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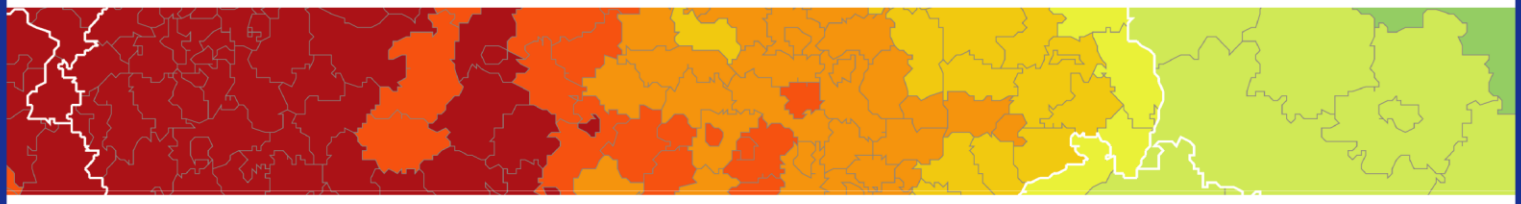

Possible European Territorial Futures

Applied Research

Final Report
Volume A

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Possible European Territorial Futures

Table of contents

List of Figures

List of Maps

List of Tables

Abbreviations

EC	European Commission
ESPON	European Territorial Observatory Network
EGTC	European Grouping of Territorial Cooperation
EU	European Union
FYROM	Former Yugoslav Republic of Macedonia
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GVA	Gross value added
IoT	Internet of things
NUTS	Nomenclature of Territorial Units for Statistics
R&D	Research and development
R&I	Research and innovation
RDI	Research, development and innovation
RES	Renewable energy sources
SME	Small and medium-sized enterprise
UK	United Kingdom

1 Introduction

The ESPON project 'Possible European Territorial Futures' stands in the tradition of past ESPON future and territorial impact assessment studies. The project developed a new approach to territorial foresight and tested it on three foresight topics: a new place based economic organisation as part of a circular economy, European energy supply and consumption that is 100% renewable and a collapse of European property markets.

Researching the future implies dealing with uncertainty. One way to work with high levels of uncertainty is to develop participatory approaches, which complement data analysis, modelling and desktop studies. An additional feature is enabling a cross-fertilisation of ideas and common learning, in line with co-creation and design-thinking scenario-building approaches. These are important perspectives forming the basis of the territorial foresight approach developed.

Having tested the approach, we are happy to conclude, that the new participatory approach to territorial foresight works. The results of the three test cases and the feedback from the participants in the interactive processes show that approach to territorial foresight can be applied for other topics and at any other geographical level (from local to global). Policy-makers may use the new insights on the three foresight topics (used for testing) to assess the robustness and 'future-proof' capacity of their policies.

This report brings together the most important results of ESPON project 'Possible European Territorial Futures'. While this report synthesises the analysis presented in subsequent volumes, the single volumes present more details of the work carried out.

For those interested in running an own territorial foresight exercise, chapter 2 presents shortly how to conduct territorial foresight – regardless the topic or geographical scale in question. A more detailed handbook on territorial foresight is presented in Volume C.

Chapter 3 synthesises territorial features in Europe today which will most likely shape European territorial futures in the coming decades. It also contains a short reflection on territorial implications of a possible European disintegration. This chapter serves as general background against which the territorial implications of the foresight topics – used for testing the approach – have been assessed. A more detailed analysis is in Volume B.

The results of the testing of the foresight approach is presented in three chapters addressing the three foresights or 'what if questions' defined in the Terms of Reference for this study:

- What could be the territorial consequences if a new place based economic organisation were implemented as part of a circular economy? This question is addressed in chapter 4 and more detailed analysis is presented in Volume D.
- What could be the territorial consequences if Europe's energy production and consumption were 100% renewable? This question is addressed in chapter 5 and more detailed analysis is presented in Volume E.

- What could be the territorial consequences if European property markets collapsed? This question is addressed in chapter 6 and more detailed analysis is presented in Volume F.

Chapter 7 addresses some of the key methodological steps in the research. More detailed discussions on territorial foresight approaches and methodologies are in Volume C. Finally chapter 8 points at further research in the field.

At the end of the report, there is a glossary with a wide range of different terms which can be useful when engaging with territorial foresight. As a taster, the below textbox contains some conceptual definitions of relevance for this study.

Some conceptual definitions

Foresight – also referred to as forward thinking – is widely understood as a future oriented approach characterised by (a) critical, lateral thinking concerning long-term developments, (b) broad discussions creating wider engagement (ranging from expert panels to crowd intelligence) and (c) shaping the future, especially by influencing public policy. The Joint Research Centre[1] describes foresight as a framework for people concerned with common issues to jointly think about the future in a structured and constructive way. Foresight provides a number of tools to support participants in structured forward thinking (Loveridge, 2009; Steinmüller and Steinmüller, 2006).

Scenarios describe a plausible version of how the future might develop, based on a coherent and internally consistent set of assumptions ('scenario logic') about the key relationships and driving forces (based on Carpenter et al., 2005). The focus is usually on alternative scenarios to highlight the uncertainty. Scenarios are most useful when considering whether policies or specific measures are suitable for the future with regard to the territorial diversity of expected developments (Zillmer et al., 2015).

Visions describe a desirable picture of the future, based on a core set of ideas, values and principles. In an ideal case, visions are based on broad participatory processes creating a large ownership of this shared picture of the desirable future. In some cases, the terms 'perspectives' or 'long-term strategies' are also used. Visions are most useful when discussing whether a policy or specific measure is likely to contribute to desired territorial patterns in Europe (Zillmer et al., 2015).

[1] See e.g. https://ec.europa.eu/jrc/en/research/crosscutting-activities/foresight and in particular the JRC's ForLearn research project http://www.foresight-platform.eu/community/forlearn/

2 Guidelines for participatory territorial foresight processes

An important part of the ESPON study on possible territorial futures was to develop and test approaches to territorial foresight. This chapter provides practical steps for people to explore participatory territorial foresight, at any geographical level and for any foresight topic (in or outside the context of ESPON). This is a short, hands-on guide.

More substantial and broader information and instructions are in volume C, including a comprehensive review of the most important studies and methodologies as well as a comprehensive general guide to foresight. The volume also contains lessons learned from this and past ESPON studies as well as recommendations for a stepwise approach to co-create territorial foresight.

Territorial foresight is a future oriented approach characterised by (a) critical, lateral thinking concerning long-term developments and their impacts on territorial development, (b) wider participatory engagement and (c) informing public and/or private decision making. Territorial foresight provides a framework to support 'a group of people concerned with common issues' to jointly think about possible futures and its territorial consequences in a structured and constructive way. As foresight process it provides a number of tools to support participants in structured forward thinking (Loveridge, 2009; Steinmüller and Steinmüller, 2006). To ensure the territorial dimension in foresight thinking, the ESPON approach to territorial foresight adapts elements of the territorial impact assessment developed under earlier ESPON studies. This approach can be used to study any policy questions, future vision or dystopian thoughts.

Territorial foresight can be conducted at any geographical level. While this study focused on the European level, it could equally well be applied at any other scale from local to global.

The ESPON approach to territorial foresight starts from a roughly defined topic or 'what if question'. The aim is to explore possible answers to a question such as 'What would be the territorial implications, if we had XYZ in future?'

The centre piece of the approach is a well prepared and clearly structured focus group.

One way of conducting a participatory step-by-step approach, brings together foresight processes and the ESPON approach and is split into three distinct phases:

- **Preparation** (incl. document studies and analysis on foresight topic and preparation of the participatory event);
- **Interactive participatory involvement** (incl. at least one participatory event, possibly also several events or also accompanying online surveys or webinars);
- **Finalisation / post-processing** (post processing of the results of the participatory event(s) including additional analysis where needed).

2.1 Preparation

The success of a territorial foresight depends on how existing materials (both quantitative and qualitative) are brought together and fed into participatory processes. Furthermore, the quality of a participatory approach depends on the profile and composition of participants. Therefore, the preparatory steps are important.

2.1.1 Selection of participants

In short, a crucial question for the selection of participants is 'Who has a stake in the foresight topic or relevant expert knowledge?'. Based on this, participants should be selected carefully taking into account: (a) expertise in the field (b) different functions (e.g. academics, policy makers, practitioners) (c) different 'thematic expertise' (e.g. different professions) (d) different 'geographical expertise' (e.g. levels and/or parts of the territory covered).

2.1.2 Preparation of a discussion paper to set the scene

Generally, participants should receive input to set the scene, prior to the participatory event (workshop / focus group). This input can be a discussion paper, which sets the mood for the topic to be discussed and provides background information on the process, topic, possible trends/features to be addressed and how far in the future the process should look. The aim is to provide a common basis of understanding on a number of points:

- Structural information
  - Context and aim of the event
  - Approach at the event
  - Use of the results
- Content information
  - Description of the topic
  - Information on the topic, including inputs and maps on indicators that show the territorial dimension of the foresight topic
  - Factors impacted and cause-effect chains
  - First hypothesis on territorial exposures and sensitivities (or impacts)

2.1.3 Pre-selection of maps and indicators

To ensure high quality discussions at the event, information such as maps and statistics should be available to be fed into the discussion when needed. The preselected material may include:

- Thematic information
  - Fine tuning understanding of the foresight topics
  - Forecasts and prognoses for specific aspects of the foresight topics
  - Initial systemic picture showing cause-effect relations between parameters influencing the foresight topic
- Territorial information showing the territorial diversity of the topic
  - Geographic information with the exposure of types of territories to the topic

- Geographic information with the sensitivities of types of territories to the topic
- General territorial background information such as standard indicators on GDP, population, rural-urban distinctions etc., that may be of interest

2.1.4 Preparing the moderation

To ensure smooth running of the event, preparing and printing materials is helpful:

- Detailed moderation script
- Basic flipcharts for 'framing the topic' and the 'cause-effect chains'
- Empty maps for mapping exposure and sensitivity
- Background maps to inform the mapping exercise
- Feedback form

2.2 Running an interactive participatory foresight process

The participatory event or focus group is the centre piece of the territorial foresight exercise. Running a participatory foresight process, is an interesting exercise, where a large number of people need to be guided through complex discussion rounds. The general welcome and introduction to the event should clarify:

- Aim of event and use of the results
  - Broadening the scope – ensuring a wide perspective
  - Input for further research
  - Workshop results are not the final results
- Definition of the approach
  - Time perspective – roughly what year
  - The exercise is about what the future might look like (Imagine you wake up and the foresight topic is reality, what will the territory look like?)
  - The exercise is not about how to get there
- Definition of the foresight topic
  - Definition of the system boundaries (e.g. the territory, general information)
  - Parameters describing the foresight topics
  - Technological, social, economic, environmental changes which can, or cannot be assumed

The general introduction, is followed by specific steps towards a territorial foresight discussion.

2.2.1 Framing the foresight topic

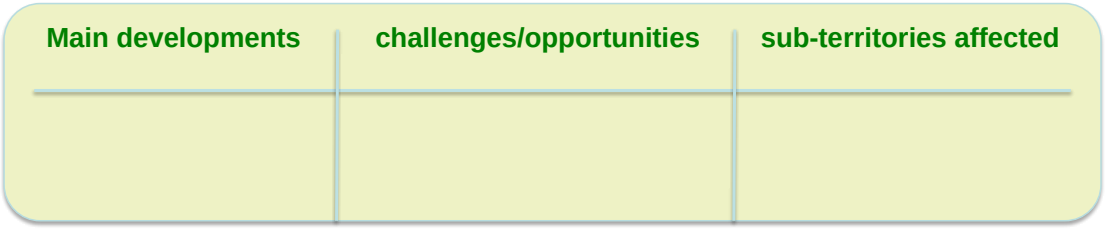
The first participatory moment focuses on establishing common understanding, in small working groups, of the topic:

- Imagine, you wake up in the future:

- What would be the main changes which characterise that new situation in the territory?
- What would be the main challenges/opportunities people will be facing?
- What types or parts of territories would be positively or negatively affected by these developments?

- Following a short time for individual reflection, each sub-group starts to populate a flipchart with developments, challenges/opportunities and sub-territories affected (see below).

Figure 2.1 Structure to discuss framing the foresight topic



Source: ESPON Futures project team (based on ESPON TIA approach)

2.2.2 Identifying cause and effect chains

The second participatory moment focuses on establishing a systemic picture with basic cause-effect relations:

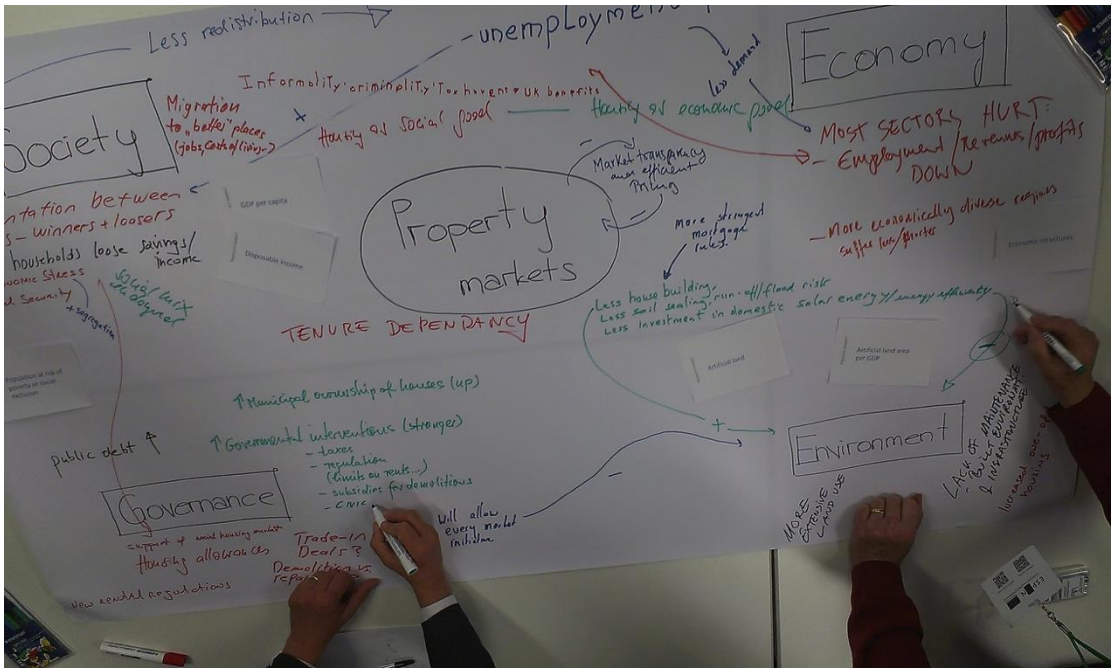
- The group gathers around a large piece of paper where the foresight topic is written in the center and the corners are labeled economy / environment / society / governance
- The group discusses the territorial effects regarding each factor of economy / environment / society / governance
- Who is affected by the new situation and how?
- What are the relationships between the factors?
- Discussion points are noted on the paper and linked with arrows where appropriate

2.2.3 Identifying indicators which can help to illustrate key aspects

After describing the systemic linkages possible indicators and factors were identified that could help to describe these linkages:

- Looking at the cause-effect chains developed in the earlier step, the group considers which factors should further discussed
- The group discusses which factors can be linked to, or represented by, existing indicators
- The group discusses which factors cannot be linked to existing indicators but can be reflected through qualitative information and/or tacit knowledge

Figure 2.2 Identifying cause-effect chains



Source: ESPON Futures project study (focus group in Vienna, February 2017)

Following the general discussion on indicators, the discussion on what should be mapped and what information can be used involves:

- Small group / table discussions focusing on the most important factors / indicators to describe the new Europe?
- Selecting and ranking these factors / indicators (e.g. top 5)
- For each of the factors / indicators, the group discusses what information can help to create a map

2.2.4 Explore exposures

The next participatory moment focuses on identifying the factors to be mapped and which territories are exposed. The exercise ought to be preceded by an explanation of "exposure" and "sensitivity" including concrete examples of exposures and sensitivities.

- **Exposure** (foresight question as a starting point)**:** Are the expected changes especially relevant for certain types of regions? This is mainly to find out which regions/territories to consider for further discussion.
- Group discussions on the areas most exposed to this change? (negatively and/or positively)
- Groups put the areas on draft maps
  - Using blank maps
  - Using tacit knowledge

Exposure: Taking different components of the foresight topic as starting point, exposure is determined by asking: Is a region/territory likely to be (positively or negatively) affected by the change?

2.2.5 Explore sensitivities

The next participatory moment focuses on identifying factors to be mapped, which types of territories are most sensitive to the change:

- **Sensitivity** (regional characteristics as starting point)**:** To what degree will a region/territory be affected? This is mainly to discuss the intensity of impacts that can be expected in exposed regions/territories, considering the specific characteristics of the regions/territories.
- Group discussions on which areas are most sensitive to the change? (negatively and/or positively). Groups put the areas on draft maps
    - Using blank maps
    - Using tacit knowledge

Sensitivity: Taking regional characteristics as starting point, sensitivity is determined by asking: To what degree will regional development be affected? What is the intensity of impacts due to specific regional characteristics?

2.2.6 Developing a foresight narrative

The final participatory moment focuses on developing the final (mind) map and a short presentation on the rationale or narrative for it:

- Group discussion on the 'final' presentation
    - What to put on the map?
    - What story to tell
- Preparation of a 'final' map
    - Use symbols, colours etc. according to their own liking
    - Add a key / legend
- Prepare a flipchart with the story
    - Key messages
    - Rationale / narrative

Figure 2.3 Example - Reporting focus group discussions - map

Source: ESPON Futures project study (focus group in Vienna, February 2017)

Figure 2.4 Example - Reporting focus group discussions - key messages

Source: ESPON Futures project study (focus group in Vienna, February 2017)

2.3 Finalisation / post-processing

While the participants have done their main duty during the focus group work, a lot of the territorial foresight work comes with the post-processing of the focus group discussions. The insights and discussion points from the interactive participatory work need to be followed up. Subsequent document studies and research enrich the territorial foresight narrative into a territorial foresight report.

2.3.1 Meeting information needs

The write-up of the foresight report (see above) will also require additional research to follow-up on points raised during the participatory process, as far as possible.

2.3.2 Write-up

Following the participatory event, the results need to be documented, covering:

- Discussion findings on
  - Framing the topic
  - Cause-effect relations
  - Types of territories affected
  - Factors to territorialise exposures and sensitivities
- Identification of needs for further information
  - Quantitative
  - Qualitative
  - Cause-effect

2.3.3 Combination and fuzzy maps

The hand drawn maps developed during the participatory event function as mind maps. Given the additional information collection these maps can be adjusted to better reflect factual elements. However, to communicate that the foresight is not a prognosis nor a forecast, the sketchy character of the maps should reflect the uncertainty by showing only rough ideas of territory affected. Therefore, it is suggested to develop new sketchy or fuzzy maps.

Having that in mind, development of the final foresight report and maps, should repeat the steps in the participatory foresight process, refining and complementing them with additional desk research.

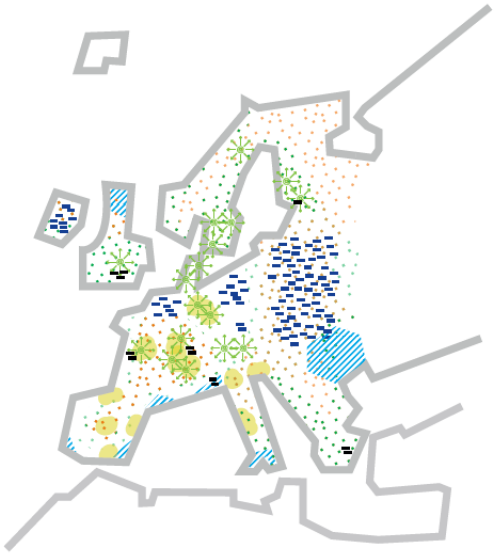
This work will take into account a wide range of uncertainties and therefore allow for variations of single aspects. Based on this, a series of fuzzy maps can be developed showing the main dimensions of the territorial foresight.

The story can be told along arrows in a graphic. More information on fuzzy maps and territorial sketches to illustrate the uncertainty and complexity of territorial foresight can be found in volume C.

2.3.4 Feedback loop

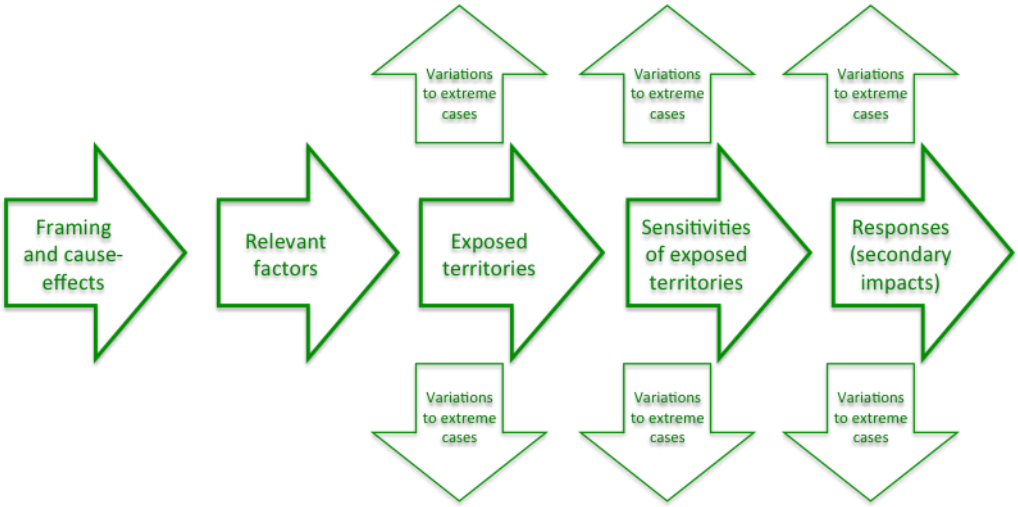
Once the document on the territorial foresight has been written and maps have been developed, the results should be circulated to the participants in the event for feedback. Certainly, responses from this feedback loop need to be considered for further revisions of the report and maps.

Figure 2.5 Example for a sketch, or fuzzy map



Source: ESPON Futures project team

Figure 2.6 Developing the main dimensions of territorial foresight



Source: ESPON Futures project team

3 Europe today and tomorrow

To understand Europe's territorial situation today and changes expected before 2030, the report focuses on four domains: demography, socio-economics, environment & climate change, research & technology and European integration (Böhme and Lüer, 2016, 2017). Based on this analysis, the report draws initial conclusions about the effects on territorial cohesion (see e.g. Zaucha, 2017).

Key messages are:

- Increasing polarisation of settlements;
- Increasing concentration of economic activities;
- Climate change and environment are growing concerns;
- Technology and innovation hold the potential to make new regional stars;
- European disintegration may affect lagging regions more than advanced regions.

3.1 Demographic change

Europe's demographic structure and territorial expression, or settlement patterns, change only slowly. Key factors are increasing concentration and ageing. Migration at global, European, national and also regional level play an important role and further accelerate territorial imbalances.

The implications of demographic developments in Europe can only be fully understood from a global perspective. In short, Europe is an ageing part of the world. In the decades to come it will most probably face demographic decline. At the same time, the global population is growing and Europe is surrounded by areas with very young populations. In the coming decades migration will be increasingly important for Europe. This concerns both immigrants arriving from other parts of the world, but also an increasing number of young and talented Europeans migrating to young and vibrant metropolitan areas outside Europe. Overall the developments are expected to lead to greater rural-urban disparities in Europe with more working-age people in metropolitan areas. In some areas such as eastern Europe and Germany the metropolitan areas might also face population decline. At the same time some rural areas, such as in France, Italy or Scandinavia might see population growth.

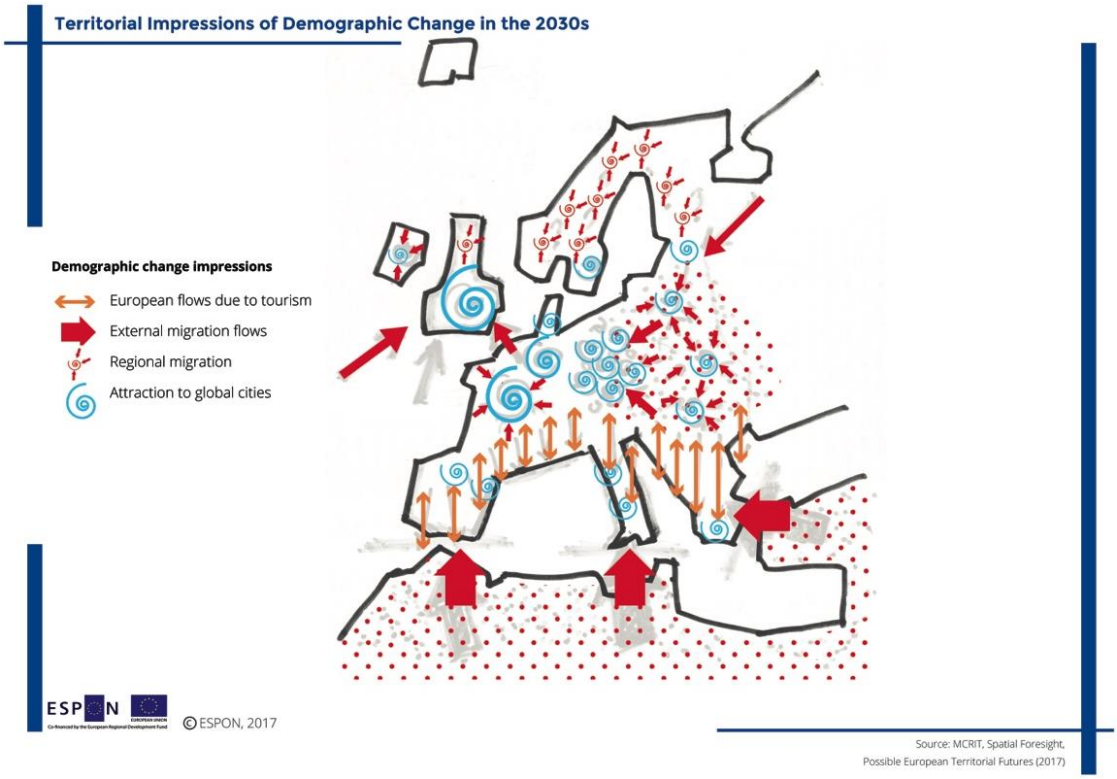
A territorial impression of Europe's demographic future is depicted in Map 3.1. This map is a rough sketch territorialising demographic aspects for 2030. Three key messages shown in that map are:

- Migration flows from the rest of the world to Europe, particularly from Southern Mediterranean regions, represented (red arrows).
- Internal migration towards global cities competing to attract more creative and talented population is represented in smaller red arrows. In the case of Eastern European and some Baltic cities, people from rural sparsely populated areas continue to move towards

large cities and capitals in their countries, as well as towards Western cities (red arrows, blue circles).

- More intense north-south flows linked to residential tourism (orange arrows). This movements will increase all over Europe with increasing number of temporary residents, especially in large cities and most touristic areas.

Map 3.1 Territorial impressions of demographic change in the 2030s



3.2 Socio-economic developments

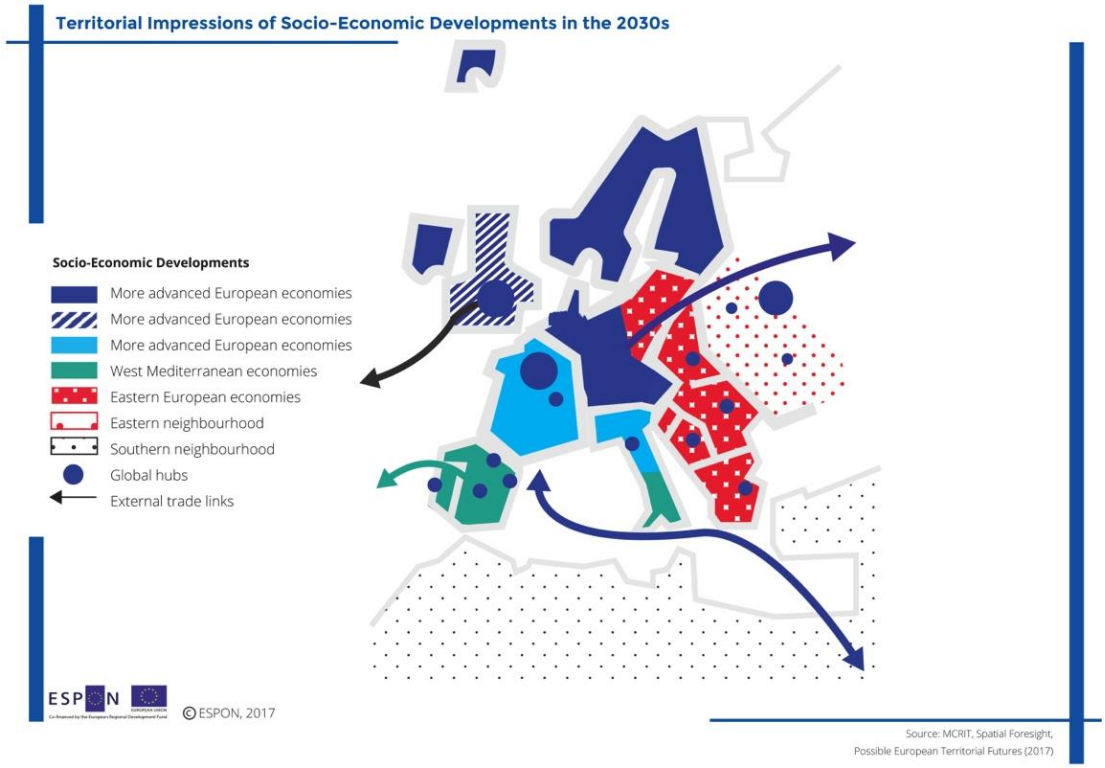
Europe's socio-economic development has been asymmetric since the economic and financial crisis. There are increasingly unbalanced distributions of GDP and employment. These imbalances are further accelerated by jobless economic growth. This is also reflected in the disparities of household incomes. In Europe, the gaps between north and south and also between regions within countries are widening. In particular Greece, but also Cyprus, Spain, Ireland and Italy faced considerable declines in household incomes and increased social disparities.

Any prognosis on socio-economic development in Europe and its territorial pattern has to be handled with great care. Developments towards more territorial cohesion are expected to pick up again in the years to come. However, factors such as global economic integration and technological change could lead to very different developments and critical bifurcation points may emerge before 2030.

A very rough territorial impression of development by the 2030s is shown Map 3.2. It shows a Europe in which borders between countries or groups of countries are more pronounced than today. Key messages shown in that map include:

- Borders between countries or groups of countries are more pronounced than today. The Single Market remains fragmented.
- Socio-economic differences turn Europe more into a sort of archipelago underlining low levels of territorial cohesion and major macroeconomic disparities. Different colours represent different income levels (from red to dark blue)
- To some degree metropolitan areas (blue circles) stick out in economically weaker territories.
- Links to global networks and markets point in divergent directions. While German trade grows in relation to Asia, on the one hand, Iberian countries towards the Caribbean and Latino America, UK towards the Commonwealth and the rest of the wolf (arrows).

Map 3.2 Territorial impressions of socio-economic developments in the 2030s



3.3 Environment and climate change

The environment in Europe continues to be under threat, among others through climate change. At local level increasing levels of soil sealing add to already high levels of artificial land use. An intensification of artificial land use is especially evident in Eastern Europe and some coastal areas of the Mediterranean.

Adaptive capacity to climate change differs across European regions. While regions with severe environmental challenges are more vulnerable to the impacts of climate change, there

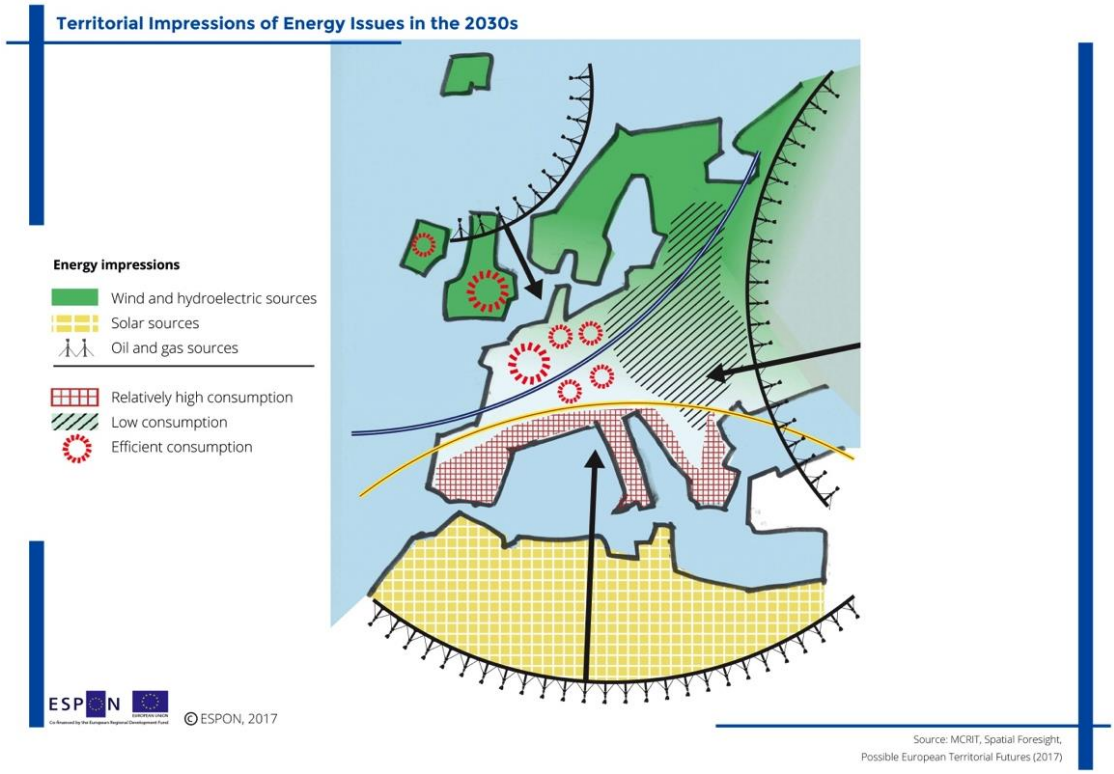
is greater adaptive capacity in wealthy northern Europe. The diversity of energy dependency and the consumption and production of renewable energy also play a role. Energy intensity is still considerably higher in eastern Europe than in western Europe. At the same time large parts of eastern Europe are lagging behind for renewable energy production and consumption. Between 2004 and 2014 renewable energy consumption has increased, especially in Denmark, Iceland and Sweden, followed by Austria, Bulgaria, Estonia, Finland, Greece, Italy and Norway.

To a large extent, current land-use, renewable energy and climate change trends are expected to continue along the same lines for at least the coming decade. In other words, the overall outlook is negative.

Picking up some of the key features of the future energy situation, Map 3.3 provides a sketchy image of expected territorial diversity. Key messages shown in that map include:

- Europe is to a large extend energy dependent. Fossil energy needs to be imported from neighbouring areas, either the North Sea, Russia, Middle East or the North of Africa (black circles and arrows)
- There is a territorial potential for wind (blue line) and solar energy production (yellow line, yellow zone in the north of Africa). To a large degree there is a divide between south and north.
- Centres of energy consumption in terms of major urban agglomerations (red circles), with high relative energy efficiency contrasting with energy intensive economies in Eastern Europe (grey pattern) as well as in the Mediterranean areas (red pattern).

Map 3.3 *Territorial impressions of energy issues in the 2030s*



3.4 Technological change

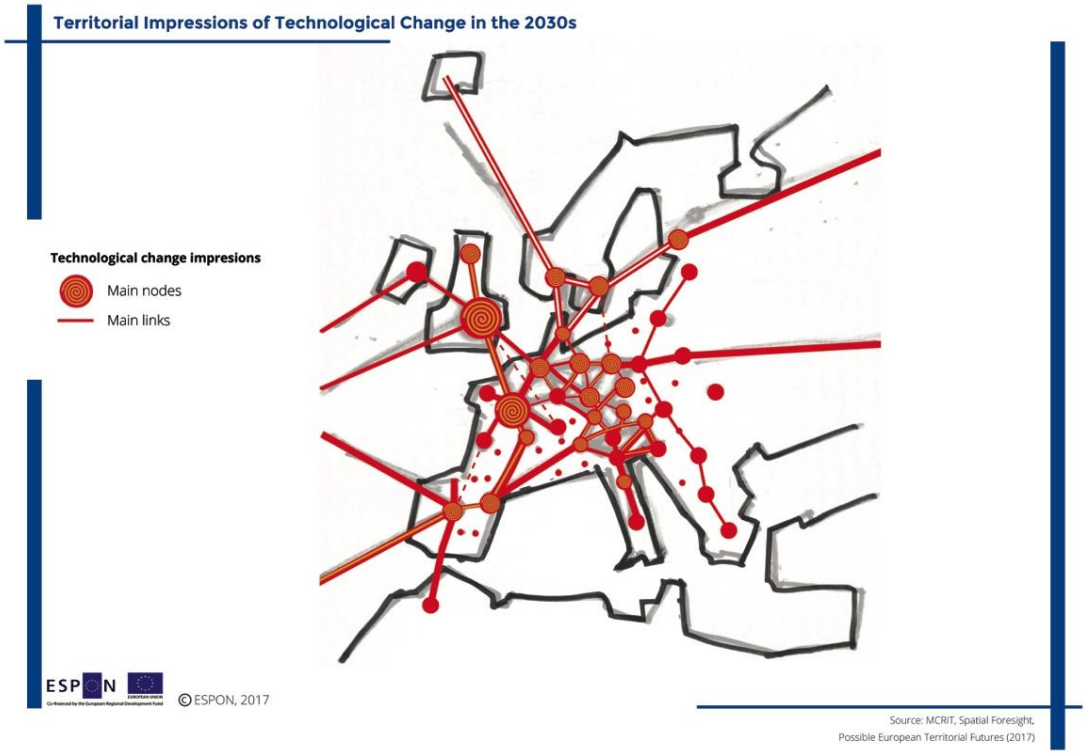
New technologies will change economies and societies and thus affect territories. Research, development and innovation (RDI) capacities will continue to concentrate in Europe's capital city regions and regions with high technological activities. Innovation leaders are mostly located in southern England, southern Germany, Île de France, Sweden and Denmark. In the strive towards innovation and new technologies, education plays an important role. There are distinct rural-urban differences in education levels of people aged 30-34. This is most pronounced in Luxembourg, Hungary, Slovakia, Bulgaria and Romania. For the same age group, in some countries, there was still a tertiary education level gender gap in 2016.

By 2030, firms and industry are expected to be predominantly digitised, enabling product design, manufacturing and delivery processes to be highly integrated and efficient. The so-called 4th industrial revolution will lead to fusions of technologies and will blur the lines between physical, digital and biological systems. On one hand there will probably be strong territorial, economic and societal concentration processes, as innovation leaders will have the most advantages, while adapters will benefit less. On the other hand, new technologies may reduce agglomeration advantages and bring more decentralisation, especially production processes, but will also increase urban sprawl.

Picking up some of the key features of future technological change, Map 3.4 provides a design image of the expected territorial diversities. Key messages illustrated by this map include:

- The focus is on the increasing importance of networks (represented in red links and circles). Networks (transport and communication networks, energy grids…) are represented integrated in a single cross-border network linking territories inside Europe as much as globally. The network has more density in the centre than in the periphery.
- The main nodes in those networks are large and medium-size talented cities where key innovators and early adopters provide the basis and long-lasting advantages for local and regional development (circles).
- New technologies may reduce agglomeration advantages and bring more decentralisation (this is represented in the map by isolated red points).

Map 3.4 Territorial impressions of technological change in the 2030s



3.5 European integration

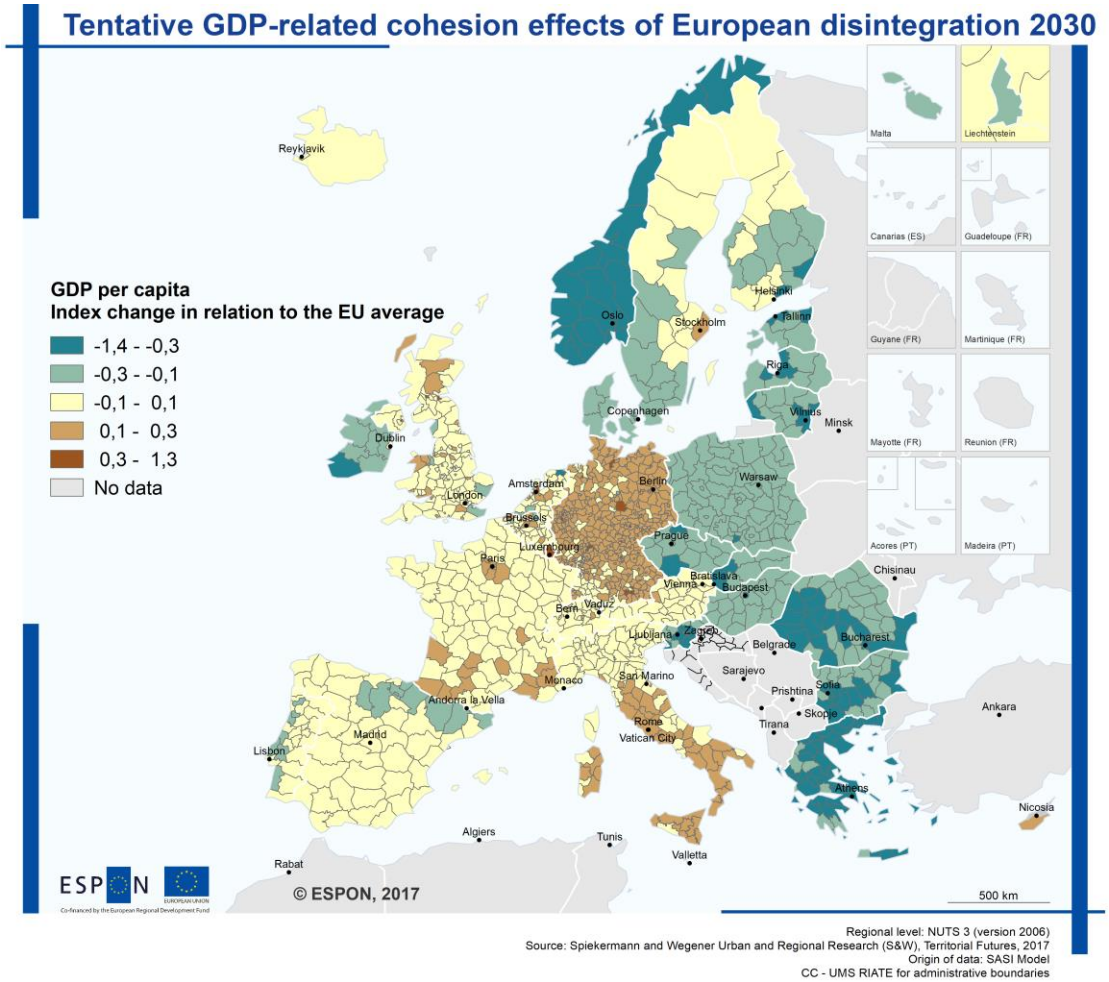
European integration was the main trend of the past decades. The number of EU Member States grew considerably to today's 28. The Single European Market and trans-European transport networks were constantly further developed and political, social and cultural barriers were reduced. This integration process is also true for the relationships of the EU with non-EU countries in Europe and neighbouring countries in Africa and the Middle East. However, there are signs that the European integration processes might come to a halt or even might be reversed. The Brexit is the most prominent case example for this. However, the recent and on-going controversial discussions about financial support mechanism for the losers of the economic crises, about a joint handling of the refugee issue, about cohesion police, i.e. about solidarity in general in Europe show that further European integration must not necessarily remain the main trend in the years to come.

To analyse the direction of change a reduced European integration would have, a sensitivity analyses has been carried out using the SASI model. Two variants of an exploratory scenario on less integration were implemented in which the only assumptions changed were increasing border waiting times at EU internal and external borders and different degrees of enhanced political and cultural borders between countries in Europe.

The effects of disintegration processes in Europe are reductions in economic growth in all regions of Europe, i.e. in such a situation the GDP per capita would be lower everywhere than compared with a continued integration path. An impression on the territorial distribution of tentative changes in terms of GDP per capita, based on the modelling results, is shown in

Map 3.5. The impacts of disintegration on territorial cohesion are negative as many of the lagging regions will have to face stronger reduction, i.e. fall behind compared to the European average, whereas most stronger regions will also lose out in absolute terms but gain in relative terms compared to the European average.

Map 3.5 Tentative GDP-related cohesion effects of European disintegration 2030



3.6 Key conclusions on territorial cohesion

The current state of the European territory and the outlook for 2030 as described above helps form initial conclusions as to whether Europe becomes more or less territorially cohesive.

The key messages are:

Increasing polarisation of settlements. The territorial concentration of population is expected to become stronger supported among others by migration trends and economic agglomeration advantages.

Increasing concentration of economic activities. Developments towards socio-economic cohesion in Europe were stalled by the global financial crisis. The recent asymmetric growth and developments are expected to continue.

Climate change and environment are growing concerns. Increased soil sealing and artificial land use as well as energy production and consumption remain important territorial development issues tightly linked to climate change in the coming years.

Technology and innovation could create new regional stars. As seen with information and communication technologies, major technological innovations including robotics and fusion technology will reduce the importance of location. Production can be decentralised (e.g. through 3D-printing) and people can work from more places. However, until then location matters.

European disintegration process are likely to reduce the path towards territorial cohesion. Regions in Europe that are lagging behind are likely to face more negative effects of a halt or reversal of the European integration process than advanced regions.

Putting all this together, it seems that general development trends point to an increasing role for metropolitan regions but not necessarily balanced across Europe. So, there is potential for polycentric development, but at the same time territorial cohesion is becoming an ever more distant idea. In other words, if territorial cohesion remains a policy objective it is unlikely to be achieved by itself.

Pointers for policies

To achieve territorial cohesion, major efforts are needed to ensure more balanced development at all geographical levels. Single measures addressing single drivers will not be sufficient to ensure territorial cohesion. Below are a few suggestions, or pointers, for both high and low level policies:

- **Rural-urban partnerships and inner peripheries.** Policies covering rural-urban partnerships and inner peripheries have been less emphasised in recent years. Given growing disparities, this choice could be reconsidered.
- **EU Cohesion policy to diminish disparities.** To reduce socio-economic disparities, basic ideas behind EU Cohesion Policy may need to be revamped and instruments reconsidered to ensure maximum contribution to that objective.
- **Make better use of renewable energy potential.** Territorial potential for renewable energy is not maximised. Utilising territorial advantages to produce renewable energy can boost development substantially. This needs to be paired with development of the necessary infrastructure and grids.
- **Increase adaptive capacity to climate change.** Areas with high vulnerability to climate change and medium to low adaptive capacity, may need more intense support.
- **Ensure attractiveness of all places.** To ensure that key points of attraction and drivers for development are not only selected metropolitan areas, all locations need to be empowered for further development. Services of general economic interest may be an important vehicle for this.
- **Place based policy making.** Governance and broad involvement under place based policy making, may still hold the key to improving the situation.

- **Wide European and national policies.** In many cases the key to improved territorial balance lies not just with regional policy but with a ‘tailor-made’ mix of sector policies at various levels.
- **The policy and legal environment matters.** Encouraging early adaptors of key innovations and technologies is not only about the right environment, human capital, technology infrastructure and venture capital. It is also about adjusting regulatory and legal frameworks to suit upcoming technologies. This may decide where winners are located.

4 What if we had a place based circular economy?

What would the European territory look like in 2030, if it were a place based circular economy?

Summarising volume D of this report, the next section shows the understanding of a place based circular economy within Europe. This is followed by three sections going into more detail on specific dimensions of a place based circular economy and its territorial expressions. The final section closes with some considerations on what a place based circular economy might mean in relation to European territorial cohesion objectives.

4.1 The place based circular economy Europe we wake up in

A place based circular economy brings together the idea of the circular economy (see Ellen MacArthur Foundation et al., 2015; European Commission, 2015a; European Environment Agency, 2016; World Economic Forum, 2014, 2015) with the idea of place based policy making (see Barca, 2009; European Commission, 2015b; Zaucha, 2017; Zaucha et al., 2013). In a place based circular economy, resource efficiency is key to economic activities, particularly production. This includes reducing waste to a minimum while maintaining the value of products, materials and resources in the economy for as long as possible. In a circular economy the amount of newly produced products declines as reuse and repair become mainstream. This implies that territorial patterns change following the key assumptions presented in the textbox below.

Key assumptions

The transition to a place based circular economy implies drastic transition in all cities and regions involving:

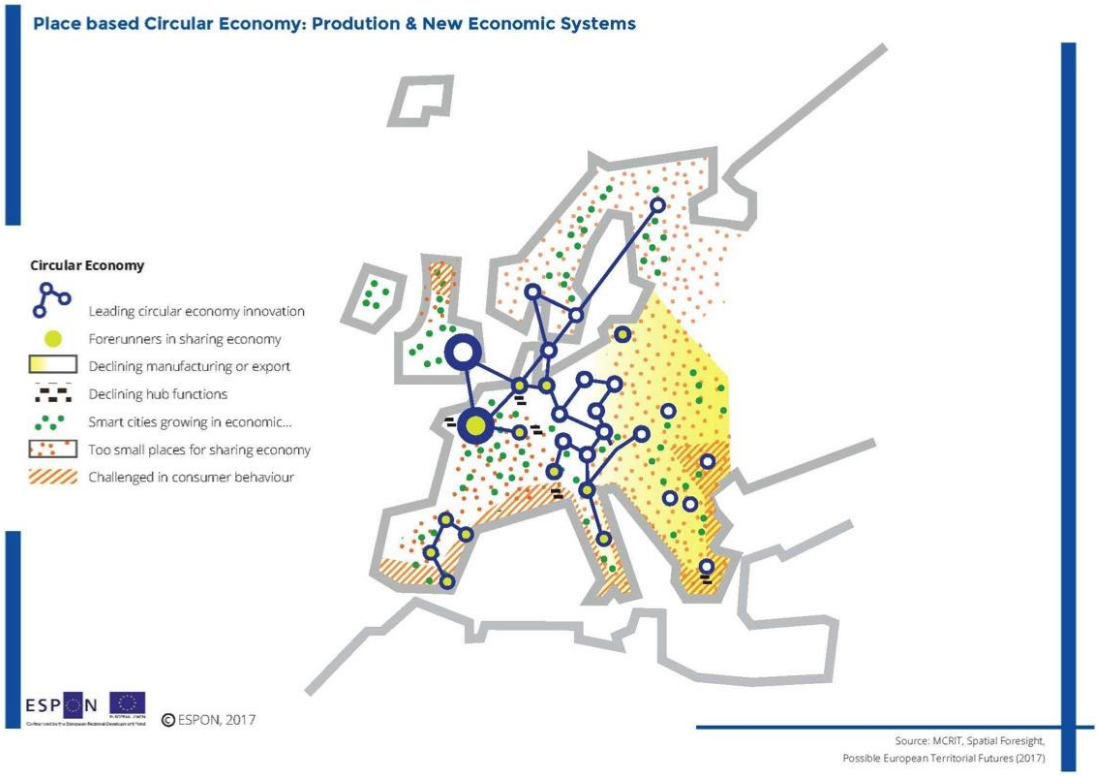
- **Resource efficient production systems – changing production patterns**
  - Reducing waste to a minimum
  - The value of products and resources remains in the economy for as long as possible
  - Less products are produced
  - Repair, reuse and recycling implies a shift from large to smaller production sites

- **Resource efficient use- changing societal and behavioural patterns**
  - Focus on use rather than ownership, sharing resources
  - The understanding of prosperity moves beyond GDP

- **Place based – balancing local and global interaction**
  - Making the best use of a region's endogenous resources
  - Involvement of local population and local influencers
  - Transport and trade continue
  - Migration continues

Europe's territorial structure will differ from today's under a place based circular economy. This will imply dramatic changes for all parts of Europe and will also affect urbanisation and territorial balance. At European level, the differences between strong socio-economic areas and lagging regions may reduce under a place based circular economy. The map below illustrates the potential for small and medium-sized towns, as well as the challenges for sparsely populated areas and inner-peripheries. It also highlights the importance of networks in driving innovations in a circular economy and leading areas in the sharing economy. Furthermore, the map shows areas which could expect particular transition challenges in consumer behaviour (often tourists) and changing manufacturing structures.

Map 4.1 Territorial impacts of the transition to a place based circular economy



Key aspects of changes in territorial patterns and indications of how the patterns may differ in a place based circular economy are described under three components; production, consumption and transport flows.

At the same time, things may turn out differently depending on which aspects of the place based circular economy are emphasised more (see box).

For further thinking: possible other development paths

Scenario: Driving local behavioural changes. This scenario implies drastic transition in all cities and regions including a transition to a low-carbon economy, the use of new advanced (nano- and bio) materials in production and consumption processes, IoT based optimisation, diffusion of additive manufacturing along with virtualisation and automation of logistics, collaborative consumption and the diffusion of zero-waste and nature-based solutions.

Scenario: Global industrial waste management. Multiple players across the business and research communities, supported by policy makers and investors, reconceive key manufacturing processes and flows of materials and products, establishing standards for recycling components and materials. They succeed in closing loops of material on a global level, achieving tipping points that bring major streams of materials back into the system, at high volume and quality, through established markets. The paradigm shift from disposability to restoration almost eradicates waste. Eco-design has made products more durable and easier to repair, upgrade or remanufacture. The consumer is replaced by the user.

4.2 Resource efficient production systems

In a European place based circular economy, resource efficiency is key to economic activities, particularly production. This includes reducing waste to a minimum while maintaining the value of products, materials and resources in the economy for as long as possible. In a circular economy the amount of newly produced products declines. In territorial terms, this means that key patterns change:

Large scale manufacturing will experience significant economic transition, adjusting to reduced production quantities and industrial symbiosis. This will be a challenge for all cities and regions where manufacturing is a significant proportion of employment and GDP. In particular, areas with low resource efficiency will face particular transition challenges. The same goes for cities and regions where manufacturing cannot easily cooperate to establish residual streams. Areas facing particular transition challenges are regions in the Czech Republic, most rural regions in eastern Romania, regions with high levels of manufacturing in Bulgaria, rural Poland and partly rural areas in Estonia. Some of these regions may lose considerable parts of their manufacturing capacity in a circular economy if they do not manage the transition well.

Innovations are needed for a transition to circular economy production systems. Areas with strong innovation profiles, especially eco innovation and the green economy, face less of a transition challenge. This further underlines the focus on the core and northwest of Europe as drivers of the change. Ile de France, the south coast in the UK, Switzerland, large parts of Southern Germany as well as most urban agglomerations in Germany, Northern Denmark, the Øresundregion, metropolitan regions of Sweden, plus Northern Sweden and the capital region of Finland may increase their standing as areas where key innovations serve the economic transition across Europe.

The strong focus on 'repair, reuse and recycle' implies new jobs in labour intensive sectors. In a place based circular economy new jobs will be created throughout Europe. While in economically stronger regions this will partly help to replace jobs lost in other sectors, economically weaker areas should see new job opportunities. The emergence of new economic activities to 'repair, reuse and recycle' should follow the territorial logic of providing services of general interest meeting 'everyday demands'. In other words, these activities will

be strengthened in all major settlements, though inner peripheries will not profit from this upswing.

4.3 Resource efficient use - changing societal and behavioural

A place based circular economy cannot be implemented as a purely technical solution. It is not only about the way we produce goods but also about the way we use them. Resource efficient use of products will be a key feature strongly influencing behaviour and social capital.

A focus on 'repair, reuse and recycle' implies households becoming more resource efficient and household waste an exception, as the focus is on reuse and recycling. Areas that already have limited household waste and which have significant recycling will be frontrunners in that transition. Areas with high levels of household waste per capita and limited recycling will face a more drastic transition. In many cases these are areas where high numbers of tourists or visitors increase the amount of household waste. Primary examples include Malta, Cyprus, tourist areas in Scotland, along both the Atlantic coast and the Mediterranean coast in France, Greece, Italy, Spain, Croatia and the Algarve in Portugal, as well as tourist urban nodes, such as Venice, and winter sport destinations.

The sharing economy is important for increasing resource efficiency. This can be done through internet sharing platforms and on the basis of informal and small scale collaboration. A significant increase in product sharing (beyond occasional car or ride sharing) towards a large range of products and involving most of society implies major social transitions. Cities and regions which are already forerunners in sharing and collaboration initiatives should have an easier transition, in particular if they have a critical mass of inhabitants. The level of social trust also plays a major role. Among potential frontrunners are urban agglomerations in France, Ireland, Latvia, Croatia, Germany, Estonia, Romania, Spain and Italy.

Areas with limited use of sharing and collaboration platforms, low population density and/or low levels of social trust face more dramatic challenges in the transition. Among these areas are rural regions in Cyprus, Malta, the Czech Republic, Portugal, Finland and Lithuania.

Changing understanding of prosperity. Given the above transition, a place based circular economy may be accompanied by developments towards a post materialistic social model, or at least an understanding of prosperity going beyond GDP. The territorial dimension of such a transition is hard to judge. The European social progress index (European Commission, 2016) and the European quality of sub-national government index (European Commission, 2014) provide insights into the expected capacity to cope with and support social transition in promoting a place based circular economy. This may be particularly challenging in regions with low quality government, such as South-Eastern Romania, Eastern Bulgaria and Southern Italy.

4.4 Place based – balancing local and global interaction

A place based circular economy implies changing transport patterns. Among others, the amount of goods and raw materials transported over long distances is expected to decline

considerably. Fewer material goods will be produced and these will be used, shared, reused and repaired, so they last considerably longer. In addition, industrial production symbiosis will lead to production sites clustering. This contributes to changes in the patterns for European urban areas and in the roles some cities play.

Major international freight transport hubs lose importance. Cities and regions which host major freight ports and airports and have a high share of employment in the logistics sector will be challenged as transport declines in a place based circular economy. Some major urban agglomerations may lose some of their dominance. Among these are metropolitan regions, especially those with major ports, including Rotterdam, Antwerp, Bremerhaven, London, Paris, Genoa, Helsinki, Riga and Athens.

International export-import patterns change. The transition of production systems to a circular economy implies changing export and import patterns. Cities and regions with highly international economies and with economic players highly dependent on imports and exports, face particular transition challenges.

4.5 Towards territorial cohesion?

Taking all these points together, a place based circular economy implies dramatic changes for all parts of Europe as well as the European urban system and territorial balance. At a European level, differences between socio-economic strong points and lagging regions may become less pronounced. However, this will be highly dependent on the capacity of lagging regions to adopt innovation systems and offer job opportunities that encourage a place based circular economy.

There is potential for territorial cohesion in Europe. Additive manufacturing plus a stronger focus on ‘reuse, repair & recycle’ and a declining importance of transport hubs will provide opportunities for smaller, more peripheral and lagging areas to grow. At the same time, some of the dominant urban agglomerations could lose importance, as a decline in production and transport of goods reduce agglomeration advantages and challenge hub functions. At the same time a place based circular economy might also emphasise some territorial disparities in Europe. Regions that are heavily dependent on large scale manufacturing may fall behind, regions leading in green technology solutions may become even more dominant, and some behavioural changes may affect convergence regions more than leading regions.

4.5.1 Territorial cohesion today and tomorrow

Compared to the baseline scenario described in chapter 2 this place based circular economy holds more potential for territorial cohesion. Examples for this are:

Changing manufacturing processes : Labour intensive repair, reuse and recycle activities will create new jobs throughout Europe and benefit polycentric development with new jobs emerging in smaller and lagging areas. This development will also be supported by manufacturing moving from large scale production to additive manufacturing. However, low population areas and major urban inner peripheries will not benefit from this.

Increasing sharing and repairing attitude: Overall the sharing and repairing models hold potential for increasing territorial cohesion, softening the dominance of urban agglomerations. Nevertheless, boosting the sharing economy will be easier in some places than in others. It might be particularly challenging for areas with currently low levels of sharing economy, low levels of social trust and/or low population density. Among the potential frontrunners are urban agglomerations in France, Ireland, Latvia, Croatia, Germany, Estonia, Romania, Spain and Italy.

Changing understanding of prosperity: A place based circular economy implies an understanding of prosperity and wealth which goes beyond GDP and focuses more on well-being. Trust and governance are key aspects in this. The areas with the most dramatic transition processes are South-Eastern Romania, Eastern Bulgaria and Southern Italy.

Changing role of transport hubs: International transport volumes will drop substantially. This implies that major transport hubs for freight (ports and airports) will decline in importance. The biggest declines are expected in London, Paris, Genova, Helsinki, Riga and Piraeus as well as Rotterdam, Bremerhaven, Hamburg, which for some reason do not feature in the statistics.

Changing role of goods exports-imports: International export and import for goods will decline dramatically. This challenges industrial regions in Belgium, the Netherlands and Ireland.

At the same time, a place based circular economy may also further emphasise territorial disparities in Europe. Regions heavily dependent on large scale manufacturing may fall behind, regions leading in green technology may become even more dominant, and some behavioural changes may affect convergence regions more than leading regions. Examples for this are:

Changing manufacturing processes: In a place based circular economy places with high levels of manufacturing and low resource efficiency risk falling behind (large parts of manufacturing may even disappear). Among the areas facing particular transition challenges are regions in the Czech Republic, most rural regions in eastern Romania, regions with high levels of manufacturing in Bulgaria and rural Poland as well as rural areas in Estonia.

Driving role of green innovations: Regions with significant innovation and in particular eco innovation could become champions, producing solutions that spread throughout Europe. This includes Northwest Europe; Ile de France, the south coast in the UK, Switzerland, large parts of Southern Germany as well as most urban agglomerations in Germany, Northern Denmark, the Øresundregion, metropolitan regions of Sweden, plus Northern Sweden and the capital region of Finland.

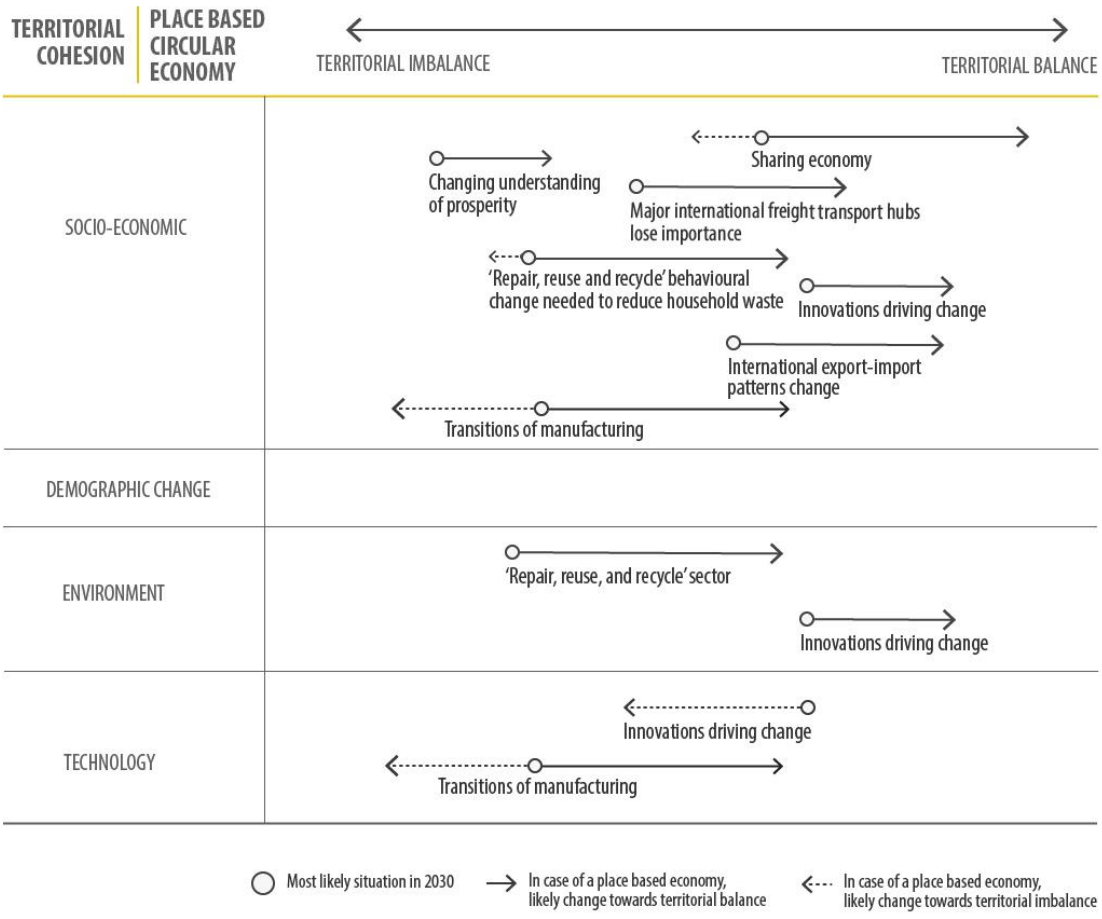
Behavioural change needed to reduce household waste: Household waste volumes and recycling are particular challenges for tourist areas with low recycling cultures. Among these

are Malta, Cyprus, tourist areas in Scotland, along French coasts and large parts of other regions along the Mediterranean coast in Greece, Italy and Spain and the Algarve in Portugal.

Taking all these points together, a place based circular economy will imply dramatic changes for all parts of Europe and will also affect the European urban system and territorial balance. At a European level, the differences between socio-economic strong points and lagging regions may become less pronounced. A place based circular economy holds potential for increasing territorial cohesion and polycentric development in Europe, while at the same time posing new challenges to cohesion.

To conclude and simulate for further thinking, the below figure presents an attempt to summarise in what way a place based circular economy might change the expected territorial outlook presented in section 3. The figure illustrates the results with regard to the single factors used in the analysis (see Volume D) and main topics for describing the current territorial situation of Europe and future outlook presented (see volume B). The arrows indicate whether a place based circular economy is expected to give a push towards more territorial imbalance or balance at European level.

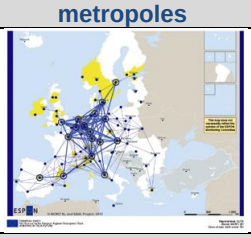
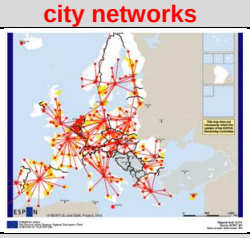
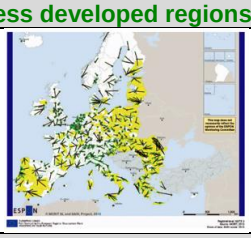
Figure 4.1 Place based circular economy impacting on tomorrows territorial patterns



4.5.2 A place based circular economy in the light of ET2050

Table 4.1 puts the expected changes in light of the three policy scenarios developed by the ESPON ET2050 project (ESPON, 2014b). These scenarios focus on polycentricity at geographic scales based on networks of (a) major global or European metropolis, (b) urban areas of national or transnational importance, so-called secondary cities, and (c) cities of regional importance. The following table summarises what a place based circular economy means in the light of these three scenarios.

Table 4.1 Place based circular economy contributions to ET2050 scenarios

	Focus on large metropoles	Focus on secondary city networks	Focus small cities and less developed regions
			
Resource efficient production systems			
Transition of manufacturing	↓ Central large scale manufacturing sites will decline	↑↑ Stronger focus on decentralised production	o Only secondary effects for small cities
Innovations driving change	↑↑ Centres of innovation will be very centralised	↑ All areas will benefit as innovations are quickly shared across territories	↑ All areas will benefit as innovations are quickly shared across territories
'Repair, reuse & recycle' sector	↑ All areas will benefit from new local jobs in the repair and reuse sector	↑ All areas will benefit from new local jobs in the repair and reuse sector	↑↑ Increase of jobs throughout the territories, also in small centres
Resource efficient use – balancing local and global interaction			
'repair, reuse and recycle'	↑ Household waste will decline in all areas	↑ Household waste will decline in all areas	↑ Household waste will decline in all areas
Sharing economy	↑ Bias towards urban centres with a critical mass	↑↑ Bias towards urban centres with a critical mass	↓ Small places may face challenges establishing a sharing economy
Changing understanding of prosperity	↓ Agglomeration advantages might become less important	↑ Changing value systems may hold potential for secondary cites	↑↑ Changing value systems hold potential for lagging regions
Place based – balancing local and global interaction			
Major international freight transport hubs lose importance	↓ Major metropolitan areas face decreasing importance	↑ Stronger focus on decentralised production	o Only secondary effects for small cities
International export-import patterns change	↓ Export dependent cities see declining economies	↓ Large scale manufacturing cities see declining economies	↓↓ Connectivity for rural and peripheral areas may decline

↑↑ Strong developments in support of this scenario
↑ Development in support of this scenario
o Neutral with regard to this scenario
↓ Developments counteracting this scenario
↓↓ Strong developments counteracting this scenario

4.5.3 Pointers for tomorrow's territorial cohesion policies

To ensure better territorial cohesion in a place based circular economy, negative aspects need to be counteracted and positive aspects supported. Some pointers for policies are:

Polycentric structures for additive manufacturing. This could help economic development also in smaller and lagging areas. Supporting this by increasing investment capacity, funding and knowledge in smaller centres and lagging regions can further strengthen territorial cohesion.

Local and regional industrial symbiosis processes are an important part of the place based circular economy. These may evolve faster in areas with higher awareness and a good mix of production processes. Supporting these processes in smaller locations through increased investment capacity, funding and knowledge can further strengthen territorial cohesion.

Declining manufacturing and transport hubs may contribute to more balanced development in Europe if this reduces the socio-economic dominance of major urban agglomerations. However, this may also affect manufacturing in other areas and thus contribute to further disadvantages for these areas. In any case, policy interventions may need to facilitate and cushion the decline of production and transport hubs.

Changing transport and distribution patterns could lead to more polycentric freight transport systems which are better suited to declining transport volumes. Supporting the development of a polycentric system with smaller transport hubs may further strengthen territorial cohesion.

New technological solutions for resource efficient production are needed. While many examples show that a wide range of such solutions already exist, there is also a need to develop further solutions.

For both existing and new solutions, it is important that ideas and solutions are quickly shared and adopted throughout the territory. Policies supporting the sharing and dissemination of circular economy solutions can support these processes. This may also contribute to reducing disparities between areas which are driving innovations in the field and those merely adapting new solutions.

Sharing economy solutions supporting a behavioural shift in our consumption of goods are important in a place based circular economy. These can generally be supported through adequate legal frameworks and online platforms. A particular emphasis will be needed for smaller, sparsely populated areas and inner-peripheries where there is no critical mass for self-sustaining local sharing platforms. Supporting innovative solutions for these areas will be important to avoid them falling behind in the paradigm shift.

Changing behaviour concerning household waste is a challenge in all parts of society. In areas with many tourists this may be a significant challenge as tourist behaviour strongly

impacts on the volume of local household waste. Particular policy action might be needed for popular tourist areas.

Sparsely populated areas and inner peripheries will be additionally disadvantaged in a place based circular economy. Therefore, it is important to develop policy actions which ensure that their potential is developed and that innovative solutions are supported to ensure their access to goods and services.

5 What if we had 100% renewable energy?

What would the European territory look like in 2030, if Europe had completed the transition to a fully renewable energy system? That is, if all primary energy production in Europe would come from RES (sun, wind, flowing water, biological processes or geothermal heat flows) and the total energy consumed in Europe will be renewable? Summarising volume E of this report, the next section shows the understanding of a fully renewable European energy system. This is followed by two sections going into more detail on specific dimensions of a fully RES energy system and their territorial expressions. The final section closes with some considerations on what a RES energy system might mean in relation to European territorial cohesion objectives.

5.1 The fully renewable energy future we wake up in

A transition to a fully renewable energy system in Europe will require significant changes on both the demand and supply side. Different starting points of regions regarding their current energy systems as well as different socio-economic conditions will account for how challenging they will find this transition.

Renewable energy generation

To keep up with energy demand in Europe, renewable energy production will be further expanded across Europe, according to each region's specific renewable energy potential. However, land availability will be a major limiting factor as, depending on the technology and conditions, renewable energy production tends to be considerably more land-intense than fossil energy production. Huge investments in Europe's energy infrastructure will be needed. Besides additional RES capacity, the energy grid will have to be expanded and reinforced to be better able to match demand and supply, including additional storage capacity. The future energy supply has the potential to be much more decentralised and democratic, allowing citizens to have a direct stake in the transition to a cleaner energy supply through ownership of renewable energy installations (see info box).

Place based: People have the power

Consumer empowerment has become reality and their level of engagement in the grid is strong. Consumers and prosumers supply the grid at low and medium voltages, providing the required flexibility on both demand and supply sides. Distributed RES generation plants, such as wind, roof-top PV and biofuel powered micro-CHP, assure electricity production. An efficient management of heat and electricity increase system flexibility allowing effective demand response schemes. Most of the value creation remains in the regions.

Network-based: Networks in control

The distribution system remains primarily hierarchical, with electricity flowing one way from generators to end consumers, but security of supply cannot be guaranteed at all time due to the difficulty of managing periods of low demand and high generation from wind parks. To

enhance interconnection capacity and ensure network flexibility by integrating variable RES, a reinforced grid infrastructure (including superconducting solutions) manages data exchange and communications across countries to store and trade electricity. Medium and high voltage grids have been widely equipped with ICT solutions improving grid management and control. A large share of the value creation will go to utility companies and their shareholders and drain out of the regions.

Some renewable energy will be imported, but there will also be imports of "grey fossil energy", i.e. fossil energy embodied in imported manufactured goods and services. However, measures will be taken to achieve protection of the competitiveness of the European economy, potentially with a border tax adjustment on energy imports, including grey energy (to the extent possible under GATT). All across Europe, policies will have been put in place that incentivise energy saving, additional RES production capacities and better management of energy demand.

Reduction in energy consumption

A significant reduction in energy consumption for industrial processes, transport, buildings and households (mainly as a consequence of rising energy costs) is expected. Some of the most energy-intense sectors, such as steel and aluminium, cement and ceramics, will, however, lose competitiveness and are likely to move production to non-European countries. The most dramatic change will have happened in transportation, where renewables currently account for only 1-10% of energy used. So there is an enormous investment backlog, but also a lack of marketable technological innovations. Air transport will be largely uneconomical and railways will experience a true renaissance, in particular for long-distance transport. Overall, transportation will be much more expensive, which will severely shake current mobility and goods-flow patterns.

5.2 Renewable energy generation

Regional renewable energy production capacities will have to increase in all regions across Europe, but not all regions will require the same effort and not all regions will have the same possibilities as they have different starting positions regarding:

- regional and local RES potential, which determines to a large degree how much renewable energy a region can produce to meet its demand;
- energy-self-sufficiency, i.e. how much of the energy demand is currently met with endogenous energy sources and how much of these are renewable;
- existing infrastructure for production, distribution and storage, so the additional capacity or replacement requirements.

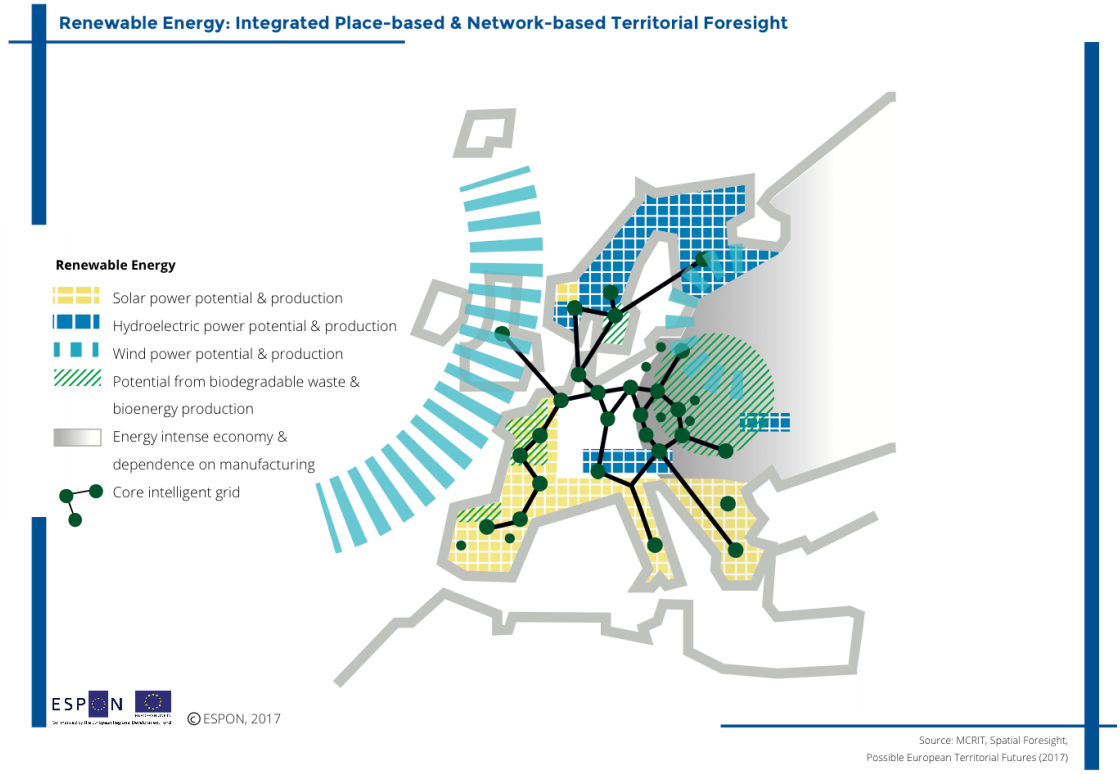
Wind power will be a corner stone of Europe's energy supply. Areas with high potential that can be further exploited and with significant installed onshore and offshore wind power capacity can be found around the North Sea; most notably the UK, and North/ Northwest

France. Other regions with significant installations and potential are the Rhône-Alpes and Central Poland as well as the Iberian Peninsula.

Solar power will gain in importance as an RES, mainly because of its high power density and significant biophysical potential. Large parts of Spain, but also Italy will be in a favourable position as they boast the greatest techno-sustainable solar potential (in particular, in terms of available land) and already have considerable installed capacity.

While bioelectricity will not be developed further, biofuels and biogas, in particular from non-food feedstocks, will play an important role as transport fuels. Areas with high bioenergy potential and significant production capacities are in France, Germany, Poland, Sweden, Finland, and Spain.

Map 5.1 Territorial impacts of a transition to 100% renewable energy



Geothermal power will continue to play a minor role in Europe's energy supply, with the exception of Iceland. Areas with significant geothermal energy potential for district heating and existing installations are in Italy (mainly Tuscany), France (the Paris Basin and the Aquitaine Basin) and Eastern Hungary and selected regions in Germany.

Hydropower will continue to be important, especially for pumped storage. Areas with a high but unexploited potential for hydropower generation will experience conflicts between biodiversity protection and energy production. Areas with both significant hydropower generation and high potential are in the Alps and Scandinavia, but also in South-West Oltenia in Romania. Regions with a high potential, but less exploitation are in south-eastern Europe.

Regions that rely heavily on fossil or nuclear-based energy and/or have significant extraction of fossil fuels will feel the transformation strongly. For oil and gas, this is the Agder and Rogaland region and Vestlandet (Norway) and North-Eastern Scotland (UK). For

coal these are Slaskie, Silesia, Opolskie (Poland), Severozápad (Czech Republic), the Carpathian-Balkanian Basin (Bulgaria and Romania) and North-Eastern Scotland (UK).

The energy system transformation will require huge investments, which regions with low economic performance will find harder to mobilise. Regions that are primarily affected by the need to extend or reinforce their grid infrastructure, but which will be challenged financing these investments are the Baltic States, the Iberian Peninsula and South Eastern Europe.

5.3 Energy consumption

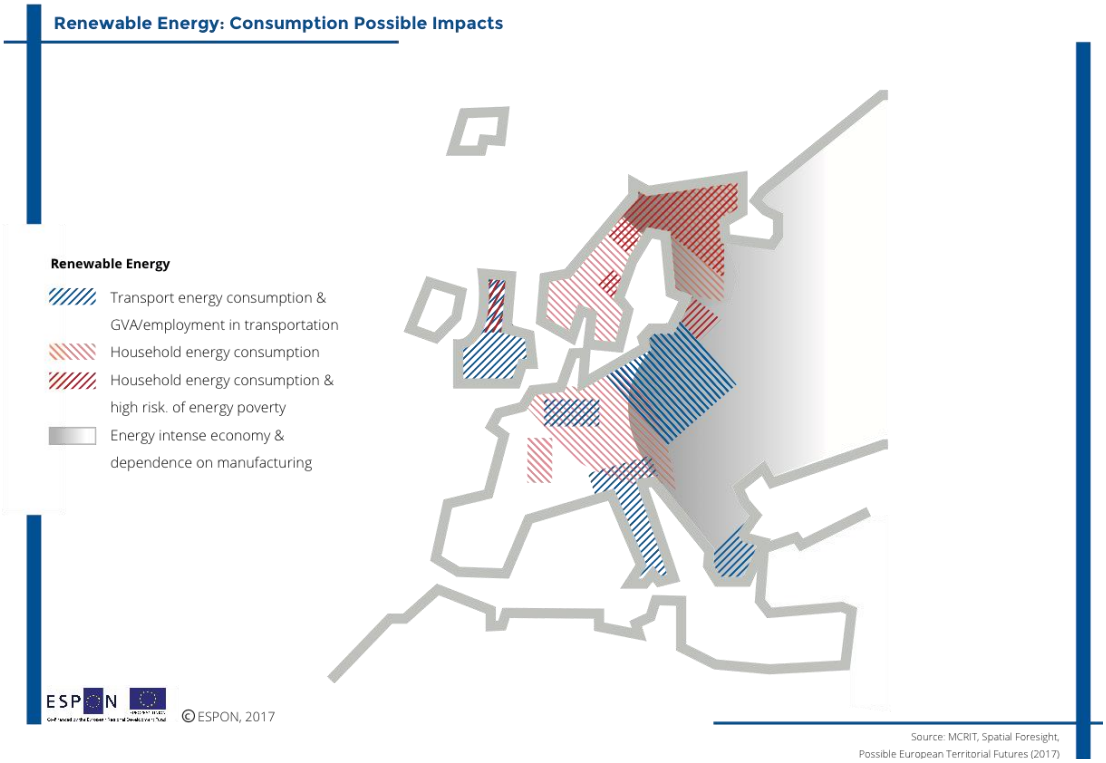
Europe's energy consumption will have to decrease substantially to ensure that European energy demand can be fully met by renewable energy.

Regions with high per capita household energy consumption, together with low household disposable income, will be particularly vulnerable to energy price increases. The most vulnerable regions are in Estonia and Latvia.

Regions with a highly energy-intense economy will face a loss in competitiveness and, ultimately, in jobs. Most vulnerable economies are in industrial regions in Eastern Europe (in particular, the Czech Republic, Slovakia, Romania, Bulgaria, Poland, Hungary and Estonia).

To curb the use of energy for transportation, the share of public passenger and freight transport will have to increase. Regional economies and employment depending on the transport sector will be heavily affected. Among the most vulnerable regions are Norway (with the exception of Agder and Rogaland), the German regions of Cologne and Darmstadt, but also the greater London area and Highlands and Islands (UK), the Latium and Campania region as well as the islands of Sardinia and Sicily (Italy) and parts of Poland.

Map 5.2 Territorial impacts of a transition to renewable energy consumption



Remote regions will experience a substantial loss in accessibility and, hence, attractiveness as places to live and do business. Especially peripheral regions that live on tourism and are highly dependent on good accessibility by air and regions with important airport and port hubs will be affected. The most highly exposed regions are Mediterranean coastal areas in the Iberian Peninsula, Highlands and Islands (Scotland), Central Macedonia (Greece) and the Bulgarian Black Sea coastal region as well as Mediterranean islands.

5.4 Towards territorial cohesion?

Territorial impacts are based on the presumption that regions in Europe have different starting positions which determine how hard they will find it to adapt to the new reality. However, the precise nature and magnitude of territorial impacts and, hence, the ensuing overall effect on territorial cohesion is unknown. For example, while the focus on energy production from endogenous renewable sources is likely to strengthen rural and peripheral areas, the radical change of transport and mobility patterns will have a clearly negative impact on those areas, and will reinforce urbanisation and centralisation.

5.4.1 Territorial cohesion today and tomorrow

Regions with a high renewable energy potential and sufficient available land may become energy exporters. This could particularly benefit small rural economies. However, since much of the renewable energy will be in the form of electricity, proximity to large power load centres (i.e. centres of consumption) is important to minimise distribution losses. That might hamper the prospects for remote rural regions to export their surplus electricity to neighbouring regions and urban centres. Densely populated areas, i.e. urban and metropolitan regions, but also many of the coastal areas and areas with limited arable land such as mountainous areas, are likely to see increasing tensions over conflicting land use.

Current economic disparities in Europe may be entrenched since the ability to finance the necessary investments in energy infrastructure and, hence, regional value creation, is linked to a region's economic performance and wealth. Rising energy costs may throw a large part of the population in less developed regions into energy poverty, especially in central and northeastern Europe where the heating demand is high.

The future energy supply has the potential to be much more citizen-owned. Energy self-production will, however, mainly benefit house owners outside central-city locations where there is limited available space and too much shade. On the other hand, cities and densely populated areas will gain from having the critical mass needed to provide accessible and high-quality public services (e.g. district heating solutions, public transportation), but also flexible mobility services (e.g. car sharing schemes, self-driving cars, etc.). This will help decarbonise utilities and maintain a high quality of life.

Current urbanisation trends may persist or even accentuate. Europe's population, infrastructure and industry currently concentrates in the centre of the continent and around major conurbations in the northern Europe and on the Mediterranean coast. Overall, there

may be a reinforced tendency for people, particularly of working age, and businesses to move to the highly urbanised, well-connected parts of Europe where also the highest (green) economic and innovation performance is found, providing them with new economic opportunities in the development of new energy-efficient technologies and appliances. In particular regions and cities with a dense rail network are likely to be in a favourable position and attract businesses and people since air transport will nearly disappear and much of the air and most (heavy) freight transport will be shifted from road to rail (and partly to ship).

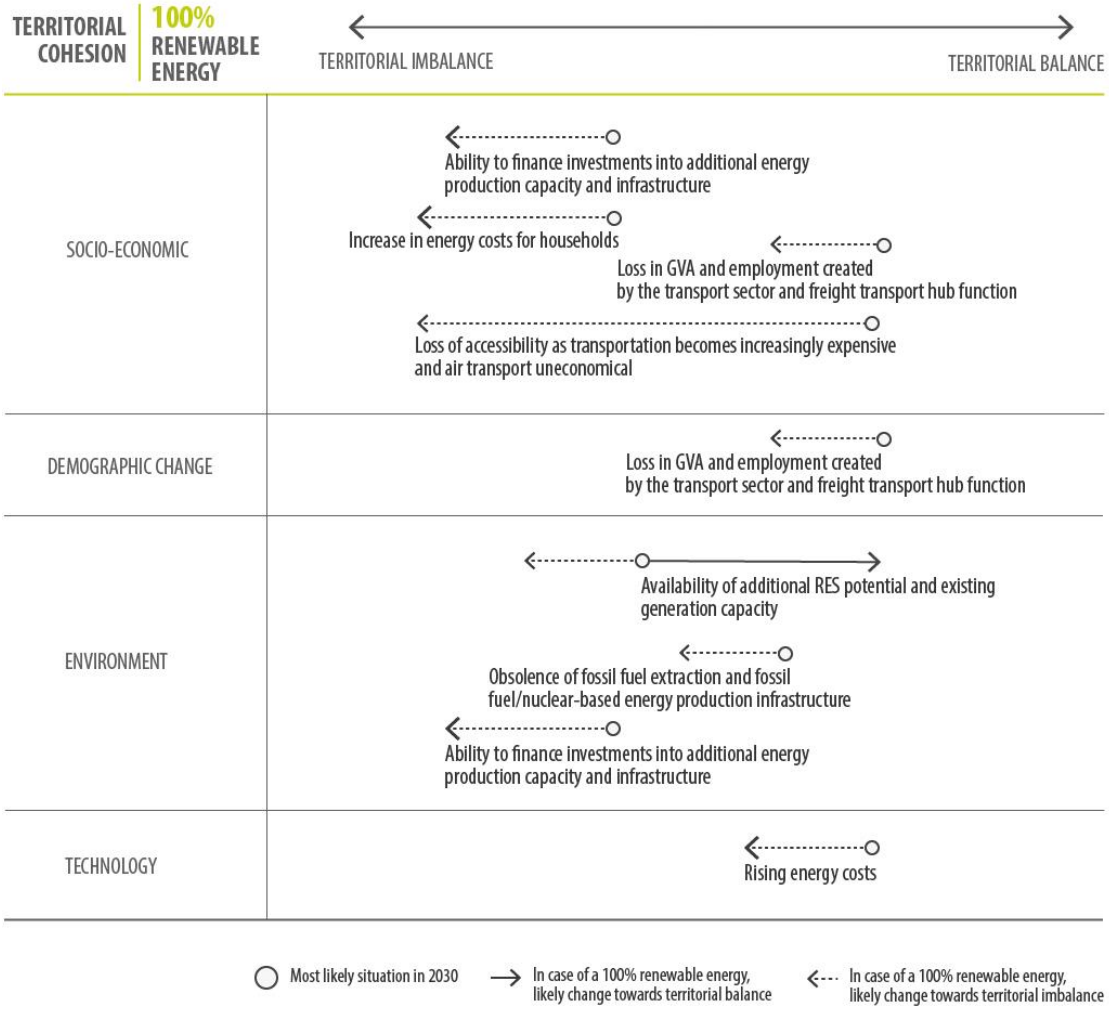
Peripheral areas, far from bigger centres, will be greatly disadvantaged by the increased costs of transportation. The current trend of aging and depopulation in less accessible regions may accelerate. Regions whose economies are strongly transport-dependent, especially remote tourism regions, will also be heavily affected. However, central locations and European capital regions will also be affected if they have an important airport or port hub function and related logistics industry.

Increased freight transport costs will alter Europe's trade structure. Exactly how the new origin-destination pattern of goods flows will affect each region is hard to predict, but in all probability, regions that are far from major centres of production will be heavily affected.

Impact on energy-intense industries will reinforce Europe's east-west divide. Regions with heavy industries and significant production of fossil based energy and industry related to this are often found in Eastern Europe.

To conclude and simulate for further thinking, the below figure presents an attempt to summarise in what way a fully renewable energy system might change the expected territorial outlook presented in section 3. The figure illustrates the results with regard to the single factors used in the analysis (see Volume E) and main topics for describing the current territorial situation of Europe and future outlook presented (see volume B). The arrows indicate whether a fully renewable energy system is expected to give a push towards more territorial imbalance or balance at European level.

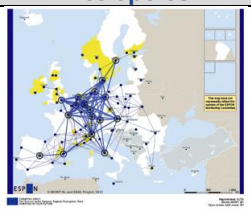
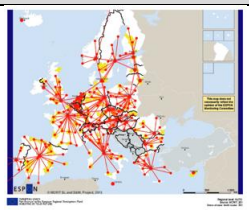
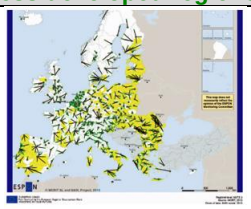
Figure 5.1 Fully renewable energy system impacting on tomorrows territorial patterns



5.4.2 A fully renewable energy system in the light of ET2050

Table 5.1 puts the expected changes in light of the three policy scenarios developed by the ESPON ET2050 project (ESPON, 2014b). These scenarios focus on polycentricity at geographic scales based on networks of (a) major global or European metropolis, (b) urban areas of national or transnational importance, so-called secondary cities, and (c) cities of regional importance. The following table summarises what a fully renewable energy system means in the light of these three scenarios.

Table 5.1 Fully renewable energy system in the light of ET2050 scenarios

	Focus on large metropoles	Focus on secondary city networks	Focus on small cities and less developed regions
			
Regional renewable energy potential and existing production capacities			
Availability of additional RES potential and existing generation capacity	↓↓ Lack of available land for RES generation in cities and potential land use conflicts in densely populated areas	○ No specific impact	↑↑ Better use of endo-genous development potential, especially in rural and coastal areas with available land
Ability to finance investments into additional energy production capacity and infrastructure	↑↑ If the transition is financed largely by large utility companies and multinationals	↑ If the transition is financed largely by national and regional (public) utility companies	↑↑ If the transition is largely financed by citizens and citizen cooperatives
Obsolescence of fossil fuel extraction and fossil fuel/ nuclear-based energy production	○ No specific impact	↓* Need to manage obsolete infrastructure *only in selected regions	↓ Loss in GVA and employment related to the extraction of energy material *only in selected regions
Need for additional energy infrastructure investment	↑ Highest grid densities and net transfer capacities	○ No specific impact	↑ Possibility to become autarkic and indepen-dent from national grid. *Also possible lack of inter-connecting grid to export surplus renewable electricity
Regional energy consumption			
Increase in energy costs for households	↑↑ Large cities and densely populated areas will gain from having the critical mass needed to provide accessible and high-quality public services	↑ Medium-size cities will also gain, although to a lesser extent	↓↓ Remote rural areas may experience accelerated emigration
Loss of accessibility as transportation becomes expensive and air transport uneconomical	↑↑ Major urban centres with good rail connections will attract businesses and people	↑ Regional centres with good accessibility will experience a further inflow of people at the expense of the rural hinterland	↓↓ Regions that are far from major production centres will become increasingly inaccessible
Regional transport and mobility patterns			
Loss in GVA and employment created by the transport sector and freight transport hub function	↓↓ Major urban centres with an important airport or port hub function and related logistics industry	↓ Regional centres will only be affected if they have an important transport industry	↓ Rural area will only be affected if they have an important transport industry

↑↑ Strong developments in support of scenario
↑ Development in support of scenario
○ Neutral with regard to this scenario
↓ Developments counteracting scenario
↓↓ Strong developments counteracting scenario

5.4.3 Pointers for territorial cohesion policies tomorrow

The transition to an energy system that is fully based on renewables within the next 15 to 20 years will severely affect nearly all spheres of life for Europeans who will have to drastically reduce their energy consumption, sacrificing some of their quality of life (in particular, mobility), economic competitiveness of Europe's industry and energy security, but also possibly lead to greater regional value creation. This is likely to partly reinforce and partly reduce current territorial disparities in Europe. Stretching this process of transformation over a longer period of time would alleviate some of the expected adverse effects on territorial cohesion. To ensure better territorial cohesion, negative aspects of this energy transition on territorial cohesion need to be counteracted and positive aspects supported. Some pointers for policies are:

An interconnected grid is a prerequisite for rural and peripheral communities to export their surplus electricity and benefit economically from the energy transition since much of the additional renewable energy will be generated in the form of electricity.

The enhanced dependency of cities on rural areas to secure their energy supply ought to also lead to deeper coordination of energy and land use planning between cities and rural regions. Highly suitable areas for renewable energy production ought to be kept free from infrastructure or settlement development.

Peripheral areas must be made fit for a 100% renewable future as they will be greatly affected by the increased costs of transportation and the fact that air transport will largely disappear, in particular when the distance to bigger centres is large. This may accelerate the current trend of rural depopulation. Thus, the value added potential from becoming centres of renewable energy generation is unlikely to make up for other location disadvantages. Provided there is a political and social consensus that peripheral, rural communities are to be maintained as liveable environments for people and businesses, targeted policies for rural areas are needed to actively support them (e.g. policies covering public service provision, public transport and rail infrastructure development, diversification of the economy, etc.).

Citizens shall be encouraged and supported to have a direct stake in the transition to a renewable energy supply through ownership of renewable energy installations. This way parts of the benefits will remain with the local population rather than with large utility companies and multinationals. Acceptance of the energy transition by local people will increase.

Social protection measures are needed to buffer the effect of rising energy costs on energy poverty and avoid increasing social disparities in Europe. Since all Europeans will experience a steep increase in energy costs, it is important to have the population on board. Otherwise this may be seen as a project for the elite.

Alternative economic models are needed as increased transport costs will likely overturn Europe's current trade structure and flow of goods, possibly resulting in more local production of goods, fewer intermediaries and lower consumption. While this is, in principle, a positive

development towards sustainability, it is likely to also result in high job losses. Timely alternatives to the current growth-based economic model have to be developed, accompanied by open public discussion and participation.

Alternative concepts to mass tourism such as soft or slow tourism, especially for remote tourism regions have to be developed as rising transport costs will make such a business model no longer viable.

Policies that support enterprises to better exploit energy saving potential would be a win-win as it helps both decarbonise the economy and increase the competitiveness of Europe's industry. Even though energy intensity in the EU, so the productivity of the economy relative to its consumption of primary energy, has decreased over the past two decades, there are still major savings to be tapped, in particular in the energy-intense industries.

6 What if European property markets collapse?

What would the European territory look like in 2030, if all European property markets had collapsed?

Summarising volume F of this report, the next section discusses the understanding of a collapse of European property markets. This is followed by three sections going into more detail on specific dimensions of a property market collapse and its territorial expressions. The final section closes with some considerations on what a collapse of European property markets might mean in relation to European territorial cohesion objectives.

6.1 The situation we wake up in after a property markets collapse

Following the terms of reference, European property markets have collapsed in the new future. For the purpose of this project, only the residential property market or housing market is considered and the collapse has been defined as a significant reduction or halt in transactions. Territories respond differently and find different ways to restore housing market transactions.

A property market normally has boom-bust cycles. A ‘boom’ sees higher property prices and more transactions. As property supply takes time (construction), extra demand will not instantly result in more houses, so prices go up. Suppliers must first establish whether this extra demand is durable and potentially profitable.

The long-term nature of property market cycles as well as their complex interconnections with economic policy, the financial sector and their non-transparent character means that people can start to believe that property prices only increase and the resultant speculation can give rise to a ‘property bubble’. In this case, a bubble involves the price of houses and apartments increases until prices rise to unsustainable levels that may not be in line with other economic indicators such as salaries or returns.

Usually property markets in Europe at different geographical levels are in different stages of these boom-bust cycles, though with the euro and more global integration the differences are less pronounced. The territorial situation described in the following sections assumes a halt to transactions on all European property markets at the same time.

A sudden halt in transactions has different implications depending on the regional characteristics of the property market. The main effects are social, based on regional housing market structures and economic, as a result of the relative importance of the housing market in the regional economy. In addition regions have different capacities to cope with a full European collapse. Some markets may already be vulnerable and a sudden halt in transactions may be the direct trigger for a deep crisis or may trigger a series of events moving the region to a relatively long period of downward socio-economic development.

Scenarios on approaches to a property market collapse

Two alternative territorial futures of Europe are presented. One is a highly resilient territorial future in which Europe's economy has successfully diversified its sectors and where governments have sufficient capacity to quickly respond to the effects of a property market collapse. The other territorial future describes crisis prone territories that are specialised in certain economic sectors and have low government capacities, for example as a result of privatisation.

High resilience scenario

European cities and regions will only experience a short downturn of the economy due to the capacities of society, the market and governments to cope. House prices are relatively stable supporting greater labour mobility across countries and regions.

Regional economic structures are highly diversified with a large variety of sectors and limited dominance of certain sectors, with a lower weighting for the construction and financial sectors in some regions compared to today. Areas which can benefit from a complex network of economic sectors will be less affected by the collapse in property market transactions. The resulting spill-overs to the economic system are therefore reduced. The positive implications on household disposable income and the stability of the banking system can revitalise both demand and supply. Governments at different levels can intervene in different ways. These include through the supply of social housing, land-use planning, rental and financial regulations as well as property taxation.

Low resilience scenario

The halt to transactions in the property market translates to a steep decline in housing demand and decreases the mobility of people. House prices go down and cities and regions that have specialised in finance and construction enter a period of economic decline with increasing unemployment and social exclusion due to the lack of government schemes to support people that cannot afford accommodation. This development will impact other cities and regions which may see an increase in migrants seeking employment in cities and regions that were not specialised in sectors closely related to the housing sector. Governments lack the capacity to quickly respond to these developments.

6.2 Social effects based on regional housing market structures

Housing is one of the most significant expenditures for most people. For homeowners it is probably the most expensive purchase in their life while for tenants their rent probably accounts for a large share of their monthly expenditure. A region's dominant housing market characteristics, such as tenure or mortgage market structures, illustrate the form of direct social-territorial impacts after a property market collapse. The two main impacts are expected to be an increasing risk of lock-in and increased poverty and social exclusion.

The risk of lock-in is understood as restricted mobility since households cannot easily move to another location. A halt to transactions increases uncertainty for homeowners concerning the price of their property. People may wait to move, or accept a lower price. In some cases, homeowners cannot realistically sell their home, or temporarily rent it out, in order to generate income to subsidise their move. A significant fall in prices could mean the value of the house is less than the mortgage, leading to significant problems for the borrower and the lender.

Homeowners may risk getting 'locked-in' even though their property does not fit their needs anymore. The share of homeowners is highest in Romania with a rate of 96.4%, followed by FYROM, Croatia, Lithuania, Slovakia, Hungary, Poland and Norway. These countries would therefore be most exposed to a lock-in effect. In Switzerland, Germany and Austria tenure structures are more equally balanced, so these countries are least exposed.

In particular people living in peripheral and rural regions are at risk of getting locked-in, mainly because the chances of temporarily renting out the property to students or tourists is low. Furthermore these regions are generally less attractive for new homeowners due to large distances to urban centres.

The risk of social exclusion increases for those people most vulnerable to change in their household situation and due to a halt in transactions on the housing market not able to find suitable accommodation in a short time. As a result of unemployment can increase the share of people overburdened by housing costs, where the cost of accommodation is more than 40% of their income.

The housing cost burden is highest in Greece, Denmark, the Czech Republic, Germany, the Netherlands, Romania, Bulgaria, Macedonia, Spain, Switzerland and the UK where more than 10% of the population is overburdened by housing costs.

The risk of social exclusion is highest in cities. People who are particularly sensitive to social exclusion or poverty due to the housing market collapse are concentrated in the main urban centres of Bulgaria and Romania as well as in the Netherlands and Denmark. Cities in these exposed countries have many young people as well as single households at risk of not being able to pay their housing costs if there is a change in their financial situation.

6.3 Economic effects based on the importance of the housing market

The housing market is closely linked to the rest of the economy. If transactions in residential markets drop sharply in a short timeframe companies directly related to the housing market will be most affected. This entails the real estate, construction and financial sectors. Other sectors are also at risk if the region's economic structure is dominated by housing related sectors or where links between the property and financial markets are close as a large part of the housing stock is financed with debt. The importance of the housing sector in the overall economy illustrates two main territorial impacts – an increased risk of unemployment and an increased risk of a general economic crisis.

The risk of unemployment increases directly for people working on the supply side of the housing market. A halt in transactions increases the pressure on suppliers to either accept lower prices or to wait. Suppliers may be existing homeowners, construction companies and developers acting as intermediate bodies. If these suppliers do not have sufficient reserves to wait for transactions to start again, they may need to let employees go.

The risk of unemployment increases an urban-rural divide. Regions exposed and sensitive to increasing unemployment are often close to urban areas, but exclude the urban centres themselves, making the distinction between urban and rural regions more stark.

Employment in construction is highest in smaller towns and cities as well as areas close to larger urban regions. Example regions include those around Berlin, Bucharest, Vilnius and Porto (Portugal) as well as southern Norway, the highlands in Scotland, the North West in the UK, Corsica (France) and Presov in the Slovakian Carpathians. The share of people employed in real estate is higher in tourism areas and large cities, in particular the Algarve in Portugal as well as Riga, Vilnius, Bratislava, Halland in Sweden and Dumfries and Galloway in Scotland. These regions are directly exposed to a risk of increased unemployment.

Regions with a shrinking population are particularly sensitive to increasing unemployment, as well as areas that have experienced a housing boom prior to the collapse.

Risk of spill-over effect to other economic sectors. A collapse of the property market decreases consumption and hampers overall economic activity. Transactions in property markets are closely related to increased consumption. Buying or renting a house often involves buying furniture, fittings and appliances, as well services such as conveyancing and moving. Densely populated regions in northwest Europe, capital regions in eastern Europe and tourism areas in southern Europe are exposed to spill-over effects due to their high shares of employment in wholesale and retail sectors.

Also regions with high shares of outstanding home loans against GDP are exposed to spill-over effects. The share of outstanding residential loans against GDP is particularly high in northern and western European countries as well as on the Iberian Peninsula and Cyprus. The large share of residential loans against GDP in these countries illustrates the close links between the financial system and the rest of the economy and thus a higher risk of a financial crisis beyond the housing market.

Some of these regions are particularly sensitive to spill-over effects, for example due to lack of demand as a result of population decline or low resilience levels as a result of sector concentration.

Territories most impacted by spill-over effects are scattered around Europe. These include tourism areas such as the Algarve in Portugal and Greek island regions as well as urban regions in the UK, Ireland, the Netherlands, Latvia, Lithuania as well as Basse-Normandie and Nord-Pas de Calais in France and capital regions in the eastern Europe such as Warsaw, Bratislava, Budapest and Bucharest. In particular eastern European regions are

highly impacted due to their declining populations and thus the reduced chances of transactions and demand recovering.

6.4 Coping capacity of regions and cities

The coping capacity illustrates the magnitude and length of the property market collapse. It shows the region's market and government capacity to contain the collapse to a relatively short or shallow crisis. A halt in transactions may imply a deep and/or long crisis. A deep crisis may be expected in dynamic markets that typically establish many transactions, while a long crisis may be expected in markets where demand may recover slowly.

Cities are most at risk of a steep decline in demand. Urban regions in the Nordic countries, the Baltic countries, the UK, Ireland, the Benelux and in Romania have the most dynamic property markets, with relatively high residential loan to household income ratios and relatively long supply chains. In particular these dynamic markets are exposed to negative impacts of decreasing demand as they have institutions based on a rapid turnover of properties and homeowner ladders.

Inner peripheries are most at risk of a long period of decreasing demand. In particular inland and rural regions in former Eastern Germany, Romania, Bulgaria, Lithuania and the Nordic countries, as well as central regions in France and Spain, with the exception of Madrid, are at risk of a long decline in demand for housing. The regions have more static markets with slow changes in demand and supply. Furthermore, some of these regions experience diminishing demand, due to population decline. This reinforces the halt in transactions and creates a downward spiral in the housing market. In particular, regions with low coping capacities to counter balance this downward spiral may see the start of a long period of economic crisis.

A halt in property market transactions may imply short term increasing territorial cohesion. In particular regions in northwest Europe may see a steep decline in demand. These are currently among the more prosperous regions in Europe and low demand directly after the property market collapse may suggest a more balanced distribution of GDP in the short term. However, most of these regions are expected to quickly recover from the property market collapse.

Rural regions in eastern and southern Europe might experience a longer decline suggesting increasing territorial imbalances at European and urban-rural levels. Although these regions are not hit by a steep decline in demand directly after the property market collapse, they lack the opportunities to regain demand or limit supply after a halt in transactions.

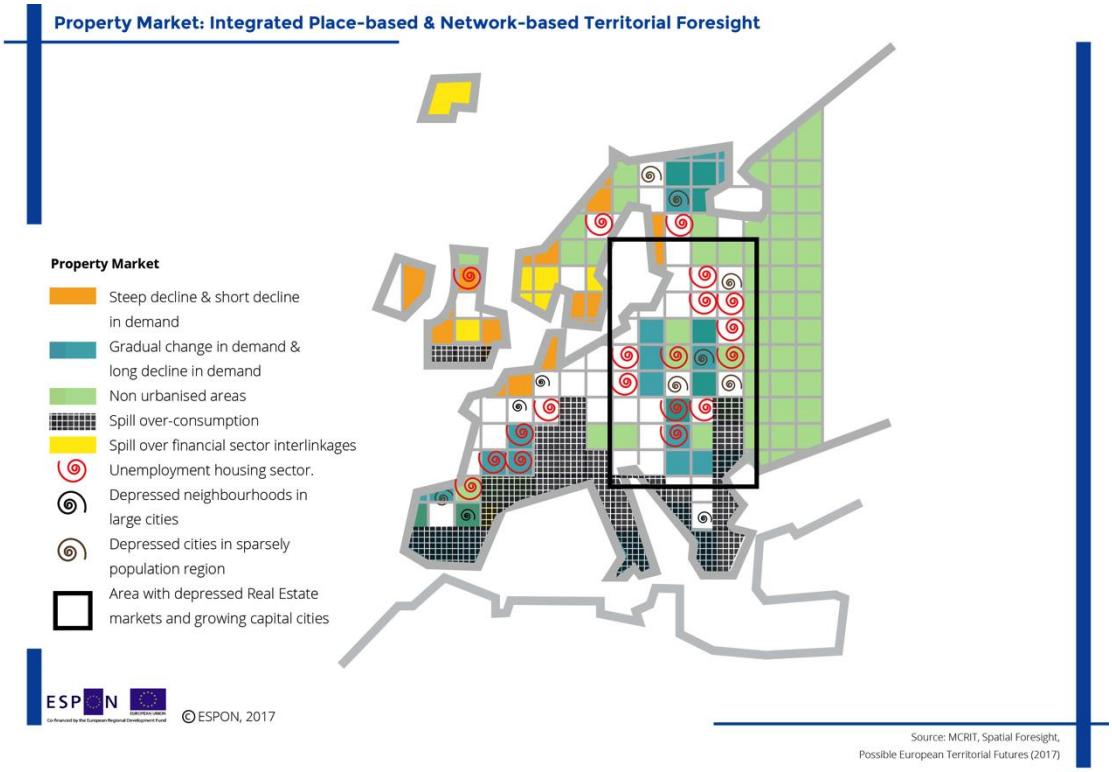
The collapse in property markets suggests multi-speed economic development in Europe. Urban regions in northwest Europe may be hard hit, but only for a short period of time. These regions have attractive property markets and their governments have sufficient capacity to counterbalance the main negative effects. Coastal regions in southern European

countries, such as Portugal, Spain and Greece, may be hit later as they are less likely to see a steep decline, but they are exposed to a long period of declining demand. However, these regions can prevent long-term declining demand in the housing market. Rural and inland regions in southern and eastern Europe as well in the northern periphery are hit later by the collapse in the property markets and lack the market and government capacity to prevent long term decline in housing demand.

6.5 Towards territorial cohesion?

Summarising the territorial consequences per component, a property market collapse impacts European regions to different degrees. Mediterranean regions are mostly affected by a risk of spill-over effects due to lower consumption. As a secondary effect these regions experience more unemployment. Regions and cities in eastern Europe see mostly unemployment and social exclusion and are at risk of a long term-decline in housing demand. Cities in northwest Europe are most at risk of a steep, but short decline in housing demand (see Map 6.1).

Map 6.1 Territorial impact after a property market collapse



6.5.1 Territorial cohesion today and tomorrow

Compared to the baseline scenario described in chapter 2 this collapse of housing markets implies different levels of achieving territorial cohesion objectives.

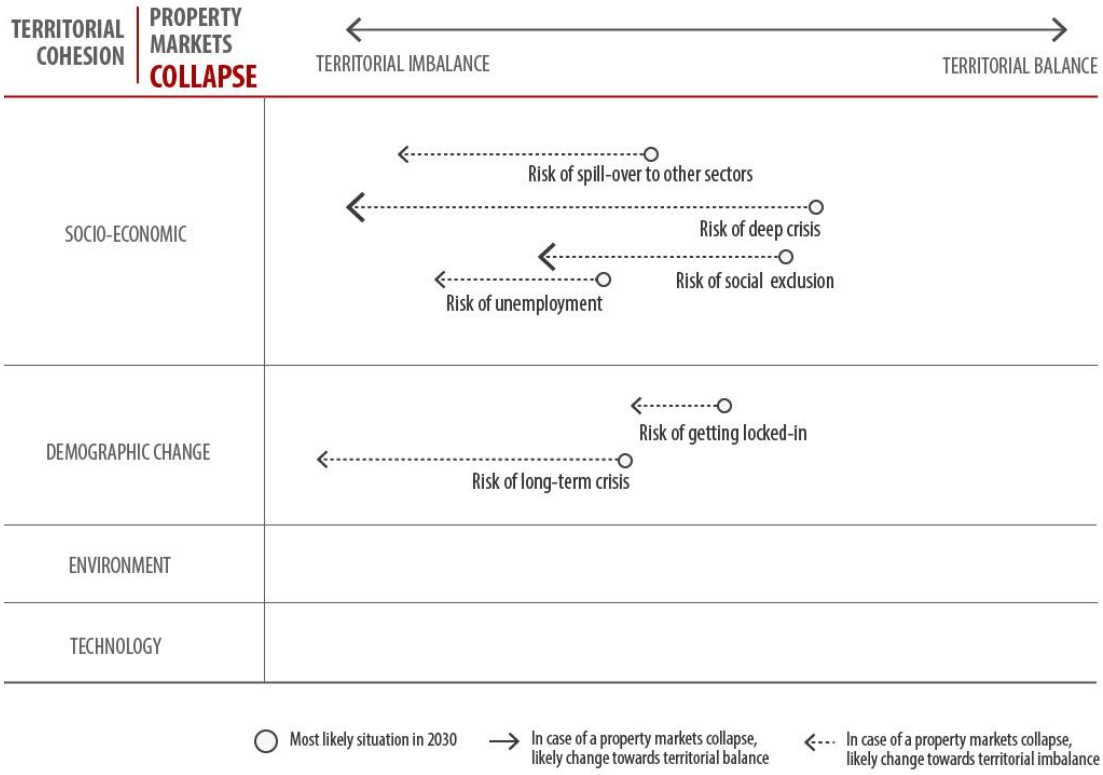
Increasing disparities between urban and rural regions. Sectors directly linked to housing, such as the construction sector are more represented in rural regions. Also, people in these regions generally have fewer opportunities to temporarily rent out their house if they need to move and cannot sell their house immediately.

Temporarily increasing territorial cohesion due to highly impacted northwest European cities. Regions in Europe's core are among the most exposed and sensitive regions to a halt in transactions as some of these markets are more dynamic and the interlinkages between the property market and the financial market are tight. Furthermore, cities are mostly impacted by increasing poverty and social exclusion, implying lower wealth in urban regions compared to rural regions. On the other hand, these regions are least impacted by a long decline in demand. Therefore the effect on increasing territorial cohesion may be temporary.

Increasing centre – (inner) periphery differences in the long-term. Disparities between urban centres and (inner) peripheries may grow. Inner peripheries have declining populations and therefore fewer chances to regain transactions in the property markets. In addition, these regions are challenged by lock-in.

To conclude and simulate for further thinking, the below figure presents an attempt to summarise in what way a property market collapse might change the expected territorial outlook presented in section 3. The figure illustrates the results with regard to the single factors used in the analysis (see Volume F) and main topics for describing the current territorial situation of Europe and future outlook presented (see volume B). The arrows indicate whether a property market collapse is expected to give a push towards more territorial imbalance or balance at European level.

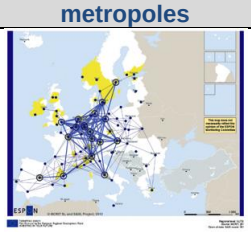
Figure 6.1 Property market collapse impacting on tomorrows territorial patterns



6.5.2 A collapse of the housing market in the light of ET2050

Table 6.1 puts the expected changes in light of the three policy scenarios developed by the ESPON ET2050 project (ESPON, 2014b). These scenarios focus on polycentricity at geographic scales based on networks of (a) major global or European metropolis, (b) urban areas of national or transnational importance, so-called secondary cities, and (c) cities of regional importance. The following table summarises what a place based circular economy means in the light of these three scenarios.

Table 6.1 Effects of a property market collapse in the light of ET2050 scenarios

	Focus on large metropoles	Focus on secondary city networks	Focus small cities and less developed regions
			
Housing market structures			
Risk of getting locked-in	↑↑ Homeowners in cities are least likely to get locked-in.	↑ Homeowners in cities are least likely to get locked-in.	↓ Homeowners in inner-peripheries are less able to rent out their property, hampering mobility and socio-economic development.
Risk of social exclusion	↓ Poverty and social exclusion will be concentrated in cities.	↓ Poverty and social exclusion will be concentrated in cities.	↑ Small cities and rural areas are less sensitive to poverty and social exclusion.
Importance of the housing market			
Risk of unemployment	↑ Unemployment will be highest near urban centres.	↑ Unemployment will be highest near urban centres.	↓ Small towns and rural areas are among the least affected.
Risk of spill-over to other sectors	↓↓ Tourism areas and densely populated regions are most negatively affected.	↓ Tourism areas and densely populated regions are most negatively affected.	↑ Rural and less densely populated areas as in the northern periphery or central France will be least affected.
Coping capacity			
Risk of deep crisis	↓↓ Urban regions in Nordic countries, Baltic States, the UK and Ireland and Benelux are most impacted	↓ Urban regions in Nordic countries, Baltic States, the British Isles and Benelux are most impacted	↑ Only secondary effects for rural areas
Risk of long-term crisis	↑↑ Urban regions especially regions in northwest Europe are least impacted	↓ Coastal regions in Spain, Portugal and Greece as well as larger towns in Germany are exposed but not so sensitive.	↓↓ Rural areas in eastern and southern Europe are most impacted

↑↑ Strong developments in support of this scenario
↑ Development in support of this scenario
↓ Developments counteracting this scenario
↓↓ Strong developments counteracting this scenario

6.5.3 Pointers for tomorrow's territorial cohesion policies

To ensure more territorial cohesion after a property market collapse, negative aspects would need to be prevented and positive aspects encouraged. Literature proposes mainly economic and financial measures at the national level. The following pointers in support of balanced polycentric development and territorial cohesion focus on local and regional levels.

Increase diversity. Diversity is one of the key concepts to increase resilience to a property market collapse.

- **Diverse tenure structures increase stability in the housing market.** The most static markets in Europe have the least difference in transactions and housing prices during both boom and bust phases. Tenure structures can be diversified by providing more social housing, creating more possibilities for new developments.
- **Diversity in economic sectors increases economic resilience.** The ESPON ECR2 (ESPON, 2014a) project showed that economic diversity in terms of the variety of sectors increases resilience to crisis in terms of employment and GDP. Decreasing a dependency on construction and / or real estate sectors decreases the risk of unemployment.
- **Diverse service provision increases attractiveness of the location.** Ensuring good access to public services may improve the attractiveness of a location, increasing demand or slowing a decline. Local or regional authorities in such areas may want to cooperate to reach critical mass for service provision in a wider area.

Ensure more flexibility in cohesion policy. A collapse of the housing market risk to result in a general economic or financial crisis. Cohesion policy has the possibility to address some of the negative territorial imbalance resulting from such crises, but often lacks the possibility to quickly intervene in the market. Future cohesion policy benefits from more flexibility to address different crises in cases needed.

7 Methodology and approach

The ESPON territorial futures study set out to develop a territorial foresight approach and test it for a diverse set of foresight topics. This approach should be useful for policy makers and planning practitioners at any level of governance to quickly understand the territorial implications of a foresight topic, vision or scenario.

The territorial foresight approach has been developed taking into account a rich body of studies and experience including previous ESPON studies, the workshop on 'territorial scenarios and visions of Europe for 2050' organised under the Luxembourg EU Presidency in 2015, as well as a large number of studies focused on the three foresight topics. These however often lack explicit territorial dimensions but the studies and reports are highly relevant both for their content, findings, approach and methodologies.

A detailed, step-wise description of the territorial foresight method developed is provided in a separate handbook on territorial foresight (Volume C). Given the complexity and uncertainty of future developments and their territorial dimension, the method combines quantitative and qualitative approaches emphasising participatory processes. Quantitative modelling and forecast results from other European studies and meta modelling approaches were used to forecast territorial developments within clearly defined frameworks. This was enriched with document studies and talks with experts to fill knowledge gaps when quantitative data was scarce. Participatory approaches in the form of surveys, webinars and focus groups were employed to approach the complexity and high levels of uncertainty when researching the future. Drawing on the tacit knowledge of a large number of experts and planning practitioners has been helpful to deal with the future questions posed by the study.

7.1 Quantitative models

Quantitative models are useful for developing prognoses of territorial developments within clearly defined frameworks. Beyond the two most prominent ESPON scenario projects 3.2 and ET2050, various other ESPON projects have applied scenario techniques. For this study the SASI model[2] (Wegener, 2008) was used to develop prognoses of the business as usual developments presented in volume B. The territorial dimension of the three foresight topics was assessed using meta modelling approaches, which are further described in Volume C.

7.2 Qualitative approaches

When quantitative data was scarce and questions far beyond the boundaries of existing theories and computational models, qualitative assessment was based on expert judgment. The qualitative approaches included a wide range of document studies and talks with experts

[2] The SASI model is a recursive simulation model of socio-economic development of regions in Europe subject to assumptions about the economic and demographic development of the European Union and transport and other spatial policies. The SASI model differs from other approaches to modelling regional development by modelling not only production (the demand side of regional labour markets) but also population (the supply side of regional labour markets).

in the various domains addressed by the study. These have mainly been used to enrich understanding of the general territorial developments in Europe towards 2030 and the three foresight topics.

7.3 Participatory approaches

Participation, especially engaging experts, stakeholders and possibly also citizens, is essential to foresight processes. Participatory approaches help collect insights on highly uncertain and complex developments. Furthermore, participatory processes in territorial foresight increase both the robustness and representativeness of the result:

1. An online survey to frame the foresight topics by collecting insights on how to understand them.
2. A participatory workshop to discuss European territorial development perspectives and initial systematic approaches to the foresight topics. The results shaped the narrative on the future of Europe and further refined the framework for the three foresight topics.
3. An online survey on specific dimensions of each foresight topic assessing which territories are most likely to be positively or negatively affected. The results were used to prepare the territorial impact assessment.
4. Three parallel participatory workshops, assessing the territorial implications of the foresight topics and developing initial maps of how the European territory might look. The workshop results formed a major input to the territorial impact assessment.
5. A webinar on further refinement of the three foresight topics and potential extreme case scenarios. The result of this helped develop extreme cases for the three foresight topics.

The participatory approach are further explained in the handbook (Volume C).

7.4 Territorial impact assessment

To give the foresight approach a territorial focus, ESPON approaches to territorial impact assessment (Essig and Kaucic, 2017) were developed further. In assessing the territorial dimension of these foresight themes in the 2030s the project identified a number of key components. The territorial dimension of these key components was studied, based on the approach to territorial impact assessment developed within ESPON. In this approach impacts are defined through the exposure and sensitivity of a territory towards a specific component.

Consider Europe's territorial diversity in a foresight topic:

- **Exposure**: taking different component of the foresight topic as starting point, exposure is determined by asking**:** To what degree is a region/territory likely to be (positively or negatively) affected by the change?
- **Sensitivity:** taking regional characteristics as starting point, sensitivity is determined by asking: To what degree will regional development be affected? What is the intensity of impacts due to specific characteristics?

8 Further research

The three test cases have illustrated that the approach to territorial foresight works. The results of the three test cases and the feedback from the participants in the interactive processes underline the added value of territorial foresight approaches.

The results from the three test cases show that the methodology is applicable to a variety of topics. This has been underlined by the participants of the interactive processes that suggested the usefulness for other topics as well as at other geographical levels (from local to global). The research illustrated the added value of territorial foresight approaches by offering a simple methodology allowing to understand territorial consequences of (im)possible futures, as well as an approach addressing complexity and uncertainty. The approach itself shows its usefulness in the richness of insights deriving from the interactive sessions. This included indicators, linkages between the indicators and first maps and was sufficient for the subsequent steps of the territorial foresight approach. In short, the interactive sessions allow participants without territorial background to think territorially, and offer a format for structured forward thinking.

As concerns possible next steps and future research some of the key ideas are:

- **Applying the method to other topics**. Stimulate a discussion about 'What if questions' which are of high relevance to policy makers at different geographical levels.
- **Applying the method in different contexts.** Encourage decision makers at all geographical level to consider territorial foresight as a tool in complex policy processes.
- **Testing the method for thematically open and geographical limited foresights.** Could the approach be applied to foresight processes where the geographical scope is more limited but the thematic scope wider?
- **Further developing the tool and making it more accessible to policy makers.** Develop an online tool which guides through the different steps of a territorial foresight process and helps to collect available research in a structured form, moderate participatory processes and follow up on the participatory process in terms finding additional evidence, developing narratives and maps.[3]

Some more ideas concerning the online tool to enrich and facilitate the participatory approach might be in place. To start with, the tool could guide the user through the various steps of a territorial foresight process.

An online tool may include the opportunity to store collected qualitative and quantitative data in a structured way in preparation of the participatory meeting. This supports quick access to relevant data during the participatory meeting. Furthermore, the tool might involve platform

[3] Inspiration for such a tool could come from existing tools such as http://www.futuresplatform.com/ or http://www.z-punkt.de/mountforesight/#en The challenge would be to bring the territorial dimension into it.

functions where the foresight topic can be defined, e.g. through a number of questions guiding to coherent formulation of the foresight topic. Thereafter this definition of the topic at stake could be broken down into a number of relevant sub-themes and the platform could allow for additional materials to be uploaded and for links to ESPON reports, cases studies, maps and data sets.

The tool might also contain a function for identifying and addressing relevant stakeholders and experts, e.g. through a series of guiding questions to identify stakeholders and a mailing function to invite them.

As for the participatory event, the tool might contain features facilitating the moderation process. Alternatively a tool including easy to handle functions for exploring existing maps or creating own maps might facilitate the territorialisation of the discussion during the event.

Finally the tool might even provide an online guide or form for developing and drafting the final foresight report, and sharing it with other people for comments and discussion. Such a guide needs to offer possibilities to be adjusted to the specificities of the foresight topic at stake.

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Territorial foresight glossary

Action research: Comparative research on the conditions and effects of various forms of social action and research leading to social action (Jackson, 2013). Action research conducts research about an activity while conducting that activity; e.g., studying micro credit approaches while conducting micro credit programs (Glenn et al., 2015).

Action science: One of the major theories within action research. Designed to generate knowledge that is both theoretically valid and practically useful (Jackson, 2013).

Agent-based modelling (ABM): Simulates complex systems, particularly the interactions between autonomous agents along predefined rules. The interactions reveal emergent patterns across the system that might not be obvious when studying agents or interactions in isolation.

Appreciative inquiry (AI): Process of change that focuses and builds on the positive things that are working. It is the cooperative, co-evolutionary search for the best in people, their organisations and communities, and the world around them. It involves systemic discovery of what gives "life" to an organisation or community when it is most effective and most capable in economic, ecological, and human terms. AI assumes that every organisation or community has many "untapped and rich accounts of the positive" - what people talk about as past, present and future capacities -the positive core. Appreciative inquiry links the knowledge and energy of this core directly to an organisation or community's change agenda, and changes never thought possible are suddenly and democratically mobilised.

Backcasting: Tool in which an envisioned future is linked to today by imagining sequential cause and effect steps that lead back from the imagined future to today's situation (Glenn et al., 2015). Backcasting works with normative visions and explores their feasibility and implications. In most cases, it involves participatory process. Backcasting is widely used in the context of sustainable development.

Benchmarking: Process in which organisations evaluate various aspects of their processes in relation to best practice, usually within their own sector (Jackson, 2013).

Bifurcation: Point at which developments may take different directions. Bifurcations are the cross-roads that emerge at specific moments in time, in which different evolutions are possible. In future research, bifurcations are very important as these are the moments of game changers.

Black swan: Rare and discontinuous event that is unprecedented, unexpected and has major effects. Black swans are often inappropriately rationalised after the fact with the benefit of hindsight, but this tendency to see coherence can obscure future threats.

Brainstorming: Intensive discussion method to solve problems or generate ideas (Jackson, 2013). Brainstorming is a subjective method to enhance creativity and elicit ideas from groups. The moderator makes the ground rules clear: during the session all ideas are welcome, no such thing as a bad idea. No criticism, no ideas rejected as being too fanciful. Filtering of the brainstorm suggestions occurs after the session. Brainstorming sessions generally involve between 6 and 12 people (Glenn et al., 2015).

Causal Layered Analysis (CLA): Method for examining the causes of social change that produces forecasts as to the future course of those changes (Glenn et al., 2015)**.** CLA is an exercise in deconstructing stakeholder narratives surrounding an issue or strategic option about the future. It identifies driving forces and worldviews underpinning diverse perspectives about the future, and what it means to different groups through discussion and deconstruction of conventional thinking. Based on that, CLA is able to produce a shared view of possible future outcomes that can break existing paradigms of thinking and operating. It is particularly useful when different groups hold different perspectives on the future of an organisation and what strategy should be used.

Cognitive bias: The human tendency to make systematic errors in certain circumstances based on cognitive factors rather than evidence (Jackson, 2013). In other words: a pattern of deviation in judgment that influences the way information is received, processed, retained or called. Cognitive biases influence how inferences, judgments and predictions are drawn.

Cognitive dissonance: The mental stress or discomfort one experiences when confronted with new information or views that contradicts existing values or beliefs. Because humans strive for internal consistency, individuals tend to reduce cognitive dissonance by denying or devaluing new information and views, or rationalising their own values and beliefs.

Complex systems: Non-linear and diverse networks made up of multiple interconnected elements. Cause and effect relationships within the system are not easily discernable or predictable. Historical extrapolation is futile for predicting emergence (new patterns and behaviours) in complex systems.

Conference model: Original methodology to engage large numbers of people in system-wide change through a series of integrated conferences and 'walkthrus'. The model consists of three elements: (1) a series of integrated conferences, (2) the 'walkthru' process, and (3) simple commitments. The conference model creates an open exchange of information, increased understanding of the system under consideration, new agreements and actions, and enhanced relationships among participants. It is also useful for involving internal and external stakeholders in the redesign of processes and organisations. Conference model applications include redesigning processes, developing new organisational cultures, integrating organisational units/processes, and creating organisational alignment with new strategic directions.

Cost-benefit analysis: Method that intends to identify all the costs of a proposed project such as financial, environmental, cultural, political, health, etc.. It also attempts to identify all the benefits: financial, political, health, etc.. It then attempts to weigh all the costs compared to all the benefits to see if the benefits are worth all the costs. Businesses tend to add up production and marketing costs compared to expected sales. Futurists looking at the larger picture might bring in externalities (e.g., environmental clean-up costs) to help the business to a more thorough analysis. They may also help include risk factors; alternative futures to the future the business expects; technological research could make that businesses' product obsolete (Glenn et al., 2015).

Cross-cutting issues: Issues or challenges that affect more than a single interest area, institution or stakeholder, and that need to be addressed from all points of view. A Whole-of-government or networked approach is useful for addressing cross-cutting issues.

Cross-impact analysis (CIA): Family of techniques often thought of as an extension of the Delphi method. CIA is an analytical approach for consistently estimating the probabilities of a set of events. Like its name entails, it involves identifying and evaluating the impact of trends or events upon each other using a matrix format. Its probabilities can be adjusted in view of judgments concerning potential interactions among the forecasted items. Its steps are: (1) to define the events, (2) to estimate the initial probability, and (3) to estimate the conditional probabilities – the impact of one event's occurrence on the likelihood of another's (Glenn et al., 2015).

Decision analysis: Analytic study of the validity of contemplated decisions and their intended and unintended consequences. It involves estimation of costs and benefits, consideration of risks and objectives, and articulation of a decision principle, such as minimising downside potential. It comprises the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner (Glenn et al., 2015).

Delphi method: Systematic, interactive forecasting method which relies on sequential questionnaires completed by carefully chosen groups of experts. It is frequently used in forecasting, foresight, and policy studies. In a sense, the Delphi method is a controlled debate. The reasons for extreme opinions are made explicit. More often than not, groups of experts move toward consensus; but even when this does not occur, the reasons for disparate positions become clear. Planners reviewing this material can make judgments based on these reasons and their own knowledge and goals (Glenn et al., 2015). The Delphi method first establishes the group's initial view, presents instant feedback on differing opinions, and goal seeks an agreed position in the final round. Contributors to the group analysis do not have to meet in person and can see the results as they, and their colleagues, add their views in real time. At the beginning, the organiser(s) formulate questions about the future and present these to contributors. Contributors respond by adding their rankings and comments. The organisers then modify the anonymous comments received to formulate

better questions. The process is run again, in a series of rounds, until a consensus answer is arrived at.

Design thinking: Participatory method that stimulates co-creation between participants with the intent to obtain an improved future result. Design thinking is a form of solution-based, or solution-focused thinking, starting with an objective instead of solving a specific problem. By considering both present and future conditions and parameters of the problem, alternative solutions may be explored simultaneously. Design thinking identifies and investigates both known and ambiguous aspects of the current situation in order to discover hidden parameters and open alternative paths which may lead to the goal.

Diagnosis: Aims to understand the current situation, or to identify of the nature and cause of a certain phenomenon. As it is often linked to the medical understanding of diagnosis, there is an element of understanding what the situation is, and comparing it to what it should be, i.e. identifying a problem and thus applying a clear judgment to the current situation. In that sense the diagnosis is often linked to identifying the needs of the concerned players.

Disruptive event: Event that creates a new situation and eventually disrupts existing patterns (e.g. societal or economic structures), displacing established structures and patterns. They are rather similar to wild cards, however, not necessarily as unexpected as disruptive events and can build up from seeds, via trends, to setting the new norm. Lately, this idea is also used in innovation theory, referring to disruptive innovation.

Driver: Player or development that brings a specific development forward. Drivers are forces for change or trends- usually external- that act as independent variables, often with the greatest impact (Glenn et al., 2015).

Drivers analysis: Determines which of the drivers are most critical for consideration for a given topic. High-level drivers include issues such as globalisation, demographic change and technology. Horizon scanning is often the largest source for the identification of drivers, which can then inform an overall outcome, such as a scenario.

Enabler: Player or development which makes something possible, i.e. encourage or enable developments into a certain direction. Enablers can play an important role for the development of seeds into trends, or for the directions taken at specific bifurcations.

Environmental scanning: Study and interpretation of the political, economic, social and technological events and trends which influence a business, an industry or even a total market. The factors which need to be considered for environmental scanning are events, trends, issues and expectations of the different interest groups (Glenn et al., 2015)**.** It aims to (1) better understand the nature and pace of change in that environment, and (2) identify potential opportunities, challenges, and likely future developments relevant to an organisation. Environmental scanning is not about making predictions, but about exploring new, strange and weird ideas, as well as persistent challenges and trends today. For governments, scanning helps ensure that policies are resilient to different future environments. The increasing availability of large amounts of open data, including from massive online surveys and consultations, social networking platforms or crowd-sourcing tools, is also changing the way traditional environmental scanning or ground-sensing can be conducted.

Experimentation and prototyping: Experimentation is a process that seeks to test and validate competing hypotheses. Prototyping refers to creating models or sketches to test ideas and spot problems. Experimentation and prototyping are effective ways to navigate and test hypotheses and ideas in complex or rapidly changing environments.

Expert panel: Uses a pre-determined group of experts and renowned people from outside the organisation (sometimes anonymously) to give feedback on issues.

Exploratory futures: Futures research into plausible futures without consideration of desirability (Jackson, 2013).

Forecasting: Process of making predictions of the future based on past and present data and analysis of trends. Importantly, forecasting starts with thinking the future from where we are today (and how we have got here). Uncertainty is a central dimension of forecasting. It is generally considered good practice to indicate the degree of uncertainty attached to forecasts. Forecasting can build on quantitative modes, past data or elaborated macro-economic and

agent-based models, as well as on qualitative techniques getting on board the insights of experts or a wider public (Randers, 2012).

Foresight (also called: *Forward thinking*): Future oriented approach characterised by (1) critical, lateral thinking concerning long-term developments, (2) large discussions creating wider participatory engagement (ranging from expert panels to crowed intelligence) and (3) shaping the future, especially by influencing public policy. JRC (Joint Research Centre) describes foresight as framework for a group of people concerned with common issues at stake (e.g., future of the European territory) to jointly think about the future in a structured and constructive way. Foresight provides a number of tools to support participants (i.e. policy makers, experts and other stakeholders) in structured forward thinking (Loveridge, 2009; Steinmüller and Steinmüller, 2006).

Foresight study: Multi-disciplinary qualitative and quantitative analysis which assumes that alternative futures are possible. Foresight studies may include alternative scenarios. Foresight activities may also consider the actions that should be taken to shape the future (Danish Techonological Institute et al., 2010).

Future search: A 3-day task-focused planning meeting that enables people to cooperate in complex situations, including those of high conflict and uncertainty, and which helps people transform their capability for action very quickly. It brings together people from all walks of life into the same conversation—those with resources, expertise, formal authority and need—to discover common ground through dialogue. Concrete action plans are made after people share stories about the past, present and desired future.

Futures dialogue: Brings together a range of stakeholders to reflect and debate on alternative futures. In a structured futures dialogue, foresight methods are used to structure the debate on alternative futures (European Training Foundation, 2014).

Futures wheel: Graphical visualisation of direct and indirect future consequences of a change or development. The name of a trend or event is written in the middle of a piece of paper, then small spokes are drawn wheel-like from the centre. Primary impacts of consequences are written at the end of each spoke. Next, the secondary impacts of each primary impact form a second ring of the wheel. This ripple effect continues until a useful picture of the implications of the event or trend is clear (Glenn et al., 2015). Futures wheels can also be used in decision making (to choose between options) and in change management (to identify the consequences of change). The tool is especially useful during the brainstorming stage of impact analysis.

Genius forecasting: Generation of a vision (or several visions) of the future through the insights of a gifted and respected individual or individuals (UNIDO, 2005). The processes need not be the same for any two geniuses. Genius forecasts are those pronouncements in their areas of expertise for which they have proven insight. Genius forecasts can also come from people whose IQ is less than genius, but who have proven great insight in some specialty (Glenn et al., 2015).

Heuristic: Useful mental shortcut or approximation, such as a rule-of-thumb, for guiding analysis and facilitating adaptive decision-making or thinking. Heuristics are intellectual tools, methods and procedures that favour scientific analysis and invention (Glenn et al., 2015). One of the basic lessons of cognitive psychology is that people use simple mental shortcuts, known as heuristics, to manage complexity and uncertainty. Heuristics are experience-based techniques for problem solving, learning, and discovery that find a solution which is not guaranteed to be optimal, but good enough for a given set of goals. A heuristic is an algorithm that is able to produce an acceptable solution to a problem in many scenarios using experimental and especially trial-and-error methods.

Horizon scanning: A “look-out” or early warning system designed to identify interesting and important developments as soon as possible. It usually involves manual or automated literature review, continuous analysis of Web sites and seminars on a wide variety of topics, and interviews (Glenn et al., 2015). Horizon scanning calls for determining what is constant, what changes, and what changes constantly. It explores novel and unexpected issues as well as persistent problems and trends, including matters at the margins of current thinking that challenge past assumptions (OECD, n.d.).

Interdependence: A relationship of mutual reliance between two or more factors within a system such that changes in one area affect the other(s).

Issue: Problematic element that entails in itself a potential of changes, positives (opportunities) or negatives (threats), that are necessary to consider to construct a forecast and to determine a strategy. It is the measurement of the impact of a given situation on the strategic position of an actor (Glenn et al., 2015). An issue or challenge is the core problem that is being addressed by a foresight exercise; global warming would be an example. Not every foresight exercise primarily focuses on an issue (European Training Foundation, 2014).

Management by discovery: A style of management based on continual reframing and adaptation of the problem-solving process. It is well suited to complex and unpredictable environments, or to solve wicked problems, where details about goals and objectives are likely to emerge only during the course of a project. In fact, the goals and objectives themselves are likely to shift as a result of actions taken.

Modelling, simulation and gaming: Techniques to help decision makers see the effects of policies in advance. Modelling, simulation and gaming have grown in influence as computerisation of the structure and rules allow complex systems dealing with many variables to be presented dynamically and graphically. As computer gaming technology becomes more sophisticated and monitoring devices become ever more ubiquitous we can expect these foresight methods to become ever more pervasive and exciting to use. For instance, virtual worlds too are very large simulations hosting smaller simulations and these are growing in power exponentially.

Morphological analysis: Method that allows the decomposition of the studied system into essential magnitudes (fields and variables) and the study of its possible recombination to determine its possible evolutions (Glenn et al., 2015). Morphological analysis is often used in conjunction with a relevance tree, that is used to identify new product opportunities. This type of analysis explores all the possible solutions to a multi-dimensional, non-quantified, complex, usually 'wicked', problem.

Multi-criteria decision analysis: Discipline aimed at supporting decision makers who are faced with making numerous and conflicting evaluations (Jackson, 2013).

Narrative inquiry: A sense-making process based on stories and narratives provided by participants through interviews that help analysts identify key patterns, weak signals and key perspectives. It is based firmly in the premise that, as human beings, we come to understand and give meaning to our lives through story. Narrative inquirers strive to attend to the ways in which a story is constructed, for whom and why, as well as the cultural discourses that it draws upon. Narrative inquiry can be supplemented with sentiment analysis, which aims to determine the attitude of a storyteller. Sentiment analysis is common practice in the private sector to track an understand perceptions of an organisation or brand.

Normative: Ideal standard or model. In practice, it has strong connotations of relating to a typical standard or model (Jackson, 2013).

Normative futures: Futures research which involves consideration of the desirability of the outcome and typically involves planning and proactive action to achieve more desirable outcomes (Jackson, 2013).

Participatory approach: An approach that offers and encourages the participation of individuals and groups. Future-oriented activities can be considered participatory if (1) they involve participants from at least two different stakeholder groups (e.g. researchers and business people; experts and policy makers; experts and lay people), (2) they disseminate their preliminary results (e.g. analyses, tentative conclusions and policy proposals) among interested non-participants, e.g. face to face at workshops, over the internet with free access for everyone, or in the form of printed documents, leaflets, newsletters, or (3) they seek feedback from this wider circle (again, either face to face or in written form) (FOR-LEARN, 2007).

Path dependency: The inclination to stick to past practice despite the availability of newer, more efficient practices as a result of cognitive biases such as risk aversion, or concerns over sunk costs. Designing contingency plans with ample space for flexibility can reduce the constraints of path dependency.

Prognosis: A prediction of how a problem will progress, and whether there is chance of recovery (Jackson, 2013). Prognosis is often the core of forecasting and future studies, though it is often either strongly focused on the medical prognosis understanding in terms of cause-effect relations, or rather imaginary, coming close to oracles, predictions and crystal ball gazing. Usually prognosis work is heavily expert-based and can apply a wide range of tools.

Real time strategic change (RTSC): Large group intervention method whose primary aim is the design and implementation of "whole system" change. RTSC is a highly structured and organised two to three day event that consists of a sequence of small and large group activities previously determined by a design team. Events are grounded in giving participants a common database of information from which to work. Participants mostly work in mixed stakeholder groups of six to eight people. RTSC is not just an event, but the beginning of a process that leads to a fundamental system-wide change in the way the organisation works.

Reflexivity: An act of self-reference where examination or action "bends back on," refers to, and affects the entity instigating the action or examination (Jackson, 2013).

Relevance trees: Analytic technique that subdivides a broad topic into increasingly smaller subtopics (Jackson, 2013). The output is a pictorial representation with a hierarchical structure that shows how a given topic can be subdivided into increasingly finer levels of detail.

Resilience: System's ability to cope with and recover from shocks or disruptions, either by returning to the status quo or by transforming itself to adapt to the new reality. Resilient systems view change as inevitable and failure as opportunities to learn from. Social cohesion, trust in government and national pride can be indicators of resilience.

Retrospective coherence: Assigning coherence in hindsight in order to make sense of what is happening. Practicing retrospective coherence presents the danger of making decisions for the future based on the lessons of history that may not apply in similar situations.

Roadmapping: A graphic representation or listing showing sequences of developments or elements in the expected evolution of a product, process, strategy, or the consequences of a policy or action; usually based on anticipated cause and effect (Glenn et al., 2015). Roadmapping is an important tool for collaborative planning and coordination for corporations as well as for entire industries. It is a specific technique for technology planning, which fits within a more general set of planning activities. A roadmap is the document that is generated by the process. In effect, a technology roadmap identifies alternate technology "roads" for meeting certain performance objectives.

Scenario: Plausible version of how the future might develop, based on a coherent and internally consistent set of assumptions ('scenario logic') about the key relationships and driving forces (Carpenter et al., 2005). The focus in scenario work is usually on alternative scenarios to underline the uncertainty of the future. Scenarios are most useful when considering whether policies or specific measures are fit for the future with regard to the territorial diversity of expected developments (Zillmer et al., 2015).

Scenario planning (Also called: *Scenario building*): Scenario planning is one of the most well-known and most cited technique for thinking about the future. Scenario planning does not attempt to predict what will happen, but through a formal process identifies a limited set of examples of possible futures that provide a valuable point of reference when evaluating current strategies or formulating new ones. This method questions assumptions about the future and creates confidence to act in a world of uncertainty.

Scenario workshop: Aim to build internally consistent pictures of future possibilities that are useful for envisaging implications of uncertain developments and examining the scope for action. Scenario workshops are a popular way of building scenarios. They usually bring together participants with a wide range of knowledge and experience in various fields such as technology, economy, social or political sciences. (European Training Foundation, 2014).**Scope:** The set of things the exercise will look at (and, therefore, also implicitly defines what will be left out). There are basically two aspects involved in defining the scope of a foresight exercise: (1) choosing the topics to be dealt with, and (2) developing the perspective to be taken regarding the topics under investigation (FOR-LEARN, 2007).

Search conference: Participative planning method that enables people to create a plan for the most desirable future of their community or organisation—a plan they take responsibility for carrying out themselves. In a search conference, people (citizens, community leaders, managers, workers) become a planning community. Together they create a plan for the future, based on shared human ideals, that they can live for and work to implement. The search conference makes it possible for any kind of system, whether community or workplace, to thrive in the face of uncertain, turbulent times.

Seed: Emerging trend, i.e. an element of currently marginal relevance which may grow over time. Seeds can give an indication of other possible directions. However, as they are only emerging, the full impacts are not yet to be predicted. Despite the uncertainty, seeds are important to be taken into account to explore possible future developments and changes in development directions.

Signposts: Milestone markers between a given future and the present day that aid visualisation by breaking up the path to the future into manageable blocks of time. They can help to gauge the extent to which a particular scenario has materialised, and can be events, thresholds or s and patterns.

Status-quo analysis: Description of the current state of affairs. In future studies the status quo is part of the preparatory work identifying where we are today. In many cases, the status quo analysis is considered as the baseline against which change takes place. As compared to diagnosis, the status quo analysis is often more static and less judgmental.

STEEP analysis: Useful framework to apply in scanning work that considers the Social, Technological, Economic, Ecological/Environmental, and Political domains. Other domains to consider include Legal, Ethics and Demographic (STEEPLED), Regulatory factors (STEER), or value-based issues (STEEPV) (European Training Foundation, 2014).

Strategy: Method or plan chosen to bring about a desired future, such as achievement of a longer-term goal or solution to a problem, based on the most efficient and effective use of resources (European Training Foundation, 2014).

Stress-testing: Tool to help decisions makers asses policy robustness by identifying weaknesses or flaws in existing policies and potential breaking or failure points along possible policy trajectories. Existing thresholds of failure are tested for robustness by applying policies to worst case scenarios.

Structured futures dialogue: Structured debate is a courtroom-style argument that takes alternative views and presents arguments and counter arguments to a decision or hypothesis.

SWOT analysis: Analytical method that is used to identify and categorise significant internal (strengths and weaknesses) and external (opportunities and threats) factors faced either in a particular arena, such as an organisation, or in a territory, such as a region, nation or city (European Training Foundation, 2014).

System: Set of elements or parts that is coherently organised and inter-connected in a pattern or structure that produces a characteristic set of behaviours, often classified as its "function" or "purpose" (Jackson, 2013).

System dynamics: Approach to understanding the behaviour of complex systems over time using quantitative modelling (Jackson, 2013).

System sciences: Collective disciplines that study systems and system-related phenomena and their associated knowledge base, including such sciences as biology, cybernetics, electrical engineering, evolutionary ecology, mathematical biology (Jackson, 2013).

Systemic pictures: Visualisations of a set of interrelated development factors. System pictures may show unidirectional and multidirectional cause-effect relations as well as non-linear, complex feedback mechanisms.

Systems theory: Conceptual framework of system-related principles, theorems, and logic from across the system sciences. It is an interdisciplinary field which studies relationships of systems as a whole (Glenn et al., 2015).

Systems thinking: Analytical problem solving approach that looks at a system as a whole rather than in isolation, and that considers the interactions between various elements. The

big-picture overview helps decision makers see linkages across different sections within the system and can foster collaboration and shared understanding within an organisation. Systems thinking also helps policymakers identify cause-effect relationships and how they might manifest in the larger system.

Territorial foresight: A future oriented approach characterised by (a) critical, lateral thinking concerning long-term developments and their impacts on territorial development, (b) wider participatory engagement and (c) informing public and/or private decision making. Territorial foresight provides a framework to support 'a group of people concerned with common issues' to jointly think about possible futures and its territorial consequences in a structured and constructive way. As foresight process it provides a number of tools to support participants in structured forward thinking (Loveridge, 2009; Steinmüller and Steinmüller, 2006). To ensure the territorial dimension in foresight thinking, the ESPON approach to territorial foresight adapts elements of the territorial impact assessment (TIA) developed under earlier ESPON studies. This approach can be used to study any policy questions, future vision or dystopian thoughts. Territorial foresight can be conducted at any geographical level.

Territorial impact assessment (TIA): Methodology that helps to assess positive or negative, intended, unintended or even unknown territorial impacts of a policy. The ESPON ARTS approach to territorial impact assessment is based on the vulnerability concept of the IPCC (Intergovernmental Panel on Climate Change) and assesses exposure and sensitivity of regions with regards to the policy in question. Exposure describes the intensity of potential effects on the European territory stemming from the policy assessed. Sensitivity refers to expected impacts in individual regions as a result of their specific characteristics (ESPON, 2012). The ESPON TIA Quick Check translated that approach into a we-based tool combining an expert discussion in a workshop set-up with a set of indicators describing the sensitivity of European regions. The result is a map showing the potential impacts in European regions. The FP7 project FLAGSHIP has taken first steps to further develop the ESPON TIA approach and apply it to grand societal challenges rather than individual policies (FLAGSHIP, 2013).

Text mining: Identifies patterns and breakthrough occurrences in large amounts of raw data and information gathered from internal or external sources. The goal is to discover previously unknown information to the researcher. Text mining is an interdisciplinary field which draws on information retrieval, data mining, machine learning, statistics and computational linguistics (Glenn et al., 2015). Text mining tasks include text categorisation, text clustering, concept/entity extraction, production of granular taxonomies, sentiment analysis, document summaries, and entity relation modelling (i.e., learning relations between named entities). Text mining requires the use of specialised software.

Theory of inventive problem solving (TRIZ): Methodology, tool set, knowledge base, and model-based technology for generating innovative ideas and solutions for problem solving (Jackson, 2013). It is intended for application in problem formulation, system analysis, failure analysis, and patterns of system evolution. It can be used in many foresight projects such as technology forecasting, advanced SWOT and patent analysis.

Trend: General direction in which something is developing or changing. Sufficient data are required to observe relationships and changes over time. A trend is a measurable or observable transformation in a given system (Glenn et al., 2015).

Trend extrapolation: Extending trends into the future by continuing the directions of change of the past. The trends may be linear, exponential, logistic, cyclic, or in fact any shape defined by the historical data on which the extrapolation is based (Glenn et al., 2015).

Trend impact analysis: Forecasts which examines the cause, nature, potential impact, likelihood and speed of arrival of an emerging issue of change. Some trends are relatively predictable like global population growth but most trend extrapolations deteriorate over time the further out the projection goes. Trend impact analysis seeks to look at the envelope of possibilities that deviate from the expected norm.

Uncertainty: State of having limited knowledge where it is impossible to exactly describe an existing state or future outcome, or more than one possible outcome (Jackson, 2013).

Unknown unknowns: Issues and situations in organisations that have yet to surface and which are blind spots for planners who are unaware that they do not know about them.

Utopia: Any real or imaginary society with many desirable features. Representation, system or project that a priori seems unrealisable or impossible. Vision of a society organised and governed of ideal form that would not consider the reality (Jackson, 2013).

Vision: Desirable picture of the future, based on a core set of ideas, values and principles. In an ideal case, visions are based on large participatory processes creating a large ownership of this shared picture of the desirable future. In some cases, also the terms 'perspectives' or 'long-term strategies' are used. These, however, have a stronger focus on the steps towards the desirable future, whereas visions often mainly describe the picture and not the path how to get there. Visions are most useful when discussing whether a policy or specific measure is likely to contribute to developments leading to desired territorial patterns in Europe (Zillmer et al., 2015).

Visioning: Method for determining a compelling vision of a preferred future. Visioning a desirable future is the first step in creating a powerful strategy to achieve a particular purpose. Clarifying a vision is one of the most powerful mechanisms for engaging a team, organisation or community and getting them excited to push forward into new territory. A successfully designed product, service or policy should intentionally impact the thoughts and behaviours of society and culture, and serve as an example of the mind-set and values of its creators. Creating that clear vision is a precursor to planning, and a key to creating the conditions to mobilise a group of collaborators around a common goal. Ultimately, it is not about creating my vision, but about creating a shared vision.

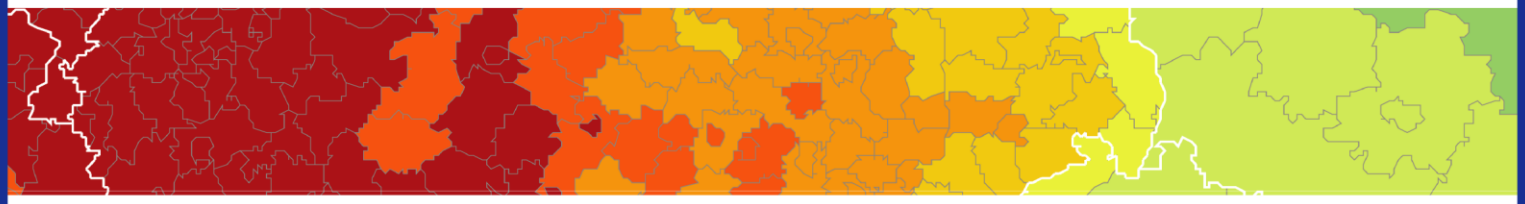
Weak signals: Advanced, noisy and socially situated indicators of change in trends and systems. They constitute raw informational material for enabling anticipatory action. In policy processes, weak signals can anticipate the agenda setting or when "the policy window" of an issue might open.

Whole-of-government (WG): 'Joined-up' or networked approach to governance that represents a shift from vertical to horizontal decision-making, and which is built on inter-agency collaboration and collective problem-solving. Whole-of-government involves a process of identifying, analysing and managing wide-ranging and cross-cutting issues.

Wicked problem: Large and intractable issue or challenge, that has no immediate or obvious solutions, and whose causes and influencing factors are not easily determined. Wicked problems are characterised by many agents interacting with each other in often mystifying ways, and involve multiple stakeholders operating with different perspectives and goals.

Wild card: Low-probability but high-impact events that seem too incredible or unlikely to happen, for example September 11, the recent Global Financial Crisis or SARS. Considering the extreme impacts of a wild card may lead to the discovery of new opportunities and risks and the establishment of simple early warning systems of their potential arrival. Wild cards may or may not be announced by weak signals.

Wind tunnelling: Testing chosen objectives against alternative futures (Jackson, 2013). Wind tunnelling is a relatively new method similar to backcasting. By inviting participants to imagine how they would meet their objectives in different scenarios, wind tunnelling helps them identify critical planning points where strategy needs to be flexible and adaptable and what policies may need to be strengthened. Wind tunnelling is viewed as a good public sector technique for policy testing, which leads to continual scrutiny of decisions.



ESPON 2020 – More information

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