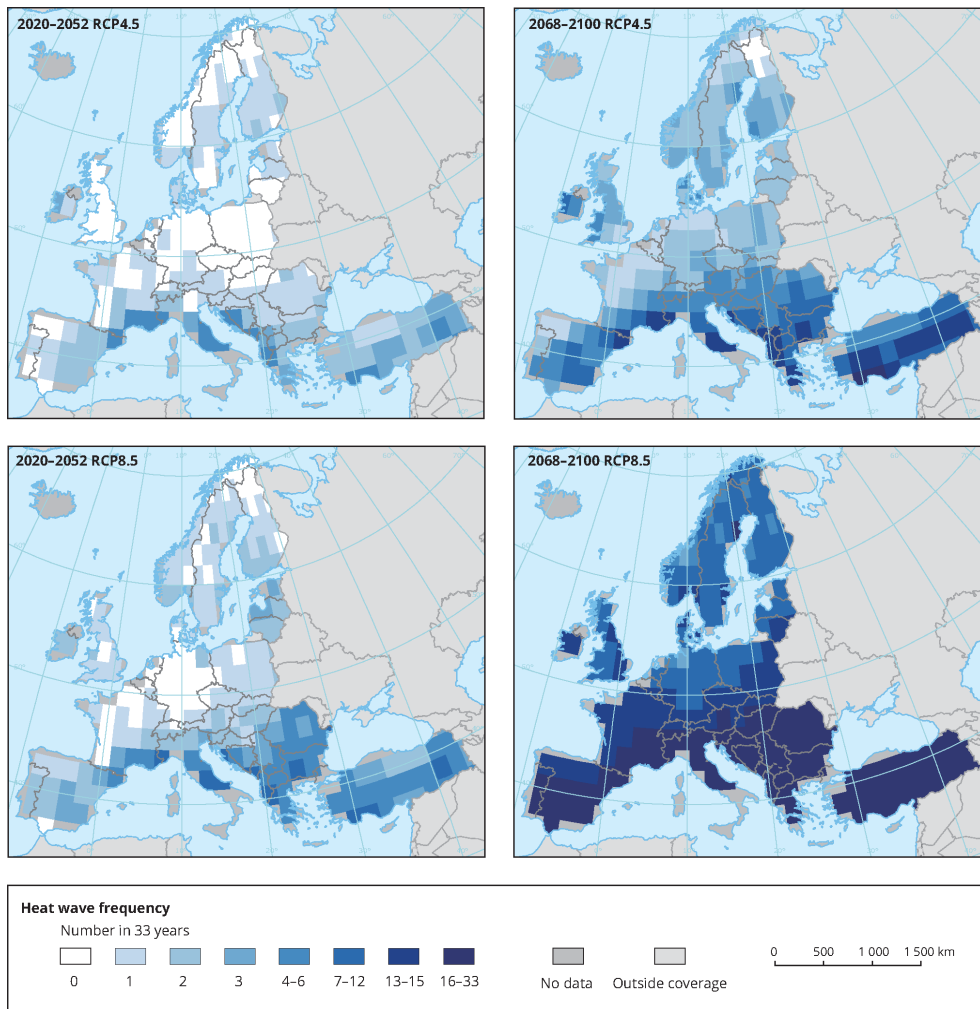


Figure 8

The number of heat waves in the period 2020–2052 and 2068–2100 under the RCP4.5 (moderate) and RCP8.5 (extreme) scenario (EEA, 2019b)

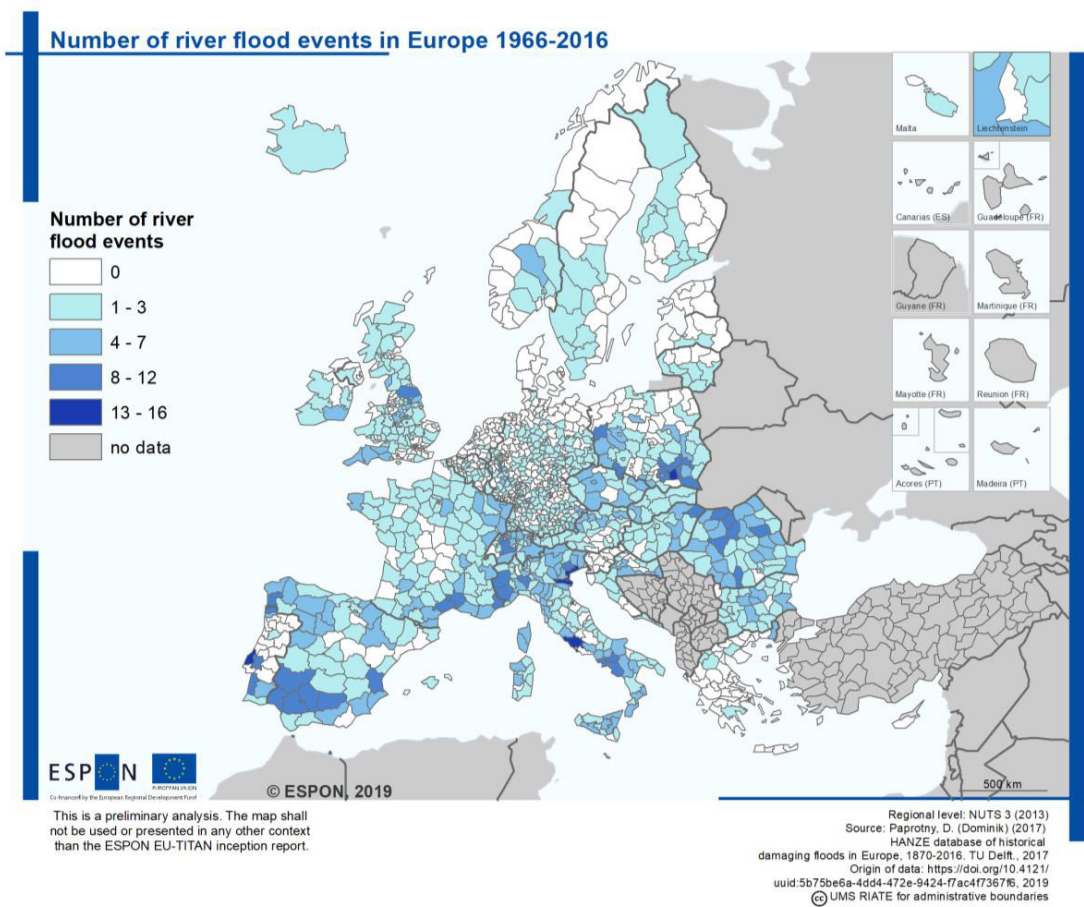


Flooding can damage both urban infrastructure and property, while heavy water run-off affects every aspect of urban life - from transport and logistics to public health and the residential sector. The territorial impact of policies to decrease the risk of urban floods can be assessed using the ESPON TIA tool. The flood hazard map based on the HANZE database shows the number of events per

NUTS3 area for a given time frame between 1966 and 2016. The uncertainty of the HANZE database survey concerns the reliability and inter-comparability of the reported historical data. Change in relative sea level causes damages and disasters in European coastal zones, and has an extended impact via functional tiers to coastal regions, logistics and tourism-driven economies.

Figure 9

Number of river flood events in Europe, 1966-2016 (ESPON TITAN, 2019).



Direct damage of climate disasters. Climate hazards can directly damage buildings and capital stock, impacting the value of the property. Direct damage to energy, transport, telecoms, waste, and ICT infrastructure can happen. Long-term damage and disruptions may affect the region's services and daily operations. Social impact may cause loss of life, evacuations and societal disruptions. Using damage functions, TITAN distributes the total costs of a climate hazard event across six main capital stock types, namely: human capital, machinery, infrastructure, buildings, arable land, and others. Climate disasters lead to the loss of various types of regional and sectoral capital stocks that result in lower outputs, lower regional incomes and lower regional demand. After capital stocks have been damaged by a climate hazard, they need to be reconstructed. The territorial vulnerability of European regions is mapped based on impact pathways, weighed vulnerability scores and potential economic losses. Regions with more green infrastructure per capita may be less exposed to environmental impacts, e.g., heat islands and floods. (TIA tool, 2018). By nature, small cities are more resilient.

Mobilisation on programmed climate actions based on regional evidence. The overall assessment of SDG 13 (climate action) is neutral, as both progress and negative developments have occurred. As energy efficiency targets are compromised, and the increase in the share of renewable energies has slowed down, the adaptation is booming, in particular at municipal territorial governance. The EC has introduced adaptation in the Covenant of Mayors and has been mobilising cities in adopting local adaptation strategies. By 2019, roughly 1,800 Covenant signatories from European countries, covering around 75 million inhabitants, had committed to conducting vulnerability and risk assessments, and to implementing adaptation plans (EC, 2019).

The TITAN project will propose instruments and policies for disaster risk management and adaptation. It also identifies governance structures that have succeeded in integrating disaster risk management into spatial planning and cooperation mechanisms of stakeholders at various territorial governance tiers (ESPON TITAN, 2019).

With the ESPON TIA tool, territorial sensitivity describes the baseline situation of a region, in terms of its ability to

cope with external effects. It is a characteristic of a region that can be described by different indicators independently of the topic analysed. The exposure layer describes the intensity of the potential effect on a specific indicator of the EU's implementation of the 2030 Agenda.

3. Discussion

The following discussion topics occur in relation to sustainability, climate change resilience and their territorial dynamics in stakeholder and research communities of the European territorial development:

- Territorial capacities of adaptation: fixed territorial structures, fluid functional tiers, long-term change and disasters
- Lock-ins, trade-offs versus synergies: sector versus cross-cutting approaches
- New emerging discourses, such as climate resilience versus 'old' sustainability (Agenda 21)
- Territorial governance tools for long-term changes

3.1. Global and European diversity

The sustainability goals and indicators lead to the question of European diversity. The discussion could be shifted to the plurality of cases across the European Union concerning awareness of the Sustainable Development Goals and their implementation through integration with their spatial planning. A clear signal on sustainability is paramount. There is the possibility to be trapped by dichotomic paradigms of the type North/South or East/West. Political culture, social traditions and economic outlook do affect how holistically, comprehensively and systematically each country develops its strategic spatial planning, though usually popular general statements tend to blur the territorial realities and do not allow us to see how neighbouring countries act in territorial policy making for sustainability and balanced growth. Sweden and Finland were given as an example of such differences, with Sweden following a more decentralised model referred to the Urban Impact Assessment Report on the Implementation of the 2030 Agenda (ESPO, 2018).

Is land use regional and local? It relates to the adjusted national commitments of EU member states based on carbon accounting, which is focused strongly on the supply side, with few amendments from the demand/end-user/consumer side, undermining the carbon leakage both continentally and globally. As for what can be done locally in urban areas with high land intake, the sustainable land-management framework requires sectoral coordination and investments in integrated land-use planning, including urban land with the built environment. Evidence-based accounting for carbon debits and credits are essential, not just on forest and agricultural land uses, but also for transfers and land intake, which are not

recognized by current international and European carbon accounting and national reporting (UN, 2019).

Measurable indicators play a crucial role in delivering sustainability. Downscaling and refining the SDGs and selecting the relevant indicators could be challenging. The optimal spatial scope of city-region relations depends on the policy intervention capacity to make the most of the regional endogenous potential. Understandably, this spatial scope depends on the city's functional regional influence. Highly adaptable sustainable urban development policies fuel the inter-urban competition for investment, shared discourses of growth and development, jobs, as well as the realities of increasing pressures to decarbonise the urban economies and to mitigate climate risks in international economic integration (Peck, Theodore, and Brenner, 2013).

The Nordic municipalities struggled with breaking down global goals and priorities to the local level and noted the lack of support from higher tiers of government (Nordregion, 2018). To avoid inefficient use of resources, it is necessary to define priorities at the beginning of process, keeping in mind the holistic nature of the sustainability concept and the 2030 Agenda. Local and regional authorities should define how to start and what actions are needed first. Potential conflicts between SDGs must also be addressed internally, from the outset of the process.

Another fundamental issue is the developed world – developing world dilemma of the SDG methodology. The SDGs should be adjusted, usually upgraded to the European welfare and standards, as the SDGs and their global approach tend to prioritize settings of the developing world. The European refinement of the SDGs should take into consideration and benefit from much higher 'normal' standards. The insight and monitoring can be enhanced

from better data coverage by Eurostat and other sources. For example, SDG11 on sustainable cities and communities is featured by the following indicators: overcrowding rate by poverty status, recycling rate of municipal waste, population living in poor conditions, population connected to at least secondary wastewater treatment, share of busses and trains in total passenger transport, population reporting occurrence of crime.

Push and pull measures in sustainable urbanisation.

Urban sustainability seeks to tackle concerns of climate change, urban land use, economic development, and environmental protection through a multi-stakeholder approach (Adscheid and Schmitt, 2019). Tackling urban complexities includes challenging inertia in the built environment and weak systems thinking for sustainable urbanisation. Insight into changing urban dynamics and its impacts and relevance to urban form results in different consequences for infrastructure and urban environments. There is still widespread disagreement on the relative importance of drivers (Colsaet et al., 2018); that is, to what extent are observed urbanisation dynamics caused by demand (e.g., demography, economic development), supply (e.g., the development of land by market actors), territory (e.g., existing infrastructure), and/or institutional practices. Similarly, the vulnerability and predisposition of people to be negatively affected by climate change is quite complex, linked to personal vulnerability, economic status, social support and awareness of risk.

3.2. Unexpected consequences and feedback loops in holistic approaches

Focusing on the SDG indicators as a single policy outcome to achieve climate and energy goals may have unexpected consequences (Camagni & Capello, 2013). An improvement in the quality of people's lives is simply ensured through access to public services and reduced

inequalities, regardless of the energy transition or climate disasters. Progression towards one goal of the SDGs may result in a cancellation effect, whereby progression towards another goal is then limited (Scherer et al., 2018). The territorial synthesis is not a simple mathematical exercise in addition.

The feedback loops between the goals lead to synergies, where development in one goal is beneficial to another, as well as to trade-offs (where development in one goal negatively impacts another). The goals with the highest number of trade-offs are economic growth and the environment (SDGs 8, 9, 12, 15). These interactions occur due to the current reliance on economic growth and increasing levels of consumption at the detriment of the environment. The negative implications in relation to sustainable goals as well regions and territories must also be taken into consideration when creating policy to achieve the SDGs.

The challenge is taking a holistic regional approach instead of split sectoral policies. To avoid this, an integrated approach is required to ensure that the actions that have synergies with other targets are implemented (Allen et al., 2018). Both a lack of technical capacity in terms of the skillsets of the policy makers, and a difference in countries and regions impacts the degree to which the synergies occur, as well as the impact that different actions have.

Miola and Schiltz (2019) argue that country context dependent indicators should be used as they provide a more consistent data source to evaluate the performance of a country. Assumingly, the variations at a NUTS3 region could be even higher. Also, the rankings can be sensitive to the imposed assumptions and chosen aggregation method, even when the same indicators are used. Depending on political climate, in some countries, the process of implementing the SDGs framework could be more important than the final result in terms of performance.

4. Policy recommendations

The urban sustainability and resilience discussed in this paper provides a background and framework to support the ESPON discussions on European territorial cohesion. The following thematic clusters need further discussions for contributing evidence-based knowledge to the territorial policies in the sustainability pathways:

1. Addressing the risk of widening territorial gaps (coal regions, territories with specificities)
2. Elaborating and integrating climate-proofing in urbanisation, strategic planning and investing
3. Establishing multi-level policy making for sustainability and climate change

Single territories contribute in different ways to the transition towards climate-proof and decarbonised regions and cities, according to their structural features, various limitations and lock-ins. Among major policy implications based on competitiveness and growth, the environmental dimensions of territorial cohesion should be integrated more strongly in key European policies to reach a territorial cohesion according to the SDGs.

1. Addressing the risk of widening territorial gaps

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future, in this context with the purpose of stimulating a more balanced EU territory, mainly because of the growing horizontal interventions of a Green Deal, climate policies and a transition that occurs in changing territorial and urban patterns. The draft of the Territorial Agenda 2030 states that global challenges in the field of sustainable development are highly relevant for local and regional development in Europe, while transformation and transition are gaining momentum. The sustainability transition and climate change adaptation must continue to help European countries and regions grow upwards and towards one another, while avoiding wider regional injustices and inequalities in the EU, both within and between regions. EU cohesion policies should articulate measures to prevent climate policy packages from increasing territorial disparities. Rauhut and Medeiros (2018) proposed the Territorial Cohesion Index, which indicates and integrates rationales for development challenges, particularly for regions and cities that are lagging behind. Also, various composite sustainability indices are applied in macroregions and countries.

Widening territorial gaps. There are risks associated with enlarging territorial gaps due to implementing the climate policy in the form of the Green Deal. Therefore,

much more focused analysis is needed to explore the energy transition, structural change and its impact chains in the coal and carbon-intensive regions. The cohesion policy remains a major EU investment tool to support the implementation of sustainable development that is in line with the Urban Agenda for the EU, such as investing in more sustainable infrastructure and balancing territories.

Coordinated policy making in cross-border areas and territories with specificities. Transboundary risks need to be assessed and taken into account in a coordinated manner. There is a direct need to strengthen adaptive capacity across borders and have similar territorial specificities in EU macroregions that share common climate risks and territorial conditions (e.g., pan-European river basins such as the Danube, Rhine and Elbe, mountainous areas such as the Alps, and islands).

2. Climate-proofing in urban development, strategic planning and investing

Climate policy will be an engine of the green economy and infrastructure in the coming decades. The know-how in making urban development and urban living greener and more resilient is a new societal task in rethinking spatial planning, design, infrastructure, services and mobility. The importance of enhanced urban resilience and adaptation action is acknowledged by many European mayors, as the declaration and methodology of the Covenant of Mayors has integrated adaptation to municipal climate policies (EC, 2018b). Still, special attention is needed for sustainable urban peri-urban development, despite increasingly strict controls on greenfield urban growth and land use in general.

Ensuring more resilient infrastructure could be achieved by climate-proofing sectoral and infrastructure investments. The current framework of the Strategic

Environmental Assessment needs advances in the direction of climate risks. Adaptation means anticipating the adverse effects of climate change and taking timely precautionary measures to prevent or minimise the damage they can cause, though taking advantage of opportunities that may arise from climate change is often overshadowed or totally forgotten. Here, the picture is more nuanced for winners and losers in the land use, energy, and transport sectors.

Climate-proofing through systematic scrutiny in this way would allow policy makers to recognise trade-offs that might exist between urban development and climate risks. One way, for example, is by developing a localising suite of screening tools for sustainable development goals that are used in territorial governance, to consider the trade-offs and synergies between the policies in question and other sustainable development outcomes.

Making greater use of integrated urban development policy approaches increases resilience to unexpected disastrous events, thus keeping public services, efficient transport, reliable energy networks and broadband internet throughout the territory. The focus should be on integrating mitigation and adaptation efforts to avoid trade-offs and counteracting. New business models that are fit to the economic and energy transition and resilient to the climate change should take advantage of new technologies enabled by finance, pricing and taxation, and social responsibility.

The quantification of the benefits of green infrastructure should be operationalised to create economic motivations for implementing it. This involves applying economic valuation methods to the specificities of green infrastructure. The strong benefits and allocating hot spots should inform decision makers where to invest in green infrastructure. Policy integration with relevant domains, such as finance, energy, health and social services, is vital; it should become prominent by the integration of ecosystem and green infrastructure principles in strategic spatial planning (GRETA, 2018). Climate-proof is future-proof.

Assessment of the SDGs and climate goals. Assessing sustainable development and climate goals requires critical upgrading in terms of scientific excellence and integrity. This is not provided by the current framework and methodology of statistical and environmental reporting, which belongs to the ready-made cohesion paradigm and policy relevance from the 2010s. If there is methodological progress at the national scale, regional coverage remains fragmented, with low quality and certainty. This undermines the overall multidisciplinary, targeted and balanced approach to reflect the universal, indivisible and integrated nature of sustainability. Several global, developing-country-adjusted approaches, methods and priorities do not fit European countries and regions.

There is the need to refine the SDGs to the local and regional level in order to exploit the transformative potential of the 2030 Agenda, and to empower policy support and awareness in addressing the SDGs at regional levels of governance. For this purpose, the ESPON SDG localising tool provides a simple and user-friendly application that informs stakeholders of regional trends and progress, as well disparities and inequalities. The holistic approach taken on multiple territorial scales, with a variety of sources and dispersed information, needs to be assessed by scientists representing a variety of backgrounds, scientific disciplines and pan-European geographies.

As mitigation policies are well covered by quantitative indicators, adaptation policies remain relatively vague in terms of indicators and societal implications. The common metrics used for the impacts and vulnerabilities of climate change, its uncertainties and long-term prospects, should integrate non-climatic factors, cross-sectoral interactions and cross-border impacts.

3. Setting the multi-level policy making for sustainability and climate change

Policy support: turning political commitments into sustainable cities and regions. To rearrange and reset unfit policy frameworks one can create the high-level science-policy forum to provide a strong evidence-based instrument to support European policy makers in various territorial governance tiers, promoting carbon neutrality and sustainable development. Applying the political mainstream discourses, the Urban Agenda for the EU does not focus on the smaller cities that are important for territorial cohesion, but on metropolitan and bigger functional urban areas (Medeiros and Rauhut, 2018). Fuenfschilling et al. (2019) discuss urban experimentalism and governance experimentation in a multi-level governance context, calling for caution against too heroic assumptions and naïve expectations of cities and their mayors, as urban sustainability transitions are not driven in and by cities themselves.

The sustainable paradigm is a shift towards governance systems, where decisions are built upon co-operation and collective global values, and where strategies and actions of major actors are aligned, applying long-term, adaptive and participatory governance models that can also apply to urban governance (Jokinen et al., 2018). The approach should strengthen regional climate strategies, cases and practices for a policy-driven cataclysmic transition, specifically in regions with special situations. It supports designing integrated pathways to sustainable development and climate change that correspond to specific needs and priorities. As sustainability results in a certain rhetorical makeover in urbanised Europe, climate policy is already a kingmaker in Europe's territorial governance.

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