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The future of shrinking areas in the EU: potential policy impacts in light of pressing pandemic, environmental and institutional challenges

Doctoral Thesis

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Spatial Foresight
Territorial policy support and research

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REVIVING SHRINKING CITIES
innovative paths and perspectives towards livability for shrinking cities in Europe

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Summary

When the Treaty on the Functioning of the European Union was agreed, demographic challenges were identified as affecting a limited set territories with geographical specificities. Since then, demographic decline has expanded, and research shows that this concerns all types of territories across the EU (Wolff and Wiechmann 2018). Shrinkage is the territorial transposition of demographic decline, and it entails rooted nets of structural social, economic and environmental issues. These influence development trajectories and shape varieties of shrinkage (Haase et al. 2016).

Territorial disparities of shrinking areas are not acknowledged in European policies, and recent debates within 2021-2027 Cohesion Policy negotiations reveal an inbuilt resistance to formally recognising their structural vulnerability in regulations (Pazos-Vidal 2021). Meanwhile, macro trends and other sectorial policies generate territorial impacts that vary across territories depending on their exposure and sensitivity to available EU instruments (Böhme and Lüer 2017).

Acknowledging the limited appeal of shrinking areas in territorial development debates, but considering the relevance of other trends and policies in generating territorial impacts, this research relates future trajectories of shrinking areas with major challenges ahead for the European Union. These include the socioeconomic consequences of Covid-19 restrictive measures, energy transition and industrial restructuring of local economies (Just Transition Fund) as well as citizen discontent and lack of engagement in decision making processes.

Following exploratory research approach based on mainly quantitative but also qualitative foresight assessments, this dissertation bridges a research gap from case-study to give an aggregated perspective on shrinking areas at European scale. This generates new knowledge on territorial disparities to tie shrinkage closer to current European policy debates. The research design combines and cross analyses EU level data using: a)statistical demography modelling (Siegel et al. 2004), b)Territorial Impact Assessment (Essig and Kaucic 2017) and c)policy content analysis.

Results of statistical demography modelling confirm the consolidation and intensification of shrinkage until 2050 for currently shrinking areas (28% of European municipalities).

Moreover, results highlight its geographical expansion to new territories through the identification of blind spots of future shrinkage and, by 2050, 77% of European NUTS 3 areas will be confronted with shrinkage in at least part of their territory.

The sensitivity assessment of Covid-19 restrictive measures reveals that shrinking areas have been relatively spared from the worst hits of the pandemic. However, cross analyses with future shrinkage trajectories contradict potential revitalisation paths. The few areas with a positive demographic outlook are more vulnerable to the pandemic crisis, and, overall, shrinking areas reveal significant structural gaps in digital working preparedness. Similarly, the Just Transition Fund has been analysed as a potential source of structural revitalisation concerning 18% of European shrinking areas. Apart from some exceptions, the cross-analysis reveals little green innovation capital in most negative projection cases, and better preconditions concentrated in the very few areas that already had a positive demographic outlook for 2050. The policy does not seem well suited and risks being inefficient given the territorial context of most shrinking areas.

The results highlight low quality government as a crucial element of vulnerability for shrinking areas. Institutional capacity and digital preparedness will be essential ingredients for societal transitions (Rodríguez-Pose and Ketterer 2020). So the future looks dark for shrinking areas, especially while they remain ignored in territorial development debates. The limited importance of shrinkage is also perceived by citizens when called on to shape future policy agendas of the EU. Nonetheless, qualitative results show that citizens have visions and concrete proposals for shrinking areas, suggesting the capacity for wider and more capillary engagement.

All assessments show important variations in territorial sensitivity depending on local conditions, which confirms the importance of context underlying shrinkage (Haase et al. 2016). This also reinforces the need to adopt place-based designs in territorial policies and place-sensitive approaches as a cross-cutting value in sectorial policy processes (Sotarauta 2020).

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List of abbreviations

ARIMA: Autoregressive Integrated Moving Average
BBSR: Bundesamt für Bauwesen und Raumordnung (Federal Office for Building and Regional Planning)
CAP: Common Agricultural Policy
CLLD: Community Led Local Development
CoR: European Committee of the Regions
COST: European Cooperation in Science & Technology
EAFRD: European Agricultural Fund for Rural Development
ERDF: European Regional Development Fund
ESIF: European Structural and Investment Fund
EU: European Union
GDP: Gross Domestic Product
GVA: Gross Value Added
ITI: Integrated Territorial Investment
JRC: Joint Research Center of the European Commission
LAU: Local Administrative Units
LEADER: Liaison Entre Actions de Développement de l'économie Rurale
MEPs: Member of the European Parliament
NGO: Non Governmental Organisation
NUTS: Nomenclature of Territorial Units for Statistics
OECD: Organisation for Economic Co-operation and Development
R&D: Research and Development
SCiRN: Shrinking Cities International Research network
SME: Small and Medium Size Enterprises
TA: Territorial Agenda
TEQUILA: Territorial Efficiency Quality Identity Layered Assessment
TIA: Territorial Impact Assessment
TFUE: Treaty on the Functioning of the European Union

1 Introduction

This chapter outlines the concepts and topics underlying this dissertation, with descriptions of the academic and policy context as well as the issues through which it develops.

1.1 Shrinkage in a European perspective

The European population is shrinking and the negative trend is expected to consolidate in the coming decades. The main driver of European depopulation is natural. Since 2015 the birth ratio has been below the replacement rate and our society is ageing (European Parliament. Directorate General for Parliamentary Research Services. 2019). In many countries this started before 2015 and intra-European migration has also played a role. In the long run the population is expected to decrease significantly in some European areas. Not all countries are affected in the same way, with some losing more people and faster than others. Within countries and across European Union regions the population loss is even more unequally distributed, with some places taking the hardest hits. Depopulation is a growing trend, and it is here to stay. Some places already feel abandoned, and the same will been seen in more places soon. What does this mean for future territorial development and the socio-economic geography of the European Union?

Demographic decline finds its territorial transposition in the concept of shrinkage. Shrinkage is the complex process of a sustained and continuous demographic decline in a defined place. The understanding of place varies with the perspective of the researcher and can be based on municipalities but also provinces and entire regions. Research and policy debates can concentrate on shrinking cities (Hollander et al. 2009), shrinking regions (European Parliament 2008), and more generally of shrinking areas (Haase 2012). The spatial dimension and the context are relevant when investigating causes or designing policies to address shrinkage, but there is an important juncture across any kind of place. Shrinkage is a complex net of social, economic, environmental factors contributing to demographic decline. The latter is the common denominator of a downward spiral which concerns roughly one quarter of the European territory. The spatial scale may vary depending on the observer, whether a researcher or a policy maker but the process of shrinkage is the focus of this thesis.

Although population decline is most often used as its key indicator, shrinkage involves much more than just a decline in the number of inhabitants of a settlement, municipality or region (Bontje and Musterd 2012). Nevertheless, population loss may be the common denominator for a structurally declining territory. A loss of population can signal a broader spiral of decline, whose causes and distinctive traits vary across and within countries. Population decline is the common ground for wider multifaceted processes of territorial decline, with similar social and economic implications. This idea is nicely captured by the following definition:

'Shrinkage is…. an event resulting from the interplay of different macro-processes at the local scale… Such macroprocesses may be related to the economic, demographic or settlement system development, as well as to environmental issues or changes in the political or administrative system. Shrinkage occurs when the specific interplay of the mentioned macro-processes leads to population decline' (Rink et al. 2009).

The definition is particularly clear in underlining the relationship between macro-processes and their result at local level. It anticipates the importance of larger trends in determining local population decline. Shrinkage has a long history. In Late Antiquity, the Middle Ages and the Early Modern periods, the collapse of the Roman Empire, diseases, war, fire and recurrent agricultural crises all left their mark on European and Asian cities that were never completely abandoned and were usually resettled. By the late 19th century European, Asian, US and Latin American industrialisation and railroads had created larger cities (and regions) in some places, and shrinking ones in others (Blanco et al. 2009).

In recent times, economies of scale and the pursuit of economic output maximisation have fuelled a continuous process of agglomeration, expanding core cities to the detriment of more distributed, polycentric development. People have followed the agglomeration trend with job driven migration both within and across Member States. Together with the natural overall decline in population, these factors have contributed to faster shrinkage in the European Union. There are pockets of local population decline all over the European territory, and every EU country except Luxembourg is concerned by such imbalances. Previous studies have highlighted that in the European Union, at least one in five municipalities above 5,000 inhabitants has suffered episodes of shrinkage (Wolff and Wiechmann 2018). These figures leave out an important slice of shrinkage events in sparsely populated, rural areas, or simply in municipalities below the threshold. In such places, the frequency of population decline

episodes is typically higher, basically a structural issue in times of boosted urbanisation (Barca et al. 2014; Copus et al. 2020; Margaras 2016). Almost one in three municipalities have a declining population (Wiechmann and Wolff 2013).

This means that in the European Union, *on average*, at least one of the three neighbouring municipalities from the reader's location suffers population decline, with social, economic, environmental (often all three) structural challenges. Then this dissertation will discuss how this events are often clustered and concentrated in some territories more than others. Nevertheless, being shrinkage so capillary spread, it happens in a wide range of different contexts as described in existing research (Turok and Mykhnenko 2007; Wolff and Wiechmann 2018). Shrinkage can be driven by natural decline and outmigration despite growing GDP, but with weak and decreasingly competitive labour markets (post socialist countries). Shrinkage happens in old and restructuring industrial regions, where stagnating GDP and unemployment leads to disproportionate migration (e.g. in North/Eastern France, Southern Italy, Central and Eastern Poland and North-eastern Romania). Sometimes low attraction for families, youth unemployment and a lack of services lead to natural decline and a lack of immigration despite a growing economy (e.g. in Central France, Austria, Germany, Hungary and Czech Republic). Again, shrinkage can be the result of intra-regional competition with winners and losers in neighbouring areas, causing job-led, local, migration, in spite of an overall growing population and economy (e.g. in Ireland, Belgium, Netherlands, France)(Wolff and Wiechmann 2018).

Shrinkage is found all over the European Union, in different forms shaped by the effect of macro trends in different contexts. The interplay of macro trends and context determines local population decline and structural lags. The crucial role of contexts has been conceptualised in the heuristic model of urban shrinkage (Haase et al. 2014) and operationally demonstrated by shrinking city types (Wolff and Wiechmann 2018).

The impact on territories is not only shaped by exogenous trends, which are hard to describe operationally within analytical boundaries. Policy measures adopted to answer, accommodate or alleviate these trends play a crucial role in determining the implications. The interplay of macro trends, policy responses and contextual specificities determine the positive or negative development prospects of all European territories. Literature shows that shrinking areas are particularly vulnerable and fragile towards change (Wolff et al. 2017), suggesting that territorial differences matter. Their condition deserves research and their extension across and

within European countries would suggest a larger role for shrinkage in the European policy debate.

Contextualisation of shrinkage in European policy debates

When we speak of territorial disparities within Europe, the discussion can be based around the Treaties establishing the European Union. The Treaty on the Functioning of the European Union (TFEU) promotes harmonious development and declares the pursuit of actions strengthening economic, social and territorial cohesion. The Cohesion objectives are particularly relevant for shrinkage, and the same Treaty recognises the importance of demographic decline in the very first article in the chapter on Economic, Social and Territorial Cohesion: 'Among the regions concerned, particular attention shall be paid to rural areas, areas affected by industrial transition, and regions which suffer from *severe and permanent natural or demographic handicaps* such as the northernmost regions with very low population density as well as island, cross-border and mountain regions' (Article 174, TFEU[1]). When the TFUE was agreed, demographic struggles were identified quite sharply in a limited set of territories with specificities. Since then, the demographic challenge has expanded, and research has shown that shrinkage concerns all types of territories (Wiechmann and Wolff 2013).

Cohesion Policy, with roughly one third of the EU budget, is the main instrument contributing to economic, social, and territorial cohesion in the European Union as it aims to address imbalances between countries and regions. Whilst the financial instruments of EU Cohesion Policy, have certainly intervened and invested also in shrinking territories, these have not been recognised as targets of the interventions as much as other territories with specificities. The issue of shrinkage, or depopulation has not been recognised, nor described in official policy regulations until the past programming period (2014-2020)[2].

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[1] Consolidated version of the Treaty on the Functioning of the European Union - PART THREE: UNION POLICIES AND INTERNAL ACTIONS - TITLE XVIII: ECONOMIC, SOCIAL AND TERRITORIAL COHESION - Article 174 (ex Article 158 TEC). Official Journal 115, 09/05/2008 P. 0127 – 0127.

[2] Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006. *Official Journal of the European Union L 347,* 20.12.2013

Recent developments in EU Cohesion Policy seem to reflect greater attention to depopulation. Preliminary considerations of the Regulation of the European Regional Development Fund (ERDF) 2021-2027[3] for the first time include a definition of a territory affected by a demographic decline as provinces or municipalities (recital 45) – NUTS 3 or Local Administrative Units (LAUs) - with less than 12.5 inhabitants per km2 or that have suffered from an average annual population decrease of at least 1% of inhabitants over the 2007-2017 period. Member States are called to *consider* developing *voluntary* local action plans to address the demographic challenge in the new programming period.

Whilst this constitutes a significant new development for shrinkage in the European debate, it is the result a watered-down compromise. Negotiation narratives suggest that the ambitious goal of 5% of total funds earmarked for depopulating areas (according to the above definition) had to be scrapped from the Regulation in favour of the present non-binding and rather soft formulation (Pazos-Vidal 2021). All in all, the results of the negotiations suggest an inbuilt resistance to recognising these areas facing structural decline. There is limited political interest in this theme (Pazos-Vidal 2021) which has reduced the potential for a true change of pace in addressing shrinkage in EU policy making, at least until the next programming period. Whilst shrinkage and depopulation have had (Bernt et al. 2014) and continue to have a hard time gaining momentum in the debate, the policy agenda is busy with challenges underlying societal transitions.

The European Union is facing major challenges with the pandemic, climate change, the digital agenda, the political and institutional recognition of citizens, as well as the quality of government. These issues have kept European policy makers particularly busy since the start of this research in 2019. Since then, the European Green Deal has been adopted, while the pandemic hijacked the traditional policy cycle and previous priorities. In the meanwhile, trust in institutions and governments, which had started a steady decline across the EU, has led to more anti-institutional consensus and, more recently, significant abstention from political participation.

[3] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021on the European Regional Development Fund and on the Cohesion Fund. L 231/60, Official Journal of the European Union. 30.6.2021. Preliminary considerations available at: https://www.eumonitor.eu/9353000/1/j4nvhdlglbmvdzx_j9vvik7m1c3gyxp/vkorvbzgfuvb

The challenge of institutional trust has already been investigated under a territorial lens especially for places facing structural decline. With the identification and conceptualisation of places that don't matter and the geography of EU discontent, regional studies have opened the floor to a political dimension of territorial decline (Dijkstra et al. 2020; McKay et al. 2021; Rodríguez-Pose 2018). This dimension places European citizens at the centre of calls for a new role for them in the political debate. The European Union has taken the hint and adopted policy initiatives to narrow the gap between citizens and institutions. For instance, Policy Objective 5 of the 2021-2027 Cohesion Policy, 'Europe closer to citizens', involves them in implementation phase of the policy cycle (Fischer and Miller 2017). Instead, the Conference on the Future of Europe[4] voices citizen ideas in setting the agenda for future policy. The conference will be analysed in this dissertation to understand its potential implications with shrinkage.

All European cities and regions, including shrinking areas, are exposed to the pandemic, as well as environmental and institutional challenges. The impacts of these macro trends vary between regions and cities and depend on the territorial context. Seemingly similar macro trends affect European cities and regions, with their diverse social, economic and environmental characteristics in different ways (Böhme and Lüer 2016; ESPON 2014a). The interplay of context with macro trends is the key process determining shrinkage (Bontje and Musterd 2012; Haase et al. 2014). When we look at shrinkage in a European perspective, these trends are at least as important as the policies specifically designed to foster territorial cohesion for shaping the future of these territories.

Acknowledging that other trends and policies may have significant and possibly even greater impacts on territorial cohesion than specifically designed cohesion instruments, makes the study of shrinkage in Europe perspective very complex, but equally interesting. Territories in the EU have very different development conditions and prospects. Those with structural deficits or suffering prolonged distress face the future from a disadvantaged position. To discuss the future impacts of macro trends, social challenges and supralocal policies, it is

[4] The Conference on the Future of Europe offers citizens a new public space for open, inclusive and transparent debate about the future of actions and policies in the EU. Over the nine months of the virtual conference (April 2021 – December 2021), citizens are called to directly intervene in setting the priorities of the policy agenda. Traditional policy actors must synthesise the agenda and translate it into concrete measures and policy instruments (European Commission 2020a).

necessary to better understand Europe's territorial diversity (ESPON 2014b). Given the environmental, pandemic and institutional challenges, attention should be paid to the diverse potential impacts of EU policy choices on territorial balance in Europe. This dissertation addresses this need by focusing on shrinking areas, which cover one fourth of the European territory and are a growing concern for a cohesive territorial development in the European Union.

1.2 Aim of the thesis and value added in the debate

The thesis is a cross-temporal analysis of the present situation and potential future for European shrinking areas given pandemic, environmental, institutional and societal challenges in the European Union. This subchapter formulates the aims of the thesis, then presents the objectives and questions of the research and finally outlining the expected value added and envisaged contributions.

Aim of the thesis

Despite doubts about concrete implications, a small milestone has been set with the inclusion of a definition of shrinkage in official regulations. This recent development in EU Cohesion Policy and other mentions in policy documents (i.e. Territorial Agenda 2030 and the Long-Term Vision for the EU's Rural Areas 2040) offer a timely window into the policy debate to strengthen the recognition of shrinkage and depopulation. This research can advance this process with future-proof knowledge to fill the gap between the theory and practice of place-based and place-sensitive policy approaches (Barca 2009; Iammarino et al. 2019; Zaucha et al. 2013).

The intersection between policies and shrinking areas in Europe has not been explored thoroughly. A European wide perspective is needed because of the extent of shrinkage and its socio-economic complexity requires a structured approach to tackle the issue. There is a rich body of literature on shrinkage driven by comparative case studies. If shrinkage-related research remains anchored at particular level, it risks being regarded as an exception, as a niche driven by unfortunate conditions. This case study literature demonstrates how shrinkage is similar across borders and the few aggregated quantitative insights suggest that it happens a lot (e.g. Bernt et al. 2014; Hoekveld 2012; Wiechmann and Pallagst 2012).

This dissertation looks to bridge the research gap from shrinkage case studies to an aggregated perspective and tie shrinkage closer into the European policy debate. The dissertation focuses on shrinking areas facing pandemic, environmental and institutional challenges and aims at providing fresh and future-oriented insights not only on the vulnerabilities, but also on territorial capital. This knowledge creation should underline the case for a structured approach to shrinkage, but also a methodology, to facilitate the inclusion of shrinkage in policy processes, applicable at design and implementation phases.

This thesis assesses potential impacts on shrinkage of three policy and societal challenges for the European Union. The challenges transcend specific objectives of demographic change or territorial cohesion and imply structural changes in the socio-economic fabric of European territories. These changes will have an impact on demography and structural lags in shrinking areas. When territorial cohesion is overlooked in the policy process, will shrinking areas' disparities widen or narrow? This thesis looks to address the gap at the intersection between policy and research and aims to facilitate timely knowledge to help understand possible future outlooks for shrinking areas.

Objectives and research questions

Shrinking areas are vulnerable places with ongoing complex socio-economic dynamics (Wolff et al. 2017). Their vulnerability deserves a specific focus in research and practice to increase the importance of shrinkage in the policy debate (Großmann et al. 2013; Stryjakiewicz and Jaroszewska 2016). The decisions of policy makers would benefit from consideration of place-specific information and systematic generation of forward-looking insights on the impact of their decisions.

This thesis fuels the process of knowledge creation by assessing the exposure and sensitivity of shrinking areas to the most pressing topics for the European Union: a) the pandemic shock and its tumultuous social and economic effects; b) the environmental challenge and the related energy transition process; c) the decreasing trust in EU institutions and the engagement of citizens in setting policy agendas.

For each of these challenges, one policy response at European scale is reviewed for its potential impacts at European scale on the target group of shrinking areas of the European Union as a territorial focus. For the *pandemic*, the investigation is carried out on the potential territorial

impacts of lockdowns and restrictive measures that have been implemented across all countries with different intensity, but a spatially blind approach (Barca et al. 2012). For the *environmental* challenge, the dissertation reviews the Just Transition Fund, also as an important example of place-based approach to policy (European Parliamentary Research Service 2020b). For the *institutional* challenge, the Conference on the Future of Europe is analysed as a European citizen engagement initiative, designed to involve citizens in influencing future policy priorities (European Commission 2020a).

The thesis develops around the overarching research question: *what are the potential territorial impacts of selected European policies on the future of shrinking areas?*

This overarching question is specified and operationalised with sub questions. The first affirms the foresight approach by investigating future demographic outlooks and different shrinkage profiles.

1. What are the profiles and future demographic outlooks of European shrinking areas?

This provides a base for the ex-ante assessment of potential impacts specified in the following research questions.

The following questions specify the policies analysed in the study and the analytical angle through which shrinking areas are observed:

2. What are the potential impacts of selected European policies on future trajectories for shrinking areas?
   2.1 What are the potential territorial impacts of Covid-19 restrictive measures on European shrinking areas?
   2.2 What are the potential territorial impacts of the Just Transition Fund on European shrinking areas?

The last question addresses the institutional challenge from a qualitative angle by analysing potential impacts of the initiative to include citizens more in the European policy debate:

3. What is the potential impact of the Conference on the Future of Europe on the European policy debate on shrinkage?

Value added in the debate

This research complements the statistical comparative research on shrinking municipalities (Wolff and Wiechmann 2018) by updating data on shrinking EU areas. The projection of demographic trajectories for shrinking municipalities to 2050 adds considerable value to existing literature.

In the policy impact domain, the dissertation is firmly rooted in Territorial Impact Assessment (TIA) literature and its applications (Camagni 2006; Essig and Kaucic 2017; Medeiros 2014). However, the contribution lies in the cross-territorial application of such methodology to shrinking areas. Most existing applications focus on a specific province or region, or all European regions combined. Moreover, the thesis tests the concept of sensitivity in a multi-criteria matrix.

Overall, the research explores potential impacts of selected EU policies on future shrinkage and, at the same time, tests an operational tool to facilitate place-based policy approaches to address shrinkage. It contributes to the place-based and place sensitive policy debate with new evidence on shrinking areas.

The dissertation looks into the future for shrinking areas facing pandemic, environmental and institutional challenges. The analysis also offers the following contributions to shrinkage literature and the debate on European territorial development:

- Understanding the geography and diversity of shrinking areas in the European Union in a macro comparative framework.
- Providing insights on future trajectories of population loss if no specific action is taken.
- Anticipating the potential impact of selected European policies on shrinking areas through the analysis of exposure and sensitivity to pandemic, environmental and institutional challenges.
- Collecting quantitative evidence on the place-specificities of European shrinking areas vis-à-vis policy challenges, also in the form of browsable databases.
- Testing a methodology to produce an ex-ante assessment that could be replicated and adapted into more policy fields.
- Providing evidence that ‘place matters’ even more for shrinking areas, calling for place-based policies and structured approaches to shrinkage.

TIA literature demonstrates how different types of territories react differently to policies and exogenous trends (Böhme et al. 2020b; Camagni 2006; Essig and Kaucic 2017; Medeiros 2014). When place specificities and contextual features matter, place-based and place-sensitive policies are needed (Barca et al., 2012) and the intrinsic vulnerability of shrinking cities (Wolff et al., 2017) calls for a scientifically based consideration of their sensitivity and territorial capital. This dissertation explores the interrelation between these factors by applying methodological instruments, providing evidence for the need for an aggregated, place-specific knowledge of European shrinking areas. The research disentangles regional and local development drivers from exogenous macro trends to systematic endogenous development drivers, specific to each territory, sustained and strengthened by the most recent theories in the field (Churski et al. 2021).

1.3 Research design, methods and terminology

The research strategy is described in steps, stressing the intertemporal nature of the analysis. The research approach and the methods are outlined. Later, some important terminological specifications are discussed, before closing this introductory chapter with the structure of the document.

An intertemporal research strategy

The research strategy follows consequential steps in a specific order, to highlight the intertemporal perspective of shrinkage at European scale. The strategy mirrors the research questions, as the results to the first question are the basis material for the analysis.

The research activity starts with the identification and classification of the territorial target group: shrinking areas of the European Union. In this phase the time frame is 1991-2018. This allows an updated census of the population of shrinking municipalities. The focus on the present at this stage aims to capture a snapshot of shrinking areas in the status quo. Nonetheless, historical data is needed to determine the present situation, as shrinkage is, by definition, a dynamic process.

Once the analysis object is defined, the analytical work investigates the future of existing and potential shrinking areas. Future demographic trajectories are based on statistical modelling for the entire sample of shrinking areas. The time frame is 2018-2050. 2050 is a frequently

used date for European population projections (Eurostat 2021) and the largest share of the 2050 population has already been born, which gives some robustness to the data. The next 30 years will see significant changes in births, deaths and migration as demographic trends mature. 30 years also reflects the likely situation for the next generation (generational change is normally over 20–30 years, but closer to 30 for Europe).

The first two steps (described in chapter 3), together are the basis for the subsequent analytical research on the potential impacts of pandemic, environmental and institutional challenges. In this phase the temporal focus moves from present to future. The ex-ante assessment dwells on current territorial conditions with the policy measure and the challenge under scrutiny, to explore potential implications for future development.

The contextual analyses determines the potential impacts of the challenges which are systematically cross analysed with the different trajectories of European shrinking areas revealed in the first two steps. Thus, the potential impacts are discussed both with reference to 1991-2018 to assess the status quo and to 2018-2050 to compare potential future demographic trajectories for European shrinking areas. This matching of spatial coordinates and demographic trajectories over time enables the analysis to offer insights on the potential future development of shrinkage given the pandemic and the Just Transition Fund.

The intrinsic nature of the institutional challenge and the characteristics of the Conference on the Future of Europe do not enable the same spatial and intertemporal analysis as for the pandemic and environmental challenges. In this case, the research questions and the data require qualitative approaches. Nevertheless, the foresight perspective is maintained thanks to the definition of objectives for citizens to influence and possibly shape future policy agendas. This engagement looks into present conditions and current issues to determine future policy priorities of the European Union. This allows reflections on the potential impact of the policy initiative on the future of shrinking areas, though with a stronger focus on the policy content rather than on systematic analysis of the spatial and demographic patterns.

To sum up, the analysis balances the present and the future and foresight is the main distinctive feature of the research strategy.

Research design and the methodological toolbox

To understand the impacts of the selected policies on shrinkage, the methods applied facilitate ex-ante assessments and foresight approaches (Böhme et al. 2020b). A key principle of the research design is to fuel a future-oriented reading of shrinkage, its relevance and implications of and for policy decisions. Different from case study-based research, there is a macro perspective on the totality of European shrinking areas. This approach matches with the aim of studying impacts of EU policies across different shrinkage contexts, raising the profile of shrinkage in the European policy debate.

The methodological approach can be visualised as a toolbox of instruments, each carefully chosen to suit the research objectives and the characteristics of the research questions. A set of methods is required by the broad scope of the research in territorial, temporal and policy terms. The dissertation adopts a multifaceted approach to unpack the complexity of shrinkage within a broad context of macro challenges and a non-specific policy debate. The aim is challenging in methodological terms, but the choices result in a comprehensive systemic picture of shrinking areas facing the future. As a result, the designed methodological toolbox collects complementary techniques that find their common denominator in the foresight nature of the findings produced.

The research is mainly quantitative with descriptive and comparative objectives that highlight the diverse conditions in shrinking areas and in their relations to other European territories. This quantitative analysis is dominant in the first three steps (shrinkage census, pandemic and environmental challenges), the last step adopts a qualitative approach that better suits the characteristics of the institutional challenge.

Overall, the thesis balances descriptive and explanatory research, though with a strong element of anticipatory assessment. Thanks to the foresight nature of the methodologies, the research aims at anticipating possible patterns and relations between shrinkage, macro challenges, and policy responses to them. The future-oriented questions and methodologies, including ex-ante estimation techniques, embed significant elements of exploratory research approaches.

Synthetically, the most important methodological tools are:

- Data gathering and processing from existing sources to compile an original database on European shrinking areas at municipal level (LAU 2 and LAU 1).

- An original statistical demography model to define profiles of shrinking areas in the future (Stiegel et al., 2004).
- Adaptation and application of TIA methods for the challenges (Camagni 2006; Essig and Kaucic 2017; Medeiros 2014).
- Multicriteria analyses (Dodgson et al. 2009; Kubal et al. 2009) of social, economic and environmental indicators to analyse the exposure and sensitivity of shrinking areas.
- Qualitative content analysis with open coding to citizen contributions to the Conference on the Future of Europe (Flick 2014; Prior 2014).
- Comparative statistical analyses (mainly descriptive) within European shrinking areas, and between them and average European territories.

Most of the methodologies rely on quantitative data at multiple territorial levels, but qualitative information is also important. Since each research question requires a different method and different data sources, data collection, sources and other methodological information will be detailed in dedicated chapters.

The research strategy and design show that the thesis follows a compound methodological approach with successive steps and multiple methods. This does not facilitate treating the methodology as a unitary block since the methodological choices and consequent steps are hard to separate from the actual analysis and its results. Sometimes the same method (TIA) is applied, though in different ways to be adapted to different policies. Adapting and optimising this methodological tool is an initial part of the analytical work, as it requires choosing the drivers and collecting data for the assessment. It is similar for the open-coding content analysis, where methods are blended as the research progresses.

In this context, separating methodological choices from discussion of the results would be very hard to follow for the reader. This suggests blending the methods and their analysis throughout the thesis and separating the theoretical framework from the operational aspects of the research. To accommodate this and for greater clarity, this chapter has only introduced methods and their coherence in the research design. Later, in chapter 2 the methods are described more thoroughly, justifying them from a theoretical standpoint. Then, in each of the analytical chapters (chapters 3, 4, 5, 6) the method is operationalised, adapted to the challenge and the methodological choices (such as variables, indexes and their combination) are justified based on the characteristics of each research question and the literature.

Terminological tangle of space: territories, places, and areas

The chapter is firmly rooted in the concepts of territory and place. Inspired by the TIA literature (Camagni 2006; Essig and Kaucic 2017; Medeiros 2014) the term territorial implies an analysis, or analytical thinking on the diversity of geographical units in the discussion. It does not indicate a single specific territorial unit (NUTS, LAU and so on), but a reflection on the socio-economic and geographical diversity of comparable geographical units.

The comparability of geographical units is a guiding principle of the dissertation. The research moves from the assumption that contextual features are crucial to determining development trajectories at the local level. In the administrative conception of territories, this translates into a tight link between municipalities, provinces, and regions. For quantitative analyses and the utilisation of spatial data, these administrative conceptions of territories become LAUs (municipalities), NUTS 3 (provinces) and NUTS 2 (regions). The tight conceptual proximity of local and contextual scales means the spatial dimension can differ throughout the analysis. Whilst the identification of shrinkage in the European Union is strictly at municipal level, future demographic trajectories rely on contextual variables. TIAs continue, by definition, this multiple spatial perspective by taking an aggregated perspective of shrinking municipalities and analysing the different contextual features and territorial capital. The multi-spatial approach to territorial scales, and the need to consider development factors and capital at multiple spatial levels is also inspired by recent theories in European regional development (Churski et al. 2021).

Considering the conceptual and methodological twists across spatial scales, and to avoid misinterpretation and confusion, the dissertation uses the term (shrinking) *areas* under its common understanding whenever more than one single spatial data source is involved in the territorial analysis. In a similar vein, shrinkage is referred to as a process, to avoid precise identification of spatial scales, putting the accent on the phenomenon itself. Therefore, the term shrinking municipalities is used only when the analysis refers strictly to the municipal level (chapter 3), and no contextual data is involved. Similarly, the term shrinking cities will be only used when referring to the literature-based concept and understanding of the phenomenon.

While *territorial* is mainly used with analyses in the dissertation, and areas synthesises the conceptual dualism between local and supra-local spatial scales, *place* is used when referring to policy processes. Inspired by policy design debates in regional studies literature (Barca 2009, 2012; Iammarino et al. 2019; Sotarauta 2020) place is intended as an object of policy design, policy processes and governance systems. Within the key concepts of place-based and place-sensitive, place does not have a specific geographical, or socio-economic connotation. Instead, it indicates inclusion in the policy process of any kind of spatial thinking that can be at regional, sub-regional or local level.

Structure of the dissertation

Having reviewed this important terminological and spatial differentiation, the analysis can start. The dissertation is structured in three parts. The first introduces the work, illustrates the context, and places the thesis in the research and policy frameworks. The second part presents the analytical steps, discusses the analysis results and answers the research questions. Part three brings together the results, cross analyses the findings and formulates the conclusions and recommendations of the thesis.

The introduction moves on to the discussion of the theoretical framework in chapter 2. In this chapter the most relevant literature on shrinkage is reviewed together with concepts in the European policy debate. Then, the debate on place-based and place-sensitive policies is analysed to highlight the most important common features. Chapter 2 discusses the theoretical framework that places shrinkage in European policy. The chapter then moves on to the methodological framework. The methodologies are discussed theoretically to justify their application to each research question. First the focus is on the TIA and related concepts of exposure and sensitivity. Then, qualitative policy content analysis techniques are presented, with a focus on unconventional sources of data in the policy arena. Chapter 2 closes the first part of the thesis.

The next part of the thesis contains the core analytical section of the dissertation. This part has four chapters, each dedicated to one research question. Chapter 3 addresses the demographic trajectories of shrinking areas through a statistical analysis and a projection model covering 1991-2050. First it proposes a classification of shrinking municipalities for 1991-2018 based

on different data sources and different shrinkage profiles. Then it addresses 2018-2050 through an original model of population projections at local level.

Chapter 4 deals with the TIA of Covid-19 restrictive measures. It first explains the methodological choices to review exposure and sensitivity to this policy, and the data collection process. Then, the chapter illustrates the statistical findings on potential territorial impacts of Covid-19 restrictions on future development in European shrinking areas. The statistical findings are compared and the results discussed in relation to the literature. Chapter 5 mirrors the structure of Chapter 4 as it applies the same logic and methodological steps for the TIA of the Just Transition Fund. Different methodological choices and data sources, but also different analytical steps better answer the characteristics of the challenge and the policy.

Chapter 6 focuses on how shrinkage is perceived and addressed by European citizens through analysis of the debate in the nine-month Conference on the Future of Europe. The institutional challenge and the peculiarity of the policy initiative required a different methodological approach, with a different presentation of the findings. Nevertheless, the structure follows a similar sequence starting from illustration of the methodological choices to adapt the qualitative analysis to the research aims and the nature of the data. The chapter describes the coding approach and is followed by a discussion of the results and implications of the Conference on the Future of Europe for shrinkage. Chapter 6 closes the second part of the dissertation, which is the core analytical block of the research.

The third part covers the two concluding chapters of the thesis. Chapter 7 brings together the findings from part two and proposes a cross-analysis to synthesise the results of the thesis and tie these into the academic and policy debates. Chapter 8 wraps up the contributions with policy recommendations, identifying limitations and the needs for further research.

2 Theoretical background and methodological discussion

This chapter describes the theoretical and conceptual framework underlying the dissertation and reviews the methods from a theoretical perspective for their concepts and application in existing literature. Section 2.1 focuses on the definitions of shrinkage and reviews other concepts in the European debate on territorial development. Section 2.2 addresses the influence of policies and macro trends in relation to shrinkage and reviews the debate on policy approaches to territorial inequalities. Section 2.3 reviews the methods, the literature on previous applications of policy and defines the main concepts applied in the dissertation.

2.1 Definitions and conceptualisation of shrinkage

Different standards are used to define urban areas and cities in different Member States. In each country, definitions match 'the nature and history of its urban population, as well as its political and administrative structures for land-use control' (Eurostat, 1992). This thesis carries out a Europe-wide assessment, which requires ensuring the terms of comparison. Three approaches are outlined to define the urban unit: morphological, administrative and functional.

The *morphological* approach defines urban areas based on the extent and/or continuity of the built-up area, the number of inhabitants and the proportion of the municipal area covered by urban settlements. This corresponds to a city or town as a physical or architectural object (ESPON 2006). The *administrative* approach defines urban areas based on the legal or administrative status. This approach corresponds an instrument used by the state to structure, organise and control a country (ESPON 2006). In the *functional* approach an urban centre acts as the core of a large urban (functional) area, where the hinterland forms a socio-spatial system integrated by functional inter-relations (ESPON 2014c). This approach corresponds to the city as an economic and social entity, with no unified administrative boundaries.

For the sake of this study, the definition prioritises comparability to allow cross-country analysis without complications due to national specificities and interpretations. The focus is on the core elements defining shrinkage: the administrative and governmental perspective and the population. This approach is used in the few previous studies concerning shrinking areas in

Europe and when dealing with local populations. The municipal unit is also chosen considering constraints data availability (Turok and Mykhnenko 2007; Wiechmann and Wolff 2013).

This first step to defining the unit of analysis concludes that municipalities are based on the administrative status and are specified by the number of their inhabitants. The definition of shrinking spatial units combines administrative and morphological approaches. This has been considered appropriate as the thesis investigates population dynamics while looking at the roles of government and policy.

At European scale the municipal unit is captured by the spatial concept of LAUs. These provide the spatial information, which is complemented by the number of inhabitants to define the main character of this dissertation. In the next paragraphs this definition is further specified to bring the shrinkage concept into the municipal unit.

In the early 2000s, in a relatively prescient move for planners, the Institute of Urban and Regional Development at the University of California, Berkeley launched a worldwide group of interdisciplinary specialists, the Shrinking Cities International Research Network (SCiRN), that defined a shrinking city: 'a densely populated urban area with a minimum population of 10,000 residents that has faced population losses in large parts for more than two years and is undergoing economic transformations with some symptoms of a structural crisis' (Pallagst et al. 2009). Population decline is the main point, but economic downturn and more complex crises are also mentioned.

In parallel, the same network in the context of the European Cooperation in Science and Technology (COST) Action 'Cities Regrowing Smaller' takes a more quantitative approach by describing a shrinking city 'as an urbanized area with a minimum population of 5,000 residents that has faced a remarkable population loss of annually more than 0.15% at least for 5 years' (SCiRN 2008). The definition has been used in academia within and beyond the SCIRN framework, in particular for LAUs. (Stryjakiewicz and Jaroszewska 2016; Wiechmann and Wolff 2013; Wolff and Wiechmann 2018).

These definitions highlight the key elements and controversies in defining shrinkage, such as: a) Does shrinkage involve exclusively depopulation, or should there be more dimensions (e.g. a structural economic crisis, unemployment, or social and governance difficulties)?

b) What is the relevant dimension of municipalities?
c) How fast and how long should the population decline be?

Although depopulation is most often used as the key indicator, shrinkage involves more than just a decline in the number of inhabitants, as this trend is often closely intertwined with economic stagnation or decline and a lack of job opportunities (Bontje and Musterd 2012). The intertwinement of factors in the term structural crisis is often referred to, and captures the complexity of shrinkage beyond plain demography (Hollander et al. 2009; Reckien and Martinez-Fernandez 2011). The Japanese discourse characterises shrinkage as long-term depopulation caused by demographic factors like ageing and low birth rates (Hattori et al. 2017). In a way, both academic environments share the common denominator of population decline, to which they add qualitative descriptive layers with the economic and structural dimension for the EU, and a more detailed analysis of population dynamics for Japan.

This thesis argues that population loss is the common denominator for a structurally declining territory. This loss can be metaphorically seen as a warning signal for a broader spiral of decline, though causes and distinctive traits vary across and within countries. Population decline is the common ground of wider multifaceted processes of territorial decline, yet similar for their social and economic implications. This idea is captured by the following definition:

'an event resulting from the interplay of different macro-processes at the local scale… Such macroprocesses may be related to the economic, demographic or settlement system development, as well as to environmental issues or changes in the political or administrative system. Shrinkage occurs when the specific interplay of the mentioned macro-processes leads to population decline' (Rink et al. 2009: 5).

There seems to be an interest to increase the level of detail around the concept of shrinkage, but up until now there is no unified and universally accepted definition that involves drivers other than population decline, at least in quantifiable terms. In general, the European debate on shrinkage has relied on definitions placing a lower threshold on size, building on population decline trends and speed. These are the most widely applied features and the cornerstone of shrinkage definition. The concept is often nuanced and enriched by nods to economic, social and environmental decline among others, but these spheres have not been quantitatively defined and included in an operational definition.

Considering the existing literature, the definition adopted in this dissertation relies on the two SCiRN definitions, with a common denominator of minimum size of the administrative entity and a decline in population. For this thesis a shrinking municipality is an LAU with at least 5,000 residents and an annual population loss of more than 0.15% in 1991-2018. This will be later discussed in chapter 3. Over a longer period, the average measure best captures shrinkage as a long-term process, helping to control for unique events and fluctuations in population dynamics.

The shrinking municipality is the main character in this story, and its operational definition is the departing point for a broader investigation. As anticipated in the introduction, the spatial unit of research will later move from the municipal dimension towards a combination of municipal, provincial, and regional spatial scales. The study also considers the economic and social dimension of cities emphasised in *functional* and *morphological* approaches, which are also key to describing the structural complexity of shrinkage. An investigation of their territorial, social, and economic fabric in subsequent steps of the research will add different layers of information and spatial scales. The next section discusses why it is important to widen the perspective beyond municipal borders to better understand shrinkage.

The relevance of context is strengthened in literature on shrinkage (or growth) trajectories and different combinations of context-specific factors have recognised its role in determining shrinkage. The section establishes the core elements of this theoretical framework, starting from shrinkage literature, rooted in the case study-based research. The review then moves to the conceptualization of a theoretical model for urban shrinkage where context play a major role. The operationalization of such model closes the review and forges the ground for further methodological applications.

The academic debate on the interpretation of city development trajectories has a long history. An interesting Europe-wide study analysed trajectories of European cities by looking at their demographic trends, asking whether there are attributes consistently associated with growth or decline, such as city size, location and economic performance (Turok and Mykhnenko 2007). This approach reveals an interest in features and contextual variables as possible determinants of city trajectories. After discussing the relevance of other factors (such as migration, unemployment, economic activities) the study concluded that ‘City resurgence is a multi-

dimensional phenomenon requiring a basket of indicators to capture fully. This is one of the challenges for future research' (Turok and Mykhnenko 2007).

A more systematic inclusion of context specific factors in shrinkage debates sees its origins in case-study based literature. Authors have approached the relevance of context by investigating causes of shrinkage and differentiated the drivers between macro, meso and micro level (Reckien and Martinez-Fernandez 2011). More case study examples suggest that differentiation between shrinkage patterns is due to regional and local specificities and without these factors the different effects of macro-trends cannot be explained (Hoekveld 2012). All authors contribute to unpack the complexity of shrinkage through context, which can be determined, or discussed along many different perspectives: social, demographic, economic, occupational, industrial, environmental, political and historical.

The relationship between context and shrinkage dynamics is distilled in the case-study literature but finds its theoretical recognition with the *conceptual model of urban shrinkage* (Haase et al. 2014, 2016). This model has formalised and synthesised the arguments and findings underlying the case study literature into a theoretical framework. The model is inspired by the recognition that there are no' 'grand explanatory heuristics' of shrinkage and there is no 'one-size-fits-all' approach to defining shrinkage (Haase et al. 2016). The model builds a framework requiring place-specific explanations because shrinkage cannot be understood outside the context in which it is embedded. The context can vary from intra-regional, to macro-regional relationships and even global macro trends (Haase et al. 2016).

The *conceptual model of urban shrinkage* also codifies that the trajectories of urban shrinkage can also be influenced by governance arrangements operating on different spatial levels, from local to global. In this way, shrinking or shrunken cities are not only driven by changing contexts and tendencies, but are also subject to regional, national and European policymaking (Haase et al. 2016). The model offers a structured, systemic approach to study shrinkage that liaises between local population dynamics and the contextual features of the territory. At the same time, it acknowledges the role of macro trends at higher spatial scales recognising the key role of governments and institutions. This conceptual framework lies at the heart of this dissertation and shows the interplay of active (governance) and passive (context) forces shaping local population decline.

The conceptual model of urban shrinkage has been applied to define types of shrinking cities in two steps:
I) types of cities have been categorised using demographic trends as a driver to emphasise the dynamic aspect of the process and investigate to how the duration and speed of urban shrinkage differs (Wiechmann and Wolff 2013);
II) the demographic typology is then linked to the heuristic model of shrinkage to investigate and describe contextual conditions in identified shrinking cities. More specifically, the paper investigates the function of contextual variables (migratory balance, fertility, natural balance, gross domestic product, unemployment) at a regional scale (NUTS 2) on a sample of shrinking cities at European scale (Wolff and Wiechmann 2018).

This approach has shed light on the explanatory power of contextual drivers for urban shrinkage, confirming the theoretical insights previously cited in this review. Thus, typologies are a powerful knowledge source that reflects different local contexts and their relevance in determining city development. In their conclusion, the authors also suggest that this approach may support supranational regeneration strategies because they reveal how different solutions are required for different cities, depending on their economic and demographic structural variables (Wolff and Wiechmann 2018).

More studies also emphasise the determinant role of context from a different angle, as they investigate the characteristics of shrinking cities in a specifically identified context, such as post-socialist heritage. In this case, the influence of context can be observed and investigated more thoroughly. Nevertheless, the typology approach is also adopted to better describe different patterns of population decline, depending on the speed, length and intensity of the process. The authors conclude that the notion of shrinkage is gradable and each type of shrinkage demands different forms of governance response (Stryjakiewicz and Jaroszewska 2016).

As with the post socialist context, other authors suggest consideration of historical dependencies to better understanding shrinkage. Alves et al. (2016) analyse Portuguese shrinkage by tracking population over 130 years in 25 shrinking cities, examining demographic, economic, political and social drivers of the phenomenon through a qualitative-descriptive approach. The authors analyse the historical context of the main events in the area (from global trends such as industrial and trade revolutions, to agricultural crises, industry

crises, migration and urbanisation). This is combined with observation of different types of population decline: *Persistent Early Shrinkage* linked to exodus from the rural periphery, *Metropolitan Shrinkage* linked to challenges of urban sprawl, *Recent Shrinkage* in de-industrialisation hotspots, *Cyclic Shrinkage* linked to political transformations and *Mild Shrinkage* due to life-style dis-amenity (Alves et al. 2016).

Context matters when analysing shrinkage (Haase et al. 2016; Wiechmann and Wolff 2013). Authors have underlined the relevance of context in local development trajectories and contributed to both a theoretical and methodological framework, each with a particular research focus. Building on their efforts allows further research into the relationship between context and shrinkage that is underpinned by the case study literature (Hoekveld 2012; Reckien and Martinez-Fernandez 2011; Turok and Mykhnenko 2007). The relationship between shrinkage context and dynamics is synthesised in the conceptual model of shrinkage (Haase et al. 2014, 2016) which provides a framework for *place-specific* and *time-specific* explanations (Alves et al. 2016; Stryjakiewicz and Jaroszewska 2016; Wolff and Wiechmann 2018). Trajectories of urban shrinkage can also be influenced by governance arrangements at different spatial levels, from local to global. In this way, shrinking areas are not only driven by changing contexts, but are also subject to regional, national and European policymaking (Haase et al. 2016; Stryjakiewicz and Jaroszewska 2016; Wolff and Wiechmann 2018).

The conceptual model and its first implementations stand at the core of the theoretical background of this dissertation. First, they outline the relation between contextual features and the processes of urban shrinkage, showing how the former have shaped the latter to determine present shrinkage. They also hint at their role in shaping future development trajectories. Second, they include governance, hinting at how policies and regulatory decisions at different levels influence future conditions. Establishing the link between the contextual elements and higher-level policies is a hard task. However, if we consider the influence of context on city trajectories, and the potential (in terms of resources) of EU policies, this attempt is surely worth it. How can contextual elements at the local level and European policy making be more closely intertwined? This research reviews methodologies and implements them to provide an answer.

2.1.1 Shrinkage affine concepts in the European debate

Before moving on to the intersection between shrinkage, context and the European policy debate, it is necessary to review other territorial concepts that are related and display affinity to shrinkage.

Sparsely populated areas and territories with geographical specificities

The notion of sparsely populated areas and territories with geographical specificities is also associated with demographic decline in the Treaty on the Functioning of the European Union. The EU recognises that the geographic characteristics of certain regions may prevent them from competing with other regions on an equal basis and states its aim to address territorial disparities. In this context, northernmost regions, islands, cross-border, and mountain areas are identified as suffering from permanent natural or demographic handicaps (art 174 of the Treaty on the Functioning of the European Union).

More recent studies have shown that demographic decline is an issue, especially for sparsely populated areas and mountain areas to a lesser extent. Instead, the demographic scenario looks much more varied, including high growth for islands and coastal areas (Gløersen et al. 2019). Notwithstanding demographic handicaps in these areas, the approach, as the name suggests, is predominantly geographic. Whereas some of these areas face population decline, similarity with the notion of shrinkage is limited, except for sparsely populated areas. Still, the inclusion of demographic handicaps linked to territorial disparities in the Treaties is symbolic and a good starting point for a review of shrinkage affine concepts in the European debate.

Inner peripheries and inner areas

The concept of inner peripheries marks the transition in territorial disparities from geographical specificities (sparsely populated, insular, border and mountainous regions) to a purely socio-economic understanding. Inner peripheries are conceived at multiple spatial scales and primarily described by socio-economic characteristics where political and geophysical characteristics only play a secondary role. The periphery is not limited to the outer margins of a territory, so these areas can be found in both urban and rural domains, and are not permanent nor in time or space (Pérez-Soba et al. 2013). Inner peripheries have a general economic performance and potential, access to services, or quality of life that are worse than in

neighbouring territories. Their peripherality is described as relational, lack of proximity, rather than geographical (ESPON 2018a; Noguera et al. 2017).

Whilst the demographic perspective is also considered in the concept of inner peripheries, it plays a marginal role. However, a kindred concept has emerged from the Italian national context: inner areas. In this case the concept of peripherality is still important next to socio-economic vulnerability, but there are geographical connotations. Inner areas are identified based on accessibility to services of general interest, physical accessibility, and underexploited territorial capital. However, the most important defining feature for inner areas is persistent demographic decline (Barca et al. 2014; Lucatelli 2014).

The two kindred concepts of inner peripheries and inner areas provide additional material for the debate on European territorial disparities including demographic issues. The flexible approach towards spatial scales recalls the importance of studying local reality within its context.

Shrinking rural areas

Predominantly rural regions currently account for 28% of Europe's population. However, existing literature claims that in the past decades a shrinking population has become normal for many rural regions as agriculture has been restructured with population and employment increasingly concentrated in urban centres (ESPON 2017). Rural shrinkage is described as simultaneous demographic and economic decline. It has been interpreted as part of wider trends in European territorial restructuring, where agriculture has become less labour intensive causing migration from rural to urban regions, particularly for younger and well-educated workers. Rural shrinkage therefore becomes indicative of a broader structural crisis of economic and labour market decline, where depopulation is mostly a symptom (ESPON 2017). More recently, the concept of shrinking rural areas in Europe has been further investigated and a typology defined based on social, economic and demographic conditions at provincial level (Copus et al. 2020).

In the European policy and practitioner debate, the term *shrinkage* has been associated exclusively with rural areas. Notwithstanding its narrower territorial scope, this is an important milestone in the debate. In this thesis shrinkage is the consideration of demographic decline as

a signal of a broader structural crisis that is investigated and further differentiated through contextual lenses.

Lonely places

Loneliness is emerging as a key concern for social cohesion as it existed before, but the pandemic has brought it to the forefront. The concept of *lonely places* transposes the traditional concept of loneliness from the personal and social sphere to a territorial understanding. This new perspective can contribute to analyse territorial and demographic disparities through a different grid. Practically, *lonely places* are places in remote locations (45 minutes from cities), with a long-lasting depopulation trend and with low growth or even economic decline. This concept does not identify a unique typology, rather a plurality of places under a common denominator, with certain features of vulnerability in terms of a lack or insufficient local endowment, accessibility, or connectivity. In this sense, remote places are considered *lonely* due to their distance from urban centres and from agglomeration economies, but also due to the spiral of abandonment by their own citizens. This new exploratory concept of *lonely places* is multi-scalar as it is not bound to a specific geographical level (regional, municipal, or local) and it makes it possible to stretch the analysis beyond administrative boundaries. The concept is also interdisciplinary because it refers to several dimensions such as physical infrastructure, access to schools, cultural facilities, democratic participation and migrant integration (JRC, forthcoming).

Lonely places expand the feeling of abandonment from people to places, tying the social and territorial dimensions of loneliness. Even though not specified by the authors, the concept effectively also shows how this set of concurrent challenges has been neglected in European policy debates. Compared to shrinkage, it has a more limited territorial scope, requiring remoteness and ignoring non-remote shrinking areas. Nevertheless, it has many characteristics in common as it is multi-scalar with a cross-Europe scope; is based on demographic decline but is specified further with social, economic, environmental and political variables. The concept of *lonely places* is published at the same time of this dissertation, confirming the need to produce research on territorial disparities, based on population decline, with a European wide scope.

Places left behind

Last but not least, this review dwells on a fundamental notion in European Policy debates, which somehow relates to the concept of *lonely places:* 'places that do not matter' (Rodríguez-Pose, 2018), 'places left-behind' (Sandbu, 2020), and 'places of discontent' (Dijkstra, et al, 2020; McCann, 2020). Whilst there is affinity, the perspective here is less analytical and focuses primarily on the political and institutional sphere. These are identified as places experiencing long periods of decline in productivity and employment, often linked to agriculture and industrial sectors, outmigration and perceived unfairness by inhabitants. They are also usually discussed in relation to anti-establishment votes or votes for populist parties as a sign of protest (Dijkstra et al. 2018; Rodríguez-Pose 2020b; Rodríguez-Pose and Ketterer 2020).

Whilst demographic decline does not play an analytical role in this family of concepts, the affinity is still relevant when looking at the similar narrative for social and economic decline. What makes these concepts so important in the thesis is the tight link with policy debates. Place that don't matter and places left behind are conceived from a policy perspective, and their definition (rooted in political expression and participation) confirms their close link to the policy arena. In this sense, these concepts show that shrinkage is missing in the European debate. They are also particularly useful to approach the institutional challenge that this dissertation reviews. Later in the chapter, their prominence will be noted.

Shrinkage and depopulation in debates at country level

The concept of Inner Areas that emerged in Italy has already been discussed for its theoretical proximity to inner peripheries, but the Italian case is only one example among other shrinkage concepts in national debates. Other examples are '*España Vaciada*' in Spain and '*Municipios do Interior*' in Portugal. These are similarly defined as territories affected by depopulation, with low access to services, social distress, weak institutional engagement, and economic decline (ESPON 2018a). Other examples include '*la diagonal du vide*' in France focussing on low density, local population decline, and broader socio-economic distress, or the 'villes rétrécissantes' with demographic, economic and social connotations of unemployment, poverty and insecurity. In Germany the debate on shrinkage refers to 'Schrumpfung' or 'schrumpfende Stadt'. Nevertheless, in numerical terms, the European debate at national level, is still fragmented with thematic exceptions such as the post-socialist context (Döringer et al. 2020).

2.2 Policy concepts

This section unpacks the policy dimension of the dissertation by first reviewing concrete instruments and strategic documents on territorial disparities (section 2.2.1). It then introduces macro trends and challenges the EU is facing, and their indirect (but strong) relation to local development (section 2.2.2) and finally it presents an ongoing conceptual debate on how to address disparities from a theoretical perspective (section 2.2.3).

2.2.1 Policies and strategic documents addressing territorial inequalities

The upcoming paragraphs review some of the most important policy instruments and strategic policy documents addressing territorial inequalities at the European scale. Documents with a foresight approach such as the Territorial Agenda and the Long-Term Vision for Rural Areas have different time horizons than 2050, the target for population projections in the dissertation. However, this does not affect the quantitative analysis as these documents are taken into consideration for a literature review and analysed for their qualitative content on policy, not for demographic trajectories.

Cohesion Policy and European structural and investment funds

The eighth report on economic, social and territorial cohesion was published shortly before this dissertation in February 2022. Demographic change has a specific chapter in the document, and declining population is recognised as a challenge for cohesion in the coming decades. However, the report does significantly advance dealing with territorial imbalances generated by the expected demographic compared to the seventh report from 2017. Whilst the report mentions some territorial implications (such as the higher exposure of rural areas), there is no further investigation of the drivers, and no structured approach to deal with the territorial impacts of this demographic trend is discussed. Still, there is a call for helping regions to respond to demographic change. The recommendations suggest increasing opportunities for youth, women, and non-EU migrants, investing more in innovation and re-skilling and adapting basic services (such as healthcare and schools) and infrastructure (Dijkstra et al. 2022).

The seventh report on economic, social and territorial cohesion highlighted that regional disparities had been narrowing in the past years. For economic performance and unemployment, there was a convergence towards the European average, even though levels are still below pre-financial crisis times. The report also addressed demographic disparities. It stressed that for the first time, deaths outnumbered births in the EU in 2015, which strengthens the impact of migration and mobility on regional populations. It acknowledges that big differences in unemployment and income across the EU encourage people to move to find better job opportunities and/or escape unemployment and poverty, resulting in opposing trends of rapid growth and depopulation across regions (European Commission 2017).

Whilst the report addresses social, economic and territorial cohesion from many different angles and perspectives, the concept of shrinkage does not feature. Demographic decline and depopulation was presented as unidimensional, rather than a multifaceted process in the report, and addressed from a natural demographic balance and migration perspective. Still, its relevance is recognised: in the EU, 43% of the population live in a NUTS 3 region that lost population due to natural reduction between 2005 and 2015 (European Commission 2017).

Even though the seventh report did not treat shrinkage (or demographic decline) from a structured cross-disciplinary approach, the relevance of shrinkage for social, economic and territorial cohesion is implicitly recognised. In particular, among the recommendations for the next programming period: 'the system of allocation of the funds could be revised by adding criteria linked to the challenges the EU faces, from *demographics* and unemployment to social inclusion and migration, from innovation to climate change' (European Commission 2017). As we observe and compare the seventh with the newly published eighth cohesion report, demographic decline seems to now have a higher priority, at least strategically in the document. Nonetheless, there is still very little on the operational side, and no structured or coordinated approaches to shrinkage are discussed. Also, as we see in the following paragraphs, the recommendation on funding allocation has not made it into policy regulations, and does not feature in the eighth cohesion report.

The introduction to this dissertation anticipated how the fate of shrinkage and depopulation has played out in Cohesion Policy 2021-2027. Following several negotiation rounds, and the efforts of MEPs and the Committee of the Regions (CoR) advocating for more formal consideration of shrinkage in Cohesion Policy, a definition now features for the first time in

the official regulation (recital 45, preliminary considerations of 2021-2027 ERDF regulation[5]). Member States are adviced to consider shrinkage when developing specific local action plans in the new programming period. Later, article 10 of the regulation strengthens the relevance of demographic challenges and calls for Member States to deal with them in a structured way within the Partnership Agreement.

Whilst the provisions of the 2021-2027 Cohesion Policy are a significant development for shrinkage in the European debate, these are the result of a watered-down compromise. As negotiations narratives suggest, the ambitious goal of earmarking 5% of funds for demographic challenges had to be scrapped from the Regulation in favour of the present, non-binding, formulation (Pazos-Vidal 2021). It is also significant that, despite the recommendations of the seventh cohesion report, intervention on shrinkage is only suggested, and responsibility is shifted to Member States instead of favouring a European framework for coordinated intervention. First commenters see an inbuilt resistance to formally recognise areas facing demographic structural decline when allocating EU funding (Pazos-Vidal 2021).

Within the instrument fostering territorial cohesion around the EU, the European Agricultural Fund for Rural Development (EAFRD) as a European Structural and Investment Fund (ESIF) is worth mentioning. Whilst it falls formally outside Cohesion Policy (it belongs to the Common Agricultural Policy), it is designed to foster balanced territorial development, narrowing disparities in rural areas and communities. The approach is geographical as it targets the specificities of rural areas, but amongst them, depopulation is acknowledged as a commonly issue (recital 19, preliminary consideration of the previous regulation[6]).

Despite the limited relevance of demographic decline in the EAFRD intervention logic to territorial inequalities, one of the fund's policy instruments, LEADER, is an interesting approach to tackle disparities. Its relevance is highlighted in this theoretical framework because since its first application (30 years ago) it has expanded into Cohesion Policy through the wider

[5] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021on the European Regional Development Fund and on the Cohesion Fund. L 231/60, Official Journal of the European Union. 30.6.2021.
[6] REGULATION (EU) No 1305/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005.

concept of Community Led Local Development (CLLD). While this approach remains compulsory only for EAFRD and related Rural Development Programmes with a minimum of 5% allocated funds it is a powerful tool to activate and fuel place-specific intervention in shrinking areas, together with Integrated Territorial Investments (ITIs).

Cohesion Policy is the most powerful and impacting instrument addressing territorial disparities of the European Union with roughly 1/3 of the budget. The upcoming sections review other influential policies to show the stance of shrinkage in current European debate.

Long term vision for rural areas 2040

The European Commission addresses challenges and examines opportunities for rural areas and conveys its strategy in the Long Term Vision for EU rural areas (European Commission 2021). The issue of demographic decline occupies an important, and recurring role in the analysis of challenges and trends rural areas face. Rural areas struggle with demographic change and remote rural regions face a particularly difficult situation. In many ways, rural regions are ahead of the demographic curve at the EU level because in the next decades more and different types of regions will also experience ageing and population decreases. Rural regions are advised to develop policies that manage population changes to ensure quality of life and no to harm their economic and social systems (European Commission 2021). The argument and the spatial focus concentrate on the contraposition between rural, intermediate, and urban regions, so the strategy aligns with the notion of shrinking rural areas presented earlier (Copus et al. 2020; ESPON 2017). Though spatially and territorially limited with respect to shrinkage, the vision highlights the need for greater consideration of the demographic challenge at EU scale.

The New Leipzig charter and the EU Urban Agenda

Whilst Cohesion Policy and the vision for rural areas are regional frameworks of strategic intervention, Member States have also activated policy initiatives at urban level to foster cohesion and promote distributed and sustainable development. The New Leipzig Charter and the Urban Agenda of the EU are relevant for strategic guidance in this field. While demography is mentioned among other macro-challenges, there is no dedicated focus on shrinkage, nor on the impact of demographic decline on the urban socio-economic fabric. In the Leipzig Charters,

vulnerability and need for greater consideration of shrinking areas is barely mentioned (Leipzig Charter on Sustainable European Cities 2007; New Leipzig Charter 2020). Even though the priorities are often beneficial and coincide with the multifaceted process of shrinkage, the lack of formal recognition is relevant especially as Leipzig is one of the most debated cases of shrinkage.

The Urban Agenda of the EU reflects a similar approach to shrinkage as demographic change is acknowledged as a macro-challenge but is not a priority theme (Urban Agenda of the EU 2016). This is significant, underlining that shrinkage and depopulation are also missing from the list of partnerships and related action plans. These constitute the common strategic priorities of the European Urban Agenda: Air Quality, Housing, Inclusion of Migrants & Refugees, Urban Poverty, Jobs & Skills, Circular Economy, Digital Transition, Urban Mobility, Climate Adaptation, Energy Transition, Public Procurement, Sustainable Land Use, Security in Public Spaces, Culture/Cultural Heritage. Whilst these may be valid intervention axes for shrinking areas (or municipalities in this case) and the demographic challenge is seldomly mentioned in thematic action plans, the lack of structured approach to urban shrinkage stands out.

The Territorial Agenda 2030

The Territorial Agenda (TA) 2030 is a strategic document strengthening the territorial dimension of sector policies at all governance levels. In its objectives it seeks to promote an inclusive and sustainable future for all places, paying special care to territorial disparities. Unlike the other documents reviewed, the TA adopts a multi-scale approach to territory considering regions, provinces and municipalities at the same time, as they are equally important to reaching greater territorial cohesion (Territorial Agenda 2020). Whilst shrinkage is not explicitly mentioned, demographic decline is often linked to territorial disparities throughout the strategic document. The demographic trends have severe social implications in terms of social exclusion and inequalities at various territorial levels.

The Territorial Agenda 2030 draws attention to the diverse impacts of the macro-trends and challenges the European Union is currently facing, where territorial disparities are already pronounced across Europe. The document is particularly effective in putting territorial disparities at the centre of the wider European policy debate. It reflects on the diverse impacts expected from policy challenges, such as climate change and digitalisation among others, and

places the spotlight on existing territorial inequalities, sounding an alarm and providing a framework to intervene.

Shrinkage, when conceived beyond demography as a multifaceted socio-economic process, makes up a considerable slice of existing territorial disparities. The systemic (cross-sectorial and cross-thematic) approach to territorial disparities, adopted in the Territorial Agenda, lies at the core of the theoretical framework of this dissertation. The following section reviews the most pressing macro trends and challenges for the EU, setting the stage for an investigation of their potential implications for shrinkage.

2.2.2 Macro trends and challenges in the European Union

All European cities and regions are exposed to overarching trends, but territorial inequalities make some more sensitive to challenges. Shrinking areas are an important part of these, as they have a higher intrinsic vulnerability (Wolff et al. 2017). The trends are determined by exogenous factors, but local impacts are shaped by interdependence with other places, and particularly by the contextual characteristics of each place. The links between macro trends and contextual territorial features are crucial for the development of any city or region in Europe (ESPON 2019b).

This becomes visible when looking at the wide range of macro trends which influence spatial development and territorial balance in Europe (Böhme et al. 2019). These macro trends can be technological (for example artificial intelligence, big data, industry 4.0, smart networks), environmental (for example climate change, biodiversity loss), political (for example global tensions, populism, neo-nationalism, e-governance), economic (for example platform economy, accumulation of wealth by a few, circular economy, beyond-Gross Domestic Product and social (such as social fragmentation, aging, migration, new media). The impacts of these macro trends vary between regions and cities and depend on the territorial context. In other words, seemingly similar macro trends affect European cities and regions, with their diverse social, economic and environmental contextual characteristics in different ways (Böhme and Lüer 2016; ESPON 2014a). Non only the state of macro trends themselves, but local government actions and intertwinement with local territorial features, determine the transformations of development factors. These factors together lead to spatial diversification

of social and economic development in European countries and internal regional development (Churski et al. 2021).

Territories in the EU have very different development conditions and prospects and those with structural deficits or prolonged distress face future trends from a disadvantaged position. Among the latter category, shrinking areas are key to better understanding Europe's territorial diversity and discussing the future impacts of macro trends, social challenges and supralocal policies (ESPON 2014b). This dissertation focuses on environmental, pandemic and institutional challenges (with digitalisation as a cross-cutting topic), and zooms in on shrinking areas to study territorial balance in Europe in light of the diverse potential impacts of EU policy on different regions.

Pandemic challenge: different socio-economic consequences of Covid-19 restrictions

The pandemic has had more than one territorial dimension. The most visible is the different geographies of the health crisis, with places affected by many infections and high death tolls along with places affected to a lower extent. However, the health crisis has triggered policy responses in the form of lockdowns and restrictive measures. These have very diverse impacts depending on the characteristics of each place, and this territorial dimension is likely to be the most relevant in the longer term.

There was substantial alignment among EU Member States in the initial phases of the outbreak, but differences have steadily increased (Blavatnik School of Government 2020). Even though these policy responses did not include territorial thinking, restrictive measures have strong territorial implications resulting in different local impacts. Across European territories with their different socio-economic fabric, being exposed to the same national Covid-19 policy response does not lead to the same impacts. The socio-economic asymmetry of consequences across Europe, countries and regions is largely shaped by diverse regional and contextual characteristics (Böhme et al. 2020a; OECD 2020b).

Existing literature has explored the drivers of differentiated territorial impact and found two main aspects: stringency of restrictions and the socio-economic fabric. The most socially and economically hard-hit regions were under strict lockdown measures longest. Most hard-hit regions also rely on economic sectors severely affected by lock-down measures such as tourism

or the cultural industry, or with economies based on SMEs, self-employed people, other non-standard workers, and those highly dependent on international trade (European Committee of the Regions 2020; International Labour Organization 2020a).

More and more literature highlights the links between the pandemic emergency and the other major policy challenges the EU is currently facing, that are at the core of this dissertation. The CoR Barometer 2020 reflects on the relation between the pandemic and the crucial role of digital infrastructure (European Committee of the Regions 2020), and like other institutional reports (OECD 2020b) it also investigates governance across the institutional ladder during the crisis. The CoR Barometer 2021 instead focuses more on the green transition and possible intersections between responses to the pandemic and the environmental challenges (European Committee of the Regions 2021).

All discourses around the pandemic impact, both research and policy related, substantially agree on the crucial role of the digital transition and the accelerated need for digital migration of services and jobs. Basically, the crisis turned digital technologies into an imperative as online solutions became essential for public authorities across EU regions and cities to mitigate the pandemic effect and communicate with citizens. Whilst this could fuel catching up processes, it also risks exacerbating the 'digital divide', including between lagging, rural and remote areas, and the rest, or between large and small companies, as well as digitally skilled workers and others. At the same time, increased teleworking may cause demographic and economic shifts from cities towards less crowded areas. The latter is potentially emerging as a positive trend for shrinking areas but, overall, digitalisation crucially important for society as a whole and is a cross cutting theme across policy fields since the institution of a Digital Agenda for Europe[7].

Whilst the dissertation focuses on pandemic, environmental and institutional challenges, digitalisation will be a recurring theme in the analysis, as a cross-cutting issue, similar to its

[7] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS: A Digital Agenda for Europe. COM (2010)245 final. Brussels, 19.5.2010

role in the European policy debate. The next sections tie the environmental and institutional challenges into the theoretical framework.

Environmental challenge: energy transition and industrial restructuring

The environmental challenge is global and it can be described under many different aspects corresponding to different research fields. Investigating the impacts of such a complex, radical, and systemic process is of course beyond the scope of this dissertation. Nonetheless, within the European policy debate it is easier to disentangle the challenge and discussion of its territorial impacts is easier. Within the European Green Deal, one instrument stands out for its unusual design embedding ex ante territorial thinking and inspired by a territorial cohesion spirit. The Just Transition Fund will mitigate territorial imbalances generated by the energy transition.

The green transition promoted by the Just Transition Fund requires a radical transformation of the industrial fabric and synergies that have characterised local economies up to now. Such a radical shift in regional development models will have an important impact on the territorial identity of several places in the EU, but will also be an opportunity. The Just Transition Fund is an effort by the EU to narrow territorial inequalities within the Environmental Challenge, and an opportunity for some areas to mitigate the impacts by tackling both existing inequalities and prevent new ones from arising (WWF - European Policy Office 2021).

The effects on the labour market will be an unprecedented challenge of transformation and adaptation for local communities. Social and demographic conditions will be impacted by industrial transformation, which is the main outcome of the policy (Skoczkowski et al. 2020). While coal-based local economies should anticipate the inevitable decline of this industry, the Just Transition Fund aims at offering an alternative vehicle, with tools and resources to start a new journey (Colli 2020). Part of the success of this transition depends on local endowments in terms of territorial capital, but much depends on institutional capacity (at all levels) to steer such a complex process. Of course, the role of institutions is not limited to the Just Transition Fund and goes across policy themes, which makes it especially relevant for the future of shrinking areas. The next section approaches the institutional challenge, revealing territorial implications for the rest of the dissertation. The specificities of the Just Transition Fund and their relevance for the analysis is detailed in chapter 5.

Institutional challenge: quality of government and citizen discontent

Institutions and governments are facing challenging times throughout the European Union. Besides being confronted with steering profound societal changes due to the pandemic, the environmental and the digital challenges, their social role, accountability and adequacy are increasingly being questioned. The complexity of the institutional challenge for the EU is here disentangled into an administrative and a political aspect: I) governmental quality and administrative capacity; II) citizens' lack of trust and involvement.

Literature has discussed and confirmed the relevance of institutions in determining territorial development, and the connections between institutions and the wellbeing and future prospects of European territories seem tight (Charron et al. 2014; Rodríguez-Pose and Ketterer 2020). Government quality has been a consistent predictor of economic growth and resilience, which implies that measures to improve government capacity and ensure quality need to be considered when thinking of future development strategies. Previous studies also highlighted that these links between governance and territory are crucial for territorial cohesion in Europe and a challenge for lagging areas (Rodriguez-Pose and Garcilazo 2013). Also European institutions acknowledge that high-quality government plays a vital role for the well-being of society, is a pre-requisite for long-term, sustainable increases in living standards, and strongly influences people's health, access to basic services, social trust, and political legitimacy (European Commission 2017). At the same time, literature has shown how quality of government varies consistently, especially at local scale, across the European territories. The government quality and performance is influenced by several local factors, where historical trajectories such as reforms, different arrangements, shifts in competences, play an important role (Gorzelak 2019). Not only local embedded factors play a role in local governance status, but recently it has been underlined how citizen participation in local government is a major resource and relevant factor determining governmental quality (Silva and Buček 2017).

Social trust and political legitimacy are another key driver of the institutional challenge. In fact, the quality and efficiency of governments and governance processes also impact citizens' trust in public decision-making processes. The participation rate in recent elections witness increasing discontent and fragile or even declining public trust. Citizens feel increasingly less represented in the policy debate, which results in a general distrust in policy decisions translating into anti-institutional votes. Previous studies have highlighted how these dynamics

in the socio-political game are particularly relevant in territories with inequalities, such as shrinking areas (Dijkstra et al. 2018; McKay et al. 2021; Rodríguez-Pose 2018, 2020b).

The institutional challenges make the case for broader, and more significant involvement of citizens in policy decisions. The European Union has started to react to this and recent initiatives intend to revamp the role of citizens in various stages of the policy cycle (Fischer and Miller 2017). For instance, Cohesion Policy 2021-2027, includes closeness to citizens among the five transversal policy objectives (Article 5 of the official regulation[8]). It plans to involve citizens in the implementation phase through stakeholder engagement and the co-design of interventions at local level. Another initiative is even more interesting for studying shrinkage and the institutional challenge: the Conference on the Future of Europe[9]. Here, citizens are involved in agenda setting at the widest public scale and are called to share their concerns and promote their ideas to shape the future policy agenda of the European Union. The initiative is not a traditional conference, as it runs for nine months on a permanent digital platform, allowing continuous interaction between citizens while directly communicating with institutions (European Commission 2020a).

The institutional challenge is conceived as a structural process in this dissertation, with two linked drivers. The EU deals with different qualities of governments and administrative capacity across countries and at all levels. Inefficiency feeds increasing distrust in EU and lower-level institutions, which increases the distance perceived by citizens towards the institutions, lack of engagement and resignation. Both aspects of the institutional challenge have considerable territorial implications, in determining existing territorial inequalities, but also in the potential impacts of future challenges and receptiveness to opportunities. Shrinking areas start with a complicated relationship with their citizens, where 'abandonment' is a two-way feeling form citizens towards institutions and vice versa. From this perspective, shrinking areas are frontier laboratories for addressing multiple levels of the institutional challenge by reinstalling social trust through active involvement in policy decisions, while improving administrative capacity across the governance ladder.

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[8] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021on the European Regional Development Fund and on the Cohesion Fund. L 231/60, Official Journal of the European Union. 30.6.2021

[9] Joint declaration on the conference on the future of Europe-engaging with citizens for democracy – building a more resilient Europe. Document signed by the European Commission (Ursula von der Leyen), the Council (António Costa) and the European Parliament (David Sassoli).

This chapter has established the determinants of shrinkage as local results of exogenous (macro challenges) and endogenous (contextual features) trends. The theoretical framework underlying shrinking areas has been defined and placed into the wider context of European policy debates on cohesion and territorial inequalities through linked concepts and related policies. The last section has widened the policy spectrum to introduce current macro-challenges for the EU with an eye on their territorial implications. The next section addresses the gap between challenges, policies and territory, though from a theoretical standpoint. Indeed, the upcoming paragraph discusses the different approaches that policies may have towards territorial implications.

2.2.3 Spatially blind, place-based and place-sensitive approaches

Context-specific factors are essential to shaping urban development trajectories and these could be leveraged by policy makers. The diversity of regional and local potentials and their prime relation with regional development and territorial transformations has been established in the debate since long time (e.g. Gorzelak 1998). However, policy making at European level cannot take into account case-by-case context specific factors but needs a transversal approach to the consideration of such specificities. Earlier in the chapter the debate on European territorial policies revealed the implications of unbalanced territorial development, and the differences between growing agglomeration areas with shrinking and peripheral areas. In the current policy context, it is even more appropriate to consider the diversity of places while facing the major environmental, pandemic and institutional challenges with profound transitions that will heavily influence long-run outcomes (Thissen and Van Oort 2010). To consider and discuss the territorial implication of policies, regional studies have promoted conceptual, but also practical approaches that can be applied to the policy cycle: *spatially blind*, *place-based* and *place-sensitive* approaches are key in this debate.

Spatially blind policy approaches are seen in most traditional sectorial policies. The notion describes policies where the diversity of spatial and territorial implications is overlooked, resulting in uncontrolled and diverse impacts across different places (Šipikal et al. 2017). Spatially blind policies are seen as people-based policies that guarantee equal access to opportunities, regardless of where they live (World Bank 2009). However, this view has been criticised as they typically end up as capital-city promotion policies, pursuing benefits from

agglomeration (Rodriguez-Pose and McCann 2011). All in all, policies can be described as spatially blind when the impacts across different territories is the unintended outcome of decisions that follow other criteria and policy priorities.

Place-based policies instead have a different perspective for the territorial implications. A place-based policy has been described as a long-term strategy aimed at tackling persistent underutilised potential and reducing persistent social exclusion in specific places through external interventions and multilevel governance. In a place-based policy, public interventions rely on local knowledge and build on geographical context, in broader terms of social, cultural and institutional characteristics (Barca 2009). It is essential to consider the variety of contextual factors in diverse geographical locations which could influence the impact of policy interventions (Barca et al. 2012). In a similar vein, Tomaney (2010) defines a place-based approach as the identification and mobilisation of endogenous potential, aiming to develop locally-owned strategies that can tap into unused economic potential in all regions. They also form the basis for strategies that address sustainable development and human wellbeing (Tomaney and Australian Business Foundation 2010).

The place-based approach has its origins in the regional development debate and often has been limited to this policy field. This is understandable as policies addressing regional development directly target the valorisation of each territory and the harmonisation of territorial imbalances, making the link between local factors and their potential more natural. However, a vast array of European policies generates impacts on territories and cities with varying intensity according to the features of each local reality. The impact does not depend solely on local factors but rather on their links with each policy objective, the concrete measures and the absorption capacity of the territory. The need to expand the application of place-based approaches to a wider policy audience can be inferred. At European level, Shared Management and Open Methods of Coordination (Faludi 2004; Prpic 2014) offer early examples of how to unpack policy instruments at the origin (EU level) to better address place-specific differences. These approaches are an important milestone for broader place-based policy making.

In the meantime, a kindred concept has emerged and strengthens the attention to territorial matters in supranational policy making: *place-sensitivity*. The affinity between the two approaches was anticipated before place sensitivity became a self-standing concept: ‘territorially sensitive knowledge is necessary for a place-based approach’ (Zaucha et al. 2013,

p. 18). The place-sensitive approach follows similar lines to place-based as it advocates for policies implemented differently for different territories, that are sensitive to the territorial specificity of geographic features, institutional structures and local and regional development assets. In summary, it advocates that policies need to be tailored to the structural prospects of different European regions (Iammarino et al. 2019).

While place sensitivity has increased in the policy debate, a subtle theoretical distinction between place-based and place-sensitivity, emerged in recent academic debates. This distinction is closely linked to the original debate on spatially blind versus place-based approaches. Spatially blind frameworks are driven by efficiency targets to maximise agglomeration and output. Place-based frameworks are driven by targets to minimise interterritorial disparities (Iammarino et al. 2019). In this interpretation: 'too much focus on efficiency through agglomeration may therefore enhance territorial inequity, while too much focus on equity through place-based support undermines overall economic efficiency. Hence, there is a need to pursue efficiency and equity simultaneously and neither spatially blind nor place-based policies, on their own, are capable of doing so' (Iammarino et al. 2019: 288).

The valorisation of contextual factors and the attention to territorial imbalances has advanced significant with the utilisation of place-based approaches and the conceptualisation of place-sensitivity. However, these are still centred on economic productivity principles and the pursuit of regional economic development as the primary objective of the place-sensitive approach. As a result, the notion of regional differences remains limited to economic macro-categories: very-high-income, high-income, low income and middle-income regions (Iammarino et al. 2019). Such profiling risks being overly simplistic for shrinkage, where demographic and social phenomena add complexity to the economic sphere.

Moreover, this dissertation describes new challenges for the EU, which may translate into a paradigm shift that reflects on the traditional motives and targets of European policies. As environmental targets gain importance, regional economic development may no longer be the only driving force. Besides being an emerging concept in the contemporary debate, *place-sensitivity* has already been used and reinterpreted with a broader, theoretical understanding recalling the semantic definition of the word *sensitive*. 'Place-sensitive policy shows particular interest in the specific issues of particular places (. . .) and its solutions are expected to respond to time-specific, region-specific and actor-specific opportunities as well as the constraints of

each place' (Sotarauta 2020: 6). The author also stresses that regional development policies may be highly sensitive to the needs of a place without being solely place-based (Sotarauta 2020).

Following Sotarauta's understanding, the concept of place-sensitivity is essential for dealing with shrinking areas, but for this purpose, its implementation should detach from 'economic development policies' and rejoin the overarching principle of valorising local contexts for the treatment of special, sensitive places regardless of their economic development status. Nevertheless, place-sensitivity should not be opposed to place-based concepts, which are continuously valued in both the academic debate (Beer et al. 2020) and in practice: 'The diversity of places in Europe is an underused potential. Place-based policy making can help release untapped potential' (Territorial Agenda 2020, p. 7).

It emerges that the most recent debate in regional studies (Iammarino et al. 2019; Beer 2020; Sotarauta 2020; Territorial Agenda 2020) does not define a recipe to reduce territorial disparities, but place-based and place-sensitive approaches offer a common ground of similar and complementary notions that advocate for better policies in lagging regions. The two approaches can be seen as partially overlapping paths following the same direction, advocating for greater care concerning territorial disparities in policy making, with consideration of place specific conditions. The first has reached a more operational understanding as it refers to the structure and processes of a policy. The latter is a conceptual principle more broadly applicable to policy which emphasises flexibility and adaptability more than structure. All in all, the common ground between the two approaches seems substantial, so they can reinforce each other in the debate and be applied at all stages of the policy cycle to valorise the endogenous potential of shrinking areas.

Most recent theories on European territorial development also conceptualise a tighter link between place-based policies and territorial capital. The latter is unpacked into five components (human, social, material, financial and innovation capital) and lies at the intersection between policy design and regional development. In particular, development factors should be analysed through this territorial capital lens when implementing a place-based policy. Moreover, this model underlines how the intersection of regional policies and regional territorial capital is relevant for place-based approaches at the 'smallest units of administrative division' (Churski et al. 2021). The model of development factors formalises the links between

place-based policies, territorial capital, and the local impact on development. This theoretical model lies at the core of dissertation, for its clarity in defining and blending the main concepts underlying the quantitative research.

The discourse around place-based and place-sensitive approaches underlines the call to include place-specific information in European policy design. Establishing a direct link between context and higher-level policies could help bridge the knowledge gap on potential impacts of European policies for shrinkage. Considering shrinking area vulnerabilities, these territories would benefit from a procedural *filter* from EU policies to assess ex-ante the potential impact of instruments. The next section introduces TIAs, a methodological tool that can facilitate the implementation of place-sensitive and place-based approaches by systematically including place-specific knowledge in the policy process. In particular, it enables the practical installation of a multicriteria concept of territorial capital in the analysis of ex-ante policy impact, thus aligning with the recent suggestion to implement place-based policies (Churski et al. 2021).

2.3 Methodological toolbox

This section presents the methods applied in the dissertation and discusses them individually from a theoretical perspective. The theories, concepts and existing literature underlying the TIA, the policy content analysis and demographic projection modelling are described in this chapter. Then, in each analytical chapter the methods are presented from an operational perspective to discuss adapting and tailoring them to the challenges, the policy features and the data sources available.

2.3.1 Territorial Impact Assessments and their tools

Back in 1999, the European Spatial Development Perspective anticipated the relevance of TIAs for European policy making. At that time, the concept of Impact Assessment was strictly tied to environmental and large transport infrastructure projects. The report uncovered the territorial impacts of policies and called on European researchers and institutions to engage in this field from both methodological and procedural perspectives (European Spatial Planning Perspective 1999). Later, TIA is described as the multidimensional evaluation of the likely impact of policies on the territory, this is understood as the dimension on which the other relevant dimensions (economic, social, environmental and cultural) converge and with which they interact (Camagni 2006).

While in principle any impact assessment method in a specific thematic field can encompass a territorial dimension, the concept of a dedicated TIA relates to tools and methods with the explicit goal of providing information on the territorial distribution of impacts for a multitude of thematic fields (Gaugitsch et al. 2020). This purely territorial perspective can be applied beyond regional development policies and related policy fields where territorial thinking is embedded in the objectives. However, the most interesting application for TIA can be found in sectorial or cross-cutting policies as advocated and previously tried (Camagni 2009; Golobic and Marot 2011).

Arguably the most important methodological work on TIAs has been carried out under the ESPON programme. Here, one structured proposal for a TIA is the Territorial Efficiency Quality Identity Layered Assessment (TEQUILA) model. This first operates at the generic or European level, producing potential impacts based on a specific cause-effect relationship

between policy measures and expected results. Afterwards, this information would need to be translated to the regional level based on various regional characteristics. The TEQUILA model makes use of a well-established methodology, namely multi-criteria analysis, and applies it to build a theoretically sound and operationally viable methodology for TIA (Camagni 2006, 2009; Capello 2006). Afterwards, this information needs to be translated to the regional level based on regional characteristics. The model is considered a pioneer and has been included in different contexts and projects (ESPON TipTap, ESPON Arts). Though it was designed to be simple, operational and relatively user-friendly, in reality running the model requires a great deal of expertise, particularly due to the data requirements and the length and complexity of the process (Evers 2011).

Later studies have worked on the methodological and procedural development of TIAs. Medeiros has developed it through a more sophisticated qualitative approach and refined the theoretical and conceptual framework. His model (TARGET TIA) combines qualitative and quantitative information to produce a comprehensive impact assessment on a specific territory, enabling comparisons of alternative policy measures (Medeiros 2014, 2015). Whilst he has clarified the definitions and concepts of TIA, implementation of his proposed model has proven to be challenging at larger scale. As the model is the result of a complex and articulated procedure it can lead to high costs and problematic methodological decisions (Gaugitsch et al. 2020).

To assist wider and accessible implementation of TIAs, ESPON has produced a new attempt to balance between policy orientation, practicability and scientific ambition. The ESPON TIA is an ex-ante method specifically developed to depict the potential effects of a regulation or policy. It is based on the vulnerability concept that combines qualitative judgements of the intensity of effects caused by a policy in different territories (exposure) with quantitative data on the susceptibility of each region to those effects (sensitivity) to calculate territorial impact patterns in multiple fields (economy, environment, society and governance). One disadvantage of the method is the lack of in-depth assessment of the impacts, which remain qualitative and potential, mainly due to the ex-ante nature. The ESPON TIA, however, can give a good indication of impacts at European scale, and is a basis for more detailed local assessments. One important feature is that even though it uses quantitative data to calculate territorial impacts, the results are qualitative (Essig and Kaucic 2017).

For EU policy processes TIAs aim to identify if a policy has 'a large asymmetric territorial impact' (European Commission 2013a). In this sense it is a method and procedural tool closely linked to territorial cohesion debates (Böhme and Eser 2008; Evers 2011; Medeiros 2014). It can analyse, anticipate and estimate territorial convergence or inequalities of policy decisions. Indeed, TIA is a method for predicting different territorial effects and providing useful insights to policy makers (ESPON 2013). Thus, enables a systemic approach and can jointly consider the fields of other (thematic) impact assessments such as on the economy, environment, society and governance (ESPON 2012).

Over the years, a wide body of research on TIAs for various policy measures, with different territorial targets has emerged (e.g. Camagni 2006; Essig and Kaucic 2017; Medeiros 2014, 2015). This methodology is crucial in the theoretical framework of this dissertation because it emphasises the importance of place-specific contextual information in the evaluation of policy impacts and offers a tool to include this. Based on existing experiences with TIA, the next paragraphs streamline the essential concepts used in the dissertation. In the analytical chapters, these will be adapted and implemented.

TIA procedures have logical steps to be followed when preparing evidence on the potential impacts of a project, programme or policy, in a territory. This procedure can be either ex-ante, or ex-post, but this dissertation is interested in the former. The understanding of impacts in the TIA is based on the vulnerability concept of the Intergovernmental Panel on Climate Change (IPCC) and assesses the exposure and sensitivity of territories to a policy (ESPON 2012).

These definitions and logic of exposure, sensitivity and territorial impacts form the conceptual framework of TIAs. Within this framework, the concept of territorial capital is also introduced as it involves the assessment of preconditions facing a specific policy or challenge through a multiple criteria approach.

Exposure: describes the intensity that EU directives and policies potentially affect a territory by reviewing different policy components and allocation criteria (Essig and Kaucic 2017).

Sensitivity: analyses each territory in relation to the features and objectives of a challenge or policy. The determinants of territorial sensitivity need to be adapted and tailored to specificities of the policy, though the main drivers are usually social, economic, environmental, and

geographical features. Territorial sensitivity is guided by the question: how much territorial development will be affected by the policy, due to specific regional characteristics and endowments? Territorial sensitivity assesses how strong the impact of a policy option could be based on quantitative information and, in contrast to vulnerability, it also considers possible benefits (ESPON 2012). Inspired by the early years of TIA, in this dissertation the ESPON concept of territorial sensitivity is enriched with a multi-criteria approach to territorial analysis (Camagni 2006, 2009).

The territorial impact: The effects on a territory of a particular policy measure (exposure), combined with the characteristics of a region (sensitivity) produce potential territorial impacts (Medeiros 2014). These territorial impacts help discussions of territorial implications as a consequence of exposure and sensitivity of a territory towards a specific policy measure (ESPON 2012, 2018b). To sum up, territorial impact is the likely effect on a specific territory (or similar territories) of a European policy as a product of exposure and territorial sensitivity. When the TIA is applied ex-ante, the impacts are of course explorative, thus potential.

Territorial capital: Territorial capital is a set of different local assets (geographical, socio-economic, relational) that comprise the potential of a territory (Camagni 2008; Capello and Nijkamp 2009). In other complementary interpretations, territorial capital provides an appropriate analytical framework to study regional economic processes (Tóth 2014). In this dissertation territorial capital is intended in its analytical framework form as a fluid, adaptable, concept with the essential elements described by Camagni, Cappello and Nijkamp (2008,2009).

TIAs are powerful instruments for the aims of this dissertation as they require including interdisciplinary, place-specific information into the formulation of policy processes. They are flexible tools, easily adaptable to different policies (but also to trends and challenges) and they can be implemented with customised territorial focus. Through the analysis of exposure and sensitivity, they can address both short-medium term, but also longer-term impacts of policies. The possibility to use the results of ex-ante and foresight assessment is extremely valuable, if not necessary, in shrinkage contexts. Shrinking areas struggle (or have failed in the past) with maintaining sustainable development and improving living conditions and life opportunities for their citizens. Their intrinsic vulnerability requires a careful assessment of the implications of major challenges like environmental, pandemic, institutional and related policy measures in their territory. Informing research and policy at different levels about the potential impacts,

from short to longer term, can help better address current structural deficits and steer shrinking areas towards greater stability and sustainability in the future.

2.3.2 Qualitative content analysis in policy contexts

Applying TIA to any kind of policy, directive or programme has been reviewed and stressed, showing adaptability as a prime advantage. However, this is true for any policy measure that has been adopted, defined or at least roughly sketched and debated in an operational form. It is essential to investigate policy design (components, instruments, objectives and criteria) to analyse exposure and territorial sensitivity. Therefore, when a policy initiative is still in the agenda-setting phase (Fischer and Miller 2017), TIAs lack substantial elements to provide sufficient analysis. This is the case with the Conference on the Future of Europe, which has been chosen as the most suitable policy initiative to discuss the institutional challenge in relation to shrinkage. The status of the policy in the cycle and the research objectives have required an alternative methodology to favour an anticipatory discussion of potential impacts on shrinkage.

To provide an answer to the research question, qualitative content analysis is the most appropriate methodology (Flick 2014; Krippendorff 2018; Prior 2014). Nonetheless, the type of data and the research questions require that the analysis the findings include semi-quantitative elements in terms of occurrence and frequency of concepts and words (Schreier 2014). Similar to existing studies concerning EU policy content analysis, whilst the approach is essentially qualitative, it must involve quantitative methodological steps (Hecker et al. 2019; Venghaus and Hake 2018).

In this dissertation, the methodology requires the application of content analysis to data on traditional policy discourses: European citizens' ideas posted on the digital platform of the Conference on the Future of Europe. In light of this specific context, the qualitative content analysis benefits from an open coding approach (Schreier 2014). This approach enables regular reassessment of the coding protocol throughout the several analysis iterations, with the possibility to adapt and tailor the coding protocol, including the specification of sub-categories (Gibbs 2014; Venghaus and Hake 2018).

Citizen ideas in the Conference on the Future of Europe are an unconventional type of data in the context of policy content analysis. The format, length and tone of the data closely resemble Twitter and Facebook posts. Thus, from a technical perspective, the methodology deals with content analysis of social media material, which is another prominent field of application for content analysis literature (Snelson 2016). However, unlike social media platforms, the Conference on the Future of the Europe has a declared purpose to shape future policy agendas and contributions are expected for pre-defined themes. The audience is also slightly different as for social media the public is not predefined and, in most cases, restricted to existing connections, the Conference is visible to an unrestricted public that can also interact. At the same time, EU policy makers are the main target audience (European Commission 2020a).

Methods of content analysis in policy sciences have been applied to mass media and news reports (Howland et al. 2006; Sarainsky 2015). However, whilst there is literature on the role of social media in the political debate, content analysis has rarely investigated the interplay between social media data with policy processes. This dissertation applies a methodology that is widely used for social media (Snelson 2016), to a different context during an experimental phase of agenda setting for EU policy. In this way, the conceptual framework merges a traditional approach to policy content analysis with data that usually belongs to commercial, media and social fields. In addition to the research interest on shrinkage and depopulation, elements of novelty include the unusual actors, data, and format of the policy process being reviewed.

2.3.3 Demographic modelling for local population projections

A new element in the research design is the original methodology to project population at municipal level, to a European scope which analyses shrinking municipalities. The novelty lies in the geographical unit for which the population trend is projected. Previous cross-country studies have projections at regional and sub-regional (NUTS 2 and NUTS 3) levels, whereas this dissertation proposes a method for population projection at LAU 2 level. Still, the methodology relies on mixing existing data and models to obtain good proxies on demographic evolution at local scale. This section discusses the theoretical framework behind this model and presents previous applications of similar local population projections. In the next chapter, the model will be implemented through methodological steps and the related formulas presented.

There is extensive literature and cohesive methodological reviews on population projections. The debate is particularly rich for general projections, and at national and regional level. Less is available for municipal population projections. If the principles of forecasting population at macro-levels are well structured, recognised and applied internationally, for micro-level population forecasts the debate is less structured and relies on locally developed methodologies at small scale (Marois and Bélanger 2014; Romain et al. 2016). In short, in the first case the methodology stands alone and is continuously used and reproduced, in the second case the methodology is not yet consolidated and is mostly case study based. It should be noted that the theoretical base is shared by both applications, and this will be the core of this review.

Theoretical underpinnings of the model

The first distinction in the theoretical debate about population projections is already relevant and directly influences decisions on a methodology. Population projections use subjective or objective methods. Subjective methods have data, techniques, and assumptions that are not clearly identified. Consequently, other analysts cannot replicate them exactly. Objective methods have data, techniques, and assumptions that are clearly identified, so other analysis can replicate, or adapt them (Siegel et al. 2004). However, the authors of the *population projections handbook,* underline it that objective methods also require choices on variables, data sources and projection techniques. This dissertation utilises an objective method, keeping in mind that the final methodology will be a merger and adaptation of existing objective methods, which still require important methodological choices.

The objective methods can be classified into three categories based on their approach (Smith et al. 2001):

- **Trend extrapolation models:** these involve fitting mathematical models to historical data and using these models to project future population values. The principle is based on the continuation of observable historical trends.
- **Cohort-component models:** these divide the population into age-sex groups (i.e., cohorts) and accounts separately for fertility, mortality, and migration in each cohort as it passes through the projected time period.
- **Structural models:** these rely on observed relationships between demographic and other variables (e.g., land use and employment) and population changes due to projected changes

in those other variables. The relationships in structural models are typically developed using regression analysis (Smith et al. 2001).

Following Siegel et al. (2004) it is important to point out that in actual application, methods under the three categories are not always mutually exclusive. For example, applying the cohort-component method often incorporates trend extrapolations of one type or another (Siegel et al. 2004), and such a combination will be relevant for the projection method adopted here. As already anticipated, the methodology relies on combining the *trend extrapolation* and *cohort-component* principles. For this, we can exclude the structural models and focus on a closer understanding of trend extrapolation methods. It is time for another distinction into categories, the first two based on time and the third based on place:

- **Simple extrapolation:** these require data for only two dates in the past, on which future projections are I) linear; II) geometric; or III) exponential.
- **Complex extrapolation:** these require data for several dates in the past and then base projections according to: I) Linear trend; II) Polynomial curve; III) logistic curve; IV) ARIMA time series approaches.
- **Ratio extrapolation:** these are based on the population of a smaller area expressed as a proportion of the population of its larger, 'parent' area,. These can be classified into I) constant-share; II) shift-share and III) share of growth.

Within the ratio extrapolation methods, the *share of growth* is the most structured, with more data sources and thus more explanatory power (Siegel et al. 2004). This method deals with shares of population change rather than population size. It assumes that the smaller area (municipality in this case) share of population change in the parent area (NUTS 3 in this case) will be the same during the projection period as it was during the base period (Siegel et al. 2004). This share-of growth method can be expressed as:

$$Pit = Pil + [((Pil - Pib) / (Pjl - Pjb))(Pjt - Pjl)] \qquad [I]$$

In the formula Pit is the population projection for smaller area in the target year; Pil the population of the smaller area in the launch year, Pib in the base year; Pjl is the population of the parent area in the launch year, Pjb in the base year; and Pjt is the projection of the parent area in the target year. The base year has the earliest data to make a projection, launch year has

the most recent data to make the projection, and the target year is the year for which the population is projected (Siegel et al. 2004).

Among the other extrapolation methods, the simple linear model seems to be the most fit for purpose for geometric and exponential models for the medium term, considering the EU scope of analysis. This method assumes that a population will change by the same amount over a given period as during the base period. Average absolute change (Δ) during the base period can be computed as:

$$\Delta = (Pl - Pb) / (y) \qquad [II]$$

where Δ is the average absolute change, Pl is the population in the launch year, Pb is the population in the base year, and y is the number of years in the base period. A projection using this method can be computed as:

$$Pt = Pl + [(z)(\Delta)] \qquad [III]$$

This simple trend extrapolation method should be used very carefully, as it is based merely on past statistical information without considering the future dynamics of population. It is very unsafe to rely solely on such a methodology to draw important conclusions on the population of an area in the future. However, this methodology has proven to be consistently reliable, especially for short term projections, even compared to much more sophisticated methodologies. Considering the wide scope of the research objective and the limited data sources for cohort information at small scale, simple linear extrapolation should assist the share of growth model, improving its applicability, without undermining the quality of the results.

Trend extrapolation models suffer from shortcomings. They do not account for differences in demographic composition, nor for differences in the components of growth. They provide little or no information on the projected demographic characteristics of the population. Consequently, they have limited usefulness when analysing the determinants of population growth or for simulating the effects of changes in particular variables or assumptions. On the other hand, they have few data requirements, and are quick and easy to apply. They are particularly useful when data series are incomplete, time and budgets are highly constrained, and information on population characteristics is not needed. Perhaps most importantly, they

often provide reasonably accurate forecasts over short horizons. There is no empirical evidence showing that more complex or sophisticated methods consistently produce more accurate forecasts than trend extrapolation methods (Siegel et al. 2004).

Literature on micro level population projections

Municipal scale population projections, also in light of their local dimension, are not harmonised and structured as the ones available from international statistical bodies. For this reason, the methodological debate is still played on different channels and is less cohesive than the one universally recognised and applied at national level. Overall, the methodologies tend to have geographically limited scopes, and rely on local level data. As a result, each model seems to be designed ad hoc for the targeted area of study.

For example, Marois and Bélanger (2014) developed a methodology to forecast population projections for the Montreal Metropolitan Area (Marois and Bélanger 2014). The model is innovative in its treatment of migration, the most technically and conceptually difficult change to model in small area population projections[10]. From the brief description (footnote) it appears clear that such an approach is extremely accurate, rooted in local information, and cannot be reproduced in other contexts. Such detail and the focus on a single metropolitan area variable does not make it possible to replicate on a wider scale analysis with limited resources as the European scale envisaged in this dissertation[11].

Another example comes from South Africa where Munthree et al. (2016) have published the results of the country's first attempt to estimate municipal population projections at national scale. They propose a methodology which can used nationally, which relies on *ratio extrapolation methods*. In their paper they test the methodology on a region and present the results. Their conclusions are encouraging as they argue that the resulting estimates are not necessarily perfect as the methods vary, but the estimates are plausible and realistic. The authors reflect that whilst small area estimates and projections contain an element of

[10] To meet these challenges, the authors have built a dynamic time-based microsimulation projection model in where the choice of municipality is determined by a utility function that considers municipality-specific contextual factors (Marois and Bélanger 2014).

uncertainty, a careful selection of data sources and methods can produce a foundation for suitable estimates (Munthree et al. 2016).

The National Institute of Population and Social Security Research in Japan has conducted population projections of all prefectures and municipalities (Japan National Institute of Population and Social Security Research 2018). A variant of the cohort component method was used for the projections. As mentioned earlier, this method calculates future population by applying future rates to an age-specific population in a certain year. The Japanese have made probably the most refined projection with such geographical extension. It should be stressed how this methodology relies not only on data for all municipalities, but also investigates the age and sex composition of the population to apply different coefficients according to the respective fertility and mortality rates. This work is impressively accurate, but since it was done by a National Statistical body, unfortunately it falls beyond the resources and capacities of this PhD project. Cohort data availability would also be an issue when dealing with EU wide municipal databases.

In the European research domain the Brussels institute for statistical analysis has developed an independent methodology for projecting the population of the city as the result of summing all the local municipality (*commune*) projections (Romain et al. 2016). This decision was taken considering the profound differences between the communes in the city, with either an older stable population, or very high migration with a younger population. The methodology starts by dividing the communes between one typology or the other, and then applying a hybrid method, a simple version of the cohort-component that builds on historical data for future projections. This is a hybrid of the simple extrapolation model, applied to the cohort approach (Romain et al. 2016).In this case again, the effort to produce accurate estimates is impressive, and builds on a hybrid methodology that is tailored but based on existing models. However, such a method cannot be reproduced elsewhere as it is specifically designed for the needs and demographic controversies of *communes* in Brussels.

Three main considerations emerge from this review of existing examples of municipal population projections: I) the scope of municipal projections is mostly targeted to a specific town, urban agglomeration or province, II) the methodologies are unique for each case, designed on the specific needs or data availability and can range from very elaborate models to simple applications of general principles, III) the basic theoretical framework for each model

is related to two of the three approaches outlined earlier in the chapter (Siegel et al. 2004): ratio extrapolation and cohort component.

This research is another particular case, that cannot easily be replicated for either national level projections, nor for the municipal level models that have been discussed so far. The main difference is the need to project municipal population data for all EU countries at the same time, instead of a limited regional selection. The scope of the analysis is different which entails issues in replicating or adapting existing municipal projections in two ways: I) data is limited at EU level and does not allow for cohort applications, II) the wider scope of the sample requires working with a simpler, general methodology that is applicable across borders and beyond local specificities.

Nevertheless, the characteristics of this study should not damage the quality of the proposed model for three reasons: I) ratio extrapolation models have proven reliable and useful despite their shortcomings, II) the hybrid methodology merges two models to mitigate these shortcomings, III) the objectives of this research differ from the purely demographic purposes of the local methodologies discussed above, thus the instruments are deemed scientifically sound for producing a realistic proxy. The original model is described in detail under section 3.2 of the next chapter.

3 Trajectories of shrinkage from 1991 to 2050: statistical analysis and a projection model

This chapter addresses the demographic trajectories of shrinking areas through statistical analysis and an original demography projection model covering the period 1991 to 2050. First it proposes a classification of shrinking municipalities for 1991 to 2018 based on data from two different sources combining information from Eurostat, BBSR[12] and National Statistical Offices. This sample of European shrinking municipalities is then profiled and described in terms of geography, size, intensity and the evolution of population decline (section 3.1). Later, the analysis moves to 2018-2050 to project how the trajectories of currently shrinking municipalities could evolve in the coming years. Before discussing the projection results, section 3.2 describes, from a methodological perspective, the original model applied to project population at local and European levels. The results of the model are then presented and future trajectories of shrinkage also described in terms of size and intensity, also in relation to their depopulation in 1991-2018 (section 3.3). This future perspective on shrinkage will also discuss potential new municipalities, and entire territories where shrinkage is expected to start in the coming years. This section shows the likely consolidation and expansion of shrinkage throughout the European Union in the near future (section 3.4).

3.1 Shrinking municipalities 1991-2018: census, patterns and typologies

This section introduces the first analytical presentation of shrinkage at European level. The analysis maps different steps to describe and discuss shrinking areas across Europe. As mentioned in the introduction, the spatial analysis in this first step covers LAUs, which are municipalities in the majority of European countries.

Therefore, the first step presents the phenomenon in absolute terms, highlighting differences across the European Union. Member States have very different manifestations of shrinkage, which already characterise their specificities, and create the first layer of knowledge on the territorial distribution of shrinkage. The following focuses on the characterisation of shrinkage

[12] The German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) within the Federal Office for Building and Regional Planning (BBR).

in the European Union. The size of the municipalities concerned, and the intensity of population loss is analysed to reveal the first traits of European shrinkage.

The analysis in this section is based on the first block of data elaboration supporting the dissertation. A database on European shrinkage brings together municipal data from the EU 27 Member States with the following time series: 1991-2001-2011-2018. The database follows two guidelines adopted in the research design:
1) to paint a comprehensive picture of shrinking municipalities across all European countries that facilitates comparative analysis and provides a European frame for analysis.
2) current data to study shrinkage as close as possible to the present, but still giving high importance to past population trajectories that can vary across countries and regions (Stryjakiewicz and Jaroszewska 2016; Turok and Mykhnenko 2007).

From the methodological perspective, the database is compiled according to the definition of shrinkage adopted in the dissertation. Importantly, the figures in this section reflect municipalities (LAU 2) with more than 5,000 inhabitants in 2001, chosen as the reference date due to greater data availability. Shrinkage is identified by a population decline averaging sat least 0.15% per year from 1991-2018. Thus, the reference sample covers all European municipalities with at least 5,000 inhabitants with population decline of at least 4.05% from 1991 to 2018[13] (SCiRN 2008).

These European municipalities are studied at 10 year time intervals. The analysis builds on a merger of municipal data sources at Local Administrative Level. The historical data from 1991 to 2018 is taken from three sources, two from Eurostat[14] and one from BBSR: I) voluntary inputs from National Statistical offices with LAU correspondence tables for 2018[15] II) Eurostat consolidated databases of historical population data from 1961 to 2011, which are the results of a project commissioned by Eurostat and the Directorate-General for Regional and Urban Policy. III) BBSR municipal data (2001-2017) from individual National Statistical Offices

[13] 2.55% for Bulgaria, Greece, Ireland and Slovenia which only have 2001-2018 availability.
[14] Data at LAU level is sourced from the two datasets, which are both available at: https://ec.europa.eu/eurostat/web/nuts/local-administrative-units.
[15] Where 2018 data was not available, the most recent available year has been used. In most of these cases 2017 was available either from Eurostat or BBSR sources. Greece is the only exception where 2011 is the latest available year.

(BBSR 2019). The three sources have been merged for each country matching LAU 2 codes, and then compiled into the EU 27 database to reach the most representative and updated sample of population data at municipal level. Two tables in the annex provide an overview of the data source, the available years and technical notes of the merger procedure (where needed) for each Member State.

There are significant differences in the nature of municipalities across Member States. The extension of LAUs varies widely throughout the Union as does the average population of these units (ESPON 2006). Some European countries have broad and populous municipalities on average (the Nordic countries for instance) whilst other countries mainly have smaller municipalities (France is the most representative example). This of course creates a preliminary difference between countries, which stems from cultural, historical and administrative heritage.

As this factor embedded in the historical structure of each country, it is does not seem appropriate to overcome it, so it is beyond the scope and interest of this dissertation to homogenise across countries. These differences should be noted, so for shrinking municipalities, the spatial units may vary in area and populations. Importantly in this research is the administrative characterisation of municipalities as the focal point of the policy dimension[16]. The administrative sphere is ultimately impacted by policies, as they can actively manage projects, measures and funds, or must implement regional, national or supra national measures in their local boundaries. This dimension is the focus of this thesis.

The next section describes the results of the data processing and the compilation of an aggregated database on European shrinkage for 1991-2018.

Census of European shrinking municipalities 1991-2018

[16] The methodological decision to use administrative entities regardless of the difference in population and geographical extension, has required a different spatial unit in Bulgaria and Portugal, where LAU 1 has been used. This is because LAU 1 better represents the administrative authorities at local level. LAU 2 units in these countries represent neighbourhoods or different settlements administered by a single municipal entity.

The database reveals a first important finding: 28.2% of all European municipalities with over 5,000 inhabitants saw shrinkage in 1991-2018. This means more than 1 out of 4 administrative units across the Union has seen a consistent population decline. This first finding leaves no doubts that shrinkage should be a concern for policy makers dealing with European territorial development.

The total figure is the result of distinct geographical patterns that delineate very different situations across Europe. Certain countries might be heavily affected by local population decline, whilst others are fully exempted. To describe how shrinkage looks the EU countries are divided into five categories to indicate the seriousness of the phenomenon as we move across the map. The categories are based on the frequencies of shrinking municipalities within their borders to reflect shrinkage in the total number of municipalities. The categories are:

- Very high incidence: shrinking municipalities > 70%
- High incidence: 50% < shrinking municipalities < 70%
- Medium incidence: 30% < shrinking municipalities < 50%
- Moderate incidence: 10% < shrinking municipalities < 30%
- Low incidence: 1% < shrinking municipalities < 10%

The database results are summed up in Table 1:

Table 1 Shrinkage across EU Member States 1991-2018

Categories of shrinkage incidence per country	EU Member States	Share of shrinking LAU 2
Very high	Lithuania	94.83%
	Bulgaria	92.41%
	Latvia	85.19%
	Estonia	73.47%
High	Croatia	65.90%
	Hungary	62.41%
	Finland	55.96%
	Portugal	55.83%
	Czech Republic	50.38%
Medium	Romania	48.03%
	Slovakia	39.86%
	Slovenia	37.76%
	Poland	33.30%
	Greece	32.94%
	Sweden	32.37%
Moderate	Germany	24.89%
	France	20.46%
	Malta	20.00%
	Ireland	19.83%
	Spain	19.74%

	Italy	17.23%
	Denmark	10.85%
Low	Austria	9.72%
	Netherlands	7.18%
	Belgium	1.23%

Source: own elaboration based on Eurostat and BBSR databases

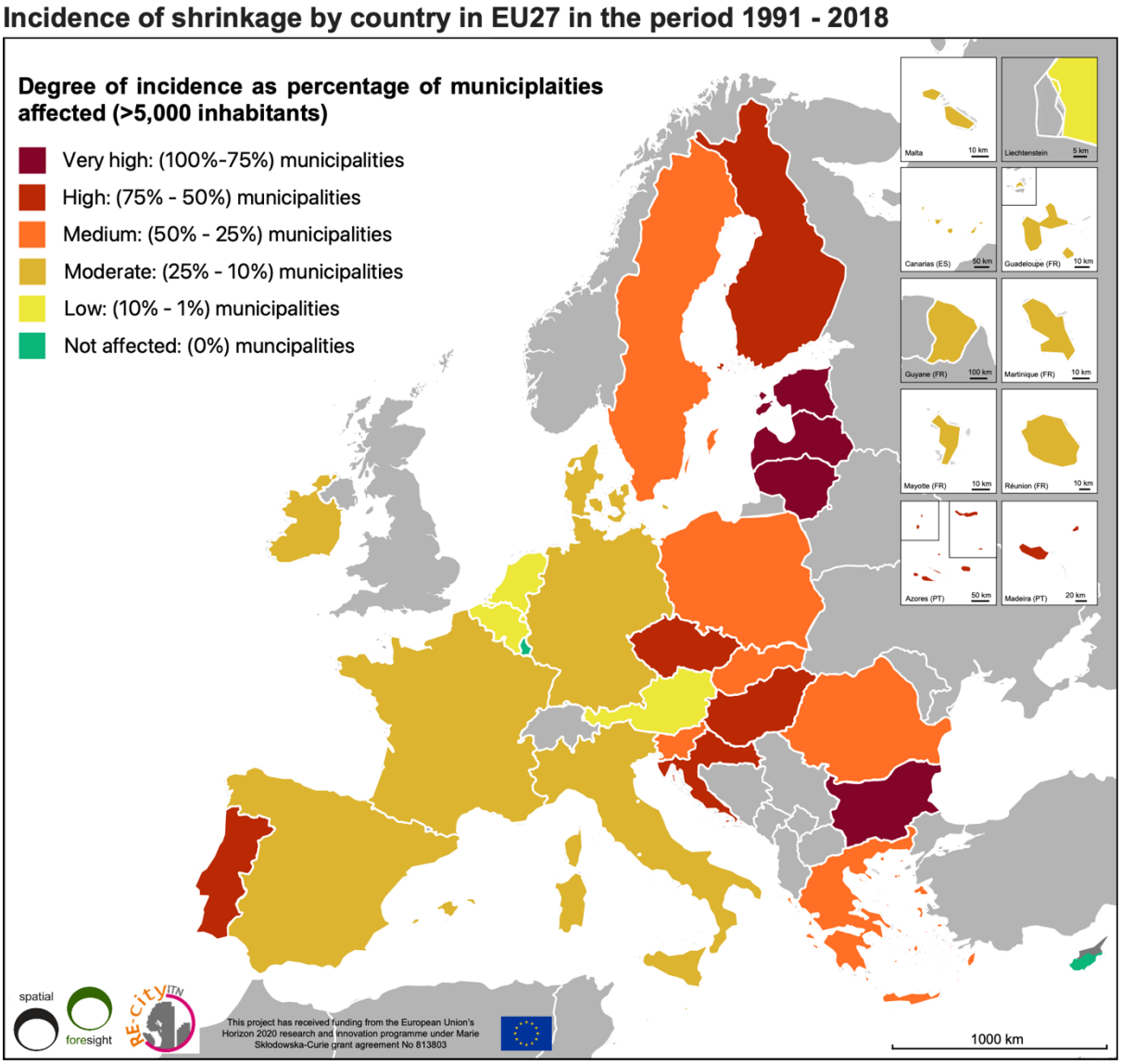
The picture that emerges from the first assessment of the database reveals clear geographical patterns for shrinkage at Member State level. There is more as we move to eastern countries in the European Union. The rates are highest at the eastern limits of the EU. The Baltic countries and Bulgaria have shrinkage in more than 70% of municipalities. The general tendency continues as it seems that shrinkage expands towards the West of the EU with gradually lower the incidence rates. Hungary, Croatia, Czech Republic and Finland are highly affected according to the standard criteria, with between 50% and 70% of municipalities concerned. Portugal is an exception to the geographical pattern, with 55.83% of municipalities affected.

Moving down to the next interval, shrinkage continues decreasing towards the West. In the medium category, where the percentage of shrinking municipalities is between 30% and 50%, are Romania (very close to 50%), then Slovakia, Slovenia and Poland, as well as Greece and Sweden. Most European countries in the eastern and nordic part of the union have higher incidence rates than their western counterparts.

Among the countries moderately affected by shrinkage are Germany, France, Malta, Ireland, Spain, Italy and Denmark. All these have incidence rates between 30% and 10%. Lastly, we have the countries only residually affected by population decline, with shrinking municipalities between 1% and 10% of the total in the Netherlands, Belgium and Austria (low category). Luxembourg and Cyprus are not included because they do not have a single case of significant population decline (according the established criteria) among their LAUs.

To sum up, the incidence of shrinkage across European countries at municipal level is displayed in Map 1. Also visually it is possible to identify a pattern of higher frequency in the Eastern and Baltic Member States for the period 1991-2018.

Map 1: Incidence of shrinkage by country in EU27 in the period 1991-2018

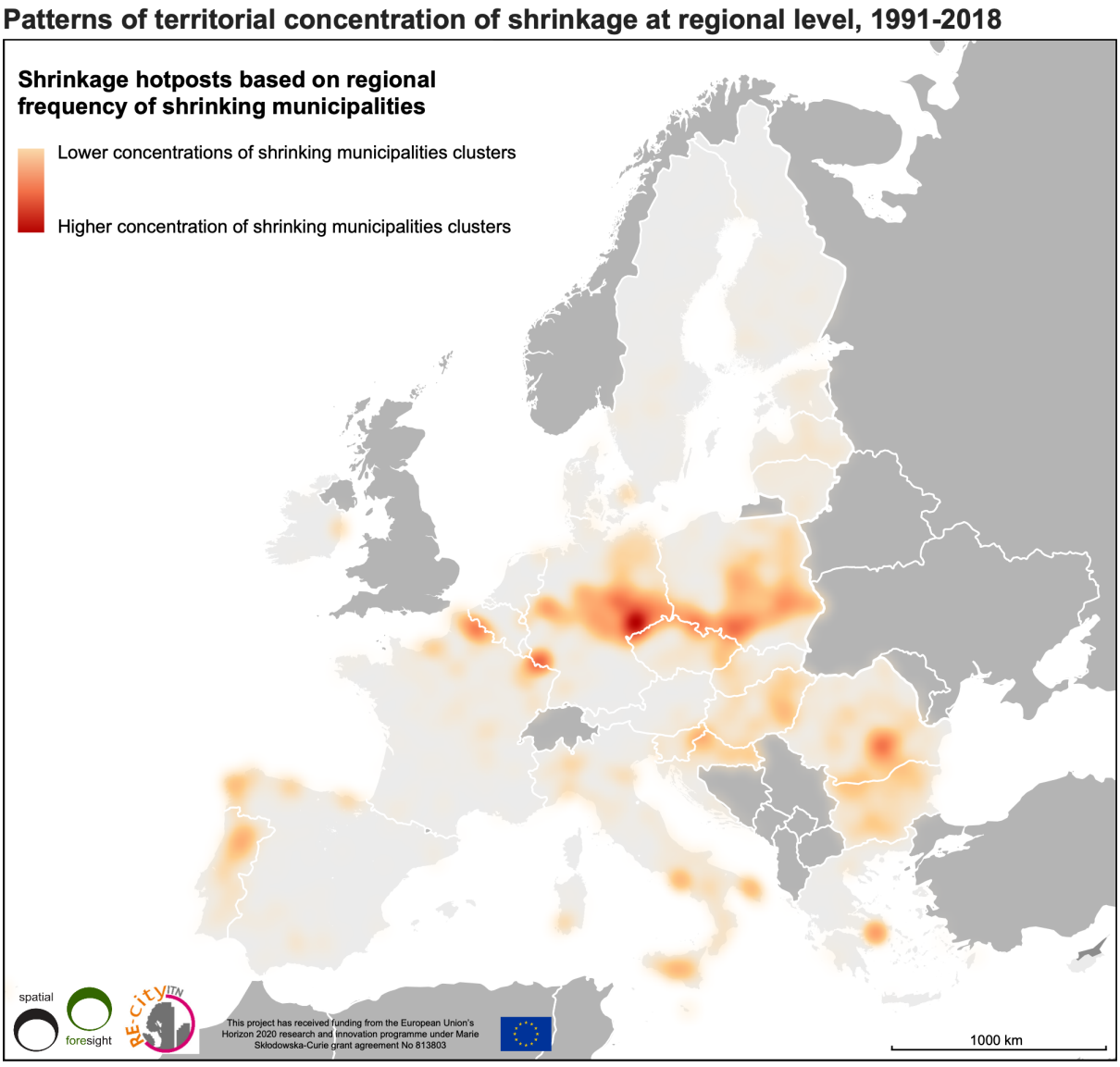


Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from Eurostat and BBSR
Administrative boundaries: Eurostat GISCO, NUTS 0 (2016).
Source: own elaboration based on Eurostat and BBSR inputs

Apart from the general trend observed through incidence rates, some countries that are moderately or residually affected might still have very high regional or sub-regional concentrations and therefore be very interesting fields for investigation. These cases might have similar local and circumstantial features as those ones in highly affected countries. Map 2 displays where in the European Union we find the clusters of highest concentration of shrinkage at regional scale. The map highlights were in the EU shrinkage is particularly incident and concentrated in a specific region with respect to other neighbouring territories. This is why, for instance, Baltic states do not show high hotspots concentrations; it is due to the fact that shrinkage in these countries is so highly diffused and uniformly spread across its

territory that it is not possible to identify hotspots at local level. Results suggest that high local concentrations of shrinking municipalities can be found all across the European territory, but the most relevant local hotspots are identified in Central and Eastern parts of the European Union

Map 2: Patterns of territorial concentration of shrinkage at regional level, 1991-2018



Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from Eurostat and BBSR. Administrative boundaries: Eurostat GISCO, NUTS 0 (2016).

Source: own elaboration based on Eurostat and BBSR data inputs

As a conclusion, a key element from this first analysis is that shrinkage, according to its most common definition, is present in nearly all European countries, though with different incidence rates. At the European scale, data suggests that we are dealing with a significant issue of population decline affecting more than 1/4 of all European municipalities with more than 5,000

inhabitants. The relevance of the topic is statistically striking and requires further investigation to better describe the phenomenon.

The next section adds two more dimensions to the investigation of European shrinkage: 1) the size of shrinking municipalities and 2) the intensity of population loss. Under these two additional lenses of analysis, national patterns will be dropped. This is in accordance with the European perspective of this research and the desire to increase the weight of local contextual factors rather than national structural differences and trends. The cross-country database of European shrinking municipalities is based on common features that define shrinkage in the present debate (SCiRN 2008; Wiechmann and Wolff 2013; Wolff and Wiechmann 2018).

Size of shrinking municipalities

To favour a more nuanced picture of shrinkage European shrinking municipalities are now categorised based on their size. The reference year is 2001, which is common to all countries in the sample, and is the mid-term point of the analysis timewise. Based on the population census of 2001, the municipalities have been assigned a category:

- Large villages: [5,000 – 10,000]
- Small towns: [10,000 – 20,000]
- Medium-sized towns: [20,000 – 50,000]
- Large towns: [50,000 – 100,000]
- Small & medium cities: [100,000 – 250,000]
- Cities: [>250,000]

The thresholds have been set according to the classification in the ESPON study on the role of small and medium-sized towns' (ESPON 2006). A core objective was to find a way to conceptualise towns that could be applied all over Europe. For this specific purpose of European harmonisation, it seems appropriate to build on the city size classification in this study. However, it should be underlined that the different size classes are not connected to other classifications that exist at national level, which may differ from the one adopted here. Thus, the need to harmonise at European scale might not reflect some National specificities.

All in all, this exercise has classified each European shrinking municipality by its size based on the reference year population. The results are shown table 2

Table 2 Size of European shrinking municipalities

Cities size	Criteria	Cases	Percentage distribution
Large villages	[5,000;10,000]	2,190	52.6%
Small towns	[10,000;20,000]	1,021	24.5%
Medium-sized towns	[20,000;50,000]	640	15.4%
Large towns	[50,000;100,000]	199	4.8%
Small & medium cities	[100,000;250,000]	83	2.0%
Cities	[>250,000]	27	0.6%
EU total	**[>5,000]**	**4,160**	**100.0%**

Source: own elaboration based on Eurostat and BBSR data.

Of the 4,160 municipalities affected by shrinkage, 2,190 are in the lowest size range. This means that 52.6% of municipalities affected by shrinkage are large villages, an overwhelming majority. Small towns are next with 1,021 (24.5%). Medium-sized towns represent 15.4% (645 cases) of the sample, whereas large towns account for 4.8% (199). This means that more than 97% of European shrinking municipalities are below 100,000 inhabitants. Small cities are shrinking in 83 cases across Europe, 2% of the sample. Finally, 27 larger cities with more than 250,000 inhabitants are shrinking, accounting for 0.6%. These findings go in the same direction as relevant literature in the field of urban shrinkage. In fact, Krzysztofik et al. (2015) have conceptualised the notion of Urban Hibernation, thus revealing the systematic association of smaller settlements with periodic processes of regression (Krzysztofik et al. 2015).

The picture mostly reflects the composition of city dimensions in the European Union. The tendency of living in smaller urban establishments is a characteristic of our continent (Dijkstra et al. 2016; European Commission and UN-HABITAT 2016). Even if this distribution does not come as a surprise, it gives some interesting facts to bring to the discussion:

- Shrinkage in the European Union affects first and foremost smaller urban settlements with under 50,000 inhabitants (95% of all cases). If we had also considered municipalities below 5,000 inhabitants, the findings would be strengthened, suggesting that shrinkage has a strong focus on small villages.
- Shrinkage is so widely spread that, on average, more than 3 small cities, and one large city per country are affected. Such cases cannot be disregarded and probably require a different policy and research focus than for the majority of small and medium-sized villages.

- Overall, the common denominator is that shrinkage is widespread geographically, but it also affects a variety of municipal contexts.

Intensity of population loss

With the same objective of offering a clearer picture of shrinkage in Europe a second set of categories describes the intensity of population loss. This layer allows better understanding of how severe the population decline is and in which proportions. Starting from a definition, the important notion here is that a population loss of 0.15% per year is required (SCiRN 2008; Wiechmann and Wolff 2013; Wolff and Wiechmann 2018). The categories are built on this requirement, which is used to create intervals of population loss that describe the seriousness of their population loss. This approach, based on proportionality, also allows for easy adaption to cases where the 1991 population figure is missing. The intensity of shrinkage is then assessed according to the following categories:

- Moderate: [0.15%- 0.30%] yearly / less than two times the baseline
- Intense: [0.30% - 0.75%] yearly / two to five times the baseline
- Severe: [0.75% - 1.2%] yearly / five to eight times the baseline
- Hard: [> 1.2%] yearly / more than eight times the baseline .

Following the data processing, the intensity of population loss varies considerably. The table assigns a degree of intensity to each shrinking municipality. The moderate category, the lowest intensity, already fulfils the shrinkage definition. Thus, the other intervals describe even more serious population loss.

Table 3 Shrinkage intensity across the EU.

Intensity of population loss	Criteria: proportionality on the baseline value	Cases	Percentage distribution
Moderate shrinkage	[0.15% - 0.30%] per year	1,089	26.2%
Intense shrinkage	[0.30% - 0.75%] per year	1,885	45.3%
Severe shrinkage	[0.75% - 1.2%] per year	756	18.2%
Hard shrinkage	[>1.2%] per year	430	10.3%
EU total	[>0.15%] per year	4,160	100%

Source: own elaboration based on Eurostat and BBSR databases.

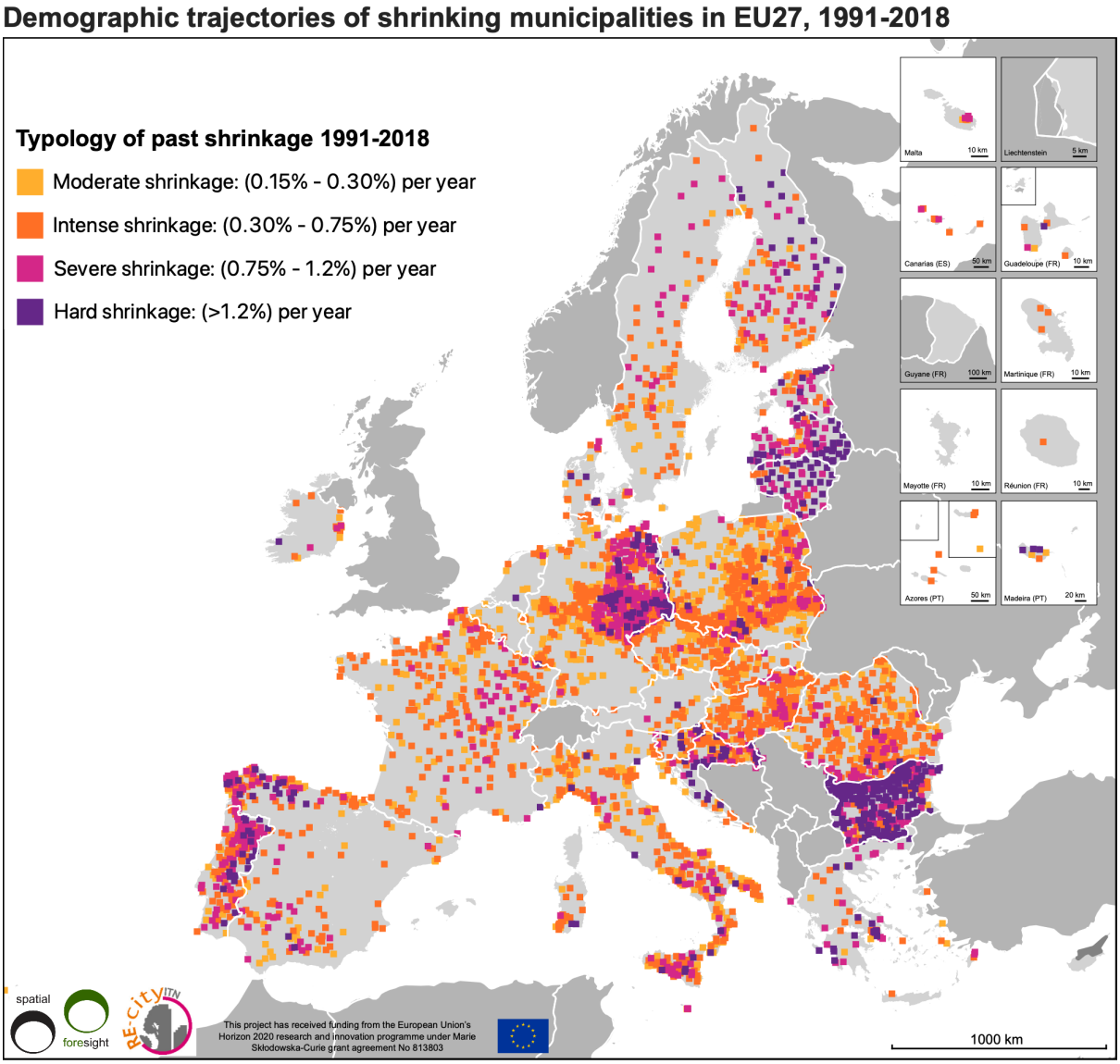
Looking at the 4,160 municipalities affected by shrinkage, we see a Gaussian distribution, slightly skewed towards the lower end of the categories. The highest concentration is in the

intense interval with 1,885 cases. This means that 45.3% of all shrinking municipalities are losing population between two and five times the baseline criterion of 0.15% per year. Moderate shrinkage in 1,089, or 26.2% of cases is between the baseline requirement and its double. The more problematic cases of shrinkage are in the severe shrinkage category, between five and eight times the baseline, with 18.2% of cases, and the hard shrinkage category (10.3% of the sample) where population loss is above eight times the minimum requirement.

These last two categories in particular, reveal startling figures, so almost 30% of European shrinking municipalities are losing an average of 1% of their population every year. If we re-adjust this information to the total number of municipalities with more than 5,000 inhabitants in Europe, we see that over 8% of all municipalities are losing 1% of their population on average every year. Screening on the intensity of population loss again reinforces that shrinkage is prominent in the European Union. Given the time horizon of 1991-2018, this also shows that shrinkage is a rooted phenomenon, which has not reversed naturally in the past 30 years, suggesting more targeted treatment.

Map 3 visualises the intensity of population loss for European shrinking municipalities in the period 1991-2018. From the visualisation of results, it clearly emerges that in the majority of cases the demographic decline has happened at a sustained pace, in most cases above the threshold of the standard definition of shrinkage (orange, pink and violet dots). from the map it also emerges that the hardest episodes of shrinkage display higher concentrations in Portugal and northern Spain, in the Baltic states, in Bulgaria, Eastern Germany, but also Slovenia and Croatia and Greece.

Map 3: Demographic trajectories of shrinking municipalities in EU27, 1991-2018



Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from Eurostat and BBSR.
Administrative boundaries: EL, IT, LT: Eurostat GISCO, LAU2 (2018); BG: Eurostat GISCO, LAU1 (2018); DK, PL: Eurostat GISCO, LAU 2 (2016); PT: Agência para a Modernização Administrativa (2018); all other EU countries: Eurostat GISCO, LAU2 (2017).

Source: own elaboration based on Eurostat and BBSR inputs

Combining the information from the first two categories sharpens the outline of shrinkage in Europe. The two criteria, size and intensity, are crossed with their intervals to delineate and reach a better characterisation for this study. The results are shown in the table below.

Table 4 Distribution of shrinkage intensity per size category in the EU.

Size and Intensity	Moderate shrinkage	Intense shrinkage	Severe shrinkage	Hard shrinkage
Large villages	24.8%	47.4%	19%	8.8%
Small town	26.6%	44.8%	17%	11.6%
Medium sized towns	27.3%	40.9%	17.7%	14.1%

Large towns	32.7%	40.2%	15.1%	12.1%
Small & medium cities	28.9%	47%	20.5%	3.6%
Cities	37%	37%	18.5%	7.4%
Overall	28.5%	45.6%	16.6%	9.3%

Source: own elaboration based on Eurostat and BBSR databases

The data analysis is interpreted in comparison with the overall figures in the last row of the table. The comparative assessment reveals there are no significant diverges from the overall distribution of shrinkage intensity. Therefore, a particular size category cannot be associated with a more or less intense shrinking trend. This implies that the intensity of population loss does not depend on the size of municipalities. More research would be needed to verify whether there are other correlations between size and intensity. Meanwhile, the data suggest that intense shrinkage remains the most frequent dimension of population loss across all sizes, followed by standard shrinkage. The minority of severe and hard shrinkage, still with a significant 25% of cases, is also proportionally distributed across size categories.

The analysis has contributed to define the working field, sharpening its boundaries and drawing the first ideas of the analytical picture for European shrinkage. It is now possible to appreciate the relevance of this phenomenon in statistical terms as more than one-fourth of European municipalities (above 5,000 inhabitants) are shrinking. The incidence of municipalities affected by population loss on a national scale varies significantly as we move across Europe. The eastern part of the Union is significantly more affected, with some of these Member States having over 70% of municipal units affected by shrinkage. The incidence is lower in the western side of the Union, and in its founding members, though they still show incidence rates between 20% and 30%.

Shrinkage is not a local phenomenon, nor are richer countries exempted, which requires further investigation into its forms and the different contexts of its development. Municipalities with less than 100,000 inhabitants represent 97% of cases affected by population loss,. Still, a significant number (over 100) of shrinking municipalities are above that threshold. Such a distribution suggests that a differentiated focus might increase the understanding of shrinkage and help design more tailored solutions. The intensity of population loss reveals that we are dealing with significant paths of decline, with over two thirds of the cases having lost almost 10% of their population in less than 30 years. In a quarter of the cases, the population drop is over 20%, or 1% per year on average.

The first level analysis has unveiled an initial map of shrinkage in the European Union. Results indicate the relevance of shrinkage for all Member States, but also its seriousness and persistence over the years. All in all, the analysis highlights the need to proceed further with the investigation to understand shrinkage. The picture drawn up to now will serve as the basis for the next steps of the analysis, where the research digs into the contextual, regional and sub-regional variables that characterise shrinking areas. The analysis will broaden its scope by involving variables that depict the socio-economic profiles of shrinking municipalities, but first it is important to improve the present picture by defining more demographic aspects. Thus, the next layer of the research focuses on patterns of population decline over time, to describe profiles depending on how the trend has developed.

Pathways of shrinkage

This section deals with the time dimension of population loss and looks at how shrinking municipalities have evolved differently from 1991 to 2018. The total population drop can be the result of a steady and continuous decline, but it can also derive from an irregular path, with alternating periods of growth and decline. There are also cases where the population figures suggests a negative or even a positive outlook.

The analysis on the pathways of shrinkage requires data availability for all the time series as it intends to observe how population decline has developed over the years. The three periods are: I) 1991-2001 II) 2001-2011; III) 2011-2018. Unfortunately, it was not possible to compile the full time series for four countries in the sample[17], these are excluded from this step of the analysis due to data unavailability. This means the sample is reduced to 3,798 cases across the rest of the European Union, or 91% of the 4,160 cases in the full database, thus making it still a representative picture of European shrinkage.

The analysis is inspired by two complementary studies, among the few dealing with shrinkage from a European perspective, and a statistical approach (Wiechmann and Wolff 2013; Wolff and Wiechmann 2018).Though the geographical scope (pan-European) and the time frame differs, the rules defining the different typologies are similar to those proposed by the authors.

[17] Ireland, Bulgaria, Greece and Slovenia do not have municipal population figures for 1991 in the databases. For Greece is also missing 2018 data.

Following existing conceptual frameworks the profiles of shrinkage in this study are based on when the decline started and how has it evolved over the years (Stryjakiewicz and Jaroszewska 2016). As a result, the shrinking municipalities are classified as:

- **Persistent shrinkage**: the most severe case of shrinkage where population has dropped in all three periods, for a loss of at least 4.05% of the initial population (0.15% per year). Persistent shrinkage can be interpreted as the manifestation of structural drivers of population decline.
- **Late shrinkage**: describes cities where the population loss exceeds 4.05% (0.15 per year), but the decline was only in the last two periods, while they were still growing between 1991-2001. This suggests an intense and faster shrinkage process to reach the threshold (0.15% per year on average) in a shorter time horizon.
- **Discontinuous shrinkage**: describes cities where the overall population loss exceeds 4.05% but which experienced an interrupted path of decline. These declined in 1991-2001, regrew between 2001 and 2011 and declined again in 2011-2018. Shrinkage might be the result of incidental factors that can fluctuate rapidly, and less dependent on structural factors. Still, we are dealing with a municipality that qualifies as shrinking, needing further investigation to verify if similar conditions apply across Europe.
- **Positive outlook**: describes cities in which the overall population loss exceeds 4.05%, but the decline stopped before the last period of observation. In other words, these are shrinking municipalities which grew in the last period 2011-2018. However, this growth has not been enough to reinvert the shrinkage, or at least not yet.

Negative outlook: an additional type describes municipalities that do not fulfil the general condition of 4.05% of population loss over the period of observation but which experienced significant population loss (0.15% per year) in 2011-2018. The negative outlook could be signal future shrinkage, and therefore it is be monitored in this analysis.

The positive outlook pathway should not be overly emphasised though, as it is hard to tell if the regrowth is a solid trend or just a temporary episode as in the previous discontinued category[18]. Similarly, the negative outlook category has not been automatically considered as shrinking, due to the limited time which could turn out to be only episodic.

[18] Two more considerations suggest carefully interpreting this typology: it is the shortest period of observation 7 years compared to the usual 10, and there is no indication about the dimension of the regrowth, which can also be

The following paragraph shows the analysis of different pathways of shrinkage, these are then cross-analysed with the categories of city size and shrinkage intensity. In the first step the distribution of the four pathways of shrinkage is analysed. There are 3,798 cases for which the distribution has been calculated. These all qualify as shrinking municipalities, including the positive outlook type.

Table 5 Pathways of shrinkage: the overall distribution.

Pathways of shrinkage	Criteria	Cases	Percentage distribution
Positive outlook	Growth or stabilization in the last period	521	13.7%
Discontinuous shrinkage	Growth in the mid period, decline in the first and last periods	261	6.9%
Late shrinkage	Decline in the last two periods, growth in the first	557	14.7%
Persistent shrinkage	Decline in all three periods	2,442	64.3%
EU total	**[>0.15%] per year**	**3,798**	**100.0%**

Source: own elaboration based on Eurostat and BBSR databases.

The analysis reveals an overwhelming majority (64.3%) of the cases saw persistent population decline from 1991 (or before) to the present. The second most frequent typology is where the population decline started only from 2001 onwards and dropped by at least 4.05% only within the last two periods. There are 557 late shrinkage cases, 14.7% of the municipalities. The first two categories are the most complex examples of shrinkage. They have an ongoing trend with linear decline, denoting a probable structural nature of the problem, and suggesting a combination of factors which deserves further investigation. The 'structural' cases together make up 80% of the adjusted total.

Discontinuous shrinkage is difficult to interpret, without a local focus on possible determinants of the trend inversion. 261 municipalities (6.9% of the cases) saw a decline in population in 1991-2001, with growth in 2001-2011, before declining again in 2011-2018. The importance of incidental factors is expected to be higher in these cases. The last typology in order of persistency, with 521 cases (13.8%) has been labelled 'positive outlook' to indicate growth or

very close to 0%. In that case we would be dealing with stabilisation rather than regrowth, which can still be regarded as positive, but not yet verified. Further investigation into the local characteristics of these cities would enrich understanding the determinants of the trend inversion.

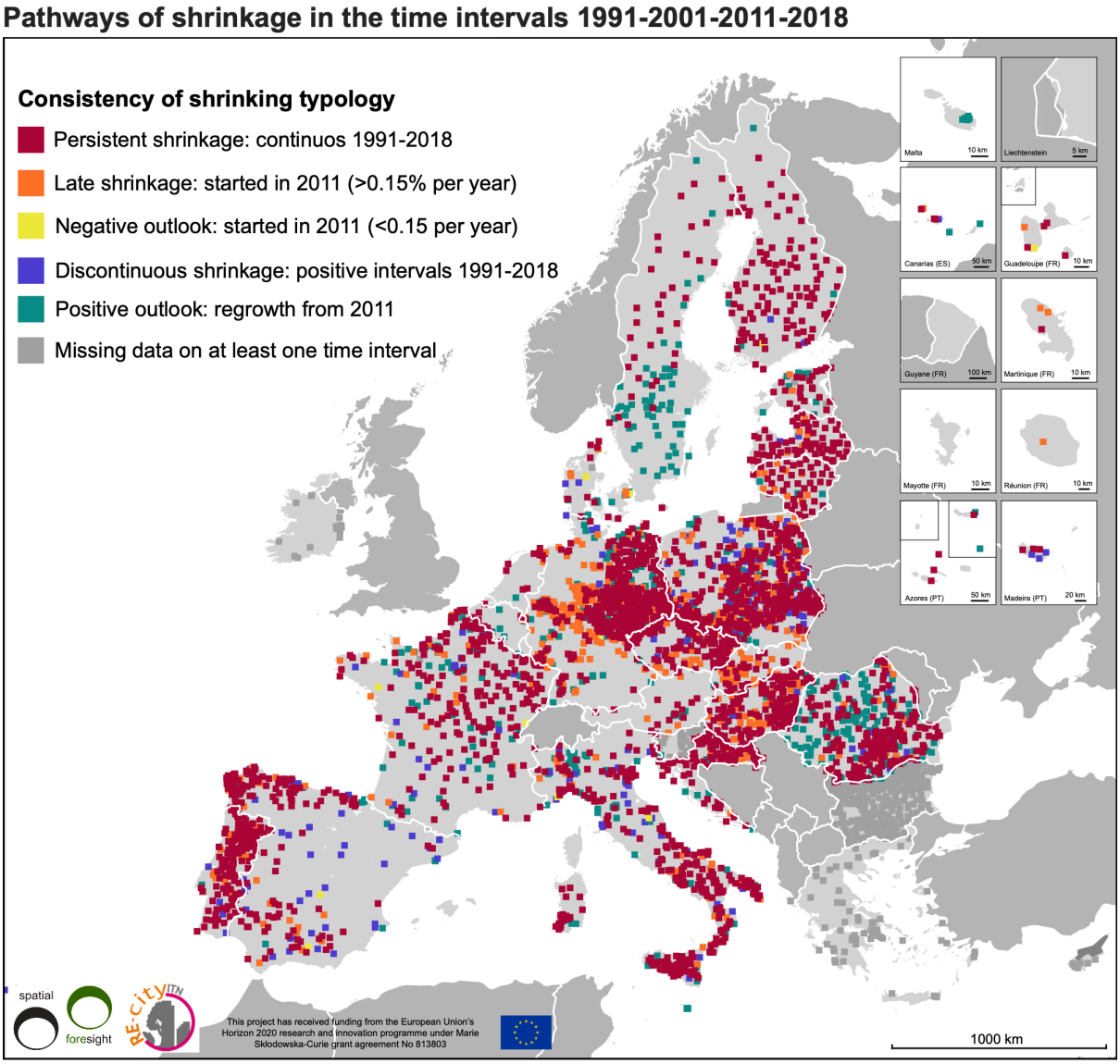
stabilisation in the last period 2011-2018. This typology regroups cases where a significant population decline (4.05% including the regrowth period) might have finished. The process of shrinkage could have found its natural/structural limit and started to stabilise towards a new, lower level equilibrium. Also, the shrinkage may have been interrupted and turned into a revitalisation process with new growth.

This additional typology (negative outlook) is a preliminary look into future development trends as it tries to capture cases that may soon qualify as shrinking, having started a significant decline. These should still be interpreted with care as it remains to be seen if we are observing a temporary population decline, or if this will turn into a shrinking condition. However, if we observe these results, we can draw one insight that in 80% of cases, once the population decline has started, this has continued in the following periods. Therefore, observing the initial steps of such a trend might be a good signal to spot future shrinking municipalities. Municipal population projections in the next sections will shed more light on the negative outlook cases.

The research on municipalities with a negative outlook reveals that 639 municipalities across Europe experienced a population drop of at least 0.15% per year in the last period of observation 2011-2018. There are more negative than positive outlook cases, thus the data suggests an incremental substitution effect between shrinking municipalities stagnating or starting to slowly regrow and new shrinking municipalities which will be taking their place very soon.. This negative outlook suggests that shrinkage is likely to become more and more diffused.

The results of the analysis on shrinkage trajectories over the timeframe considered are visualised in Map 4. Reading the map visually confirms that the vast majority of shrinking municipalities display persistent episodes of shrinkage over time (red dots), followed by episodes of late shrinkage (orange dots). Discontinuous pathways are a minority scattered across the map (purple dots), similarly to positive outlook cases which are mostly concentrated in parts of Bulgaria, Sweden and France.

Map 4: Pathways of shrinkage in the time intervals 1991-2001-2011-2018



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Source: own elaboration based on Eurostat and BBSR inputs

Pathways of shrinkage in relation to city size

The pathways of shrinkage described above are analysed in relation to size categories from earlier. This verifies whether patterns exist, linking size to a specific path of population decline. The results are displayed in table 6.

Table 6 Pathways of shrinkage in relation to cities' size.

Size and Pathways	Positive outlook	Discontinuous shrinkage	Late shrinkage	Persistent shrinkage
Large villages	10.4%	7.1%	14.7%	67.8%

Small towns	16%	6.9%	16.4%	60.8%
Medium sized towns	16.9%	6.1%	14.6%	62.4%
Large towns	22.2%	8%	11.7%	58%
Small & medium cities	27.8%	6.9%	8.3%	56.9%
Cities	48%	0%	0%	52.0%
Overall	**13.7%**	**6.9%**	**14.7%**	**64.3%**

Source: own elaboration based on Eurostat and BBSR databases

Table 6 shows that the shrinkage pathways are generally evenly distributed across the different LAU sizes. However, it is possible to point out a partially diverging trend for larger municipal units. Large villages, small and medium-sized towns show very similar percentages to the overall distribution, large towns and cities have a higher share of positive outlook municipalities, with 22.2% for large towns, 27.8% for small cities and 48% for cities. This is naturally reflected in a lower-than average number of cases in the late shrinkage and especially in the persistent shrinkage categories.

The results of this comparative analysis would suggest that larger municipalities have greater opportunities to invert shrinkage, while smaller municipalities (large villages in particular) seem to struggle more to escape the decline process, as previously hypothesised the literature (Krzysztofik et al. 2015). Large municipalities may have a greater attraction and can create opportunities with more resources and can target a wider external population, from different backgrounds. Smaller municipalities instead might have fewer resources and be less attractive in social and economic terms. Economies of scale, benefits of agglomeration economies and network effects would strengthen this narrative, and literature has suggested their role in fuelling territorial disparities (Iammarino et al. 2019). Still, this is just one possible explanation of such a diverging trend, which needs a deeper investigation into the local and regional characteristics of these cases.

Pathways of shrinkage in relation to intensity of population decline

The comparative analysis continues with a similar exercise, this time comparing the pathways of shrinkage with the intensity of population decline. The objective is again to verify any diverging patterns, suggesting a potential relationship between the two categories. The results are displayed in table 7.

Table 7 Pathways of shrinkage in relation to intensity of population decline.

Intensity and Pathways	Positive outlook	Discontinuous shrinkage	Late shrinkage	Persistent shrinkage
Standard	20.2%	17%	28%	34.8%
Intense	14.1%	4.2%	13.2%	68.4%
Severe	5.3%	0.6%	2.1%	92.0%
Hard	7%	0.4%	1.7%	90.9%
Overall	**13.7%**	**6.9%**	**14.7%**	**64.3%**

Source: own elaboration based on Eurostat and BBSR databases

In this case the diverging patterns are evident at first glance, but they also seem to be following a natural logical chain. The positive outlook path is higher than average (20.2%) in LAUs with a standard population loss, signalling a relatively lighter shrinkage process. The percentage lowers gradually and goes significantly below average for LAUs affected by severe and hard population decline. A very similar situation can be seen in for discontinuous shrinkage. Late shrinkage surprisingly shows a very similar distribution. Though this case requires further reflection. Late shrinkage regroups cases where the process started only in the last two periods of observation, which makes it less likely to find very high population loss. Therefore, the effects of shrinkage are smoothed mainly due to a shorter time horizon with respect to the other pathways.

As expected, the situation is inverted if we look at the more intense categories of population loss. For severe and hard intensities there is a strong bias towards persistent paths of shrinkage: making up over 90% of the cases in these two categories, compared to an average of 64.6%. The result of this comparative analysis is quite logical: I) less intense population loss is more frequently associated with discontinuous, stabilised or even regrowth pathways, whereas II) higher intensities are more frequently associated with persistent and continuous shrinkage.

The negative outlook category has been analysed separately as it does not belong (yet) to shrinking municipalities according to the definition, and is thus an addendum to the database of 4,160 municipalities. Given the short term of population decline (only in the last 7 to 8 years) it is too early to make an assessment. Instead, the analysis on the size of negative outlook cases reveals that they align with the distribution of all shrinking municipalities with almost 98% below 100,000 inhabitants. Similarly, to shrinking municipalities, the majority of cases are

villages between 5,000 and 10,000 inhabitants (54%), and small towns between 10,000 and 20,000 inhabitants (25.4%).

To sum up, the dynamic perspective of population decline reveals that the overwhelming majority of European cases concern persistent shrinkage. A minority of cases have a positive outlook for stabilising or regrowth after shrinkage, and these tend to be more frequent in larger cities, whereas smaller towns are mostly affected by persistent shrinkage. Intense episodes of population loss are associated with persistent shrinkage in more than 90% of the cases. Overall, the persistency and intensity of population decline suggests that shrinkage is not cyclical in most cases, as the spiral reinforces itself over the periods analysed. Moreover, data reveals first signs that shrinkage is likely to increase in Europe as there are more negative outlook than stabile or inverted, positive outlook cases.

The next section continues the investigation into shrinkage by taking a step into the future of population decline. As anticipated in the introduction to this chapter, the results (section 3.3) follows discussion of the model for local population projections in section 3.2.

3.2 The original model for local population projections

The design of the original model for shrinking municipalities stems from the theoretical review and considers previous applications of similar approaches to local population projections, as presented in section 2.3 of the previous chapter. The model merges the linear projection model and the share of growth model (both pertaining to trend extrapolation methods) in a linear way with two correction coefficients. All the intermediate formulas and their explanations are detailed in the following paragraphs.

Project municipal population data on a European scale combines the *share of growth model* and the *linear model* within ratio extrapolation. As anticipated in section 2.3, the *share of growth model* moves from the basic assumption that the target area will change in the same proportion to its parent area, as it did in the past (Siegel et al. 2004). However, the model is subject to algebraic complications in specific cases that will soon be discussed, thus the *linear model* is chosen to complement the formula to neutralise such mistakes and mitigate the potential bias.

The methodology makes use of both historical data (both municipal and sub-regional) and sub-regional population projections to extrapolate the best estimate for the municipality. The principal methodology is the *share of growth* model, as it is the most accurate, complete and tailored. It already includes information from the past and structured projections of the future based on cohort component indications and more demography-specific assumptions. Historical series from both the municipality and the parent area are used to compile a **ratio coefficient** that indicates how a municipal population trend has developed with respect to its parent area over the past time intervals. This value is then used as a correction coefficient for the parent area future population projection, which is available from existing studies (Eurostat 2016, 2018). The **ratio coefficient** weights and calibrates the parent area projection to increase the accuracy of the smaller area estimation. From now on the coefficient is labelled **Lau/Nuts** to ease the discussion and lighten the formula. Below, the adaptation of the share of growth formula is illustrated:

$$\mathrm{Plau(t+1)} = \mathrm{Plau(t)} + \left\{\frac{Lau}{Nuts}\right\} * [(Pnuts(t+1) - Pnuts(t)] \qquad [IV]$$

Where the **Lau/Nuts** coefficient is a ratio that can be expressed as:

$$\frac{Lau}{Nuts} = \left\{\frac{[Plau(t) - Plau(t-1)]}{[Pnuts(t) - Pnuts(t-1)]}\right\} \qquad [V]$$

The population of the smaller area is the LAU (Plau in the formula), whereas the parent area is renamed Pnuts. For clarity, the time is marked as **t** for the latest historical data used, **t-1** for the oldest historical data used, and **t+1** for the projection year.

Issues related to the share of growth model

The share of growth model is conceptually very solid, but can run into problems due to its mathematical formulation. More specifically, discordant trends in LAU and NUTS historical data can generate illogical results when multiplied by the projection signs, leading to serious mistakes in the projected population figure.

The assumption that the population in the targeted area with respect to the parent area will change exactly as it did in the past has to be mitigated when their demography in the two areas evolves opposite directions. This problem can be best exemplified by highlighting the formula:

$$\text{Plau}(t+1) = \text{Plau}(t) + \left\{\frac{Lau}{Nuts}\right\} * [(Pnuts(t+1) - Pnuts(t)] \qquad [VI]$$

Where the **Lau/Nuts** coefficient is the ratio, as expressed above:

$$\frac{Lau}{Nuts} = \left\{\frac{[Plau(t) - Plau(t-1)]}{[Pnuts(t) - Pnuts(t-1)]}\right\} \qquad [VII]$$

The methodology runs into problems when discordant signs are multiplied. This is outlined in the following table. The colours in the formula are reflected in table 8 to identify the three components: LAU historical data, NUTS historical data, NUTS future projection.

Table 8: Share of growth model casuistry of sign trend combinations

Coefficient			Sign +/-	Projection component		Sign +/-
Municipality		NUTS Historical	COEFF.		NUTS Future	TOTAL
Shrinking: -	:	Shrinking: -	+	x	Shrinking: -	-
					Growing: +	+
Shrinking: -		Growing: +	-		Shrinking: -	+
					Growing: +	-

Source: own elaboration based on model testing.

From the table we can see that the share of growth formula is subject to significant bias in 3 out of 4 possible scenarios: 1) LAU and NUTS 3 are both shrinking in historical data, giving a positive sign to the coefficient that is then multiplied again with a positive future projection → the positive effect is clearly overestimated in the final result 2) LAU is shrinking, NUTS 3 is growing in historical data, giving a negative sign to the coefficient that is then multiplied with a negative future projection → the positive effect is here slightly overestimated with the inversion of the projection. 3) LAU is shrinking, NUTS 3 has grown in historical data, giving a negative sign to the coefficient that is then multiplied with a positive future projection → the negative effect may be overestimated.

Due to a potentially significant bias, the share of growth model is too uncertain to be applied on a large scale as in this dissertation. It would only work smoothly where all three components are negative, in the past and in the future. This covers many shrinking municipalities, but still

the risk of bias is way too high to apply indistinctly. A case by case check could correct for the mistake and adapt the projection but this is not realistic in a sample of more than 4,000 cases.

Mixed ratio extrapolation methods for a tailored model

As previously anticipated in this section, the share of growth model can be combined with other trend extrapolation methods. Literature has also pointed in this direction when the sample covers a variety of discordant signs between the target and the parent areas in historical data (Siegel et al. 2004; Smith et al. 2001). A mixed method can contribute to significantly reducing the errors from one methodology alone. In this case, linear trend extrapolation methods helps the share of growth model to solve the issues generated by diverging signs.

To make the two models coexist the projection component of the formula is split into two, combined linearly with explaining part and influencing the final population projection. Decomposing the formula isolates the different directions, and therefore the different signs of historical population trends, neutralising the wrongful effects of having them all in the same functional component. Unbundling the two components is also more effective in capturing the importance of local dynamics for smaller municipalities. The balance between the local trend and the parent area projection is due to an additional correction tool presented below.

The first component contributes to the projection explanatory power by accounting for the targeted area trend in a linear way. This applies the *linear model*, based on historical data for each municipality.

$$\text{Plau}(t+1) = \text{Plau}(t) + \left[\frac{Plau(t) - Plau(t-1)}{[t-(t-1)]}\right] * [(t+1) - t] \qquad \textit{[VIII]}$$

To make the formula easier to read, actual years replace general time indications t, t-1 and t+1.

$$\text{Plau}(2050) = \text{Plau}(2018) + \left[\frac{Plau(2018) - Plau(1991)}{(2018-1991)}\right] * (2050-2018) \qquad \textit{[IX]}$$

This formula takes the municipal population trend in the past and projects this into the future, explaining the municipal level. However, taking this projection alone would oversimplify and be subject to bias, despite the positive outcomes claimed by previous studies.

The second component concerns the parent area, applying the *share of growth model,* with a neutral sign for the Lau/Nuts coefficient, which removes mathematical inconsistencies from divergent signs. In this way the second factor reflects the relationship between target and parent areas in the projection, without undermining the reliability of final results from mixed signs. The neutralised Lau/Nuts ratio (absolute value) reflects the proportional relation of past population trends between the targeted area and the parent area.

$$\text{Plau}(t+1) = \text{Plau}(t) + \left\{\left|\frac{[Plau(t) - Plau(t-1)]}{[Pnuts(t) - Pnuts(t-1)]}\right|\right\} * [(Pnuts(t+1) - Pnuts(t)] \qquad [X]$$

To make the formula easier to read actual years replace general time indications t, t-1 and t+1.

$$\text{Plau}(2050) = \text{Plau}(2018) + \left\{\left|\frac{[Plau(2018) - Plau(2001)]}{[Pnuts(2018) - Pnuts(2001)]}\right|\right\} * [(Pnuts(2050) - Pnuts(2018)] \qquad [XI]$$

The second component describes the municipal population in 2050 according to the share of growth model, giving a priority to the sign of the future projection at NUTS 3 level. The Lau/Nuts coefficient adjust the NUTS 3 difference of population between 2050 and 2018 to the local level. The last step to complete the design of the tailored methodology is a weighting tool that enables the two components to coexist in the same formula, and jointly give the projection.

A weighting technique to combine the linear and share of growth models

The final methodology does not want to favour one component over the other arbitrarily, but use both in a meaningful proportion to increase the accuracy, widen the explanatory power and solve problems that arise when one model is applied alone. To fulfill this aim, an additional weighting coefficient must balance the two components and determine their respective influence in the final municipal population figure. Since the two components represent the local level and the sub regional level, the methodology needs a tool that answers the following questions: which geographical dimension is more important in each case? in which proportion?

The weighting coefficient needs to solve the relevance, in quantitative terms, of the municipality under investigation in each sub-regional unit. In other words, the weighting coefficient has to assign a greater value to the second component if the municipality is relatively big in relation to the NUTS 3 area. Vice versa, if the municipality is very small in relation to the parent area, the first component, which accounts for the local trend, has to be emphasised in the mathematical calculation. Of course, the weighting values assigned to each of the two components must add up to 1. This last coefficient is labelled **City/Region ratio** to describe its purpose in the formula. It is a simple ratio quantifying the proportional relevance of each LAU area on the NUTS 3 area they belong to.

$$\frac{City}{Region} = \frac{Plau(t)}{PNuts(t)} \qquad [XII]$$

The underlying rationale is that the bigger the municipality within its sub-regional area, the more accurate the NUTS projection for 2050 (second component) will be in predicting future population. Vice versa, if the city is very small within its sub-regional area, the NUTS projection will be less capable of predicting the future population, implying a greater role for the first linear component. So, the value of the City/Region ratio is assigned to the second component. The first component will be one minus the respective Municipality/Region ratio.

Given the very wide variation of the City/Region ratio an extra step is needed to harmonise the coefficients and reasonably adapt them to a scale of 0 to 1. Such wide variation is because in some sub-regions the municipality represents less than 1% of the population, whereas in other cases the municipality exactly matches the sub-regional area (100%). Applying the pure ratio would often lead to significant over/underestimations of one parameter.

Since the methodology wants to reflect both the local and sub-regional dimensions, the distribution of all values (shrinking municipalities plus negative outlook cases) will be *normalised* around the mean and the standard deviation of the distribution. The cumulative normalization of the coefficient is essential as it re-scales the coefficients in a harmonised way around the mean in the range (0:1). In practical terms, the operation gives coefficients ranging from 0.3 for the smallest municipality to 1, where the LAU statistical area perfectly coincides with the NUTS 3.

The formula

The steps outlined above formulate the methodology, which combines the linear and the share of growth models through weighted unbundled components, for a more accurate projection of future population. To help read the formula, the first component is in blue, the second in red.

$$\text{Plau}(t+1) = \text{Plau}(t) + \left[1 - \text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left[\frac{Plau(t) - Plau(t-1)}{[t-(t-1)]}\right] * [(t+1) - t]\right\} + \left[\text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left(\left|\frac{Lau}{Nuts}\right|\right) * [(Pnuts(t+1) - Pnuts(t)]\right\} \quad [XIII]$$

In this case, the formula is applied to years:

$$\text{Plau}(2050) = \text{Plau}(2018) + \left[1 - \text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left[\frac{Plau(2018) - Plau(1991)}{[2018-1991]}\right] * [2050 - 2018]\right\} + \left[\text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left(\left|\frac{Lau}{Nuts}\right|\right) * [(Pnuts(2050) - Pnuts(2018)]\right\} \quad [XIV]$$

Simplified to:

$$\text{Plau}(2050) = \text{Plau}(2018) + \left[1 - \text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left[\frac{Plau(2018) - Plau(1991)}{[27]}\right] * [33]\right\} + \left[\text{Norm}\left(\frac{City}{Region}\right)\right] * \left\{\left(\left|\frac{Lau}{Nuts}\right|\right) * [(Pnuts(2050) - Pnuts(2018)]\right\} \quad [XV]$$

As stated above The Lau/Nuts ratio coefficient is:

$$\frac{Lau}{Nuts} = \left\{\frac{[Plau(2018) - Plau(2001)]}{[Pnuts(2018) - Pnuts(2001)]}\right\} \quad [XVI]$$

The formula is ready to be applied to the European shrinking municipalities. The next section provides information on the data availability and its sources.

Data sources

To perform the study the models count on Eurostat databases[19] for municipal population in all the EU27 countries at LAU 2 level. The resultant database merges two Eurostat sources: I) voluntary inputs from national statistical offices in the LAU correspondence tables for 2018. II) consolidated population data from 1961 to 2011, from an independent project commissioned by Eurostat and the Directorate-General for Regional and Urban Policy. These two sources are further integrated with an independent study from BBSR (BBSR 2019) to reduce the missing values and increase the total coverage, in particular for 2018 data. BBSR has compiled an updated census of all European countries sourcing from national statistical offices across Europe. After processing the data and merging the three sources, the final database gives greater statistical coverage for European LAUs in 1991, 2001, 2011, and 2018[20].

Together with LAU 2 data, the formula consistently relies on sub-regional data at NUTS 3level, for historical components and coefficients, and especially for the parent area projections. The NUTS 3 data is sourced from the Eurostat official database of regional statistics[21]. NUTS 3 projections instead come from the database annexed to Eurostat regional yearbooks (Eurostat 2016, 2018).

The projection methodology uses data from 1991, 2001 and 2018 for historical data in the formula. The time series captures the relationship between the municipality and its parent area in a reliable manner. For the **Lau/Nuts coefficient** the times series is 2001-2018 to reflect the regulation establishing NUTS 3 classification officially, which was implemented in 2000, and ratified in 2003[22]. Before this, NUTS 3 data were compiled under a 'gentleman's agreement' between Member States (as defined by the Eurostat website), which reduced data availability and reliability. Consequently, the LAU 2 data needed for the coefficient is based on 2001-2018. Instead, the LAU 2 data in the first component, for the linear extrapolation model, the time series is the full spectrum 1991-2018. A longer historical time frame increases the reliability

[19] LAU data is sourced from the two datasets, which are both available at the following address: https://ec.europa.eu/eurostat/web/nuts/local-administrative-units

[20] The data was also the basis for previous sections of the chapter. In most cases municipal entities are well captured by LAU 2 boundaries, but in Bulgaria and Portugal LAU 1 data is used. This is a better representation of local administrative authorities, given the neighbourhood character of LAU 1 units.

[21] Population on 1 January by broad age group, sex and NUTS 3 region. Browsable at https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_r_pjanaggr3&lang=en

[22] Regulation (EC) No 1059/2003 of the European Parliament and of the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics (NUTS).

of the linear projection as it limits the weights of short-term fluctuations and emphasises the overall trend (Siegel et al. 2004). Finally, the projection component of the formula uses NUTS 3 figures for 2050, provided by the Eurostat database.

After preparing the database with the relevant data sources and matching spatial information on the location of shrinking municipalities, the model runs the final formula. The results are presented and discussed in the next section.

3.3 Population projections for shrinking municipalities in 2050

In this section the results of the population projections are presented and discussed. This analysis opens the discussion on the future of currently shrinking municipalities. The methodology tries to investigate the possible development of shrinkage from the present until 2050. The analysis results are a precious source to assess the relevance and volumes of shrinkage for the European Union, as well as the intensity of population loss at local level.

Information on future population trends at municipal and European levels is a crucial step in the dissertation to investigate the shrinking trends, get a sense of their intensity and identify geographical patterns. This information will be cross-analysed with contextual variables for areas affected by shrinkage, where policies may or may not have an impact. Nevertheless, the results of the projection exercise alone are extremely relevant for raising awareness of shrinkage in European policy making.

The analysis will follow the general structure adopted in the previous subchapter dealing with the past-to-present perspective on shrinkage. Starting from a general level, the results will add layers of analysis that complement the projection data to map different shrinkage profiles. The first snapshot of the projection results presents an overview of how shrinkage will evolve in the European Union until 2050. The database mapping EU shrinkage in 1991-2018 highlighted 4,160 municipalities qualifying as shrinking municipalities with at least 5,000 inhabitants in the base year, and a population loss of more than 0.15% per year on average over the period.

This database of European shrinkage has now been complemented with future population projections for the same municipalities, implementing the original model which is detailed and discussed in section 3.4. The resultant municipal data for 2050 has enabled categories based

on the intensity of future shrinkage by analysing 2018-2050. The following categories replicate the criteria applied for the 1991-2018 historical data:

- **Regrowth**: the projection is positive for 2050.
- **Stabilisation:** the projection is negative but less than 0.15% per year in 2050.
- **Moderate:** the projection is a loss of between 0.15% and 0.3% per year in 2050.
- **Intense:** the projection is negative with a loss between 0.3% and 0.75% per year in 2050.
- **Severe:** the projection is negative with a loss between 0.75% and 1.2% per year in 2050.
- **Hard:** the projection is negative and greater than 1.2% per year in 2050.

Table 9: Municipal population projections according to shrinkage categories

Future shrinkage categories	Criteria	Number of municipalities	Percentage distribution
Regrowth	> 0 per year	126	3.0%
Stabilization	[0.15% - 0%] per year	327	7.9%
Standard	[0.15% - 0.30%] per year	600	14.4%
Intense	[0.30% - 0.75%] per year	1,213	29.2%
Severe	[0.75% - 1.2%] per year	825	19.8%
Hard	[>1.2%] per year	743	17.9%
Missing cases	No data provided at NUTS 3	326	7.8%
EU Total		**4,160**	**100.0%**

Source: own elaboration based on Eurostat and BBSR databases

The most striking result is that only 3% of the currently shrinking municipalities are expected to regrow in 2018-2050. An additional 7.9% is predicted to stabilise. However, besides being a small share of the total, stabilisation is difficult to judge, as municipalities could have experienced very intense episodes of shrinkage in the past and are only now slowly stabilising. A more detailed analysis of these cases will follow.

The remaining 81.3% of the total are expected to continue shrinking to different degrees in 2018-2050: 14.4% standard shrinkage, 29.2% intense, 19.8% severe and 17.9% hard. The main conclusion is that shrinkage is not a cyclic event. On the contrary, it is a persistent situation that is expected to increasingly affect European municipalities.

The future population profiles have been cross analysed with the historical trajectories described in the previous sub-chapter. The results are displayed in Table 9.

Table 10: Cross analysis of past and future trajectories of population decline.

Projection categories vs Pathways of past shrinkage	Positive Outlook	Discontinuous shrinkage	Late shrinkage	Persistent shrinkage

Regrowth:	13.7%	2.6%	3%	2.8%
Stabilization	21.2%	27.4%	6.7%	4.7%
Standard:	27.7%	40.2%	12%	12.8%
Intense:	30.3%	26.1%	39.2%	32.8%
Severe:	9.8%	2.1%	26.2%	25.4%
Hard:	4.6%	1.7%	13%	21.5%
Number of cases by category	**501**	**234**	**508**	**2,256**

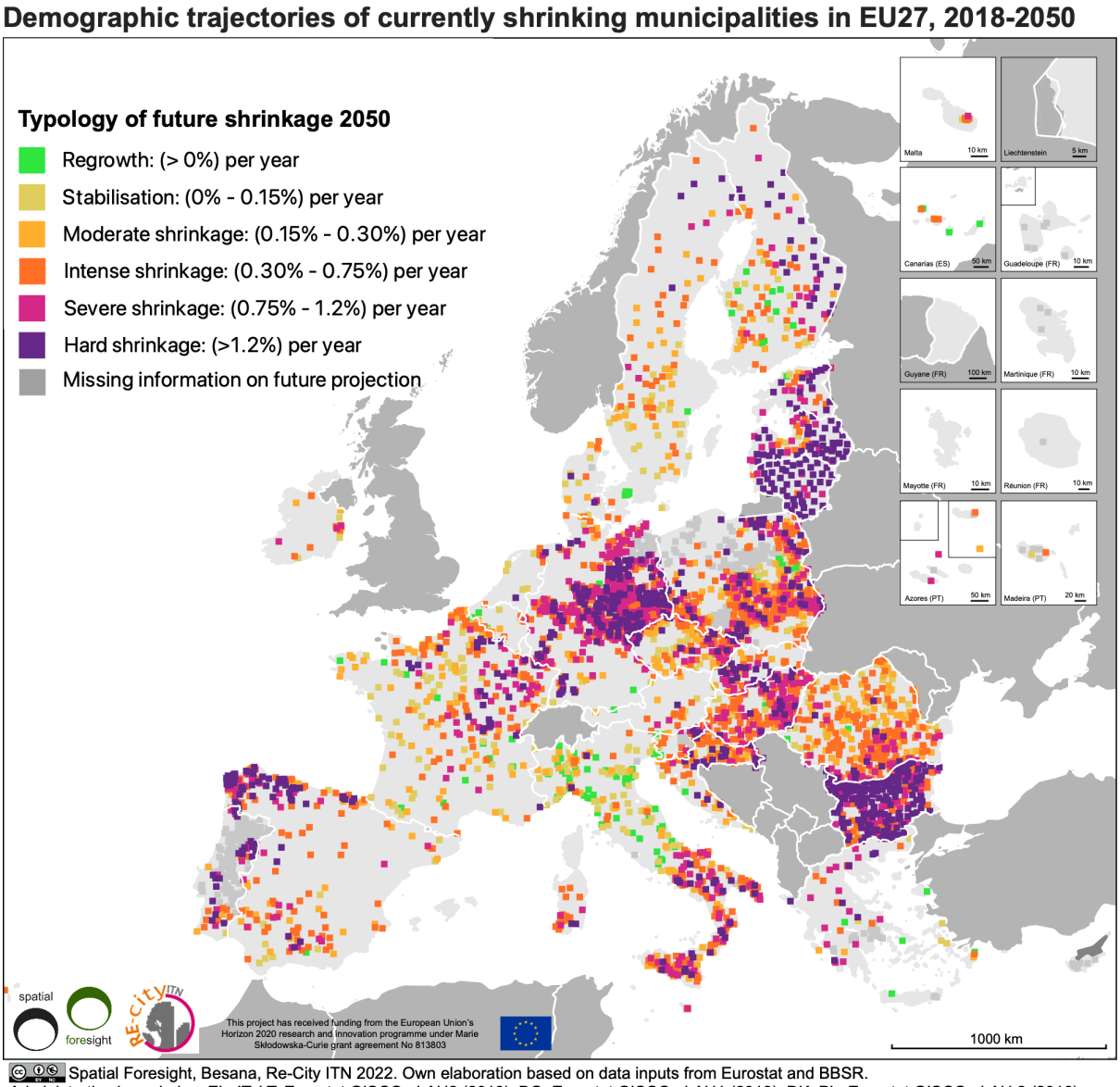
Source: own elaboration based on Eurostat and BBSR databases.

The cross-analysis between past and future trajectories of shrinkage reveal that shrinkage is very hard to reverse. Whilst the share of regrowth and stabilisation is higher for the positive outlook cases, almost 70% of these are forecast to restart declining despite the positive trend in 2011-2018. The same situation applies to municipalities with discontinuous shrinkage, where again only 30% are expected to regrow or stagnate with low to neutral population projections. Municipalities with late or persistent shrinkage in the past, are forecast to consolidate the negative outlook and continue declining at varying paces until 2050.

All in all, data shows that shrinkage is expected to consolidate until 2050 with further declines in the vast majority of currently shrinking municipalities. Even those with positive population trends in 2011-2018 will, in most cases, interrupt the positive trend and restart shrinking, or stabilise towards stagnation. A supplementary cross-analysis between future trajectories and the size of municipalities suggests that bigger shrinking municipalities (above 100,000) have higher chances of regrowth. Although the previous chapter anticipated this trend for the positive outlook cases, the projections confirm this tendency across other categories as well.

Map 5 display the results of municipal population projections for all European shrinking municipalities. It emerges that besides very few exceptions (mostly located in Northern Italy, Finland, France and Greece) where regrowth seems to be happening until 2050, the vast majority of European territory is painted in orange, pink and purple, thus signalling shrinkage is expected to continue at increasing rates. When compared with past to present shrinking trajectories displayed in Map 3 (page 73), we see that demographic decline is expanding and becoming more intense in the upcoming years.

Map 5: Demographic projections of currently shrinking municipalities in EU27, 2018-2050



Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from Eurostat and BBSR.
Administrative boundaries: EL, IT, LT: Eurostat GISCO, LAU2 (2018); BG: Eurostat GISCO, LAU1 (2018); DK, PL: Eurostat GISCO, LAU 2 (2016); PT: Agência para a Modernização Administrativa (2018); all other EU countries: Eurostat GISCO, LAU2 (2017).
Source: own elaboration based on Eurostat and BBSR inputs

So far, the European picture on shrinkage has focused on municipalities already shrinking in 1991-2018. The data portrays European shrinkage through geography, intensity, size, and most importantly time, painting a picture of shrinking municipalities from 1991 to 2050. Nonetheless, the database compilation and data elaboration opened an additional perspective on the future of European shrinkage. The analysis has uncovered areas where shrinkage is not yet present, but it is likely to begin in the near future and last till at least 2050. Municipal projections in this dissertation have enabled discussions on the future with the expected negative outlook profile, and unveiled 'blind spots' of future shrinkage. These notions are discussed in the next subchapter.

3.4 Negative outlooks and blind spots of future shrinkage

This section describes the potential increase of shrinkage in the European Union in the next three decades. The two demographic phenomena are negative outlook municipalities, and blind spots of future shrinkage. Neither of these notions are currently shrinking, but they are expected to start soon and continue until 2050. First the negative outlook type is described, blind spots will follow.

The negative outlook profile: what future?

The additional 'negative outlook' category has already been identified following the analysis of historical data. Negative outlook municipalities do not have a significant population decline (>0.15% per annum) from 1991 to 2018, but show symptoms of starting to shrink. In concrete terms, these LAUs have a significant population decline only for 2011 to 2018. It is now possible, thanks to the projected population database, to have insights on possible paths for these cases. This analysis gives a better indication of whether these places could start consistent shrinkage, or if the sudden population drop was an episodic event. A first glance at their territorial context (NUTS 3 areas) reveals that most of these municipalities (60%) are in territories with a negative population projection for 2050.

The analysis moves to the 2050 projections for each of the 639 municipalities. This draws more precise and nuanced conclusions for negative outlook municipality predictions up to 2050. The resultant municipal data for 2050 follows the categories outlined above for currently shrinking municipalities.

Table 11: Trends for negative outlook municipalities 2018-2050.

NUTS 3 projection	Criteria	Negative outlook	Percentage distribution
Regrowth	> 0 per year	67	10.5%
Stabilisation	[0.15% - 0%] per year	244	38.2%
Standard	[0.15% - 0.30%] per year	83	13.0%
Intense	[0.30% - 0.75%] per year	126	19.7%
Severe	[0.75% - 1.2%] per year	36	5.6%
Hard	[>1.2%] per year	22	3.4%
Missing cases	No data provided at NUTS 3	61	9.6%
EU Total		**639**	**100.0%**

Source: own elaboration based on Eurostat and BBSR databases

The analysis reveals that many cases are predicted to stabilise (38%), suggesting the pace of shrinkage in 2011-2018 is not expected to continue, but slow down or stabilise. In 10% of the cases, the negative outlook seems to be an episode, probably due to circumstantial events and the municipality is expected to regrow. These two cases account together for almost half the sample, excluding the missing data.

The remaining negative outlook cases for which there are NUT 3 data are expected to continue their decline with 13% experiencing standard shrinkage, 20% intense, 6% severe and 3% hard. All in all, we observe that 311 negative outlook cases, are not expected to continue shrinking but will drift towards stabilisation or regrowth. On the other hand, 267 cases are expected to continue shrinking.

Blind spots of future shrinkage

The discussion on the blind spots of future shrinkage is based on Eurostat population projections at sub-regional level and cross-analysis with the dissertation database of European shrinking municipalities. Blind spots of future shrinkage are defined as European territories that have not experienced any shrinkage in the past but do up to 2050. These are NUTS 3 territories that are forecast to experience a decline in population which is not visible at present, but is an underlying dynamic mainly due to population ageing, a birth ratio decline and migration (some drivers of Eurostat projection methods).

The blind spots label reflects this situation. Some territories are not currently being observed, studied, or treated as shrinking areas, but there are strong signals that they should be included in the phenomenon of European shrinkage. This identification can be highly relevant in the policy debate on shrinkage as these are ‘asymptomatic’ cases of future population decline.

The identification of blind spots of future shrinkage builds on the methodology developed to project municipal populations to 2050. This dissertation uses the same database information to isolate NUTS 3 territories that have not experienced shrinkage in any of their municipalities in the past, in the 1991-2018 period, nor in 2011-2018 (negative outlook typology), A cross-check of the Eurostat database on population projection for 2050 at NUTS 3 level with the dissertation database of all European shrinking municipalities (LAU 2, or LAU 1) identifies sub-regional units (NUTS 3) forecast to lose population but with no municipality currently shrinking. This

procedure unveils areas in Europe where shrinkage will become a new territorial challenge in the coming years.

This section now implements the rules applied in earlier in the chapter to map and describe shrinkage across the EU to give a more informed judgement on the intensity and geography of the predicted trends of population loss. The intensity is measured in terms of yearly population decline. According to the share of population loss per year, the sub regional units are divided into the usual categories, giving a sense of the seriousness of shrinkage for each territory. In the municipal database a population drop of less than 0.15% per year was not considered as shrinkage. Here, however, population loss between 0 and 0.15% per year has been grouped into an additional category as such population losses are registered at sub-regional level and can hide more intense declines at local level. Therefore, shrinking municipalities cannot be excluded a priori. The intervals and typologies are displayed in table 12 along with the number of cases.

Table 12: Intensity of future population loss in blind spots

Intensity of population loss	Criteria	Cases	Percentage distribution
Possible shrinkage	[0.00% - 0.15%] per year	44	34.1%
Standard shrinkage	[0.15% - 0.30%] per year	36	27.9%
Intense shrinkage	[0.30% - 0.75%] per year	44	34.1%
Severe shrinkage	[0.75% - 1.2%] per year	4	3.1%
Hard shrinkage	[>1.2%] per year	1	0.8%
EU total	**[>0.00%] per year**	**129**	**100,0%**

Source: own elaboration based on Eurostat databases

Of the 1,169 NUTS 3 geographical units in the EU27, 133 (11%) are classified as blind spots for future shrinkage. This is particularly striking when considering that these areas will be added to the existing cases of shrinkage across the EU. When looking at the intensity criteria, 34.1% are cases of possible local shrinkage, 27.9% face standard shrinkage, 34.1% intense shrinkage and 3.1% severe shrinkage. There is only one case of hard shrinkage.

The analysis paints a worrying picture for a significant number of EU territories which have not been challenged with shrinkage so far. Moreover, the percentage of population loss is assessed at sub-regional level, meaning that shrinkage is likely to be even more intense for some of the municipalities in the areas affected.

Given the breadth of the phenomenon, it is worth looking at the geographical distribution of blind spot cases across the European Union. The results of the geographical analysis are shown in table 13. The countries not listed in the table do not present any blind spots of shrinkage according to the criteria outlined.

Table 13: The geography of blind spots across the EU.

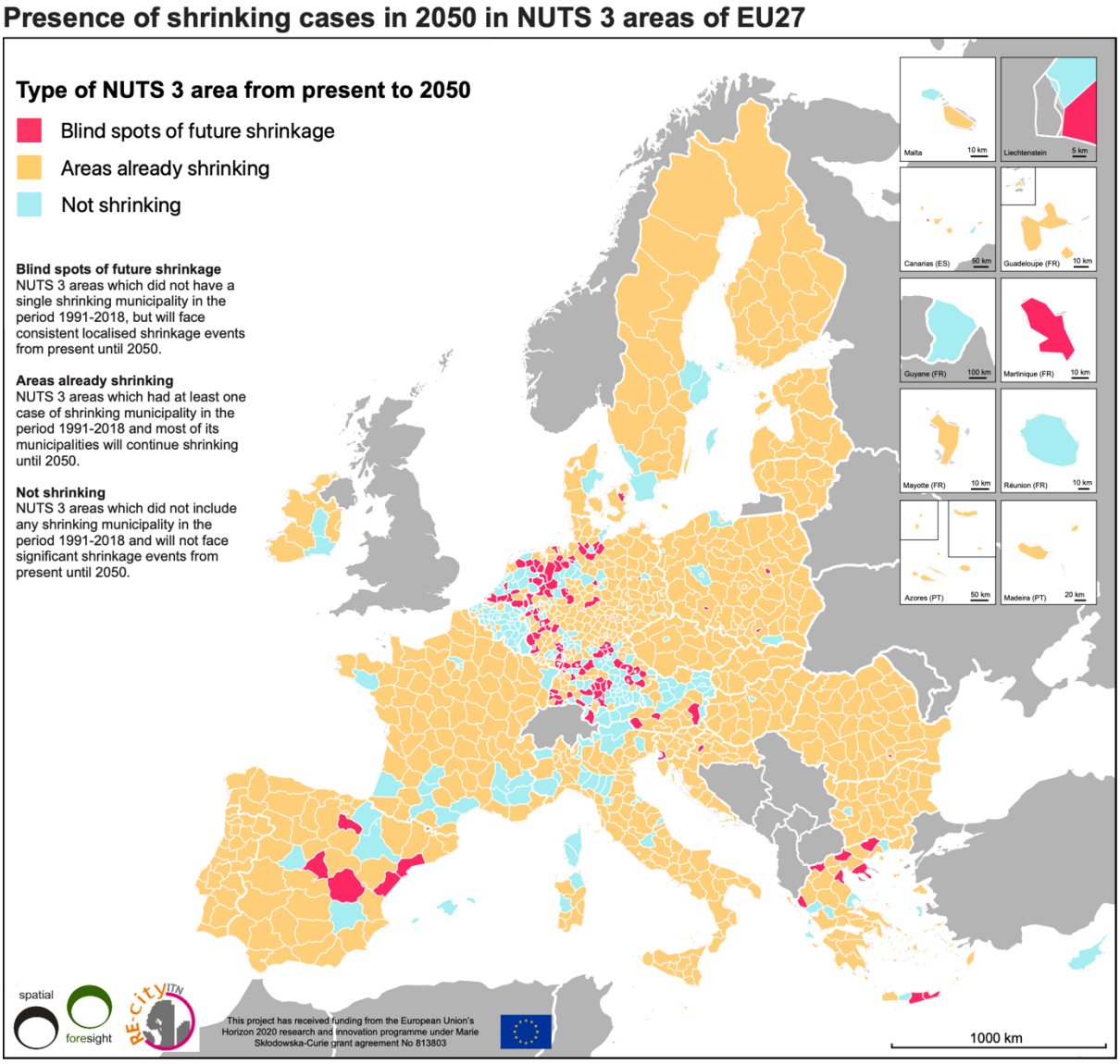
EU Member States	Blind spots (NUTS 3)	Blind spot share of national NUTS 3
Netherlands	14	35%
Germany	89	22%
Greece	8	15%
Austria	4	11%
Spain	6	10%
Poland	3	4%
Denmark	1	9%
Croatia	1	5%
Slovenia	1	5%
Romania	1	2%
France	1	1%

Source: own elaboration based on Eurostat data sources

The geographical analysis reveals important concentrations across Europe. For some countries like the Netherlands and Germany the analysis suggests that between a fifth and a third of their sub-regional units will see population loss for their first time in the coming years. Germany is also a striking case as the country is expected to start shrinking in 89 sub-regional areas, practically ¼ of the country, which will be added to the many existing cases. The remaining countries are also expected to see population decline that will be a new concern for many territories, with shares varying between 15% (Greece) and 2% (Romania) of their NUTS 3 geographical units.

To conclude, blind spots of future shrinkage are visualised in Map 6, distinguished from areas already confronted with shrinkage, and the few areas that have been and will continue being spared from shrinkage in the future. The map reveals that by 2050, the 77% of European NUTS 3 areas will be dealing with shrinkage.

Map 6: Presence of shrinking cases in 2050 in NUTS 3 areas of EU27



Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from Eurostat and BBSR.
Administrative boundaries: Eurostat GISCO, NUTS 3 (2016)

Source: own elaboration based on Eurostat and BBSR inputs

It is interesting to compare the results of this analysis with the incidence of shrinkage across Member States carried out previously in this chapter (Map 1) based on data for 1991-2018. The comparison reveals that the most severely affected countries currently will not be subject to blind spots of future shrinkage, or only to a minor extent (Finland, Hungary, Romania). This conclusion is intuitive when looking at the extremely high share of municipalities already classified as shrinking, especially in Lithuania, Bulgaria, Latvia and Estonia.

Germany is expected to face a strong increase of shrinking areas in the next 30 years including in territories that did not experience the phenomenon at all before. These make up almost 1/3

of all their NUTS 3 areas. Netherlands is the most striking case. Being a country little affected in the past, it is expected to increase the geographical scope of shrinkage at an impressive rate, with 14 completely new NUTS 3 areas facing shrinkage, 35% of the total. Some other countries will see a significant increase in shrinkage (Greece, Spain, Austria) testifying to the seriousness of the issue for almost all European countries.

Concluding remarks

Following this comparative analysis between past trends and future projections it is possible to reflect on how shrinkage takes different shapes across Europe. The two main drivers determining the different manifestations of shrinkage are 1) time and 2) incidence. European countries differ on when the population loss has been concentrated, and on the diffusion throughout each national territory (incidence). Some countries seem to have started the process already in 1991 (or earlier) involving most of their municipalities for widespread population loss, which will probably continue in the future at lower rates. Other countries started early in the process, though with a more local geographical scope that is however expected to expand significantly in the future. More countries have experienced shrinkage in very limited areas of their territory and are now expected to either continue local shrinkage with some additional spots, or expand to many new territories that haven't experienced shrinkage at all so far.

The combination of time and incidence and all their possible declinations determines different degrees of seriousness for population loss in each Member State. What emerges clearly from the European picture on future shrinkage is that population loss in the EU, after establishing as a consistent trend for more than ¼ of European municipalities in 1991-2018, will expand even further up to 2050. Thus, dealing with shrinkage is expected to be a growing concern for European territorial development debates as it touches every Member State, with increasing intensity and extension.

The negative outlook and blind spot cases are a particularly interesting territorial focus. These territories should already be included in the shrinkage debates as they can benefit from existing best practices and build on the experience of other shrinking areas to ease their transition to different equilibria. However, the same territories can offer a playing field for experimenting with new approaches to shrinkage, including interventions much earlier in the process than in cases where population decline is addressed (or not yet) only when it is already an obvious,

long-lasting trend. The blind spots might offer the opportunity to test place-based policies (Barca et al. 2012; Zaucha et al. 2013), but with an anticipatory approach, opening up a whole range of new dynamics and possibly better solutions for shrinking areas and their citizens.

This first chapter is at the core of the research design and answers the first, preliminary research question of the dissertation: *what are the potential territorial impacts of selected European policies on the future of shrinking areas?* It paints an updated picture of European shrinkage, with the aim of increasing its understanding from past to future trajectories. Results have given an idea of where shrinking areas may end up, in a scenario where structured action towards shrinkage continues to be overlooked. Past and future population trends are not just a trigger to raise awareness about shrinkage, they are also the roots of the next step of the research.

4 Territorial Impact Assessment of Covid-19 restrictive measures in shrinking areas

This chapter presents and discusses the methodology and findings of the research into the potential impacts of the pandemic on European shrinking areas, and describes their sensitivity towards the crisis. To begin with, the analysis on territorial sensitivity to Covid-19 will be presented for all European NUTS 2 regions, with the methodology and the preliminary results of the assessment. Subsequently, the assessment will be cross-analysed with the data on shrinkage in the EU, the results of the cross-analyses of Covid-19 indicators and shrinking area profiles will be discussed with different geographical lenses to zoom in from the EU wide perspective to differences across regions within Member States. The discussion addresses both the sensitivity to potential negative impacts and the preparedness to catch emerging opportunities in the pandemic recovery. Also, the results from sensitivity assessment are cross analysed with shrinkage trajectories for 1991-2050 from chapter 3, to add a time dimension that looks at shrinkage in the longer term in relation to the pandemic crisis. The patterns, findings and key messages are discussed at the end of each thematically focused section, then synthesised in the paragraph concluding the chapter.

4.1 Territorial implications, exposure and scope of the assessment

The existing literature suggests that the socio-economic impacts of the Covid-19 pandemic vary strongly between places. Beyond the geography of infections and government responses, the assessment of diverse territorial impacts is closely linked to the analysis of sectorial employment structures, social conditions (e.g. unemployment, people at risk of poverty, young workers, etc.) and economic indicators such as GDP (aggregated and sectorial), business liquidity and loan accessibility, both for countries and firms (Böhme et al. 2020a; European Committee of the Regions 2020). Although most policy responses have been national, restrictive measures resulted in very different regional effects shaped by the different socio-economic factors. Some areas will face more intense and/or longer-lasting consequences than others. The socio-economic asymmetry of consequences across Europe, countries and regions is largely shaped by the diversity of regional socio-economic characteristics (Böhme and Besana 2020). The pandemic crisis is producing multifaceted impacts for regional

development, and shrinkage is determined by the interplay of such macro trends with the local specificities of each territory (Haase et al. 2014).

The outbreak of Covid-19 has more than one territorial dimension. The different geographies of the health crisis were immediately visible, with some places affected by many infections and high death tolls while others were less affected. The health crisis triggered different policy responses in the form of the length and stringency of lockdowns and restrictive measures (Blavatnik School of Government 2020; OECD 2020b). Besides the stringency of the different approaches, the closures and strong limitations for certain economic sectors and social interactions have been shared by all Member States. These restrictive measures did not include territorial thinking in the first waves of the pandemic. Nevertheless, the restrictive measures have strong territorial implications resulting in different local impacts. The impacts of lockdowns also differ from the territorial patterns of infections or deaths. The socio-economic asymmetry of consequences across Europe, countries and regions is largely shaped by diverse regional and contextual characteristics (Böhme et al. 2020a; OECD 2020b).

Shrinking areas are vulnerable (Wolff et al. 2017) and the Covid-19 crisis has been sudden, intense and with unforeseeable longer term consequences. A pre-condition of vulnerability is an additional element of concern, risking consolidating or worsening an already struggling socio-economic situation. In a pessimistic scenario, Covid-19 may be a fatal blow for places where development already seemed to be close to a deadlock. Of course, this is an extreme image of possible impacts, but it draws the attention to the challenges that shrinking areas face. Taking into account their vulnerability and pre-existing criticalities, the recovery will be delicate. At the same time, it will offer a unique opportunity to initiate revitalisation. The injection of resources is far beyond any previous policy response and the development priorities are compatible with a sustainable future. The TIA will shed light on whether shrinking areas are as vulnerable as their pre-conditions would suggest, or if the restrictive measures will not exacerbate their situation as much as other European territories.

The analysis in this dissertation has been carried out during the so called *first wave* of the pandemic from March to June 2020. While the different approaches to restrictive measures have continued to vary since June 2020, the substance and the rationale of these policy measures has been to reduce social contacts, with the closure or limitation of economic activities and travel. Independently of these variations, the potential territorial impacts of

measures are largely shaped by structural variables and territorial features. Thus, the local socio-economic fabric determines the vulnerability of each territory to restrictive measures. As a result, although the analysis is based on the first wave of the pandemic, the structural characteristics of shrinking areas are increasingly relevant as the pandemic goes on. TIAs focus primarily on such structural variables to describe the potential impacts of restrictive measures on shrinkage.

TIAs enable a multi criteria approach that considers other (thematic) impact assessment topics such as the economy, the environment, society and governance (ESPON 2012). Chapter 2 has discussed the existence of a wide body of research on TIAs at various geographical levels (e.g. Camagni 2006; Essig and Kaucic 2017; Medeiros 2014, 2015). The territorial impact is focused on a specific geographic area and its properties (shrinking areas), defining susceptibility to policy actions (Covid-19 restrictive measures). The underlying concept is that the effects of a particular policy (exposure) are combined with the characteristics of a region (sensitivity) to produce potential territorial impacts (Medeiros 2014). Exposure and sensitivity are understood as (Böhme et al. 2020c; Essig and Kaucic 2017):

- Exposure: How much a region will be affected by the policy (either positively or negatively)?
- Sensitivity: How much regional development will be affected due to specific regional characteristics and endowments?

The exposure concept in this case is not particularly interesting for shrinking areas, considering the spatial and temporal scope of the research. Restrictive measures have often been coordinated at national level, which makes the territorial implications less relevant when we investigate the local dimension of shrinkage. In later waves of the pandemic there has been a greater territorial approach to restrictions, but these are very hard to compare as they are managed locally with individual time frames and stringencies. Whereas the restrictive measures have certainly had a day to day impact, the scope of this dissertation is to analyse medium to long term sensitivity of European territories to this crisis. Whilst small differences might have had an impact in the very short term (weeks of closure), this dissertation is interested in the longer-term perspective for European shrinkage.

The assessment of exposure fully tests the methodology, and checks for interesting patterns in shrinking areas. However, the characteristics of the challenge, the geographical scope of

restrictions (national), the continuous fluctuations, and the time scope of the dissertation necessitate focusing on the findings for sensitivity. In light of this, the remainder of this chapter excludes exposure from the analysis to favour a more thorough discussion of the vulnerability aspects triggered by the restrictive measures. Nonetheless, part of the analysis in this chapter was published in a study for the European Committee of the Regions, and a policy brief with a territorial focus on all European regions (Böhme et al. 2020a; Böhme and Besana 2020). This study focuses on exposure and describes the methodology and related data sources.

The chapter continues with a focus on the sensitivity component of the TIA on Covid-19 restrictive measures. This enables reflections on whether shrinking areas display elements of vulnerability or sensitivity to the crisis, focusing on the longer-term future of shrinkage.

4.2 Sensitivity to Covid-19 restrictive measures: methodological choices

This section illustrates attributes to describe regional sensitivities to the Covid-19 restrictive measures. The most significant features have been identified and an indicator chosen for each of them. More detailed information on indicators, data sources and the methodology can be found in the Annex.

The assessment of shrinking area sensitivity to the Covid-19 restrictive measures unfolds in two analytical flows. The first assesses sensitivity to negative impacts of the restrictive measures, studying the most critical points and sources of vulnerability. The second reinterprets Covid-19 restrictions in a positive vein. Indeed, the lockdowns have induced (or accelerated) important trends like digitalisation of jobs and services, which may entail opportunities for areas with infrastructure and preparedness. This section discusses the drivers of negative sensitivity, then addresses elements of potential positive sensitivity.

Potential negative impacts: drivers of sensitivity

The next paragraphs describe all the aspects of sensitivity considered in the ex-ante assessment to disentangle the territorial effects of the pandemic. These should be seen as drivers that define the negative consequences of restrictive measures across different territorial contexts.

Employment in risk sectors

The investigation on the vulnerability of shrinking areas established the uneven effects of restrictions across industries. Factors like the nature of the job, the possibility to respect social distancing and the different application of restrictions imposed different risks across industrial sectors. Different closures and limitations across industrial and commercial activities provokes different impacts depending on the economic fabric of territories and the distribution of workers across sectors in a specific place. Employment also has a twofold value that captures both the social and economic dimensions of the crisis:

- Employment is a good proxy to assess the economic impact of crises. Employment adjustment typically follows economic contraction (for example the global financial crisis), while in the current crisis, employment has been impacted directly as a result of lockdowns and policy measures far more than initially predicted. (International Labour Organization 2020a; OECD 2020a; WIFO 2020). Moreover, employment highlights the relevance of each economic sector in the local economy, capturing the strong territorial dimension underlying this crisis.
- Different job conditions combined with the intensity of repercussions across sectors, are common proxies for people's wellbeing[23] and aspirations for recovery after the pandemic. The current crisis disrupts work routines and burdens businesses and families with long term financial consequences. In a longer term perspective, job losses have particularly detrimental effects on the perception of social integration, life satisfaction, access to economic resources and individual mental health (Pohlan 2019). This may contribute to further marginalisation of shrinking area residents.

Reliance on tourism

Tourism is an important part of the European economy involving 3 million enterprises, 11% of total EU employment, and accounting for 9.5% of EU GDP in 2019 (Böhme et al. 2021a). Unfortunately, tourism was one of the sectors most severely affected by the crisis (UNWTO 2020). For local economies that rely heavily on tourism, the impact was dramatic in 2020 (an estimated decline of 80%). Despite some recovery, new travel burdens and anxieties about travel were also felt during 2021. Although tourist numbers increased again across Europe uncertainties about safe and seamless travel remained for many people. The negative effects of

[23] Factors such as physical and mental health, having a relationship, or contact to people, friends and family are also important factors in wellbeing, but these cannot easily be measured, or are not easily visible in one indicator (European Commission 2013b; Nozal Lena and Martin 2019; Rijpma et al. 2017)

restrictive measures on tourism were felt differently both in the short-term and the medium to long-term (Böhme et al. 2021a). Moreover, the impacts are felt beyond the HORECA[24] sector in complex tourism ecosystems and value chains across a wider range of businesses. Future trends and adaptation in the industry are subject to major uncertainties.

Reliance on international trade

Lockdown measures have disrupted industrial value chains as well as international trade. The more a region's economic fabric relies on international trade in goods, the more its industry has suffered from restrictions. The restrictions for travel and working, and the necessity to find alternatives for economic survival may leave permanent wounds in value chains and business relations, or at least adjustments may have strong regional patterns (World Trade Organization 2021). Whilst it is still hard to differentiate across sectors, greater or lower embeddedness in wider trade schemes could be a source of territorial disparities in the future (OECD 2021).

Quality of government

Recent research (in particular Rodríguez-Pose 2020a; Rodríguez-Pose and Ketterer 2020) focuses on the role of institutional change in regional development. Existing analyses reveal that institutions matter as government quality has been a consistent predictor of economic growth and resilience (Charron 2016; Rodriguez-Pose and Garcilazo 2013). Robust and efficient public institutions are vital to ensure that lockdowns, exit strategies and recovery plans are well implemented and money well spent. High quality local governments may have expertise and skills advantages for handling the recovery and creating trust in society. Poorer quality government risks exacerbating the negative impacts of restrictions on society.

Regional GDP per capita

The regional GDP per capita has been considered as a proxy for a region’s economic endowment and ability to face the initial economic disruption. The economic structure of richer regions might help them better absorb impacts from the crisis and be more effective in mitigating its long-term effects. In the longer term, such asymmetric conditions could be a drag on poorer regions. It is thus important to facilitate a catching up process for shrinking areas.

[24] Hotels, Restaurants and Catering

National debt

Member States needed to mobilise large amounts of public money to face the emergency. Beyond health spending are unprecedented needs to support economies and individuals facing restrictive measures and forced closures. More financial resources will also be needed to support the recovery. The level of national debt is chosen as a variable as it will determine the capacity or limits to comply with these emerging needs. This component of the assessment, as with the previous one, follows the emerging theories that the Covid-19 crisis will exacerbate inequalities between richer and poorer areas at multiple scales from global to local (Richard McGahey 2021).

The share of employment in micro-enterprises

Micro-enterprises are particularly vulnerable to economic disruption as they lack capital and access to finance to ensure continuity after shutdowns or reduced productivity (Ikmal et al. 2020). They have less capacity to absorb shocks created by such a crisis. Regions that rely on them are threatened in the long term as both employees and owners will have hard times finding alternative jobs, as the economic structure has less capacity to reallocate labour.

The share of self-employment

Self-employed people are also especially vulnerable as they tend to be financially worse off than other workers and State assistance tends to be lower for them than for employed workers. Moreover, self-employed people work disproportionately in sectors hardest hit by the lockdown with 44% of self-employed workers versus 37% of employees in risk sectors, making them all the more vulnerable to lockdown effects (Anderson 2020).

The share of people at risk of poverty and social exclusion

Job losses and the contraction in the real economy, as well as inflation are serious threats for families with limited financial resources. Families at risk of poverty before the crisis may face serious difficulties in making ends meet today, with more persistent effects in the longer term when opportunities are expected to be scarcer, and access to services reduced. The Bank of Italy stated in its annual report that the impact of the crisis will be much harder for poorer families, increasing disparities to an unprecedented level (Banca d'Italia Eurosistema 2020). Other sources also warn that Covid-19 may exacerbate existing social inequalities (The Lancet Public Health 2021).

The share of youth unemployment

Increasing attention in political and scientific debates has been paid to young people during the crisis as they face multiple disproportionate shocks, increasing the risk of a 'lockdown generation' (International Labour Organization 2020b). Young people are particularly vulnerable because they are more likely to have temporary or informal contracts, or no job at all. They are also less likely to have financial resources. During the crisis hiring campaigns and access to employment following studies and work experience was blocked due to a paralysed economy. Younger people might also be penalised by a relatively long period of inactivity and little or no previous job experience, making it more challenging to consolidate their skills and start building, or consolidating a career path. In general, youth employees are said to be at greater risk in the pandemic aftermath (World Economic Forum 2021).

Cross-border employment

Border closures and the general standstill in cross-national working relations impacted work in many industries. Beyond economic productivity and financial contraction, cross-border value chains were also disrupted by the closure of national borders. A region relying on cross-border employment is more vulnerable to Covid-19 as citizens in cross-border areas faced restrictions on reaching work and services, including shopping.

Measuring sensitivity

The analysis on regional sensitivity investigates the relative position of regions across Europe. Socio-economic features are crucial indicators for assessing the impacts of the crisis across territories. For each indicator, the values have been normally distributed around the EU average, and NUTS 2 regions have been assigned a category based on their relative score with respect to the European average. This gives an assessment of sensitivity for each attribute in each region, expressed as lower, medium or higher sensitivity. The medium category covers the interval between the average and +/- half the standard deviation: $\overline{X} - \frac{\text{ST.DEV}}{2}\ \overline{X} + \frac{\text{ST.DEV}}{2}$; the lower and higher categories cover the remaining bottom and top portions of the distribution.

For *employment in risk sectors* the methodology needed more elaboration and involves two steps as the assessment not only needs to collect employment data across sectors, but also assess each sector's risk to the current crisis, before concluding on regional sensitivity:

- *Sector employment:* data on employment by industrial sector has been collected into a unified database.
- *Assessment of economic risk by sector:* Each economic sector is assigned a risk factor (neutral to high) following an interpretation of the International Labour Organisation risk assessment and sub-sectorial analyses[25] (International Labour Organization 2020a). The detailed assessment of each economic sector is available in the Annex.

To calculate sensitivity, the share of employment per sector in each NUTS 2 region has been regrouped according to the risk factor for the sector. As a result, each region has a share of people working in neutral, medium and high sectors. A simple weighting factor has been assigned to the negative risk categories: 1 for medium risk and 2 for high risk[26]. A weighted score sums the shares of people working in medium and high risk sectors, each with their relative weight coefficient (1 or 2). Based on a normalised distribution of the scores, the three regional categories of risk have been defined. The medium category covers +/- half the standard deviation: $\overline{X} - \frac{\text{ST.DEV}}{2}$ $\overline{X} + \frac{\text{ST.DEV}}{2}$.

The individual attributes feed into a final assessment of each region's sensitivity to the Covid-19 crisis. Depending on the assessment of the region for each attribute scores are assigned. The composite score takes into consideration the relevance of each attribute as some can be more disruptive than others; the importance is reflected in a coefficient determining the weight of each sensitivity in the overall assessment. The final result is a composite index that assesses regional sensitivity to Covid-19 socio-economic risks. See the textbox for a detailed outline of the scoring system in the Annex.

Potential positive impacts: drivers of sensitivity

A crisis usually also contains opportunities. Sectors which are less negatively affected by lockdowns might play a crucial role in the recovery. Also, structural characteristics of territories, their socio-economic fabric and infrastructure can help recovery. The analysis maps

[25] The ILO model is based on real-time economic and financial data to assess the impact of the Covid-19 crisis on economic output at sectoral level.
[26] Different weighting systems have also been tested, but the results are always very similar so only two categories are considered in the analysis.

the territorial diversity of potential opportunities which is intended to stimulate debate and draw attention to aspects where future policies might find opportunities and potential. The potential to benefit from changing economic conditions due to restrictive measures builds largely on existing digitisation. The following attributes have been taken into consideration to reflect territorial sensitivities to the pandemic:

Employment in Information and Communication

These services, now mainly online, have not been heavily disrupted by restrictions on work and movement. Instead, demand has grown heavily as the quest for information has surged since the first outbreak. There has been an increased need for communication, from public and private sectors towards citizens, and between citizens. Initial studies indicate that the Information and Communication sector may benefit from the crisis in ways beyond the health emergency, as the increasing demand for communication generates business opportunities (Kibrom et al. 2020; UNCTAD 2021). Territories with an established information and communication sector are likely to be better prepared to grasp emerging opportunities.

Access to broadband

The pandemic crisis and lockdown restrictions disrupted normal working conditions. Tasks that used to be performed in the office have been moved online, remotely whenever possible. European regions differ in their access to the internet and even more in access to broadband, which is likely to become a minimum requirement for some jobs. As the internet becomes an essential public service, not all territories are properly endowed which may increase the digital divide and territorial inequalities (Lai and Widmar 2021).

Teleworking preparedness

Smart working has become the new normal for many across Europe including those with little or no experience of working from outside the office. The preparedness for remote working varies depending on Member State regulations and working culture habits. Places that had already implemented such schemes may have some advantage in adapting (Milasi et al. 2020; Sostero et al. 2020).

Online interaction with public bodies

In many cases requests for financial support, assistance and aid schemes for enterprises had to be made outside of public authority offices, and mostly online. European regions vary in their

offer of public services online. Regions which had already implemented and introduced digital interactions between public bodies and citizens have a comparative advantage in adapting to the new situation as well as to setting up ad-hoc platforms and migrating services onto existing online frameworks (Capgemini Research Institute 2021; Johnston and Delcorde 2021).

The assessment of each sensitivity component follows the step outlined above for potential negative impacts. Thus, each region receives an assessment (Lower, Medium, Higher) for each component. As with negative impacts, a detailed explanation of the combined scoring system can be found in the Annex.

As previously anticipated, part of the analysis in this chapter derives from a study for the Committee of the Regions, and a policy brief where the territorial focus is on all European regions (Böhme et al. 2020a; Böhme and Besana 2020). The results of the TIA on all European regions can be visualised in these sources in two maps, featuring exposure and sensitivity. In this dissertation the focus is on European shrinking areas, and their sensitivity to Covid-19 restrictive measures.

In the next sections the results of regional sensitivity to restrictive measures is cross analysed with the profiles of shrinking areas. This analysis highlights patterns on the relationship between shrinkage and Covid-19, enabling a deeper understanding of the potential impacts of the crisis and the sensitivity of shrinking areas to restrictive measures. The cross-analysis compares shrinking areas and the average of all European territories as a benchmark.

4.3 Sensitivity to negative impacts of restrictions across countries

The crisis has tumultuous socio-economic effects and, as seen before, very different sensitivities across territories, both in the final sensitivity measure and for individual indicators. This next step in the research analyses the sensitivity of shrinking areas to the Covid-19 crisis. The analysis reviews the territorial impact of Covid-19 in shrinking areas by investigating nuances and territorial differences to the crisis.

To answer the research question: *What are the potential territorial impacts of Covid-19 restrictive measures on European shrinking areas?* the data on European shrinkage from previous chapters is cross-analysed with the territorial sensitivities to Covid-19, outlined in

previous sections. The first step in the analysis is an investigation of the sensitivity at European level. This gives a first comparison of shrinking areas to other European territories in terms of sensitivity, and the sub-indicators to Covid-19. Once the general position of shrinking areas is described, the chapter digs deeper into the territorial distribution of sensitivities and investigates the characteristics of shrinking places across EU Member States. The results show the first geographical patterns, highlighting countries and regions that are particularly sensitive.

To cross-analyse the sensitivity of shrinking areas to Covid-19 each shrinking municipality has a NUTS 2 code. This makes it possible to map where shrinkage is present and, most importantly, to frame each shrinking municipality in its regional context. By cross analysing the regional codes for shrinking municipalities with the regional sensitivity analysis, it is possible to tell if shrinking areas are in regions of higher, medium, or lower sensitivity. The resulting data reveals how many shrinking municipalities are located in territories that face high sensitivities to the Covid-19 crisis. The easiest way to read the data is though percentage distributions across the three sensitivities.

To make the reading more informative, the data processing introduces a simple 'control' for the distribution of regions across the sensitivity categories. This shows the share of regions (of the total NUTS 2 regions) in each of the three sensitivity categories. A ratio for the percentage of shrinking areas in one category, and the share of regions in that category, gives a better feeling of whether shrinking areas are disproportionately sensitive to the crisis. Moreover, results tell us whether there is a particular component of the overall assessment where shrinking areas are particularly sensitive.

The relative position of shrinking areas to all European territories is displayed in the table below. The closer the ratio is to 1, the more shrinking areas are aligned with the overall distribution of sensitivities, suggesting no significant imbalances. Instead, if the ratio deviates from 1, it implies that shrinking areas diverge from the European average for Covid-19 sensitivity. If the ratio is higher than 1, the shrinking areas are more frequently in places highly

sensitive to Covid-19; vice versa, if the ratio is lower than 1, shrinking areas are not particularly affected by Covid-19 restrictions[27].

Table 14: Sensitivity to Covid-19 for shrinking areas compared to the European average

Indicator	Lower sensitivity	Medium sensitivity	Higher sensitivity
Risk sector employment	1.34	0.91	0.73
Tourism	1.01	1.08	0.85
International trade	0.98	1.05	1.02
Regional GDP	1.53	0.89	0.54
National debt	1.61	0.87	0.74
Government quality	1.48	0.84	0.71
Risk of poverty	0.82	1.01	1.26
Micro enterprises	0.83	1.23	1.04
Self-employment	0.82	1.34	0.85
Cross-border employment	0.83	1.08	1.20
Youth unemployment	1.01	1.30	0.79
Combined sensitivity index	**1.18**	**0.84**	**0.97**

Source: own elaboration based on multiple statistical sources

The ratio of combined sensitivity reveals that shrinking areas are well aligned to the overall distribution of European territories. It means that, in general, shrinking areas are not in regions where vulnerability to Covid-19 responses is higher than average. Instead, there is a slight tendency for shrinking areas to be in lower sensitivity regions, where vulnerability to restrictive measures is lower.

The composite index reveals that the socio-economic fabric of shrinking areas tends to have less elements of vulnerability to Covid-19 restrictive measure. Nonetheless, different insights emerge looking at each attribute. Shrinking areas are more vulnerable than the European average for regional GDP, government quality, people at risk of poverty and social exclusion; as well as cross border employment.

The analysis characterises shrinking areas in the pandemic crisis. The very low rates of regional economic productivity and share of people at risk of poverty point in the same direction, people

[27] This interpretation is inverted when we look at Regional GDP and Government quality. Here, the lower category signals a higher degree of risk; lower quality of government, and lower GDP are problematic when assessing a region's sensitivity to the crisis.

in shrinking areas lack financial resources, as well as public assistance and opportunities for earning. Government quality tends to be particularly low in shrinking areas, posing threats to the management of the emergency, and even more to the design of a recovery strategy in the coming years. Finally, shrinking areas tend to be located in places where more people travel across national borders for their jobs. This hints partly at the lack of work opportunities, and signals a lack of attraction. With increasing uncertainties over mobility, cross-border workers may also decide to leave their usual residence.

At the other end of the spectrum, shrinking areas do not seem to be normally sensitive to employment in high-risk sectors, nor to high levels of national debt. Data interpretations suggest that shrinking areas tend to have fewer job opportunities, but employment is less damaged by the restrictive measures. Still, employment seems to be concentrated in low productivity sectors (low regional GDP).

The next step in presenting the statistical results focuses on geographical patterns, investigating where the most vulnerable shrinking areas (higher sensitivity) are located, and vice versa, where they are less compromised. The table below displays the distribution of shrinkage across the three sensitivity classes and across Member States. Each cell displays the share of shrinking areas in each of the three categories (vertical reading). The right-hand column tells us the share of shrinking areas in each country of the European total.

Table 15: Combined sensitivity by vulnerability class and Member State.

EU Member States	Lower sensitivity	Medium sensitivity	Higher sensitivity	Share of shrinking municipalities to the EU total
Austria	1.01%	0.76%	0.15%	0.71%
Belgium	0.04%	1.11%	0.00%	0.37%
Bulgaria	1.93%	4.02%	8.36%	4.21%
Czech Republic	0.00%	1.63%	11.99%	3.54%
Germany	28.47%	14.23%	2.89%	17.39%
Denmark	2.45%	0.00%	0.00%	1.04%
Estonia	0.00%	0.00%	2.74%	0.69%
Greece	0.00%	2.04%	4.37%	1.75%
Spain	0.00%	8.69%	7.62%	4.70%
Finland	3.42%	2.39%	0.00%	2.22%
France	15.94%	5.71%	4.81%	10.14%
Croatia	4.16%	0.00%	2.07%	2.29%
Hungary	4.16%	5.36%	0.00%	3.48%
Ireland	0.13%	0.00%	1.92%	0.54%
Italy	0.00%	1.63%	39.01%	10.34%

Lithuania	0.00%	2.86%	0.52%	1.04%
Latvia	0.00%	0.00%	5.18%	1.30%
Malta	0.00%	0.35%	0.00%	0.11%
Netherlands	0.74%	1.11%	1.18%	0.97%
Poland	20.72%	21.69%	3.26%	16.57%
Portugal	0.00%	9.91%	0.67%	3.34%
Romania	12.44%	9.21%	0.00%	8.24%
Sweden	3.72%	1.40%	1.63%	2.44%
Slovenia	0.66%	1.98%	0.00%	0.91%
Slovakia	0.00%	3.91%	1.63%	1.66%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Source: own elaboration based on multiple statistical sources.

The distribution, comparing the share of shrinking municipalities to the EU total shows dense geographical patterns. Italy is significantly overrepresented in the higher sensitivity category with almost 40% of shrinking areas being the most vulnerable. The result is particularly striking when we consider that Italy has just 10% of all European shrinking areas. The Czech Republic faces a similar disproportion, with 11% in the higher sensitivity class, compared to only 3% of shrinking areas in the EU. It is similar in Latvia, which has over 5% of European higher sensitivity areas but just 1.30% of shrinking areas overall. Similar scenarios are found in Bulgaria and Spain to a lesser extent.

At the other end of the spectrum, Germany, Poland and France are underrepresented in the high sensitivity class, suggesting a lower impact of Covid-19 on their shrinking areas. In Germany and Poland, which each have around 17% of shrinking areas, we find only 3% of highly sensitive areas. However, Poland is a very peculiar case, with a pronounced variation in the sensitivity component, as will emerge from the thematic analysis. In France the ratio is more moderate, with 10% in the most vulnerable category, but 5% of European shrinkage areas.

The following section continues the investigation by unpacking the combined sensitivity, checking for other significant thematic patterns of vulnerability in European shrinking areas.

Geographies and vulnerabilities of shrinking areas across European countries

Similar tables to the one above have been produced for each component in the sensitivity index. The following paragraphs describe findings from their analyses.

Employment in risk sectors: 35% of the shrinking areas that are highly sensitive to this attribute are in Germany, making its shrinking areas by far the most vulnerable for employment in high-risk sectors. The results are striking, compared to the combined sensitivity, where Germany appears at the lower end. Portugal is an interesting case with 10% of highly sensitive vs 3% of total shrinking areas in the country. Czech and Dutch shrinking areas also have higher sensitivity for employment in economic sectors at risk due to Covid-19 restrictive measures.

Reliance on tourism: Italian shrinking areas are the elephant in the room with almost 50% of all European shrinking areas in the higher sensitivity class. Spain and France also have more in this category with respect to the baseline. These three countries together comprise 75% of European shrinking areas where reliance on tourism is an important element of vulnerability in the socio-economic fabric.

Reliance on international trade: disruptions to international trade value chains are particularly dangerous for shrinking areas in Poland (29%), Czech Republic (12%) and Slovakia (6%). Latvia, Lithuania and Hungary also have higher incidences for this with respect to their share of shrinking areas in the EU total.

Quality of government: quality of government is a higher sensitivity component for Polish shrinking areas (26%), Italy (22%) and Romania (17%). Hungary and Croatia also display higher incidence than expected based on their relevance to the EU total.

Regional GDP: Polish (30%), Romanian (15%) and Bulgarian (8%) shrinking areas are particularly affected by low economic productivity.

Employment in micro-enterprises: the most vulnerable situations for shrinking areas are in Italy (26%), Poland (25%) Spain (12%), Romania (10%) and Greece (5%).

Self-employment: the incidence reveals very similar geographical patterns to micro-enterprises. Polish (34%), Italian (32%), Romanian (14%) and Spanish (12%) shrinking areas are highly reliant on self-employment, which is an element of vulnerability to Covid-19 restrictive measures.

Youth unemployment: access to job opportunities and temporary jobs is a critical aspect of the Covid-19 crisis and is particularly sensitive for younger people. For shrinking areas, this aspect may be exacerbated where an ageing population and lack of attractivity for younger workers is a structural issue. These dynamics will be of more concern for Italy (36%), Spain (20%), France (14%) and Greece (7.5%).

People at risk of poverty or social exclusion: shrinking areas in the following countries are particularly affected by social distressed conditions: Romania (22.5%), Italy (21%), Bulgaria (14%), Spain (10%) and Croatia (8%).

Cross-border employment: According to the analysis, shrinking areas are particularly sensitive in Poland (20%), France (17%), Bulgaria (11.5%) and Hungary (10%).

Table 16 summarises the results of the analysis between countries and sensitivity attributes.

Table 16: Summary: hotspots of vulnerability to Covid-19 in European shrinking areas

Indicator	**1st range higher sensitivity**	**2nd range higher sensitivity**	**3rd range higher sensitivity**
Employment in risk sectors	Germany	Portugal	Czech Republic Netherlands
Reliance on Tourism	Italy	Spain	France
Reliance on International trade	Poland	Czech Republic Slovakia	Latvia, Lithuania
Regional GDP	Poland	Romania	Bulgaria
Government quality	Poland	Italy Romania	Hungary Croatia
People at risk of poverty and social exclusion	Romania Italy	Bulgaria Spain	Croatia
Employment in micro-enterprises	Italy Poland	Spain Romania	Greece
Self-employment	Poland Italy	Romania	Spain
Youth unemployment	Italy	Spain France	Greece
Cross-Border employment	Poland	France	Bulgaria Hungary
Combined sensitivity measure	**Italy**	**Czech Republic Latvia**	**Bulgaria Spain**

Source: own elaboration based on multiple statistical sources.

The overview of frequencies suggests that shrinking areas in Italy (7), Poland (6), Romania (5) and Spain (5) often have specific high sensitivity elements to Covid-19 restrictive measures. Shrinking areas in these countries tend to have the most negative potential impacts from the crisis. The socio-economic aspects might represent first needs and demands of these shrinking areas for policy responses in the recovery phase.

Conclusions

The investigation has shed a first light on the relationship between shrinkage and sensitivity to the Covid-19 crisis. The possibility to cross-analyse the geographies of shrinkage and socio-economic attributes, has unveiled some specificities of shrinking areas for the recovery phase. In this analysis, the focus and interpretation should be at the European scale. Until this point, the analytical scope is at the European aggregated level, and does not investigate intra-national distinctions. The analysis focuses on: I) the sensitivity of shrinking areas as a target group to the totality of EU27 territories; II) specificities across the map, between Member States, but not within them. The following key messages emerge from the findings:

- European shrinking areas on average do not display high vulnerability to Covid-19 restrictive measures compared to other territories. The analysis of sensitivity reveals that their social and economic fabric is less vulnerable than other territories for most indicators. The interpretation is that shrinking areas should be spared from the worst consequences of restrictive measures.
- Despite the generally positive assessment, the analysis of sensitivity reveals that shrinking areas are more often located in regional contexts where GDP and quality of government are significantly lower than European averages. Data suggest that these will be important elements of vulnerability in the medium to long term. To a lesser extent, people at risk of poverty and cross-border employment are also important factors for shrinking areas.
- At the other end, the sensitivity analysis shows that shrinking areas have lower levels of employment in economic sectors most damaged by the restrictive measures. This important element confirms generally lower vulnerability than other European territories.

In addition to the observations on the sensitivity of shrinking areas towards Covid-19 restrictions, two more important reflections reinforce the theoretical assumption for territorial implications of shocks and macro trends like the pandemic crisis (Böhme and Lüer 2017).

- The link between shrinkage and Covid-19 has a strong territorial dimension causing important imbalances at Member State level, due to the location of shrinking areas in highly sensitive regional contexts. For instance, shrinking areas in some countries (Italy, Poland, Czech Republic) are more vulnerable than in other countries (France, Germany, Finland).
- For each sensitivity component, profoundly different geographical patterns emerge, signalling very diverse scenarios for the recovery phase at Member State level. Each shrinking area has a customised set of highly sensitive topics to deal with in the short to medium term that heavily depends on each territorial context.

Shrinking areas reveal a variability of territorial sensitivity to Covid-19 restrictive measures, which is visible already through a national comparative framework. The next section goes one step down in the spatial scale to verify differentiated territorial sensitivities within countries.

4.4 Interregional variation of sensitivity to negative impacts of restrictions

The results emerging of the analysis at European level has unveiled distinct territorial patterns. There is a substantial imbalance in the distribution of shrinking areas over the European map with different nuances for each key attribute of vulnerability. Shrinking areas vary across territories for their sensitivity to the Covid-19 crisis.

These different socio-economic elements will be key factors in the recovery phase. In light of this, it is interesting to deepen the investigation in terms of geography and sensitivity. To get a sharper picture, the analysis investigates if the imbalances at European level include territorial variations within Member States. The rationale verifies whether the excess distribution of higher sensitivity in a specific country can be explained by most regions in the country being in the high category, or if there is a stronger tendency for shrinking areas to be located in places with such characteristics. This layer of data elaboration on the 'whys' of such territorial disproportion at European level helps understand whether differences within countries can reveal more information.

The databases resulting from the spatial code matching facilitate this additional step. The distribution of shrinking areas in each country, and across sensitivities, is now compared with the distribution of regions in the three categories within each country. Crossing these two sources of information highlights cases where the location of shrinking areas is imbalanced

towards highly sensitive regions disproportionately compared to the national distribution. It shows where, and for which attributes, shrinkage and sensitivity to Covid-19 are expected to reveal joint criticalities with respect to the national situation.

This second layer of investigation involved calculating:

I) the distribution of regions in the three sensitivity classes (lower, medium, higher) within each Member State;

II) the distribution of shrinking areas across the three classes (lower, medium, higher) within each Member State.

A two-step cross analysis answers two guiding questions when interpreting the data. Which Member States have more shrinking areas than the EU average for higher sensitivity? Is this higher incidence attributable to more regions in that category within the Member State? The logic is better illustrated with a practical example. In Belgium there is a higher percentage of highly sensitive shrinking areas than the EU wide distribution would suggest. Is this because most regions in Belgium belong to that higher sensitivity (thus most vulnerable) class? Or is it because the majority of Belgian shrinking areas are located in the few (or only) regions that belong to the higher sensitivity class? In short, we are looking to generate more precise information about the effects of shrinkage with Covid-19 restrictive measures within Member States and across different regional contexts.

Section 4.3 revealed shrinkage imbalances in highly sensitive places for the Covid-19 crisis at the EU scale. This chapter unveils imbalances at a lower level, investigating within country phenomena, though keeping the EU analytical lenses. In this sense, the results should not be seen in contrast to those in chapter 2, but as a complement. Table 17 displays the results described above for the combined sensitivity index. The white columns display the distribution of *shrinking areas* across sensitivity classes within each country. The grey columns display the distribution of *regions* across the sensitivity classes within each country. Comparing the percentages for each sensitivity class reveals whether there is a territorial concentration of shrinking areas in one or the other.

Table 17: Variations of sensitivity to negative impacts across regions in a country

Countries	Lower sensitivity shrinking areas	Lower sensitivity regions	Medium sensitivity shrinking areas	Medium sensitivity regions	Higher sensitivity shrinking areas	Higher sensitivity regions
Austria	60.53%	44.44%	34.21%	33.33%	5.26%	22.22%
Belgium	5.00%	18.18%	95.00%	81.82%	0.00%	0.00%
Bulgaria	19.47%	16.67%	30.53%	33.33%	50.00%	50.00%
Czech Republic	0.00%	0.00%	14.74%	25.00%	85.26%	75.00%
Germany	69.67%	65.79%	26.15%	26.32%	4.18%	7.89%
Denmark	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Estonia	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%
Greece	0.00%	0.00%	37.23%	61.54%	62.77%	38.46%
Spain	0.00%	0.00%	59.13%	63.16%	40.87%	36.84%
Finland	65.55%	80.00%	34.45%	20.00%	0.00%	0.00%
France	66.91%	61.54%	18.01%	30.77%	11.95%	7.69%
Croatia	77.24%	50.00%	0.00%	0.00%	22.76%	50.00%
Hungary	50.80%	25.00%	49.20%	75.00%	0.00%	0.00%
Ireland	10.34%	33.33%	0.00%	0.00%	89.66%	66.67%
Italy	0.00%	0.00%	5.05%	14.29%	94.95%	85.71%
Lithuania	0.00%	0.00%	87.50%	50.00%	12.50%	50.00%
Latvia	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%
Malta	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%
Netherlands	32.69%	41.67%	36.54%	25.00%	30.77%	33.33%
Poland	53.21%	52.94%	41.84%	41.18%	4.95%	5.88%
Portugal	0.00%	0.00%	94.97%	71.43%	5.03%	28.57%
Romania	64.25%	50.00%	35.75%	50.00%	0.00%	0.00%
Sweden	64.89%	62.50%	18.32%	25.00%	16.79%	12.50%
Slovenia	30.61%	50.00%	69.39%	50.00%	0.00%	0.00%
Slovakia	0.00%	0.00%	75.28%	50.00%	24.72%	50.00%
Total by category	42.55%	35.68%	31.96%	37.76%	25.18%	25.73%

Source: own elaboration based on multiple statistical sources.

The data reveals a substantial alignment between the distribution of shrinking areas and regions across sensitivities within Member States. This would imply that in each country, there is no substantial intensification of shrinking cases in regional clusters. Instead, the higher incidence of shrinkage roughly follows the proportion of higher sensitivity regions within each Member

State. It is worth underlining that this interpretation applies to the combined measure for sensitivity, there may be misalignments for each attribute.

Nonetheless, there are two significant exceptions to the general alignment: in Greece and Ireland, shrinking areas are consistently located in higher sensitivity regions, much more than the proportion of regions in this category would suggest. In Greece almost 63% of shrinking areas are in high sensitivity regions, whereas only 38% of its regions are highly sensitive. For Ireland the same figures are 90% vs 66% of regions in the higher category. To a more limited extent we observe a similar bias in Italy and the Czech Republic.

More exceptions emerge if we invert the reasoning and look into countries where shrinking areas are consistently (and disproportionately) located in regions where the combined sensitivity (thus the vulnerability) to Covid-19 is lower. Austria, Croatia and Hungary are the best examples of this inverted pattern. 77% of Croatian shrinking areas are in lower sensitivity regions, whilst only 50% of its regions have lower sensitivity. The same figures are 50% vs 25% in Hungary and 60% vs 44% in Austria. A similar trend can be observed in Lithuania and Slovakia, though for medium sensitivity. The following section will continue the investigation by unpacking the combined sensitivity, looking for other significant phenomena at national level.

Geographies and vulnerabilities of shrinking areas within countries

Similar tables to the one above for each attribute in the composite sensitivity indicator have been produced and analysed. This section reports the most interesting findings from their analyses.

Employment in risk sectors: Ireland (69%) and Denmark (41%) display significantly greater concentrations of shrinking areas in areas where employment in risk sectors is higher. This is in spite of the fact that only 1 out of 3, and 1 out of 5 NUTS 2 regions have higher sensitivity to this attribute. Similar trends, though in smaller proportions, can be observed in the Netherlands and Portugal.

Reliance on tourism: we observe a general alignment between the distribution of shrinking areas and regions across sensitivity categories. Mild exceptions are in Ireland and Italy, where there is a tendency for shrinking areas to be more often located in higher sensitivity regions.

Reliance on international trade: Belgium (95%), Slovenia (70%) and Ireland (90%) offer examples where shrinking areas are in regions with higher reliance on international trade, more than the overall regional assessment would suggest (64% - 66 – 50% respectively).

Quality of government: we observe a substantial alignment in the distribution. Poland and Italy stand out as mild exceptions: Poland has 75% of its shrinking areas in poor government quality regions (58% of total regions), whilst for Italy a striking 100% of its shrinking areas are in such regions, and 90% of them have poor governmental quality.

Regional GDP: there are significant misalignments, suggesting a tendency for shrinking areas to be located in the poorer regions of the country: Lithuania (87%), Italy (57%), Slovenia (70%) have a significant misalignment with respect to their regions' distribution across categories (50% - 33% - 50% respectively). Also, Slovakia, Czech Republic, Portugal and Romania show similar trends to a slightly lower degree.

Employment in micro-enterprises: Finland and Hungary are the only two countries that deviate from the general regional distribution. In these two countries shrinking areas tend to be in regions where micro-enterprises play a greater role, exposing them to more risk in Covid-19 times.

Self-employment: Spanish shrinking areas have a very strong sensitivity for self-employment. In Spain 76% of its shrinking areas are in regions with the highest share of self-employed people, whereas only 42% of regions belong to the same category. Very interesting cases emerge when we invert the focus to lower vulnerability. Hungary, Ireland and especially France have the opposite picture where shrinking areas tend to be in regions with lower sensitivity to self-employment.

Youth unemployment: Belgium stands out in this attribute, with 60% of its shrinking areas in the highest category, whilst only 27% of its regions have a higher share of youth unemployment. When twisting the argument, Austria and Slovakia reveal the opposite trend with 100% vs 66% and 48% vs 25% of shrinking areas in the lower sensitivity category.

People at risk of poverty or social exclusion: a misalignment emerges for people at risk of poverty. Romania, Italy, Hungary and Spain all range between 20% and 15%. Poverty and social exclusion emerge as a recurring factor for shrinking areas within Member States.

Cross-border employment: there is a neat incidence of cross-border sensitivity in shrinking areas for Belgium, France, the Netherlands and Slovenia. In these cases, the excess incidence with respect to the regional distribution is around and above 20% (35% for Belgium).

The table below summarises the results of the analysis within countries and across sensitivity attributes. The name of a country in the table signals the presence of high interregional disparities for the location of shrinking areas. These are concentrated in high sensitivity regions with respect to the normal distribution of regions within the country.

Table 18: Hotspots of higher sensitivity for shrinking areas compared to the distribution of regions in a country.

Shrinking area sensitivity to Covid-19 restrictive measures	**1st range most interregional disparities**	**2nd range most interregional disparities**	**3rd range most interregional disparities**
Employment in risk sectors	Ireland	Denmark	Netherlands Portugal
Reliance on Tourism	Italy	Ireland	
Reliance on International trade	Belgium	Ireland	Slovenia
Regional GDP	Lithuania	Italy	Slovenia
Government quality	Poland	Italy	
Risk of poverty and social exclusion			
Employment in micro-enterprises	Finland	Hungary	
Self-employment	Spain		
Youth unemployment	Belgium		
Cross-Border employment	Belgium	France	Netherlands Slovenia
Combined sensitivity index	**Greece**	**Ireland**	**Italy** **Czech Republic**

Source: own elaboration based on multiple statistical sources.

The overview of frequencies suggests that Italy (4), Ireland (4), Belgium (3) and Slovenia (3) have higher interregional disparities on the location of shrinking areas. These are often in regions with specific vulnerabilities to the potential negative impacts of Covid-19. There is a disproportionate concentration of highly sensitive shrinking areas than the national distribution would suggest. Such interregional imbalances hint at the need to differentiate the injection of resources, and the need to allow for place-sensitive design of policy measures.

Conclusions

The following key observations emerge from the presentation of analytical results on interregional disparities in the sensitivity of shrinking areas to Covid-19 restrictive measures:

- Shrinking areas in general are not disproportionally located in higher sensitivity regions (combined index) within Member States. The data suggests that shrinking areas have an average vulnerability to Covid-19 restrictive measures compared to other territories in the same country. Some macro geographical patterns emerge with shrinking areas in Central European countries being more often located in regions where vulnerability to Covid-19 is lower compared to other regions in the same country.
- There are territorial patterns of higher sensitivity in the interregional comparison for most attributes. For instance, shrinking areas are more often located in regions where economic productivity (GDP) and poverty or social exclusion are a highly sensitive topic compared to other regions in the country (as seen above for Lithuania, Italy, Slovenia, Slovakia, Portugal and Romania). Similar patterns are observable for almost every attribute, though with fewer countries showing disparities. These results suggest that even though sensitivity is generally lower for shrinking areas, there are exceptions and peaks of vulnerability accentuating internal disparities within most countries.

Geographical specificities in the relationship between Covid-19 and shrinkage are marked. Not only between Member States, but also within them, territorial disparities stand out. Within some countries, the location of shrinking areas is disproportionately concentrated in regions highly sensitive to Covid-19 restrictive measures. This includes too many shrinking areas in vulnerable regions, too few in less vulnerable regions (as seen above, e.g. Greece, Ireland, Italy and the Czech Republic). In other countries though, the situation is inverted, with shrinking areas less vulnerable to potential negative impacts (as seen above, e.g. Austria, Croatia and Hungary). These disproportions highlight other geographical insights when we look at each

sensitivity attribute (as commented above). The results share a common denominator that the link between potential negative impacts of Covid-19 and shrinkage is characterised by a strong place-specificity and unseen cross-national to interregional territorial patterns.

This layer of investigation has two shortcomings:

- In the countries with very few regions (or even just one) this layer of investigation is less interesting, due to a lack of variability among regions. However, this does not create misinterpretation or validity issues. It only reduces the extent and number of countries where this layer of investigation adds significant information.
- The results can be proxies of the impacts of Covid-19 restrictive measures on shrinkage at European level. The robustness of the results is significantly reduced for a specific municipality within a specific region. This lower significance means the presentation of results does not proceed to a lower spatial scale. A case-study approach would be needed to reach more specific conclusions at this level.

Overall, these two limitations should not create a bias in the interpretation of results as long as they are correctly framed in the research design. The analysis intends to answer research question 2.1 *What are the potential territorial impacts of Covid-19 restrictive measures on European shrinking areas?* also by capturing territorial differences across European territories. The results should feed a European policy debate on shrinkage which would inevitably include a degree of generalisation. The scope of the research remains at EU27 level and the findings should not privilege one territory over another. An investigation is needed though, to provide knowledge about the different socio-economic profiles of shrinkage and vulnerability to Covid-19 restrictions, transcending the regional and national levels.

4.5 Sensitivity to potential positive impacts of restrictions

This section investigates the sensitivity of European shrinking areas to potential positive impacts of the crisis asking how they are positioned for rapidly changing workflows and communication modes. As new job conditions and new routines emerge, shrinking areas might offer new opportunities, or face the need to tackle (digital) infrastructure gaps. Areas with high sensitivity, (i.e. potential to benefit), might have advantages for their recovery. At the same time, regions with low potential to benefit from changing economic conditions due to Covid-19 policy responses are likely to face additional structural challenges in the recovery process.

In fact, the interpretation of sensitivity is inverted here. Contrary to the previous subchapter, higher sensitivity here means above average potential to benefit from recovery.

Shrinkage is intertwined with the recovery phase and if shrinking areas are located in regions where structural conditions are favourable for new trends resulting from the pandemic, this can be a turning point in their development, with long lasting effects. Seizing the opportunities that the recovery is expected to offer could be a way to invert the negative spiral, reducing gaps with more prosperous and attractive places. If shrinking areas are not well positioned in such structural variables, it rings yet another warning call for targeted interventions.

The data analysis adopts the modalities outlined above for negative sensitivity between countries. To improve the reading there is a similar 'control' for the distribution of regions across sensitivity classes. This describes the percentage of regions (in the total number of EU27 NUTS 2 regions) pertaining to each of the three classes for sensitivity to positive impacts. By computing a ratio between the share of shrinking areas in one category, and the share of regions in that category, it is possible to have a better feeling for the position of shrinking areas. Are shrinking areas more sensitive to the positive impacts of Covid-19 than the European average? Is there a particular attribute where shrinking areas are particularly sensitive?

The relative position of shrinking areas with respect to all European territories is displayed in the table below. The closer the ratio is to 1, the more shrinking areas are aligned with the overall distribution of sensitivities, suggesting no significant imbalances. In the positive impact analysis, unlike the interpretation of negative impacts, a ratio of higher sensitivity below 1 means that shrinking areas are comparatively less well positioned, due to their regional context, to benefit from the new trends induced by Covid-19 restrictive measures. Vice versa, if the ratio is above 1, the location has more favourable structural conditions than the European average.

Table 19: Sensitivity of shrinking areas to potential positive impacts of the pandemic.

Indicator	Ratio lower sensitivity	Ratio medium sensitivity	Ratio higher sensitivity
Employment in information and communication	1.23	0.99	0.52
Broadband access	1.41	1.07	0.59
Smart working preparedness	1.11	0.59	0.56
Online interactions with public bodies	1.64	0.85	0.64

Combined sensitivity	**1.49**	**0.99**	**0.53**

Source: own elaboration based on multiple statistical sources.

The results of this cross-analysis reveal a strong statistical finding. Shrinking areas have ratios far below 1 in all the sensitivity attributes considered, as well as in the combined sensitivity index. Whereas for negative impacts the picture was much more nuanced, showing a substantial alignment between shrinking areas and the rest of European territories or sometimes even less vulnerability, the sensitivity to positive impacts seems negative for shrinking areas. They are consistently located in places where structural conditions, notably digital infrastructure and online service preparedness, are among the lowest for European regions. Such structural conditions create a gap from other European territories in sensitivity to the potential positive impacts of the pandemic. Online interactions with public bodies and access to broadband connections are of particular concern. This casts some clouds on the resilience of shrinking areas to react and adapt to Covid-19 trends, and their preparedness for recovery.

Digitisation is a key challenge. As of today, it is as a consistent vulnerability for shrinking areas in the crisis and beyond. The low levels of digital infrastructure are significantly more pronounced in shrinking areas than the European average. Digitisation is a primary ambition and objective of the European Commission (European Commission 2012), a warning call is dialled in the context of shrinking areas. Infrastructural gaps exist and indicate a need for targeted interventions, to avoid that the fracture widens and such places (25% of all European municipalities) are not just *left* but *kept* behind (Davoudi 2019), or forgotten.

The next subchapter puts in relation all findings on the negative and positive potential impacts of Covid-19 restrictive measures, with statistical results on European shrinkage discussed in chapter 3. This analytical step adds a time dimension to the TIA as it enlarges the perspective on past and future shrinkage trajectories in relation to the pandemic.

4.6 Shrinking area sensitivity to Covid-19 across time

The analysis of shrinkage and Covid-19 sensitivity continues in this chapter by looking at the cross-temporal dimension of these two processes. Sensitivity to Covid-19 restrictive measures is discussed in relation to population decline in *currently shrinking municipalities* over two

time horizons: I) past-present and II) present-future[28]. Moreover, the same analysis is conducted for European territories and municipalities not currently shrinking by definition[29], but have just started or are predicted to face shrinkage in the near future: I) negative outlook municipalities and II) blind spots. These elements together offer some foresight on the diversity of shrinkage trajectories given the crisis.

Currently shrinking municipalities: 1991-2018 trajectories

Findings from the Covid-19 TIA (negative impacts) are first cross-analysed with municipalities shrinking in 1991-2018. The results of the cross-analysis are outlined in the table below in a ratio format. This highlights if, how and which type of shrinking municipality has a different pattern of sensitivity compared to the EU average.

Table 20: Sensitivity to restrictive measures and past trajectories of currently shrinking municipalities.

Shrinkage trajectories / Sensitivity to negative impacts of Covid-19	**Lower**	**Medium**	**Higher**	**Incidence by trajectory**
Positive outlook	1.19	0.92	0.79	13.7%
Discontinued shrinkage	0.85	1.01	1.26	6.9%
Late shrinkage	1.11	1.18	0.58	14.7%
Persistent shrinkage	1.08	1.01	0.86	64.3%
Distribution among sensitivity categories	**42.55%**	**31.96%**	**25.18%**	**100.00%**

Source: own elaboration based on multiple statistical sources

Moderately positive signs emerge from the cross-analysis of shrinkage and sensitivity to the negative impacts of the pandemic. Persistent shrinkage, by far the most relevant in statistical terms (64%) across the EU, is less sensitive to the negative impacts of Covid-19 than the average for EU territories of 0.86. Late shrinkage is even more positive (0.58). The sensitivity looks comforting also for positive outlook areas (0.79). The only typology displaying higher sensitivity than the EU average is discontinuous shrinkage (1.26), even though these make up only 5% of all European shrinking areas.

There is a tendency both for long-lasting shrinkage areas to be less frequently located in regions with high negative sensitivity to Covid-19 restrictive measures, this is even stronger for shrinking areas that started later. This is important, suggesting that the most tenacious

[28] The analysis is based on the results presented in chapter 3, the intensity of shrinkage.
[29] Shrinkage definition in chapter 2 and used in chapter 3.

shrinkage processes will be spared from the most problematic conditions. Instead, they can focus more resources coming from future policy responses (e.g. Next Generation EU) on structural interventions to mitigate ongoing shrinkage.

Negative impacts on currently shrinking areas: 2018-2050 trajectories

Findings from the Covid-19 TIA (negative impacts) are first cross-analysed with shrinking municipalities for 2018-2050. The relationship between future shrinkage and sensitivity to Covid-19 contribute to foresight into the cross-temporal implications of the pandemic on shrinkage. The results are outlined in the table below.

Table 21: Sensitivity to restrictive measures and future trajectories of currently shrinking municipalities

Shrinkage trajectories / Sensitivity to negative impacts of Covid-19	**Lower**	**Medium**	**Higher**	**Incidence by trajectory**
Regrowth	0.47	0.82	2.14	3%
Stabilisation	0.86	0.86	1.43	7.9%
Standard	1.07	0.87	1.06	14.4%
Intense	1.16	0.93	0.83	29.2%
Severe	1.31	0.84	0.69	19.8%
Hard	0.95	1.10	0.97	17.9%
Grand Total	**42.55%**	**31.96%**	**25.18%**	**100%**

Source: own elaboration based on multiple statistical sources

The results do not confirm the optimistic scenarios in the previous paragraph for past shrinkage. Municipalities that will initiate regrowth (3% of total shrinking cases), and those expected to stabilise (7%) display a highly disproportionate sensitivity to the potential negative impacts of Covid-19 in their territory (ratios of 2.14 and 1.43 respectively). The ratios are very high, suggesting a strong statistical robustness of these worrying implications. It seems that regrowing and stabilised municipalities are more systematically located in areas with high sensitivity to Covid-19, clouding the optimistic outlook for their future demographic trajectories.

On the other hand, shrinking areas with the worst forecast trajectories seem comparatively less sensitive to Covid-19 potential negative impacts compared to EU territories on average, Intense (0.83) and Severe (0.69) in particular. These two types represent almost 50% of all shrinking areas in the EU. Despite the mildly positive assessment for the majority of shrinking areas in

that trajectory (exceptions apply), these territories will anyway face serious issues with an increasingly negative shrinkage spiral until 2050. Moreover, previous analysis has suggested low sensitivity to the potential positive impacts of the pandemic. Taken together these signs generally cloud the moderately positive TIA for shrinkage.

Solid patterns emerge from the cross-temporal analysis of Covid-19 sensitivity and shrinkage trajectories: I) shrinking areas with regrowth and stable trends in the future, display significantly higher sensitivity to Covid-19 negative impacts. II) shrinking areas with predicted negative trends, and especially those that experienced persistent shrinkage in the past, display mildly lower sensitivity to Covid-19 negative impacts.

The cross-analysis continues investigating the sensitivity of places for potential future shrinkage: I) negative outlook cities that started demographic decline only in recent years (2011-2018); II) blind spot provinces (NUTS 3) that did not experience any population decline in the past but are predicted to start shrinking from present until 2050.

Negative impacts on areas with negative demographic outlook

Municipalities with a negative outlook do not fulfil the criteria for shrinkage today but show symptoms of being at the start of a potential shrinking process. The table below displays the results of the comparison with other European territories.

Table 22: Sensitivity to Covid-19 restrictive measures of negative outlook areas

Sensitivity of negative outlook municipalities	Lower	Medium	Higher
Risk sector employment	1.40	0.49	1.03
Tourism reliance	0.97	0.87	1.20
International trade reliance	0.96	1.01	1.08
Regional GDP	1.50	0.66	0.73
National debt	1.44	0.85	0.83
Government quality	1.28	1.01	0.71
Risk of poverty and social exclusion	1.02	1.10	0.75
Employment in micro enterprises	0.86	1.06	1.09
Self-employment	0.82	0.90	1.32
Cross-border employment	0.83	1.08	1.15
Youth unemployment	1.11	1.06	0.81
Combined sensitivity	**1.08**	**0.79**	**1.15**

Source: own elaboration based on multiple statistical sources.

The analysis reveals that negative outlook areas are partially aligned with the shrinking area patterns observed earlier. The combined sensitivity measure suggests a small tendency for negative outlook areas to be located in places highly sensitive to Covid-19 negative impacts. However, the results are extremely varied for the individual attributes of sensitivity. Regional GDP (1.50) is the most important factor for negative outlook municipalities, just as it is for shrinking areas. In a similar way, governmental quality (1.28) also tends to be poorer in negative outlook cities than the rest of Europe. Then, two very interesting finding emerge. Self-employment (1.32) and the reliance on tourism sector (1.20) stand out as prominent factors for negative outlook municipalities than in other European territories. Both attributes of Covid-19 sensitivity are inverted when we analyse already shrinking areas (0.85 in both cases).

Negative outlook municipalities are generally aligned with shrinking areas for Covid-19 negative impacts, with vulnerability in regional productivity and governmental quality. However, a partially different socio-economic profile emerges where self-employment and tourism make negative outlook areas more vulnerable to Covid-19 restrictive measures. The next section focuses on blinds spots of future shrinkage in relation to the crisis.

Negative impacts on blind spots of future shrinkage

Considering the disruptive effects of Covid-19 on society, the crisis is likely to influence the future outlook for these territories. Depending on their sensitivity to negative impacts of the restrictive measures, their future development priorities may also change.

Table 23: Sensitivity to Covid-19 restrictive measures of blind spots of future shrinkage

Blind spots of future shrinkage	Lower	Medium	Higher
Risk sector employment	0.41	0.47	2.05
Tourism reliance	0.65	1.45	0.91
International trade reliance	1.57	0.63	0.61
Regional GDP	0.30	0.64	2.01
National debt	0.16	2.43	0.28
Government quality	0.34	0.17	2.30
Risk of poverty and social exclusion	1.02	1.33	0.42
Employment in micro enterprises	1.96	0.25	0.35
Self-employment	1.91	0.46	0.38
Cross-border employment	1.04	1.21	0.54

Youth unemployment	1.91	0.03	0.42
Combined sensitivity	1.59	0.57	0.81

Source: own elaboration based on multiple statistical sources

The analysis for this particular group of territories reveals a neat scenario. Where shrinkage will become a reality in the coming years, sensitivity to the Covid-19 crisis is predominantly low. It means that these territories are less exposed to the risks and uncertainties of the restrictive measures thanks to their structural characteristics and socio-economic profiles. Being in the lower sensitivity class is consistent for all attributes of sensitivity. This reinforces the idea of low vulnerability for these territories compared to shrinking areas, negative outlook areas, and the average of all European territories.

Only one sensitivity component stands out: employment in risk sectors. Also, here the significance seems strong both in statistical terms, with a ratio of 2.05 to all other European regions', and for its implications. Employment in risk sectors constitutes one of the most important elements in the current assessment of sensitivity as it covers a wide range of the economy and jobs are an essential element for people's wellbeing, as well as a non-optional element for a prosperous recovery. Risk in employment may also be subject to structural effects and longer-term adjustments, as was the case during the financial crisis. Considering this important vulnerability, the positive scenario is partially clouded. Whilst blind spots of future shrinkage tend to be spared the hardest consequences of Covid-19 restrictions, their economic and industrial fabric threatens their mid- to long-term development perspective. Employment shocks are a particular worry for shrinkage context, as they may accelerate the social and demographic decline that is expected in the coming years. Nevertheless, strikingly higher quality of government emerges as a particularly positive aspect in the assessment, and an element of profound differentiation from already shrinking areas.

4.7 Conclusions

The TIA has shed light on the potential impacts of the Covid-19 restrictive measures in shrinking areas. The possibility to cross-analyse the geographies of shrinkage with territorial sensitivities to Covid-19 (and the details of its socio-economic attributes) has unveiled some specificities of shrinking areas for the recovery phase, compared to the rest of EU territories.

Whilst for some aspects shrinking areas are aligned with the general distribution of regional sensitivities across the EU, numerous specificities characterise the regional context of European shrinking areas. The results indicate three main interpretative lenses to understand their distinctive features in sensitivity to Covid-19 restrictive measures: I) **thematic** sensitivities differentiating shrinking areas in the crisis; II) **geographic** patterns and hotpots on the location of shrinking areas between EU countries and within them across regions; III) **cross-temporal** specificity when looking at shrinkage trajectories and their intensity vis a vis the pandemic recovery phase.

Thematic sensitivity implications

Shrinking areas have higher vulnerability to Covid-19 restrictive measures due to poorer governance quality, lower economic productivity, and precarious social conditions. When compared to other EU territories, shrinking areas more often have low quality of government, lower GDP and a higher share of people at risk of poverty and cross-border employment. Moreover, shrinking areas have a consistent gap in digital infrastructure and low preparedness to adopt digital working, also in public institutions. These are a necessary ingredient in the new normal, digital infrastructure gaps need to be filled with prioritised interventions to avoid widening the gap between shrinking areas and other territories. The assessment of potential positive impacts reveals structural disadvantages to benefit from the new digital normal.

Geographic pattern implications

Regional contexts matter, and the scattered pattern of sensitivity components highlights the need to include place-specific information in the design of policy responses. The location of shrinking areas shows territorial imbalances both between EU countries and within them, in the sensitivity to Covid-19 potential impacts (negative ones in particular). Specific sensitivity aspects emerge for different countries and regions at varying intensities. The high diversity of contextual factors generate disparities between EU countries, but also within them (interregional) vis a vis Covid-19 restrictive measures. Italian shrinking areas have the most vulnerability aspects towards Covid-19. Shrinking areas in Central European countries display a tendency to be mostly spared the worst consequences of the restrictive measures. Eastern European countries (Poland and Romania in particular) stand out for several sensitivities, but are less vulnerable for others. Notwithstanding some thematic exceptions, Scandinavian and

Baltic countries are aligned to the European average for potential negative impacts. Italy, Belgium, Ireland and Slovenia display the highest interregional inequalities for shrinking areas within their borders.

Cross-temporal implications

Shrinking areas with intense episodes of population decline show lower sensitivity to negative Covid-19 impacts. This is a potential element of comparative advantage when designing the strategy addressing structural issues for longer term sustainable development. However, important elements of vulnerability emerge from the analysis, as discussed thematically. These may hamper potential convergence, together with general unpreparedness for the digital shift. On the opposite side, shrinking areas with regrowth and stable trends for the future, have significantly higher sensitivity to Covid-19 negative impacts. This rings an alarm bell to carefully consider the design of local responses to mitigate impediments to the forecast positive trend. Blind spots of future shrinkage tend to be spared the worst effects of Covid-19. This could be an advantage in setting up the recovery strategy to mitigating the predicted decline. Nonetheless, blind spots have a particularly vulnerable situation for employment in the sectors most damaged by Covid-19 restrictions, which poses questions on their reactive capacity. However, they have very high quality government compared to already shrinking areas.

The TIA on potential negative and positive impacts of Covid-19 restrictive measures on European shrinking areas reveals a scattered picture of territorial imbalances. Significant variations between countries, and within them across regions, are observed for the vulnerability of shrinking areas to the pandemic.

The results point in two different directions, which translates into different positions for future perspectives. Areas more intensely affected by shrinkage appear comparatively less vulnerable to the worst consequences and can pool resources to design recovery strategies addressing the structural factors causing shrinking. At the same time, they are confronted with intensely negative demographic projections and non-preparedness for the digital trends induced by the pandemic. On the other hand, shrinking areas on promising future demographic paths (regrowth or stabilisation) are expected to face the highest tolls from Covid-19 restrictive measures. Sensitivity to potentially positive impacts does not look better than other shrinking areas either. Covid-19 restrictions are expected to either keep or widen territorial inequalities

between shrinking areas and other European territories. Exceptions and confirmations of this general line apply across shrinking areas.

To conclude, it is now possible to formulate a concise answer to the research question outlined in chapter 1: *what are the territorial impacts of Covid-19 restrictive measures on European shrinking areas?* Results discussed in this chapter show that shrinking areas are spared from the worst socio-economic consequences of pandemic restrictions in the short term. However, their negative demographic trajectories, vulnerability from lower quality government and lower economic productivity, and their consistent structural digital divide seriously endanger medium and longer-term development prospects. The territorial impact of Covid-19 restrictive measures is neutral today, but specific aspects of vulnerability are predicted to worsen in the longer term, widening territorial inequalities for shrinking areas.

5 Territorial Impact Assessment of the Just Transition Fund for shrinking areas

The research investigates whether shrinking areas have good territorial capital and favourable socio-demographic preconditions to turn the Just Transition Fund into the major opportunity for revitalisation and restructuring it promises to be. The answers to this research question reveal promising socio-economic aspects that might become drivers and catalysts of the transition as well as weaknesses that might be obstacles to the transition. The benefits from deep industrial transition triggered by the Just Transition Fund may transcend specific policy goals. Beneficial spillovers may impact society at large and direct or indirect effects are expected for structural conditions of shrinkage (outmigration, ageing population, unemployment, unattractiveness).

The methodology is expected to unpack the relationship between shrinkage and the Just Transition Fund. In a broader perspective, it also offers a first glimpse of shrinking areas facing environmental challenges and the energy and industrial transition that should take off in this decade. Bringing together exposure and sensitivity enables a first understanding of potential impacts of the Just Transition Fund in shrinking areas of the EU.

In this particular case, and unlike Covid-19, we are dealing with a place-based policy. The place-based element is determined by agenda setting at the very beginning of the policy cycle. In fact, the Just Transition Fund is designed specifically for territories with carbon intensive industries to favour their transition[30]. In such a policy approach, the concept of exposure is subject to different interpretations and, consequently, a different methodological step is illustrated in the dedicated section below.

This chapter starts by describing the territorial implications of the Just Transition Fund and the methodology applied to answer the research question while also illustrating the conceptual framework. After the assessment of exposure, the chapter focuses on the medium to long-term perspective and to anticipate potential impacts of the measure, territorial sensitivity is central. The exposure and sensitivity assessment highlights the diversity of territorial impact across the

[30] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. PE/5/2021/REV/1 *Official Journal L 231, 30.6.2021.*

EU, through geographical and thematic patterns. These results are discussed in relation to future demographic outlooks for currently shrinking areas. To conclude, five examples of regional snapshots add a local focus to the EU-wide comparative framework.

5.1 Territorial implications, exposure and scope of the assessment

The Just Transition Fund was agreed in November 2020 by the Commission, the European Parliament and EU Member States in the Council, and officially adopted with a regulation in June 2021[31]. It is part of the European Green Deal framework through which the EU aims to cut greenhouse gas emissions by at least 55% by 2030 and achieve climate neutrality by 2050. The principles, objectives and operational design of the Just Transition Fund (criteria, modes of implementation) already have territorial implications (European Commission 2020b). The policy aims at supporting EU regions most affected by the transition to a low carbon economy, as the achievement of environmental targets will require radical socio-economic transformations (European Parliamentary Research Service 2020a).

The policy has a territorial dimension as it introduces criteria that are based on the environmental and socio-economic characteristics of different places (emissions and employment in coal-related sectors). Thus, the design influences implementation and the impact of the Fund across the EU[32].

The Just Transition Fund support will be available at the level of NUTS 3, with the allocation criteria targeting areas with serious transition challenges from high employment in the fossil fuel sector and high industrial emissions. Annex I to the regulation[33] lays out the allocation method for resources under the Just Transition Fund, which helps identify ex-ante which territories will be selected. While all Member States can access funding, the method ensures a

[31] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. PE/5/2021/REV/1 *Official Journal L 231, 30.6.2021.*

[32] Some controversies concerning the territorial implications have already been anticipated. The pre-allocation formula of the Fund is based on NUTS 2 data whereas the Territorial Just Transition Plans (providing an outline of the transition process until 2030, another interesting element of ex-ante territorial thinking) consider NUTS 3 regions as the appropriate territorial level. This inconsistency implies that NUTS 3 regions with carbon-intensive industries risk not being taken into consideration for the Just Transition Fund because their regional specificities are considered at the NUTS 2 level (Böhme et al. 2020a; Cameron et al. 2020).

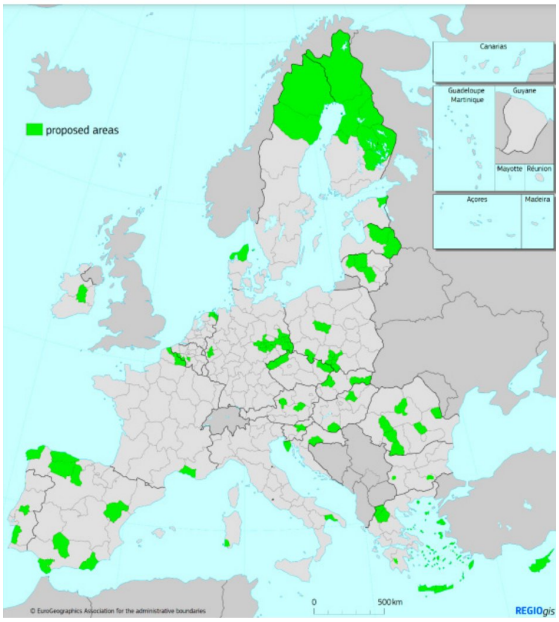
[33] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. PE/5/2021/REV/1 *Official Journal L 231, 30.6.2021.*

concentration of funding on regions with the biggest challenges resulting from the transition. Funding for each Member State is equally weighted on two pillars: I) economic[34] and II) social[35].

The allocations are further adjusted to ensure that no Member State receives funding in excess of €8 billion and that all Member States reach at least the minimum per capita aid intensity. Adjustments up or down are made on the basis of a Member State's per capita GNI in relation to the EU-27 average (European Parliamentary Research Service 2020b).

Despite the potential inconsistency between NUTS 2 allocation and NUTS 3 implementation in specific places thanks to place-based objective criteria (Cameron et al. 2020), it has been possible to identify territories where the Just Transition Fund will be activated. In the figure below, these are highlighted in green.

Map 7: Proposed territories eligible for the Just Transition Fund



Source: European Commission (2020).

[34] 49%: Green House Gas (GHG) emissions of industrial facilities in regions where the carbon intensity of those emissions exceeds the EU average; including 0.95% production of peat and 0.05% production of oil shale.
[35] 25%: Employment in mining of coal and lignite; 25%: Employment in industry in regions where the carbon intensity of emissions exceeds the EU average.

The territories highlighted in green are NUTS 3 areas that fulfil the social and economic criteria and have been agreed by Member States and the European Commission to be beneficiaries of the Just Transition Fund.

The assessment of exposure for the Just Transition Fund is non-discretionary, with the current information on allocation criteria. For other spatially blind policies, exposure is driven by assumptions and a scientific methodology to depict the likelihood of a territory being included in the policy. For a territorially targeted instrument the policy design formally identifies the targeted areas ex-ante. The Just Transition Fund provides allocation criteria that distributes funding to specific territories that are economically and socially reliant on coal-related industries that it intends to phase out (European Commission 2020b). This place-based approach translates into indicators and requisites that territories have to strictly fulfil to benefit from the Just Transition Fund. In such a policy context the concepts of exposed territory and beneficiary coincide from the design phase.

Exposure of shrinking areas to the Just Transition Fund

The formally defined territorial scope of this policy facilitates the assessment of exposure. To assess the exposure of shrinking areas to the Just Transition Fund it is sufficient to cross analyse the sources of geographical information for these two elements:

- The coded location of all shrinking municipalities in the database at LAU 2 level.
- The coded location of NUTS 3 regions formally identified for the Just Transition Fund.

The cross analysis on the location of these two types of territory returns matching codes that identify shrinking areas that will benefit from the Just Transition Fund. With this simple statistical processing, it is possible to discuss how many shrinking areas are exposed to the policy and where these are located.

- 780 or 18.8% of all European shrinking municipalities will benefit from the policy.

The spatial analysis of exposure also reveals where the shrinking LAU 2 units are located. This information is available at country, regional and provincial level, which defines the allocation criteria. The paragraph below illustrates the findings of this geographical analysis by indicating the areas with more shrinking areas that will benefit from the Just Transition Fund.

Country level

In absolute terms the countries with more shrinking areas that can benefit from the Just Transition Fund are Germany, Poland, Romania and Spain, all with around 100 LAU 2 units. Nevertheless, it is interesting to take a relative measure into account. This measure (expressed in % in table 24) reveals the share of the country's total shrinking municipalities that are exposed to the policy. This tells us more about the potential impact and how big the opportunity of the Just Transition Fund is for shrinkage in different EU countries. In relative terms, Finland (44%), Belgium (43%), Latvia (41%) and Spain (37%) seem to get greater opportunities for tackling shrinkage through the green transition. Slovakia, Sweden and the Czech Republic also have some 30% of their shrinking areas exposed to the Just Transition Fund.

Regional level

The analysis of exposure also returns important results at regional scale. Across the EU some regions are particularly relevant as they combine significant shrinkage with a green transition fuelled by the Just Transition Fund. In absolute terms, the following European regions have the most shrinking municipalities within their Just Transition Fund territory:

- Slaskie region in Poland has the most with 58 shrinking LAU 2 units facing the Just Transition Fund opportunity. Dolnlnoslaskie in Poland also has a lot with 38 LAU 2 units.
- Pohjois- ja Itä-Suomi region in Finland has the second highest incidence with 51 shrinking municipalities exposed to the Just Transition Fund.
- In France, Nord-pas-de-Calais has the third highest incidence with 46.
- Germany is an interesting testing field for the impacts of the Just Transition Fund on shrinkage dynamics. Sachsen-Anhalt (38), Dresden (28), Leipzig (25) and Brandenburg (25) are all regions where shrinkage will go side by side with the energy transition in many municipal units.
- In Spain, Galicia (37) and Asturias (25) are the two (neighbouring) regions where shrinkage will be significantly intertwined with the transition.
- In Romania, Sud–Muntenia (37) and Sud-Vest Oltenia (30) also have considerable shrinkage and exposure to the Just Transition Fund.

The table below illustrates the exposure of shrinking areas to the Just Transition Fund across countries. Data are displayed both in absolute terms (number of municipalities) and in relative terms (share of all shrinking municipalities). The fourth column shows regions with the most

shrinking areas exposed to the policy. The joint reading of these regions reveals where in Europe shrinkage will be closely intertwining with Just Transition processes.

Table 24: Spatial distribution of shrinking areas exposed to the Just Transition Fund.

Country	Number of shrinking municipalities exposed to the policy	Share of total shrinking municipalities per country	Regions with shrinkage challenges and Just Transition Fund
Austria	5	17%	Steiermark (AT22)
Belgium	3	43%	Prov. Hainaut (BE32)
Bulgaria	14	6%	Yuzhen tsentralen (BG42)
Czech Republic	51	30%	Severozápad (CZ04 & Moravskoslezsko (CZ08)
Germany	118	14%	Dresden (DE02), Leipzig (DE05) & Sachsen-Anhalt (DEE0)
Denmark	7	16%	Nordjylland (DK05)
Estonia	5	14%	Country level
Greece	17	20%	Notio Aigaio (EL42)
Spain	90	37%	Galicia (ES11) & Principado de Asturias (ES12)
Finland	51	44%	Pohjois- ja Itä-Suomi (FI1D)
France	50	11%	Nord-Pas-de-Calais (FRE1)
Croatia	11	10%	Kontinentalna Hrvatska (HR04)
Hungary	12	7%	Dél-Dunántúl (HU23) & Észak-Magyarország (HU31)
Italy	14	3%	Sardegna (ITG2) & Puglia (ITF4)
Lithuania	19	34%	Vidurio ir vakaru Lietuvos regionas (LT02)
Latvia	29	41%	Country level
Netherlands	9	22%	Groningen (NL11)
Poland	107	14%	Slaskie (PL22) & Dolnoslaskie (PL51)
Portugal	10	6%	Centro (PT16)
Romania	101	26%	Sud – Muntenia (RO31) & Sud-Vest Oltenia (RO41)
Sweden	26	29%	Övre Norrland (SE33) & Mellersta Norrland (SE32)
Slovenia	6	16%	Vzhodna Slovenija (SI03)
Slovakia	25	31%	Západné Slovensko (SK02) & Východné Slovensko (SK04)

Source: own elaboration based on European Commission allocation criteria for the policy and statistical sources in chapter 3 (Eurostat and BBSR)

In the next sections the territorial focus is limited to the shrinking areas exposed to the Just Transition Fund. This is a necessary step to assess ex-ante the potential impacts strictly related to this policy, and do not concern the remaining 81.2% of European shrinking areas. Nonetheless, these figures are the first component to determine the impact of the policy on

shrinkage, which is limited to 18.8% of areas in Europe overall. The next section dwells on the qualitative aspect of potential impacts, by analysing territorial sensitivity.

To conclude, exposure investigates to what extent and where in the EU shrinking areas will have access to the Just Transition Fund. Sensitivity shows whether it is likely that these territories will have beneficial effects beyond the environmental targets.

5.2 Multicriteria sensitivity to the Just Transition Fund: methodological choices

Whilst the analysis of exposure answers the main research question solely in quantitative terms, sensitivity opens the floor for qualitative and content related discussion on potential impacts of the Just Transition Fund on shrinkage. Exposure tells us *if* shrinking areas will be included in the policy, sensitivity tells us *how* they can (or cannot) benefit from it.

The concept of sensitivity investigates whether a specific territory has promising territorial characteristics to profit from a policy, thus fostering development. Development is a broad concept, subject to many perspectives, drivers and objectives. Defining this concept goes beyond the goal of this thesis and this specific study on the Just Transition Fund. This analysis concentrates on whether shrinking areas display favourable conditions and fertile ground to activate a successful green transition. At the same time, the dissertation looks to include information about the degree of shrinkage related issues to assess whether the drivers of decline are structurally rooted or not.

This assessment follows the logic behind policy objectives for the Just Transition Fund to help transform the socio-economic fabric of territories that heavily rely on outdated and polluting industries. Such a deep transformation process may have spill over effects on employment, diversification, attraction and social conditions that transcend the environmental targets set by the policy and these may have highly beneficial effects on shrinkage. The Just Transition Fund can be a game changer for at least some shrinking areas, or yet another unfocused instrument with limited potential and feeble chances of success for others.

Shrinkage, its complexity, but most of all its diversity, is often overlooked in European policy measures and territorial cohesion debates (Bernt et al. 2014; Pazos-Vidal 2021), as is the case for the Just Transition Fund. However, shrinkage is a cross-cutting societal trend that can

influence the implementation of all policies, and the likelihood that these attain their objectives. Conversely, policies that do not target shrinkage like the Just Transition Fund and the underlying environmental transition, will have an impact on its dynamic as well (Böhme and Lüer 2017). The links between shrinkage and other policy objectives seem particularly relevant. In this case, the analysis investigates whether these areas have territorial capital (Camagni 2008; Capello and Nijkamp 2009) allowing them to exploit the Just Transition Fund for a wider societal benefit. Sensitivity could answer this question through a quantitative tailored investigation of territorial capital vis a vis the Just Transition Fund.

The scope of the sensitivity analysis focuses on the shrinking areas that will be exposed to the Just Transition Fund. The aim of this assessment is to compare and discuss the conditions of shrinking areas with respect to other territories in the EU. This approach should answer the research question as it addresses development potential induced by a policy which does not take into account shrinkage. From the policy perspective all territories covered by the Just Transition Fund should have enough development potential, as implementation is remitted to local institutions[36]. The interest of this chapter is to investigate whether this includes shrinking areas. Do they have the same opportunities? or does the Just Transition Fund risk creating new or greater disparities between shrinking and non-shrinking areas?

The comparative analysis underlying the sensitivity assessment is therefore benchmarked with the average of all EU territories for each indicator. This comparative framework between shrinking areas and EU averages is considered the most informative for the scope of the research and is the reference point for the comparison.

Methodology: Multicriteria analysis of sensitivity

In a broader interpretation, the sensitivity analysis gives a detailed picture of shrinking areas compared to other EU areas, at the start of the green transition process. To produce a comprehensive picture, the analysis takes into account the links between shrinkage structural problems and Just Transition Fund objectives. Therefore, the methodology for this sensitivity assessment needs an additional layer than the one presented in chapter 4 for the Covid-19 TIA.

[36] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. PE/5/2021/REV/1 *Official Journal L 231, 30.6.2021.*

Sensitivity is built around two pillars assessing shrinkage conditions and the Just Transition Fund pre-conditions. In this cross-analytical framework, each pillar is sustained by indicators assessing thematic criteria. The analysis of sensitivity, unlike standard TIAs (Essig and Kaucic 2017), introduces the multicriteria approach in the concept of sensitivity (two pillars – two criteria) and in the use of the two pillars with data selection (multiple thematic categories – multiple criteria). To sum up, the assessment of sensitivity is run through a multicriteria analysis (Dodgson et al. 2009; Kubal et al. 2009) based on the most relevant indicators for each pillar. In the following section each pillar is unpacked with a brief description of the indicators.

Pillar I: Degree of structural shrinkage

The first pillar of the sensitivity analysis assesses shrinkage conditions from a demographic and socio-economic perspective. As previously outlined the objective is to understand how much shrinkage is a rooted structural issue of the shrinking area exposed to the Just Transition Fund. The following paragraphs illustrate the choice of indicators and their role in this analytical framework.

Crude rate of net migration

Outmigration is the primary demographic indicator to assess shrinkage in previous European analyses (Wolff and Wiechmann 2018). It captures a very representative cause and symptom of shrinking areas. The crude rate of migration covers the flow of working age people, most often younger people, who are forced or induced to relocate due to a lack of opportunities related to their (lack of) job situation (Copus et al. 2020; Hospers 2011), or sometimes a lack of basic services (ESPON 2018a). In this thesis the crude rate of net migration describes outmigration and is the difference between the crude rate of population increase and the crude rate of natural increase. This means that net migration is the part of population change not attributable to births and deaths. Instead of using single year data, the average for 2009-2018 has been used. The ten-year average is better at capturing an ongoing trend and mitigates very frequent yearly outliers at sub-regional level.

Generational dependency ratio

Whilst the net migration rate assessed non-natural population change, the second indicator for the demographic component of sensitivity captures the natural population change. Aging population is cited in recent shrinkage debates as an important component of the negative trend

(Jarzebski et al. 2021; Wichowska 2021), and has been part of the debate since its onset (Hollander et al. 2009; Pallagst et al. 2009; SCiRN 2008), including in European comparisons (Wolff and Wiechmann 2018). This dissertation uses a slightly different composition of the indicator than the age dependency ratios provided by Eurostat. The indicator is the ratio between people over 60, and people age 0-19 years.

This sensitivity assessment is tailored to the policy but, unlike other indicators which typically consider all working age (15-64) people together, it emphasises young people, in education or just entering the job market. The choice has two reasons: I) it emphasises the intergenerational disproportion between retired persons and new workforce in shrinking areas; II) in the logic of the Just Transition Fund, workers over 60 (and often in coal related industries), might not be ideal candidates to steer this radical transition. Such a paradigm change requires a good share of young learners whose education is already based on the principles of the transition.

GVA per inhabitant

Gross Value Added (GVA) captures the economic productivity of sub-regional areas. GVA is the difference between gross output and net output and measures the output of the sub-region, less intermediate consumption. GVA is preferred to GDP because it shows how much economic value is added (or lost) in a particular territory (NUTS 3), mitigating the influence of tax location choices and capital movements. In this perspective it is a better measure of the health of the local real economy, more informative about the basis on which local economies start their transition. The GVA data has been compared with the sub regional population to make it comparable across NUTS 3 areas in the EU.

Long term unemployment

A measure of unemployment complements the socio-economic side of pillar I. *Long term unemployment* is preferred to other measures following the same tailored approach to the research question. Shrinking areas are often associated with a lack of employment opportunities which are not relatable to volatility or temporary shocks on the job market (Hoekveld 2012; Wolff and Wiechmann 2014). The objective of this pillar of the sensitivity assessment is to assess structural shrinkage conditions to other EU territories. Moreover, areas that still rely heavily on coal industries may have started to directly or indirectly feel affected by the initial steps of phasing out in the job market (Rolčíková et al. 2014), which will be

accelerated by the Just Transition Fund. In accordance with the research objectives and to assess the abovementioned hypotheses, the *long-term* unemployment measure is more fitting.

People at risk of poverty and social exclusion

To emphasise social conditions, a measure of social distress has been introduced in the first pillar of the sensitivity analysis. The indicator (people at risk of poverty and social exclusion) also follows the results in chapter 4, as poverty is an element of vulnerability for shrinking areas. The measure of people at risk of poverty and social exclusion offers a picture of the local level of social disparities. These social disparities are particularly relevant in assessing how much shrinkage has become a structural issue, as literature has pointed out the intrinsic nature of these disparities for shrinking areas (Fol 2012).

Pillar I: Composite indicator

The analysis of territorial sensitivities investigates the relative position of territories across Europe concerning these demographic and socio-economic features that are particularly relevant to green transition in shrinking areas. For each indicator, every shrinking municipality (LAU 2) has been assigned a category based on the score (of its spatial context at NUTS 3 or NUTS 2 level) with respect to the European average value. This way, there is an assessment for each municipality of its sensitivity for each attribute. The sensitivity is therefore expressed as Low, Medium or High. The medium category covers the interval between the average score and +/- half the standard deviation: $\left[\overline{X} - \frac{\text{ST.DEV}}{2}; \overline{X} + \frac{\text{ST.DEV}}{2}\right]$; the Lower and Higher categories occupy the remaining portions above and below the distribution. For each category scores are assigned to be measurable without altering the relative nature of the assessment: Low=0; Medium=1; High=2.

These five indicators belong to two macro categories that can be described as demographic and socio-economic. This analysis gives them equal weight equal after a simulation test proved it was hard to establish a weighting that does not influence the final results. As these indicators are tailored for shrinkage, no relative conceptual priority can be detected either.

The scores of each of the five indicators are summed to form composite indicator for Pillar I. As a result, each LAU 2 shrinking unit can have a score from 0 to 10. Based on the distribution of these scores following the method outlined above: $\left[\overline{X} - \frac{\text{ST.DEV}}{2}; \overline{X} + \frac{\text{ST.DEV}}{2}\right]$, three

categories reflect the degree of structural shrinkage: I) Non-structural (lower scores); II) Medium (interval scores); III) Structural (higher scores).

An overview of the indicators, the sources of data, and the available year can be found in the Annex.

Pillar II: Green territorial capital for the Just Transition Fund

The second pillar of the sensitivity analysis investigates territorial capital (Camagni 2008; Capello and Nijkamp 2009) that can activate a successful transition of the industrial fabric. The transition goes beyond the industrial segment and has implications for the local economy, society and the labour market. The success of such a profound transition depends on enabling and facilitating factors in the territory. The decarbonising commitments will bring about a paradigm shift in coal-dependent regions. Regions have different potential to induce structural change, caused by different levels of dependency on these industries which may exacerbate the socio-economic implications of such a paradigm shift (Iotzov and Gauk 2020).

This second pillar of the sensitivity identifies these enabling factors and defines their quantitative measurement. Then the sensitivity analysis assesses whether shrinking areas are well endowed with these features compared to the average for EU territories. This pillar has four thematic categories for factors that facilitate green and digital transitions in the economy. The four categories describe the territorial potential facing the Just Transition Fund, and highlight preconditions for policy implementation benefitting local shrinking communities. The following paragraph illustrates the indicators for each category which were inspired by recent literature on the Just Transition Fund (Cameron et al. 2020; Iotzov and Gauk 2020), and adapted for shrinking areas.

Industrial diversification

Industrial diversification captures the reliance of the local economy on mining. A preexisting diversification of the economy from mining is a better starting condition for territories to transition (Iotzov and Gauk 2020). The alternative industries can become drivers for green innovation or be social stability pillars for greater diversification. Alternative (to coal) businesses can lead the transition and catalyse investments to innovate or expand their

business; or they can act as supporting pillars of the economy while the green transition is undergoing.

Mining reliance ratio

Sectorial employment data at regional level captures the dependency on coal-related jobs and diversification of the local economy. The employment data reflects the social functions of jobs in a territory better than productivity indicators and reveals how rooted and important mining is in each local community. The indicator is calculated as the ratio between employment in mining and quarrying (numerator) and the sum of the top three employer sectors for each European NUTS 2 region (denominator). These ratios are then normalised to assess reliance on mining compared to other leading sectors. In this sense, the indicator does not tell us how diversified the economy is in absolute terms, but can reveal a lot about the presence and the relevance of alternative businesses.

Skills endowment

Skills, higher education and research are considered as both an *engine* for innovation and a *catalyst* for sustainability development. The integration of both roles is well reflected in the engagement of higher education in innovation ecosystems (Cai et al. 2020). This thematic category tries to capture the roles of skills and higher education networks to assess territorial capital in terms of knowledge endowment and labour force elasticity to facilitate uptake of the green transition.

Persons with tertiary education and/or employed in science and technology

The indicator measures the number of people with a tertiary education (university degree or equivalent) or that are employed in science and technology sectors according to the Eurostat definition (HRST metadata). This stock measure captures the level of skilled labour already locally available and the variation across EU territories. The incidence of skilled labour is measured as a share of the active population in NUTS 2 regions, enabling EU comparability.

Accessibility to universities

This sub-regional indicator shows which areas have good access to a university and those that do not. It uses data on the location of all universities, population grid statistics as well as the road network to measure the number of people who live more than a 45-minute drive from a

university. Convenient access to higher education can be an important asset for regional development and competitiveness.

Widespread access allows more people to attend university, including those who do not have the means to relocate independently to pursue university education (European Commission. Directorate General for Regional and Urban Policy. 2019). Complementing the previous indicator, university access gives an indication not only of skills already locally available, but also on the potential to further develop them. The indicator measures the share of people in the NUTS 3 sub-region that have access to a university (main campus) in less than 45 minutes.

Business dynamism and innovation

Regions with comparably good knowledge and entrepreneurial stock are likely to benefit from opportunities during a structural transformation process. However, low levels of business innovation and dynamism signal excessive dependence on incumbent industries and the need to induce a new, sustainable entrepreneurial culture (Iotzov and Gauk 2020). Literature suggest that, while the diversification required for structural change originates mostly from new establishments with non-local roots, subsidiaries of local firms are more likely to induce durable structural change in regions (Neffke et al. 2018). Moreover, intellectual property that remains unused by incumbent firms can spill over to start-ups that seek to appropriate such knowledge residuals (Acs et al. 2009).

These considerations indicate that an existing innovative business environment, supported by investments in new technology would catalyse innovation and fuel a long-term positive cycle in the local socio-economic fabric. Three indicators below assess the existing stock of entrepreneurship and innovation.

SMEs innovating in-house

This measure indicates the percentage of small and medium-sized enterprises (SMEs) with in-house innovation activities. These are enterprises which have introduced product or process innovations either themselves or in co-operation with other enterprises or organisations. Thus, the indicator measures the degree to which SMEs with new or significantly improved products or production processes have innovated in-house or in cooperation instead of adopting more widespread innovation. The inclusion of such inter-firm cooperation is particularly relevant in the context of the Just Transition Fund, which would benefit from more sustainable business

networks (Mowery et al. 1996; Ritala and Ellonen 2010). The indicator is expressed as a percentage of total SMEs firms in the region.

R&D intramural expenditure by region

This indicator collects all expenditure for Research and Development in a statistical region (NUTS 2) during 2019, and includes all sources of funds (Government, Business, NGOs, etc.). Intramural expenditure includes current costs (labour, non-capital purchases of materials, supplies and equipment to support R&D, etc.) and capital expenditure (land and buildings, instruments and equipment, computer software). Existing economic theories (Romer and Solow models) and recent literature have demonstrated the positive effect of R&D on innovation, and economic development, at least in developed and emerging countries (Guloglu and Tekin 2012). Moreover, the positive effectiveness of R&D could depend also on skills and skilled labour in a territory (Rheault 2014). Therefore, this indicator is important to complement the category *Skills endowment* in the assessment of territorial capital. The data is sourced from Eurostat and is expressed as a percentage of GDP.

Taxonomy of technological innovation

The ESPON applied research project Technological Transformation & Transitioning of Regional Economies introduced the notion of innovation islands (Capello et al. 2020). These findings are used to assess the potential coming from the adoption of technological innovation to induce more innovation across different industries. The capacity to catalyse emerging technological and innovation opportunities depends also on the adoption of technological capabilities driving previous technological 'revolutions' (Iotzov and Gauk 2020). The indicator combines information about technological development from 2000 until 2015, and divides EU regions into: I) low tech ; II) technologically falling behind regions; III) new islands of innovation; technology leader regions (Capello et al. 2020).

Green economy potential for the Just Transition Fund

Following the above considerations on the existing stock of knowledge of incumbent firms and the spillover effects of industrial environments, this category approaches the topic from a more concrete, content-related perspective. The previous category assessed the state of 'innovation health' in general terms to capture the preparedness, flexibility and adaptability of the business fabric. The green economy potential assessment further specifies sensitivity by adding the theme that is most relevant for the Just Transition Fund. The previous thematic category assessed 'physical preparedness', this one assesses local 'mental preparedness'.

Index of green economy theoretical potential

The index of green economy theoretical potential is a composite indicator encompassing different aspects that according to the authors of the GREECO study, are essential ingredients in green economy transitions (Tapia et al. 2013). The index of green economy potential captures a variety of crucial factors in the economic aspect of sensitivity to the Just Transition Fund, a perspective that is missing in the other thematic categories. The indicator is a result of the ESPON study and uses a range of data on good governance through institutions, policies and regulations, access to finance, territorial assets and physical conditions, access to environmental technology (patents), expected market demand for the green economy as well as environmental awareness and voluntary actions (Tapia et al. 2013).

Employment in circular economy

This indicator builds on the Circular Economy Territorial Consequences project (ESPON 2019a). The indicator measures employment in circular business model sectors. Circular business models facilitate the uptake of circular processes through innovative services and new forms of consumption by connecting businesses to businesses, businesses to consumers and consumers to consumers. The presence of circular business models is fertile ground for green transformation processes. It not only means there are entry points and synergies in the industrial fabric, but it also implies a specialised labour force that can train new workers for the transition. For this TIA, circular economy employment figures is compared to total employment in the region to allow comparability across EU regions.

Number of Greentech clusters per million inhabitants

This indicator relies on data in the European Cluster Observatory[37] and available in the ESPON database[38]. The indicator characterises the spatial distribution (at NUTS 2 level) of more than 170 cluster organisations, consulting organisations, national agencies, professional organisations, regional agencies, science parks and universities that are involved in green research and development covering environmental technology, bioenergy, hydrogen and fuel cells, recycling, solar energy, wind energy, eco-construction, renewable energy, sustainability, as well as water and green technology (Tapia et al. 2013). The indicator examines the existence

[37] https://ec.europa.eu/growth/industry/strategy/cluster-policy/observatory_en
[38] http://database.espon.eu/

of business clusters that can catalyse and multiply the inputs of the Just Transition Fund. Greentech clusters embody a mix of innovation, digitalisation and green economy that the policy intends to fuel. The indicator is reported per million inhabitants, by NUTS 2 region, to allow for EU comparability.

Pillar II: Composite indicator

The analysis of territorial sensitivities looks to investigate the relative territorial position across Europe in Just Transition Fund related features. For each of the nine indicators, every shrinking area has been categorised based on its score compared to the European average. This assesses the sensitivity of each area to each attribute and is expressed as Low, Medium or High. The medium category covers the interval between the average score and +/- half the standard deviation: $\left[\overline{X} - \frac{\text{ST.DEV}}{2}; \overline{X} + \frac{\text{ST.DEV}}{2}\right]$; the Lower and Higher categories occupy the remaining top and bottom portions of the distribution. For each category, scores are assigned to be measurable without altering the relative nature of the assessment: Low=0; Medium=1; High=2.

The indicators belong to one of the four thematic categories. Unlike the first pillar of sensitivity, these indicators are regrouped under parent categories and the assessment is made in two steps. In the first step the sensitivity is calculated for each category (i*ndustrial diversification, skills endowment, business dynamism and innovation, green economy potential*) following the same principle as for pillar I[39].

At this stage each shrinking area exposed to the Just Transition Fund has an assessment (Low=0; Medium=1; High=2) for each of the four thematic categories. To obtain a composite sensitivity, the categories are summed with an equal weighting. Based on the distribution of these scores following the method outlined above: $\left[\overline{X} - \frac{\text{ST.DEV}}{2}; \overline{X} + \frac{\text{ST.DEV}}{2}\right]$ results in a measure of sensitivity that assesses Just Transition Fund territorial capital. In this way the second pillar sensitivity reveals if each shrinking area has: I) Low potential (lower scores); II) Medium potential (interval scores); III) High potential (higher scores).

[39] The category Industrial Diversification is an exception as it is made up of one single composed indicator

The choice of a multicriteria analytical framework, with linear proportional weighting, rests on the idea that it is the combination of the different perspectives and explanatory factors involved in green economy transitions rather than fine-tuning the integration methodology itself may better support decision making at all territorial levels (Tapia et al. 2013).

An overview of the indicators, the sources of data, and the year available are in the Annex.

Sensitivity of shrinking areas to the Just Transition Fund: combined matrix

The two pillars of sensitivity need to be read together to assess if the Just Transition Fund can be a game changer for shrinking LAU 2 units. If there is promising territorial capital, and the shrinkage conditions are not structural, the Just Transition Fund can contribute to reviving the socio-demographic fate of shrinking areas. Conversely, where there is little fertile ground for such a profound transition, and the shrinkage conditions are particularly severe, the Just Transition Fund may not contribute to addressing shrinkage. Most importantly, it could become a major missed opportunity to reconstruct the socio-economic fabric with negative effects on credibility, reputation and attraction.

In-between the two scenarios described above, there will be a variety of nuanced situations in EU territories with different combinations of potential and structural shrinkage. These nuances may be the great majority of cases and can be a good knowledge base for tailoring usage of the Just Transition Fund, and strategically designing Just Transition Plans.

To assist a flexible cross-reading of all the sensitivity elements, the two pillars are combined into a matrix (see graph 1). This is an interpretative tool for the results of this TIA. Pillar II sensitivities are plotted on the vertical axis, while on the horizontal axis are pillar I sensitivities. The matrix is illustrated in the figure below; with each box corresponding to an intersection of sensitivities to the Just Transition Fund. Each shrinking area has its own assessment in the model, which can be viewed in the database down to the individual indicator level.

Graph 1: Cross-sensitivity matrix of a shrinking area to the Just Transition Fund

High potential	High green potential but structural shrinkage	High green potential with medium shrinkage	High green potential and non- structural shrinkage
Medium potential	Medium green potential but structural shrinkage	Medium green potential with medium shrinkage	Medium green potential and non- structural shrinkage
Low potential	Low green potential and structural shrinkage	Low green potential with medium shrinkage	Low green potential and non-structural shrinkage
	Structural	**Medium**	**Not structural**

Source: own elaboration

The sensitivity matrix allows a cross reading of the two pillars and presents the results in an aggregated form. It combines the assessment of structural shrinkage (pillar I) and territorial capital for a green transition (pillar II). The latter is a composite indicator assesses dependency on the coal industry, skills endowment, business dynamism and existing capital for the green and circular economies. A cross-analysis of sensitivities reveals potential impacts of the Just Transition Fund in shrinking areas by answering the questions:

- how deep are shrinkage-related structural issues? is shrinkage too firmly rooted in socio-demographic structural decline?
- is there territorial potential (green economy pre-conditions) to benefit from the Just Transition Fund?

Cross analysing the two sensitivity elements defines potential impacts of the Just Transition Fund on shrinking areas. The lower the structural shrinkage (Pillar I) and the higher the green economy potential (Pillar II) the better chances for the policy to have a positive impact on shrinkage. The matrix displays all nine combinations between the two pillars of sensitivity, grading the potential impact.

5.3 Territorial Impact Assessment: results

The results of the sensitivity are presented first in aggregated terms, to discuss the European picture of potential impacts of the Just Transition Fund on shrinking areas. As anticipated in the introduction, the term shrinking area is used whenever more than one spatial data source is

involved in the territorial analysis. Whilst the identification of exposure to the policy is based on the location of shrinking municipalities (identified in chapter 3), the sensitivity assessment involves variables at both NUTS 3 and NUTS 2 levels. To avoid misinterpretation, the results are discussed in terms of shrinking areas which are an aggregation of shrinking LAUs.

Cross-reading of sensitivities to the Just Transition Fund

The European aggregate picture on potential impacts of the Just Transition Fund on shrinking areas is pessimistic. The most frequent assessment for shrinking areas exposed to the policy (18.5%) reveals conditions below the European average for both structural shrinkage and green capital. Many other shrinking areas display either medium shrinkage conditions but low green potential (7.9%) or highly structural shrinkage with medium potential (17.8%). Taken together, almost half the shrinking areas exposed to the Just Transition Fund have unfavourable conditions to successfully install the green transition process because their socio-economic fabric is compromised or because they have poor green territorial capital, or both.

On the opposite side of the matrix, 12.7% of shrinking areas exposed to the policy have both non-structural socio-demographic conditions and promising territorial capital. The assessment suggests that the Just Transition Fund can have positive implications on shrinkage, and that territorial disparities could be narrowed by the policy. In fact, the ex-ante assessment identifies above average values in both sensitivity pillars. In addition, there is a moderately positive outlook for those areas where either non-structural shrinkage is associated with medium green potential (5.4%) or where medium shrinkage is associated with high green potential (5.3%). Altogether, ¼ of shrinking areas exposed to the Just Transition Fund are expected to see a positive impact. At European level, including shrinking areas not exposed to the Just Transition Fund, less than 4% are expected to benefit from the policy. Whilst the positive assessment is limited to a small group of shrinking areas in Europe, the Just Transition Fund policy objectives, may still be an opportunity to revitalise declining territorial context in a socially sustainable way, as the policy aims at a systemic transition of the socio-economic fabric.

The remaining shrinking areas in the matrix are mixed. 10.3% have promising green territorial capital, but highly structural shrinkage conditions. Here, the Just Transition Fund might mitigate losses from a deep social transition, but current social distress makes it hard to imagine revitalisation. Another 14% have non-structural shrinkage but low green territorial capital. In

these cases, the Just Transition Fund will probably have little or no impact on shrinkage, but combined with other policies might still help to reverse non-structural decline.

It should be noted that these are the *aggregated* results of a multicriteria approach to the sensitivity analysis. A negative impact assessment for both pillar I and II might, in some cases, hide exceptions in a particular aspect of the composite indicator that can still play a decisive role in steering a successful green transition, especially if combined with non-structural shrinkage. Conversely, a positive impact assessment may underestimate potential bottlenecks in one aspect of sensitivity. Later in the chapter a thematic analysis of sensitivity will deepen this discussion.

Table 25: Results of the cross-sensitivity matrix

High territorial capital ***(28.2%)***	10.0%	5.3%	**12.7%**
Medium territorial capital ***(31.4%)***	17.8%	8.2%	5.4%
Low territorial capital ***(40.4%)***	**18.5%**	7.9%	14%
	Structural shrinkage ***(46.5%)***	**Medium shrinkage** ***(21.4%)***	**Not structural shrinkage** ***(32.1%)***

Source: own elaboration based on multiple data sources (see methodology) and TIA methodology.

The next paragraphs briefly assess shrinking areas in each of the two sensitivity pillars separately. Then, the assessment is further specified through geographical lenses across Member States.

Degree of structural shrinkage

The majority of shrinking areas exposed to the Fund (46.5%) have severe structural socio-demographic conditions compared to the European average. This is in line with the demographic distress that defines shrinking areas. Nevertheless, it is remarkable to observe

that most areas are below the EU average in four or five (out of five) of the indicators. This would suggest significant social distress as well, beyond purely demographic decline. On a positive note, 32.1% of these shrinking areas do not have highly structural issues in (almost) any of the shrinkage related issues considered. In such cases, shrinkage seems driven by outmigration and aging, or other elements falling outside the scope of this assessment.

Green territorial capital

The majority of shrinking areas exposed to the Just Transition Fund (40.4%) have limited green territorial capital, according to the elements considered in the sensitivity assessment. As with pillar I, such an outcome may not be particularly surprising if we consider that these territories, by definition, still heavily rely on coal-based industries, thus are not likely to have a strong green economy. Nevertheless, when considering the weights and multiple disciplines in the composite indicator (transcending coal-related employment) it is significant to note that the industrial fabric tends to be associated with lower skills, lower business dynamism and less innovation capacity. On the other hand, a considerable number of shrinking areas (28.2%) display multiple and differentiated aspects of existing territorial capital that are systematically above EU average. For these areas, the Just Transition Fund could find fertile ground, with positive impacts on shrinkage as well, especially when the socio-demographic conditions to be removed are not critical.

Geographical patterns

The cross-sensitivity matrix is nuanced with geographical patterns. The table below displays where on the European map each cross-category is mostly present, at country level. A geographical reading of this analysis identifies ex-ante, potential winners and losers of the policy based on an assessment of local context. Where in the EU can the Just Transition Fund have a consistent positive impact on shrinkage? Where in the EU, could the policy fall into a downward spiral?

Table 26: Geographical distribution of the matrix results.

High territorial capital ***(28.2% areas)***	Czech Republic Germany Croatia	Germany Netherlands	France Finland Belgium Austria Sweden Denmark

Medium territorial capital ***(31.4% areas)***	Hungary Lithuania Spain Portugal Estonia	Spain Greece Portugal Slovenia	Sweden Finland
Low territorial capital ***(40.4% areas)***	Bulgaria Italy Latvia Romania Slovak Republic	Romania Slovak Republic Czech Republic Poland	Czech Republic Poland
	Structural shrinkage ***(46.5% areas)***	**Medium shrinkage** ***(21.4% areas)***	**Not structural sheinkage** ***(32.1% areas)***

Source: own elaboration based on multiple data sources (see Annex) and TIA methodology.

Finland, France and Sweden are expected to have the most positive impact from the Just Transition Fund on their shrinking areas. In these countries, the relevant shrinking areas have the best sensitivity to benefit from the policy. Even though exposure is limited in numbers and the aggregated impact will be limited for shrinkage, Belgium, Austria and Denmark have similar or even better ex-ante conditions. For these shrinking areas, the Just Transition Fund can be a game changer.

Germany and the Netherlands also display convincing favourable conditions for the Just Transition Fund to be a credible instrument for revitalisation, as the chances for successful social transition are above the EU average. Croatia and Czech Republic can also be considered in this group, though with more uncertainties as they face more structural shrinkage conditions.

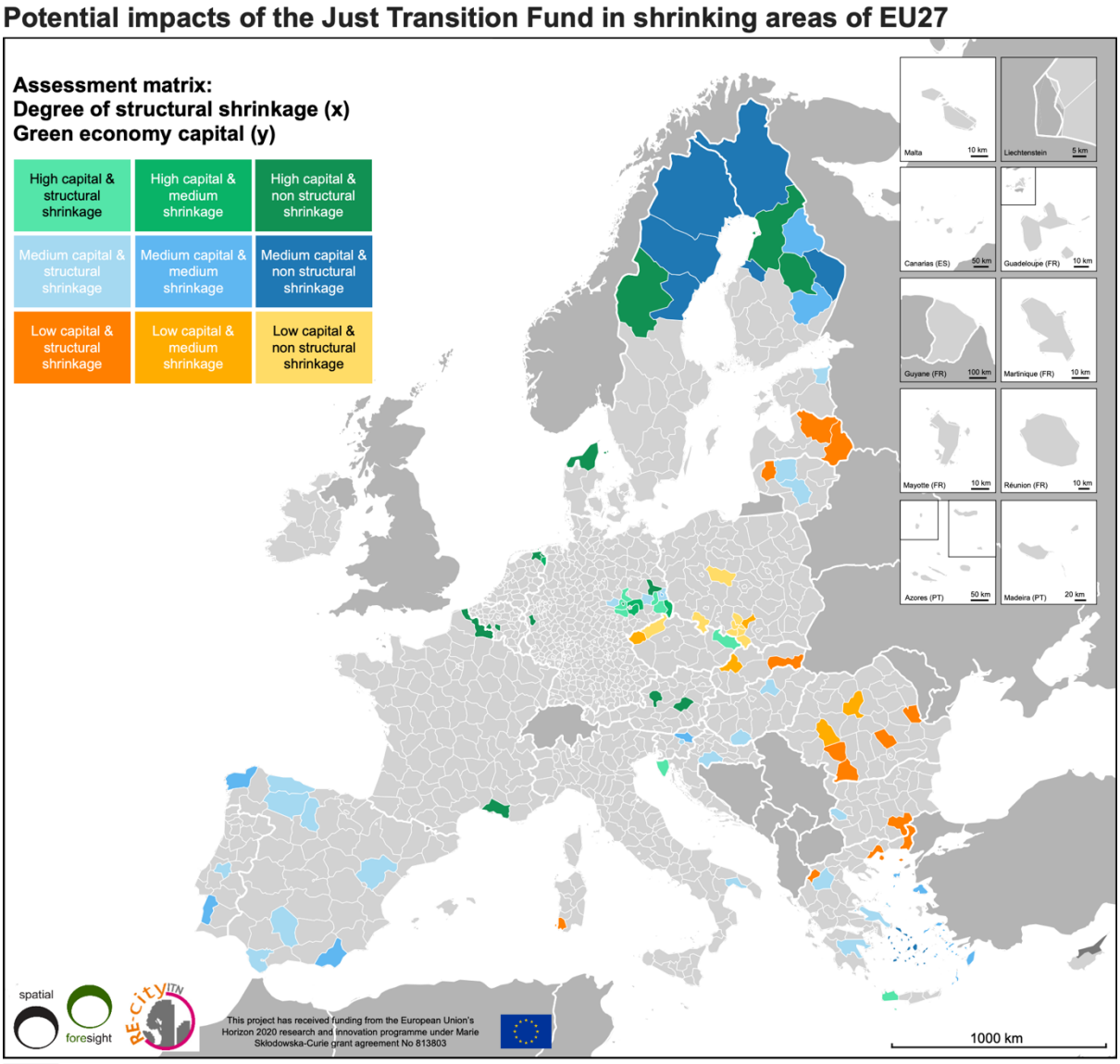
Spanish, Portuguese, Slovenian, Estonian and Polish shrinking areas show a more diverse for potential impacts. The impact of the Fund can vary from being neutral to being positive or even negative. In these countries, a discussion at the lower territorial level would be appropriate to better capture the national situation. Whilst this remains possible within the TIA assessment, it falls beyond the scope of this analytical discussion. A separate section below offers a regional perspective on selected cases.

Romania, Bulgaria, Italy, Latvia and the Slovak Republic have a compromised scenario in shrinking areas for the Just Transition Fund. These areas do not seem to have enough territorial capital to facilitate the implementation of Just Transition Fund objectives. In addition, their socio-demographic profile reveals structural shrinkage.

This analysis is at a European cross-country level traces macro territorial patterns across the EU, localising the results of the analysis. It is very important to note that exceptions may deviate from the national pattern. There are territorial disparities within countries shown in NUTS 3 and NUTS 2 data. These disparities are limited (in some countries only a single region is exposed to the fund), which favour a national level analysis. These inter regional (or even inter provincial) disparities in the combined sensitivity assessment are displayed in Map 8, where the results from the TIA are visualised for the exposed NUTS 3 areas[40].

[40] The colours differ from the matrix in table 25 and 26 because their tone proximity caused problems of representation in the map. It has been decided to keep the original colours in the matrix as they better represents the shades and nuances of the assessment.

Map 8: Potential impacts of the Just Transition Fund in shrinking areas of EU27



Spatial Foresight, Besana, Re-City ITN 2022. Own elaboration based on data inputs from several sources cited below.

Administrative boundaries: Eurostat GISCO, NUTS 3 (2016)

Sources: own elaboration based on the following data inputs along two pillars

Pillar I: degree of structural shrinkage: Crude rate of net migration: average 2009-2018 (Eurostat); Ageing index (Eurostat); GVA per inhabitant (Eurostat); People at risk of poverty and social exclusion (Eurostat and ESPON 2020 Database); Long-term unemployment (Eurostat)

Pillar II: green territorial capital: a) Industrail diversification and resilience: ratio of dependency of the industrial fabric on phasing out sectors: ratio of employment in 1st, 2nd and 3rd industrial activity sectors (NACE) over employment in mining (Eurostat). **b) Skills endowment**: share of persons with tertiary education and/or employed in science and technology (Eurostat); accessibility to unversities: share of regional population who can access a university campus within 45 minutes (European Commission - DG Regio). **c) Dinamicity of the business environment** SMEs innovating in-house or in collaboration with other SMEs (Regional Innovation Scoreboard); R&D total intramural expenditure: share of GDP (Eurostat); Taxonomy of innovation regions (ESPON). **d) Green economy potential**: index of green economy theoretical potentials (ESPON); Employment in circular economy business models (Eurostat); Greentech clusters: number of clusters per million inhabitants (ESPON).

Source: own elaboration based on data inputs from multiple sources (see annex and text below the map)

The following sections disaggregate the combined assessment of sensitivity to the Just Transition Fund, by analysing each of the two sensitivity pillars in detail. The disaggregation identifies which of the 14 indicators constitute specific challenges or opportunities for different shrinking areas. It is important to disaggregate the analysis because particular elements can

offer valuable information to build on and discuss. Even in areas where the overall sensitivity of the two pillars is negative, there might be a positive element in shrinkage conditions or more interestingly, a specific aspect of green territorial capital to fuel optimism. Such information can be an important driver of the transition in these shrinkage areas. First the analysis of structural shrinkage is presented, followed by the analysis of green economy potential.

Degree of structural shrinkage: thematic sensitivity

When we look more closely at the structural conditions of sensitivity, some interesting considerations emerge which unveil similarities and differences in shrinkage conditions across Member States. Table 27 illustrates the variation of structural shrinkage profiles within countries, and the most pressing shrinkage challenges detected in the sensitivity assessment. The table also displays the average scores (0-10) of all shrinking areas per country in the coloured column. This score is the sum of the five indicators assessing structural shrinkage. Higher scores show more indicators are below the European average. Findings are based on the interpretation of data used for this sensitivity component of the TIA, specifically the five indicators discussed in section 5.2. To help visualise the data, the number of LAU 2 units are used since the share per country on such low numbers risks overemphasising some results at first look. This does not modify the general assumption of spatial scales (preferring shrinking areas where some contextual data is involved) discussed in chapter 1 and noted at the beginning of this chapter. The same applies for table 28.

Table 27 Structural degree of shrinkage classified by country and aspects of vulnerability.

Country	Not structural	Medium	Structural	Average scores	Most pressing issues
Austria	5			3.4	Ageing and Outmigration
Belgium	3			4.0	N/A
Bulgaria			14	7.0	GVA, Outmigration, Social exclusion
Czech Republic	17	10	24	6.1	GVA, Outmigration
Germany	5	38	75	6.6	Ageing, Outmigration
Denmark	7			2.0	Outmigration
Estonia			5	7.0	GVA, Ageing, Outmigration
Greece	1	7	9	7.5	Social exclusion, LG unemployment
Spain		38	52	6.7	Ageing, LG unemployment, Outmigration
Finland	39	12		4.6	Ageing, Outmigration
France	50			4.9	Outmigration

Croatia			11	7.6	GVA, Outmigration, Social exclusion
Hungary			12	7.0	GVA, Outmigration
Italy			14	9.6	All
Lithuania			19	7.8	Outmigration, Social exclusion, GVA
Latvia			29	7.0	GVA, Outmigration
Netherlands	5	4		5.0	Outmigration
Poland	92	15		4.8	GVA, Outmigration
Portugal		3	7	7.4	Ageing, GVA, Outmigration
Romania		23	78	7.3	GVA, Outmigration, social exclusion
Sweden	26			2.8	N/A
Slovenia		3	3	6.5	GVA, Outmigration
Slovakia		14	11	6.4	GVA, Outmigration, LG unemployment

Source: own elaboration based on multiple data sources (see annex) and TIA methodology

Outmigration is a general problem for all shrinking areas in the EU, and in all Member States. This is the only variable scoring below the EU average regardless of the sensitivity assessment.

In Belgium, Sweden and Denmark the demographic decline does not seem to be linked to any issue considered in this assessment, which are among the most frequently mentioned in shrinkage literature (Bontje and Musterd 2012; Fol 2012; Hoekveld 2012; Wolff and Wiechmann 2018). Similarly, in France and the Netherlands, shrinkage seems to be characterised by outmigration (the only component with high sensitivity). The sensitivity assessment reveals that for shrinking areas in these countries, socio-demographics are not compromised and structural. At the opposite end of the spectrum, Italy stands out as a negative case where its shrinking areas exposed to the policy display are below the EU average in all the sensitivity categories.

The remaining countries show more delicate sensitivity, with a wider number of themes, making shrinkage a structural intertwinement of factors. According to analysis in this study, in Southern and Eastern European countries, outmigration is often associated with a standstill economic situation shown by low value-added scores.

Ageing problems have no clear territorial pattern, but are seen in most shrinking areas exposed to the Just Transition Fund. These include Finland, Germany and Austria in the northern-

central European section, Italy Spain, and Portugal in the South-Eastern part, and Estonia in the Baltic territories. According to the data, only Eastern European countries do not seem to face a structural issue with ageing.

Poverty and social exclusion are important structural factors for shrinking areas in countries in the Baltic and Eastern corners of the EU. This important social theme is a problem for Bulgaria, Romania, Croatia, Lithuania and Greece, as well as for Italy.

Data suggest also that long term unemployment is not a widespread problem for these shrinking areas. Nevertheless, this symptom of a structural socio-economic difficulty is above the EU average in Greek, Spanish and Slovakian shrinking areas.

Combining these thematic considerations and the averages per country (see table), both resulting from the TIA, reveals two groups of countries. A smaller set of countries does not display symptoms of a structural shrinkage (Denmark, Sweden, Austria, Belgium, France, Poland and the Netherlands) whereas the rest display a more complex situation, with varying degrees of social and demographic struggles. Within this second more complex group, the thematic analysis has unveiled different combinations of shrinkage sensitivity. In some cases, the themes have clear patterns across Europe, in other cases not, thus local factors seem to play a bigger role in determining their structural decline.

Just Transition Fund territorial capital: thematic sensitivity

The assessment of Just Transition Fund territorial capital is now disaggregated to review similarities and disparities from a thematic perspective, to the single indicator level. The table below illustrates the variation of green territorial capital profiles within countries, and the most interesting opportunities revealed by the sensitivity assessment. The table also displays the average scores (0-8) of all shrinking areas per country in the coloured column. These scores result from the sum of the four categories identified in section 5.2. Below the table are the most interesting findings that emerge from the analysis. As with structural shrinkage, these considerations are based on the cross-analysis of the nine indicators in the TIA.

Table 28: Green territorial capital by country and theme.

Country	Low potential	Medium potential	High potential	Average scores	Most vivid opportunities

Austria			5	6.6	Tech & SME Innovation, Universities, Green economy, Greentech, R&D
Belgium			3	6.0	Universities, SME and Tech innovation, Greentech
Bulgaria	10	4		1.6	Green economy
Czech Republic	27		24	3.0	Universities, Tech innovation, Circular and Green economy
Germany		25	93	5.4	Green economy, Tech innovation, SME innovation, High skills
Denmark			7	5.0	SME and Tech innovation
Estonia		5		3.0	High skills, Tech innovation, Green economy
Greece	4	12	1	2.9	Circular economy, SME innovation, Diversification
Spain		90		3.0	Tech innovation, Greentech
Finland		32	19	4.4	SME & Tech Innovation, R&D, Green economy, Greentech
France			50	5.2	High skills, Universities, Diversification, Greentech
Croatia		7	4	3.7	Tech innovation, Green economy, Greentech
Hungary		12		4.0	Tech innovation, Circular economy, Diversification
Italy	8	6		1.9	Tech innovation
Lithuania	4	15		3.2	Universities, SME & Tech innovation
Latvia	29			1.0	
Netherlands			9	5.0	High skills, Universities, Green economy
Poland	107			2.0	High skills, Universities, Greentech
Portugal		10		3.7	SME innovation, circular economy
Romania	101			0.2	Tech innovation
Sweden		21	5	4.2	High skills, R&D, Tech innovation, Green economy, Greentech
Slovenia		6		4.0	Universities, Tech innovation, Green economy
Slovakia	25			0.9	Green economy

Source: own elaboration based on multiple data sources (see annex) and TIA methodology.

The territorial capital for a green transition is very diverse between countries. It is difficult to draw spatial patterns or recurring elements of high sensitivity in groups of territories. Local factors and local variables in the industrial and business fabric, university networks, R&D expenditure and green economy seeds vary significantly, sometimes within countries. Still, some considerations are valid and valuable at national level, especially since in some countries there is only one region (or province) that has shrinking areas exposed to the Just Transition

Fund, and at most only five regions. The national comparison gives higher comparability at the European level and better visualisation of results, but regions can be consulted in the table in section 5.1. Moreover, the most exposed regions will be analysed in more detail in section 5.5.

According to the data displayed in the table, European countries can be grouped into three classes:

- A first set of countries offers fertile ground in most territorial capital elements. For around a third of EU countries sensitivity to the Just Transition Fund is very positive as they have good seeds for the green economy in many indicators, which could generate synergies to install a green transition path. These countries are: Austria, Belgium, Germany, France, Finland, Sweden, Slovenia, the Netherlands, Hungary and Denmark.
- Intermediate countries display above average aspects in some of the indicators, but these are less varied. For shrinking areas in Croatia, the Czech Republic, Estonia, Lithuania, Spain and Portugal the ground is less fertile, but there can be positive impacts from the Just Transition Fund.
- The last group of countries displays poor territorial capital to benefit from the Just Transition Fund. Shrinking areas in the following countries score consistently below EU averages in most of the indicators: Poland, Slovakia, Italy, Romania, Latvia, Greece and Bulgaria. Nevertheless, there are at least one indicator above average in each territory on which the green transition can start. However, these shrinking areas seem to lack the synergies and systemic innovation environment that would facilitate paradigm transition from the Just Transition Fund.

To exemplify the thematic variability of green economy potential, there are examples from each of the three groups with the most shrinking areas. These consideration are based on the data displayed in table 28 plus a targeted navigation of the database:

- Among the top tier countries, German shrinking areas have strong opportunities to leverage on technological and SME innovation and the presence of green economy and high skilled labour. France, is highly sensitive to the policy, but has different opportunities through universities and skilled labour, but also a diverse industrial fabric and existing Greentech clusters.
- In the intermediate group of countries, Spanish shrinking areas can leverage on technological innovation and the presence of Greentech clusters, whereas Portugal seems to have more opportunities with SME innovation and the circular economy. Within this

group, the Czech Republic is interesting as it has very diverse conditions. Half its shrinking areas have good opportunities through universities, the circular and green economies, whilst the rest have little or no territorial capital in any of the indicators.

- In the last group of countries, Poland has a moderately good set of opportunities with skilled labour, universities, and some Greentech clusters. Romania instead seems to be limited to opportunities from technological innovation and Bulgaria to the green economy.

The next section, as in chapter 4, adds the temporal dimension to the assessment by cross analysing the TIA with European shrinkage discussed in chapter 3. This analytical step adds a time dimension to the analysis of Just Transition Fund impacts enlarging the perspective on past and future shrinkage.

5.4 Sensitivity and future shrinkage

This analysis gives a better insight about the future trajectories of shrinking areas exposed to the Just Transition Fund. Cross-reading future trajectories and potential impacts of the policy facilitates a better understanding of the likelihood a successful green transformation, and the additional challenges that shrinking areas may face during the process.

With respect to future demographics presented in chapter 3, here *intense*, *severe* and *hard* shrinkage have been grouped together to facilitate cross-analysis and improve the presentation and interpretation of results. These three categories are merged as they indicate different degrees of population decline beyond the standard definition of shrinkage (SCiRN 2008; Stryjakiewicz and Jaroszewska 2016; Wiechmann and Wolff 2013). For this discussion we have the following types of demographic outlook: I) higher speed; II) standard; III) stabilisation and IV) regrowth.

Exposure

The assessment of exposure looks into future demographic profiles (2018-2050) of the shrinking areas exposed to the Just Transition Fund to have a better feeling of the severity of population loss for these areas. The cross-analysis with future outlooks reveals a cloudy picture these shrinking areas. As noted in section 5.1, these exposed areas represent 18.2% of all European shrinking areas and of these:

- 74% are forecast to shrink faster than the standard definition in 2018-2050.

- 17% are forecast to shrink at the standard speed.
- 8% are forecast to stabilise.
- 1% are forecast to regrow.

The data suggest a tendency for these shrinking areas to shrink faster in the coming years than the standard definition. If we compare these results to the profile of all shrinking areas (including those not exposed) presented in chapter 3, the negative trends are slightly worse than the general distribution.

The geographical distribution across EU countries mainly reflects the general tendency that shrinking areas exposed to the Just Transition Fund have negative population projections until 2050, either faster or at the standard pace compared to the definition. Greece, France and Romania are exceptions to the general patterns thanks to a more balanced distribution of demographic profiles. For regrowth areas, more than half are in Greece while France and Romania have many municipalities on a stabilisation path. Belgian and Danish shrinking areas also display a promising future demographic outlook, even though they have a very limited exposure overall.

When we shift the focus to within each national border, some interesting considerations of relative incidence. Within some countries, most shrinking areas with projected steeper population declines, are also exposed to the Just Transition Fund: Finland (65%), Sweden (51%), Latvia (45%) and Spain (43%). In most other countries, the exposed shrinking areas account for one third of those with steep population declines within the country. At the other end, Greece is an interesting case where almost all its stabilisation and regrowth areas are exposed to the policy.

The picture from the cross analysis of exposure with the demographic outlook for shrinking areas reveals that most have negative demographic projections for 2050. Whilst this may entail additional difficulties for a successful green transition, it is not a negative scenario per se. The fact that a consistent portion of the hardest hit by population decline in 2050 will be supported by a powerful policy instrument like the Just Transition Fund may also entail positive synergies. In areas with particularly negative demographic outlooks, a profound, paradigm transformation can be an opportunity to start social revitalisation. Nevertheless, the projections suggest that the intertwinement between shrinkage and the environmental transition will not be

spared demographic complexities. More information to disentangle the future outlooks can come from a cross analysis of sensitivity with demographic projections.

Sensitivity and future demographic outlook

The results of the Just Transition Fund sensitivity matrix are cross analysed with the future demographic profiles of the shrinking areas concerned. This step combines multiple layers that are not easy to interpret if presented altogether. For this reason, the results are illustrated in two heatmaps. Both heatmaps combine the information on both pillars of sensitivity and their geographical distribution on the map. However, the first map concerns shrinking areas that will stabilise or regrow to 2050, whilst the second displays the same information for shrinking areas projected to have further population decline (at higher and standard speeds). The coloured squares indicate the incidence of shrinking areas belonging to each typology and to the sensitivity assessment in the grid. Each heatmap contains information about:

- Sensitivity: I) structural degree of shrinkage and II) territorial potential vis a vis the Just Transition Fund.
- Future demographic outlook.
- Spatial distribution at national level. The regions are also displayed in brackets.

Regrowth and stabilisation heatmap

The first heatmap illustrates sensitivity to the Just Transition Fund of regrowth or stabilisation shrinking areas. The results show that most shrinking areas have the best ex-ante conditions to be positively impacted by the Just Transition Fund. These areas have higher scores than the EU average both in territorial potential and in the socio-demographic assessment, which reveals non-structural shrinkage. Thus, most shrinking areas on a regrowth or stabilisation path are likely to see a successful energy transition, with positive social spillovers. The results are visualised in the heatmap below (graph 2).

Graph 2: Heatmap for the sensitivity assessment of regrowth and stabilisation areas.

High territorial capital	**4.5%** **Greece** (Anatoliki Makedonia) **Czech Rep.** (Moravkoslezsko)		**43.3%** **France** (Nord Pas De Calais, PACA) **Denmark** (Nordjylland) **Austria** (Oberösterreich)

			Netherlands (Groningen) **Belgium** (Hainaut) **Finland** (Pohjois- ja Itä-Suomi)
Medium territorial capital	**9%** **Spain** (Andalucia, Castilla y Leon)	**7.5%** **Greece** (Voreio Aigaio, Notio Aigaio)	**1.5%** Greece (Notio Aigaio)
Low territorial capital	**16.4%** **Romania** (Sud-Muntenia, Sud-Est, Sud-Vest Oltenia) **Slovakia** (Vychodné Slovensko) **Greece** (Kriti)	**7.5%** **Romania** (Centru, Vest)	**10.4%** **Poland** (Slaskie, Dolnoslaskie)
	Structural shrinkage	**Medium shrinkage**	**Non-structural shrinkage**

Source: own elaboration based on multiple statistical sources (see annex) and TIA methodology.

The ideal scenario applies only to regrowth and stabilising areas in France, Denmark, Austria, Belgium and the Netherlands. Greek regrowth areas diverge from this optimal scenario with either high territorial potential and structural shrinkage, or non-structural shrinkage but low potential, also average scores in both categories. Spanish, Romania and Slovakian shrinking areas (exposed to the Just Transition Fund) with positive future outlooks, do not seem to be endowed with promising territorial capital and their shrinkage is currently structural.

The results reveal a potentially bright future for regrowth and stabilising shrinking areas. In many countries the projections for demographic restructuring in 2050 coincide with high positive sensitivity to the policy. Here, all elements seem to naturally point to prosperous revitalisation. In the remaining half of the cases, average to low ex-ante conditions suggest that the need for additional support and careful long-term planning. Solutions will not follow a natural path, but there are positive signs that demographic revitalisation can be accompanied and strengthened by a green transition, leading to a socially and environmentally sustainable future.

Faster and standard shrinkage heatmap

The second heatmap illustrates sensitivity to the Just Transition Fund of shrinking areas that are forecast to see standard or worse shrinkage up to 2050. The results show a substantial proportion of shrinking areas in the worse sensitivity categories. Most areas suffer structural

shrinkage and low territorial potential to benefit from the Just Transition. Combined with a negative demographic outlook this does not make a good case for these areas. There are exceptions but these are limited to some shrinking areas in Nordic countries, the Netherlands, France, Germany and Austria where sensitivity to the policy is high for both socio-demographic and green territorial capital. The details of which areas are concerned by each assessment are reported in the heatmap (graph 3) in brackets at regional level.

Graph 3: Heatmap for the sensitivity assessment of higher speed and standard shrinkage areas.

High territorial capital	**11% areas** **Germany** (Brandenburg, Dresden, Sachsen-Anhalt) **Czech Republic** (Moravskoslezsko) **Croatia** (jadranska Hrvatska)	**5.9% areas** **Germany** (Leipzig, Dresden) **Netherlands** (Groningen)	**10% areas** **France** (Nord Pas de Calais, Paca) **Denmark** (Nordjylland) **Austria** (Steiermark) **Finland** ((Pohjois- ja Itä-Suomi) **Sweden** (Mellersta Norrland) **Netherlands** (Groningen) **Germany** (Köln)
Medium territorial capital	**17.5% areas** **Croatia** (Kontinentalna Hrvatska) **Germany** (Brandenburg, Sachsen-Anhalt) **Lithuania** (Lietuvos regionas) **Spain** (Andalucia, Asturias, Castilly y Leon) **Estonia** (Esti) **Hungary** (Dél-Dunántul, Eszak-Magyarország) **Italy** (Puglia) **Bulgaria** (Yugozapaden)	**8% areas** **Spain** (Andalucia, Galicia) **Portugal** (Alentejo) **Greece** (Notio Aigaio, Voreio Aigaio) **Finland** (Pohjois- ja Itä-Suomi)	**5.9% areas** **Finland** (Pohjois- ja Itä-Suomi) **Sweden** (övre Norrland, Mellersta Norrland)
Low territorial capital	**19.1% areas** **Romania** (Sud-Muntenia, Sud-Vest-Oltenia, Sud-Est) **Latvia** (Latvija) **Lithuania** (Lietuvos regionas) **Slovakia** **Bulgaria** (Yuzhen tsentralen) **Greece** (Anatoliki Makedonia, Dytiki Makedonia) **Italy** (Sardegna)	**8.2% areas** **Romania** (Centru, Vest) **Slovakia** (Západné Slovensko) **Czech Republic** (Severozápad) **Poland** (Slaskie)	**14.5% areas** **Poland** (Slaskie, Wielkopolskie, Dolnoslaskie) **Czech Republic** (Severozápad)
	Structural shrinkage	**Medium shrinkage**	**Non-structural shrinkage**

Source: own elaboration based on multiple statistical sources (see annex) and TIA methodology.

Elsewhere in the EU, future shrinking areas are expected to face increasing additional challenges to installing the green transition. In Southern European, Baltic, most Eastern European, but also some German shrinking areas the policy will face a structural socio-demographic struggle that will worsen up to 2050. In these countries, the policy risks being less effective, or even insufficient to exploit the opportunity of a green transformation. Unless a capillary, place-based and multidisciplinary strategy is adopted, the transition might be limited to the environmental footprint while social and economic shrinkage will continue, or even worsen given anticipated coal-related job dismissals.

Some Polish, Czech, Slovakian, Romanian, Spanish and Portuguese shrinking areas are partial exceptions to the most negative scenario. In many of these shrinking areas (see brackets in the table for details) there are intermediate sensitivities to the Just Transition Fund and sometimes, medium or non-structural shrinkage issues at present. In these cases, a similar non-ordinary, multidisciplinary, long-term planning strategy would counter the forecast negative demographic outlooks. However, the likelihood that the environmental transition affects social and economic spheres is higher, as the territories have more opportunities, and the social fabric is less compromised.

5.5 Regional future outlooks on the green transition: examples

The methodology and data processing help deepen the investigation to individual shrinking areas and the intermediate sub-regional and regional spatial levels. This is possible simply by navigating the database, using filters and matching formulas. In this section the results of the TIA are illustrated with a regional geographical focus. Each box is a regional snapshot of potential impacts of the Just Transition Fund on shrinkage, through the demographic projections and the sensitivity analysis of green territorial capital. Regions with the highest exposure of shrinking areas to the policy are highlighted. The analysis in each box relies exclusively on the indicators (14 in total) which determine the two sensitivity pillars (structural shrinkage and green economy potential), to show the overall territorial potential with the Just Transition Fund. As previously outlined in the methodology (section 5.1), the indicators are compared to the European average for all territories, to show territorial disparities.

Regional outlook examples

Slaskie, Poland

58 LAU 2 units

Future demographic typologies: *negative*
54 LAU 2 units are predicted to continue shrinking until 2050. Most (47) will shrink faster than the standard definition. Only 3 municipalities are on a stabilisation path.
Structural shrinkage: *positive*
The great majority, 39 LAU 2 units, have a non-structural shrinkage. The remaining 15 are close to the EU average.
Green territorial capital: *negative*
31 LAU 2 units have low territorial capital, the remaining 23 are average.
Challenges and Opportunities: *neutral*
Outmigration seems to be the main challenge in the region. The district of Bytomski (PL228) also has ageing problems. The universities, skilled workers, and green economy potential are opportunities for the region.

Pohjois- ja Itä-Suomi, North and East Finland

51 LAU 2 units

Future demographic typology: *negative*
49 LAU 2 units are predicted to continue shrinking until 2050. Of these, 44 will shrink faster than the standard definition. Only 2 municipalities are on a stabilisation path to 2050.
Structural shrinkage: *positive*
The great majority, 39 LAU 2 units do not display structural shrinkage. The remaining 12 are average compared to other EU territories. There are delicate situations in the districts of Etelä-Savo and Kainuu.
Green territorial capital: *positive*
19 LAU 2 units have high green economy potential to benefit from the Just Transition Fund; these are located in the Pohjois-Savo and Pohjois-Pohjanmaa districts. The remaining 32 municipalities, in the other districts, have a medium green economy potential.
Challenges and Opportunities: *positive*
Outmigration is the greatest challenge in the region. Pohjois-Savo and Pohjois-Karjala districts are exceptions with outmigration near the EU average. Ageing is a challenge as well, but only in the districts of Pohjois-Karjala, Etelä-Savo and Kainuu. In the other districts ageing is at medium or even low levels. There are many opportunities for SMEs innovation, tech innovation and high potential for green economy development. In addition, there is a Greentech cluster already in the region, and R&D expenditure is already high.

Nord pas de Calais, France

46 LAU 2 units

Future demographic typology: *neutral*
Only 10 shrinking LAU 2 units are predicted to continue declining until 2050 faster than the standard definition. 19 municipalities have standard population decline, whereas the remaining

17 are expected to stabilise. All shrinking municipalities covered by the Just Transition Fund are in the Nord (FRE11) district.
Structural shrinkage: *positive*
None of the 46 LAU 2 shrinking municipalities have structural shrinkage, and score below the EU average in the sensitivity assessment.
Green territorial capital: *positive*
All the 46 LAU 2 shrinking municipalities have high green economy potential to benefit from the Just Transition Fund.
Challenges and Opportunities: *positive*
The only challenge detected is outmigration, and the other sensitivity indicators are close to the EU average or even below (ageing). The region has strong positive aspects offering opportunities for a successful green transition: the industrial fabric is already diversified, with a low reliance on coal-related businesses; skilled labour and universities are strong in the region and above the EU average, there are also Greentech clusters in the territory. Circular economy employment and SME innovation are around the EU average and can also increase their relevance through the Just Transition Fund.

Galicia, Spain

37 LAU 2 units

Future demographic typology: *negative*
35 shrinking LAU 2 units are predicted to shrink faster than the standard definition up to 2050. The 2 remaining municipalities are expected to shrink at the standard pace. No stabilisation, nor regrowth is detected.
Structural shrinkage: *neutral*
None of the 37 LAU 2 shrinking municipalities have structural shrinkage. All municipalities are around the average of other EU territories.
Green territorial capital: *neutral*
All 37 municipalities have medium green economy potential to benefit from the policy.
Challenges and Opportunities: *neutral*
The only shrinkage related challenge detected is ageing. Galicia is one of the few exceptions in the EU that do not have high outmigration. All the other indicators for structural shrinkage are around the EU average. In terms of active opportunities, the Greentech clusters stand out. However, it seems to be the only excellent aspect of those considered. Nevertheless, the majority of aspects display values around the EU average: industrial diversification, high skilled labour, universities and circular economy employment. Whilst these do not represent clear opportunities, they signal diverse territorial capital to work with in the green transition.

Sud – Muntenia, Romania

37 LAU 2 units

Future demographic typology: *negative*
20 LAU 2 units are predicted to shrink faster than the standard definition up to 2050. 13 municipalities will shrink at the standard pace and the remaining 4 will stabilise.
Structural shrinkage: *negative*
All 37 LAU 2 shrinking municipalities have structural shrinkage and are below the EU average.
Green territorial capital: *negative*
All 37 municipalities have low territorial capital to benefit from the policy.

Challenges and Opportunities: *negative*
Sud – Montenia has rooted challenges with outmigration, social exclusion, and value added in the local economy. Ageing and long-term unemployment seem to be under control and around the EU average. Sud-Monteia does seem to have opportunities under a green transition. Nevertheless, universities, tech innovation and circular economy employment are established in the region with scores close to the EU average. Even if these become promising entry points for a green transition, shrinkage seems inevitable. The Just Transition Fund will not be sufficient to mitigate shrinkage dynamics. Without substantial additional intervention it risks having zero impact.

5.6 Conclusions

This chapter has investigated implications of the environmental transition challenge on shrinkage. It has applied TIA concepts to the Just Transition Fund, with the target group of shrinking areas, the main focus of the dissertation. Exposure is limited to 18.8% of shrinking areas, so the impact concerns a subset of all European shrinking areas. Elsewhere, the impact of the policy can only be felt indirectly and these go beyond the scope of this analysis. Nevertheless, the Just Transition Fund could induce structural change. The policy can be a powerful instrument for a significant portion of shrinking areas in the EU. In some countries (as seen in section 5.1, e.g. Belgium, Finland, Lithuania, Spain, Latvia, Slovakia), more than 30% of shrinking areas are exposed to the policy, which can significantly impact shrinkage.

The multicriteria analysis of sensitivity suggests that for many of the areas the Just Transition Fund will not address shrinkage. In fact, more than 50% of shrinking areas exposed to the Just Transition Fund display unfavourable pre-conditions for a successful green transition fuelled by the policy, either because they suffer deeply structural shrinkage (as seen in section 5.3 for Hungarian, Lithuanian, Spanish, Portuguese and Estonian shrinking areas), or because they have little green territorial capital (as seen in section 5.3 for Polish, Czech, shrinking areas, or both elements (as seen in section 5.3 for Bulgarian, Italian, Latvian Romanian Slovakian shrinking areas).

The remaining half of these shrinking areas have intermediate, or optimal preconditions to benefit from the Just Transition Fund. The impact of the Just Transition Fund will be shaped by the ability of territories to exploit specific elements of their green territorial capital and non-structural or intermediate shrinkage (as seen in section 5.3, intermediate situations apply in most German, Dutch and Greek shrinking areas, as well as some Spanish, Slovenian and Croatian ones). Among this second half, a smaller sample (12.7%) have optimal sensitivity to

benefit from the Just Transition Fund (as seen in section 5.3 for most French, Finnish, Belgian, Austrian, Swedish and Danish shrinking areas exposed to the policy). Here, the policy impact should be positive thanks to better socio-demographic conditions than the European average, and a variety of elements of territorial capital (skills, innovation capacity, green economy networks) on which to build synergies.

Anyhow, territorial patterns between European countries are strong, anticipating potential winners (a minority) and losers (the majority) among shrinking areas. The analysis has unveiled that in each country and across regions (sometimes even at sub-regional level as highlighted by the regional outlooks in section 5.5) different sensitivity elements are the most relevant. A customised sensitivity emerges for critical shrinkage issues (Pillar I), and for green territorial potential elements (Pillar II). Such variability in contextual factors is believed to shape the potential impact of the policy (Haase et al. 2014), and the different sensitivity elements may contribute to inspire place-based implementation of the policy (Barca et al. 2012).

The cross-analysis with future demographic outlooks reveals that shrinking areas where policy impacts are expected to be more positive also have the best demographic outlooks. Vice versa, areas with the worst demographic outlook in 2050 (most) tend to also have negative structural pre-conditions and low territorial capital to benefit from the Just Transition Fund. Such results, with strong national and regional patterns, cloud the picture. So the Just Transition Fund alone could be a game changer in a few areas where shrinkage conditions may have revived anyway. In the majority of the remaining cases, the socio-economic distress and lack of green territorial capital, combined with negative projections, make the future of these areas darker, and the potential impact of the policy negative, or ineffective.

Territorial patterns, regional focuses, and individual LAU 2 outlooks (in the database) could already suggest territory needs and possible targets for supporting policies. For a long-term transition with wide social implications (especially for shrinkage), this analysis is only a tiny introductory step to initiate a debate on what is needed for these areas to design their strategy and continue identifying their additional needs along the journey.

To conclude, it is now possible to answer the research question outlined in chapter 1: *what are the territorial impacts of the Just Transition Fund on European shrinking areas?* The Just Transition Fund can be a game changer for roughly 4% of shrinking areas (all in the three

Nordic countries, France and Belgium) with optimal territorial capital, non-structural shrinkage and an acceptable demographic outlook. For the rest, the impact will largely shaped by the ability of local governments to leverage on their limited territorial capital (5% of all shrinking areas), or the impact of the policy is expected to be either neutral or negative (10% of all shrinking areas). The remaining 81% will not benefit from the policy. If we consider larger policy design (EU Green Deal) the Just Transition Fund will see closure of traditional industries and related employers, the impacts of the policy on social, economic and demographic decline may be negative in the medium and longer term (except for the 4%).

6 Policy content analysis of the Conference on the Future of Europe

This chapter is an abridged and modified version of the paper: 'Shrinkage and depopulation: Citizens' contribution to the debate on the future of Europe' published in the academic journal Quaestiones Geographicae (Besana 2021). The research answers to the last research question as outlined in chapter 1: *What is the potential impact of the Conference on the Future of Europe on the European policy debate on shrinkage?*

The dissertation has so far presented how shrinkage, depopulation and the related structural decline, threatened development for 28.2% of European territories today, with more areas expected to start declining from now until 2050. As anticipated in the introduction, the European Commission launched the Conference on the Future of Europe in April 2021 to involve citizens and other players beyond policy makers in shaping future policy priorities. This is a wide scale citizen engagement process, based on a digital platform that allowed all citizens to actively contribute to the policy debate from April to December 2021.

Chapter two showed that despite the growing volume of research on shrinkage, the topic has so far struggled to be part of policy debates, at least at supra-local level (Bernt et al., 2014). Notwithstanding European efforts towards territorial cohesion, local population decline has not yet been recognised as a structural issue in the European Union, until publication of the Cohesion Policy regulation for the new programming period. While these developments set the stage for recognising shrinkage by introducing a framework and a definition, the softness of the provisions, and marginality of the topic in the official documents make little difference.

As shrinkage a neglected theme in traditional policy arenas, this chapter examines the proposals of European citizens to revive shrinking areas, and their perception of this territorial development issue. This part of the analysis addresses the institutional challenge from a qualitative angle. The chapter researches if this open dialogue with citizens may have potential impacts for shrinkage in the European the policy debate on territorial development, and in general on the future policy agenda of the EU.

The first acknowledgement of shrinkage in European official regulation, offers a potential window on the policy debate to fuel greater attention on shrinking areas. Literature has argued

that in declining territories, and in the current European political situation, citizen opinions and feelings towards European decisions are extremely relevant (Dijkstra et al. 2020; Rodríguez-Pose 2018). The Conference on the Future of Europe offers a platform for this debate and looks to translate citizen proposals into policy priorities.

From April– December 2021 citizens were invited to directly intervene in setting policy priorities and traditional policy actors will synthesise the agenda and translate it into concrete measures and policy instruments (European Commission 2020a). The initiative is a process of agenda setting where unconventional policy actors (citizens) contribute to the definition of ideas and priorities (Fischer and Miller 2017). The initiative also allows for a continuous cross-border exchange of ideas and interactions among citizens.

The Conference on the Future of Europe identifies the following macro-themes for citizen to contribute with their ideas: Climate change and the environment, Health, A stronger economy, social justice and job, EU in the world, Values and rights, rule of law, security, Digital transformation, European democracy, Migration, and Education, culture, youth and sport (European Commission 2020a).

This chapter analyses citizen ideas in the Conference on the Future of Europe. The analysis retraces a recent paper and provides insights into whether European citizens are concerned by shrinkage and the decline of many territories when thinking about the future of the EU. Within the main research question the investigation also intends to see how shrinkage is perceived by citizens and which trends and themes it is mostly associated with. At the same time, the analysis gives a perspective on shrinkage and depopulation outside academia and the traditional policy debate (Besana 2021).

The rest of the chapter is organised in three sections. The second section outlines data collection, the choice of content analysis as the core methodology, including an illustration of the coding protocol. The third section presents and discusses the results. Three subsections differentiate results between I) the relevance of shrinkage and depopulation in the Conference; II) the thematic concentration of ideas and languages in the debate; III) citizen proposals to address shrinkage. The last section reflects on the results and offers conclusions.

6.1 Qualitative content analysis: data collection and coding protocol

The article on which this chapter is based analyses a European policy initiative of citizen engagement, collecting contributions (ideas) posted on the digital platform of the Conference on the Future of Europe. The methodology is designed to research shrinkage or depopulation as a direct or indirect topic in the Conference (Besana 2021). The research investigates whether broad and open engagement of citizens in the European policy debate may contribute to bring shrinkage onto the agenda. The analysis was carried out in the first months from the launch of the citizen engagement platform: 19 April 2021 – 15 June 2021.

As the study briefly outlined, the methodology was a content analysis of ideas uploaded on the digital platform (Besana 2021). Following Scheirer (2014), the qualitative content analysis follows an open coding approach. The coding protocol was then reassessed and adjusted in a second round of coding, which led to the specification of sub-categories (Gibbs 2014; Venghaus and Hake 2018). This coding was finetuned in the analysis phase (third coding round) to refine the relationship between data and the research questions. A fourth and last round of coding has sharpened the coding protocol with adjustments to improve presentation of the results Such a multi-phase process is recommended for an open coding approach (Schreier 2014). Moreover, the wide variety of languages, registers, lengths and style of the posts required flexibility in data interpretation. The codes have been refined and the groups sorted more precisely to reflect the relevance of shrinkage in the Conference debate.

As pointed out in the published article, citizen ideas in the Conference on the Future of Europe are an unusual type of data for policy content analysis. The format, length and tone of the data closely resembles Twitter and Facebook posts (Besana 2021). Thus, from a technical standpoint, the analysis dealt with a content analysis of social media material, which is another prominent application for content analysis literature (Snelson 2016). However, unlike social media platforms, the Conference on the Future of the Europe has a declared purpose to shape future policy agendas, so the influence on the policy debate follows a direct link between citizens and policy makers. There is a preferential channel between citizen ideas and the policy debate, through the digital platform (European Commission 2020a).

Data analysis has been carried out with MAXQDA software which allows for flexible coding during the multiple iterations of content analysis. It favours coding protocol as subsequent

rounds of analysis contribute to finetune or redefine the analytical framework. As laid out in the article, this is especially important when using an inductive approach (Besana 2021). The Conference on the Future of Europe (digital platform) is the original source of data for the analysis. Data collection was through an automated process from the 'ideas' section of the website[41]. Data collection relied on python scripts to transfer citizen ideas from the website to pre-categorised word documents.

A total of 4,576 ideas were collected for policy content analysis and the coding has been carried out in the original language for English, French, Spanish and Italian. For the remaining languages coding is based on the English translation of ideas using the Microsoft Word translator (Besana 2021). The previous publication also discussed how the number of ideas is significant to investigate and compare citizen perceptions and their contributions for shrinkage, underpinning the sharp decrease of new ideas in the months following the analysis cut-off date (Besana 2021).

The next paragraphs describe the framework behind the coding protocol, which retraces the previous publication. The first distinction differentiates three families of ideas based on their positioning towards shrinkage or depopulation (Besana 2021):

- **Supporting ideas**: ideas that directly or indirectly make proposals to mitigate or revert shrinking and depopulation trends, or raise awareness of the topic and call for action.
- **Contrasting ideas**: ideas clearly in favour of further agglomeration and urbanisation to the detriment of peripheral territories, or ideas that advocate for depopulation as a positive trend to be accelerated.
- **Neutral ideas**: ideas with no direct, or indirect link with shrinkage or depopulation, ideas with a very general focus, or those clearly unrelated to shrinkage issues.

First level distinction of codes

Supporting ideas have been unpacked into three sub-codes, each with additional layers. The branch system streamlines the complexity of shrinkage and includes all ideas that could have a positive impact and help shrinkage gain more attention in European policy debates. The

[41] https://futureu.europa.eu/

coding of supporting ideas is specified as: I) direct support on shrinkage, depopulation, or ageing; I) indirect support or close affinity with shrinkage; I) support for remote, and sparsely populated territories (Besana 2021).

Shrinkage, depopulation, or ageing: this most directly tackles the research questions it codes ideas that *directly* address shrinkage or depopulation. These ideas either touch upon the demographic challenge in the EU in a broad sense or refer to a specific territory. The key distinction between this and all other codes is in the *direct reference* to either shrinkage or depopulation in the text. Two sub-codes were added in the third iteration phase, which will be outlined later in the chapter: I) awareness; II) proposals.

Indirect support or affinity with shrinkage: this branch collects ideas with a clear territorial development perspective in favour of disadvantaged areas, for instance proposals that directly address lagging regions and structural gaps, as well as territorial inequalities in general. As explained in the article, it is important to underline that, although the logic underlying these proposals might collide with shrinkage issues, they *do not include any direct reference* to shrinkage or the demographic challenge. Amongst this family, additional sub-codes were specified in the third phase of coding: I) digital relocation of labour; II) structurally weak regions; III) reutilisation of infrastructure.

Support for remote and sparsely populated territories: the third branch focuses on ideas in support of rural and remote areas, or ideas discussing territorial benefits for localising life choices towards peripheral areas, thus reigniting local economic activities in contrast to agglomeration and transnational trade schemes. Notwithstanding the affinity with shrinkage, no strict reference to demography is mentioned in these ideas. Nonetheless, their potential relevance and the thematic affinity of proposals with shrinkage issues can be drawn from previous studies (Copus et al. 2020). This branch will be further specified in the results section by sub-codes: I) remoteness and ruralism; II) re-localism and deglomeration.

Contrasting and neutral ideas cover citizen ideas that are either neutral or would have a direct and explicit negative impact on shrinkage. Only ideas with a strict explicit connection with shrinkage are considered here and the code is further specified in the results section.

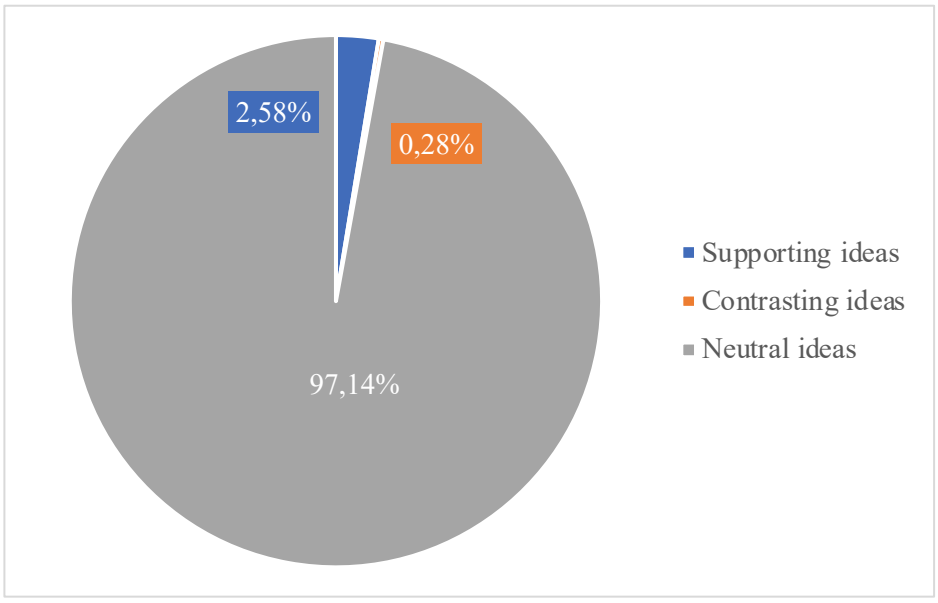
6.2 Relevance of shrinkage in the debate: coding results

The policy content analysis (reflected in the previous publication) reveals that the significance of shrinkage (or depopulation) seems limited in citizen contributions to the Conference. This section analyses of shrinkage related ideas through the results of the coding iterations. Then, a thematic analysis of proposals and their language is discussed. The third subsection regroups the content of the most relevant ideas.

Incidence of shrinkage and depopulation in the Conference on the Future of Europe

The total number of coded ideas across the ten themes categorised by the EU Commission was 4,576 from 19 April 2021 – 15 June 2021. The policy content analysis reveals that of the total number, only 119 ideas directly, or indirectly support the issue of shrinkage (Besana 2021). Graph 4 illustrates the relatively low attention to shrinkage in the Conference.

Graph 4: Relevance of shrinkage in citizen ideas in the debate on the future of Europe



Source: (Besana 2021, p. 20).

The graph shows that most ideas for the future of the EU do not have any direct, or indirect relation to shrinkage or depopulation, nor they display any affinity with typical issues in the literature backing this dissertation. the low incidence of shrinkage related ideas (2.6%) is more relevant when compared to the number of citizens that live in shrinking areas, with even more living in a wider group of territories that face with socio-economic disparities due to structural

gaps. Based on the data compiled for chapter 3 of this dissertation, at least 19.4% of the European population lives in a shrinking municipality. This estimate is definitely conservative as, following the most widely used shrinkage definition (SCiRN 2008; Wolff and Wiechmann 2018), the sample of this dissertation takes into account only municipalities above 5,000 inhabitants. This means that the percentage of people living in shrinking areas must be higher given smaller municipalities, rural and sparsely populated areas. As previous literature has argued these are often associated with shrinkage (Copus et al. 2020; ESPON 2017).

As anticipated in the published article, the numbers are not easily comparable as we have ideas on one side and population on the other, so the interpretation of these results is not stretched to quantitative considerations. Nevertheless, the limited number of shrinkage related ideas compared to other topics and to the number of people living in shrinking areas suggests a disproportion between the territorial disparities, also highlighted in previous chapters, and citizen perceptions of territorial decline. The difference can also be connected to citizens not knowing how to contribute, and lacking an existing framework or practice for dialogue with institutions. These dynamics may also be intertwined with the institutional challenges anticipated in chapter 2, and will be discussed in the next two chapters.

There may be different reasons behind a low involvement of European citizens with shrinking area futures. However, it is beyond the scope and methodology of this chapter to describe the dynamics behind this lack of engagement. For this dissertation, it is important to underline that despite the socio-economic distress and expanding territorial trend (as discussed in chapter 3), shrinkage does not catalyse citizen attention as data and literature could suggest.

Table 29 details the distribution of shrinkage-related ideas across the different sub-codes described earlier for the second iteration of the content analysis. This additional distinction allows for a more detailed perception of these citizen ideas on shrinkage.

Table 29: Coding results of citizen ideas in the Conference on the Future of Europe.

Subsections of the main code	Main code	N° of ideas
Awareness raising on shrinkage or depopulation		20
Proposals to mitigate shrinkage or depopulation		28
Ruralism and remoteness proposals		20
Re-localism and deglomeration proposals		26

Re-utilisation of infrastructure proposals		3
Digital relocation of labour proposals		6
Proposals for structurally weak regions		16
Calling for further depopulation		5
Urbanisation and agglomeration		8

Source: (Besana 2021, p. 20).

Results of the previous study highlights that only 48 of the 119 ideas directly address shrinkage, depopulation, or ageing. Among these, the successive iterations of the open coding resulted in dividing ideas into the following categories (Besana 2021):

- **Awareness**: 20 ideas that discuss the demographic issue with the main objective of raising awareness and calling for the intervention of public bodies.
- **Proposals**: 28 ideas that, besides acknowledging the demographic issue also propose solutions to address it.

Of the remaining ideas related to shrinkage, 46 proposed support for rural, remote, and sparsely populated areas. While the rural dimension of shrinkage is perceived with greater emphasis, its urban dimension does not receive significant interest from European citizens. Following the iterations, the following ideas are distinguished (Besana 2021):

- **Remoteness and ruralism:** 20 ideas propose or advocate for solutions to typical problems of remote and rural shrinking areas such as access to essential services, schools and education, social and economic opportunities, mobility and attraction (Barca et al. 2014).
- **Re-localism and deglomeration:** 26 ideas promote the positive effects of living, working and consuming in non-urban areas, or ideas to *decentralise life choices* for socio-economic and environmental reasons.

The remaining ideas show similarities to shrinkage, as they address the multifaceted issue of structural decline. While not directly mentioning demographics, the proposals cover territorial imbalances and structural lags are very relevant, invoking socio-economic disparities typical of shrinking areas. The open coding iterations distinguish the following subcategories (Besana 2021):

- **Digital relocation of labour:** 6 ideas advocate for the flexible re-location of digital jobs that directly embed a *territorial perspective*. Digital relocation of labour in general, is a trend topic across the Conference. However, ideas in favour of teleworking per se have not been considered as it was not possible to derive information about the

geography of such job location, which could also be in metropolitan areas and fast-growing cities. The key element is the co-occurrence of job relocation with a *territorial perspective* in favour of remote, or forgotten places to reduce disparities and rebalance development opportunities.

- **Structurally weak regions:** 16 ideas advocate for narrowing structural gaps between European territories. The ideas in this category directly address problems of lagging regions either with a specific target or at EU level, and call on institutions for more efficient interventions or propose solutions to redistribute development opportunities (Besana 2021).
- **Reutilisation of infrastructure:** 3 ideas propose the reuse and adaptation of abandoned industrial sites, buildings or infrastructure for new purposes. While there is no direct reference to shrinkage or demographic challenges, this category of ideas addresses a problem often characterising shrinkage.

Following the analytical steps of the article, the remaining contributions are either neutral and unrelated or express ideas that are in open contrast with shrinkage (Besana 2021):

- **Calling for further depopulation:** 5 ideas advocate for a reduction of the European population to preserve the environment and to reinstall a sustainable demographic balance among generations, which are currently ageing. The reduction of population is also welcomed to relieve pressure on the primary resources and land deprivation in the EU.
- **Advocacy for urbanisation and agglomeration:** 8 ideas propose to continue fuelling urbanisation and greater agglomeration in favour of capitals and major cities. These ideas reflect on the advantage of concentrating services and infrastructures, to improve efficiency and access to services.
- **Neutral ideas:** all remaining ideas have no direct relation to shrinkage, or affinity with shrinkage topics. The code compiles these ideas that have either a wide field of application (and no relation to demography or shrinkage) or specific proposals that do not express any territorial, or socio-demographic thinking (Besana 2021).

6.3 Language, thematic concentration and relation to policy themes

This section starts by presenting the analysis on the language of shrinkage related ideas posted on the digital platform. As with other chapters in this dissertation, the objective of this analysis

is to check for patterns, or exceptional concentrations of interest on shrinkage in specific national (or simply linguistic) debates.

Table 30: Language of shrinkage related ideas in the Conference on the Future of Europe

Languages/topics	Shrinkage, depopulation, ageing	Remote and re-localise	Indirect affinity with shrinkage	N° of ideas	% of total ideas per language
English	24	8	11	43	2.6%
French	6	14	4	24	3.7%
German	4	6	4	14	1.3%
Spanish	5	7		12	4.8%
Italian	2	4		6	2.3%
Slovakian	2	2	2	6	11.8%
Portuguese			3	3	4.4%
Hungarian	1	2		3	4.3%
Finnish		1	1	2	5%
Latvian	1	1		2	33.3%
Romanian	1			1	2.6%
Dutch		1		1	0.6%
Swedish		1		1	2.2%
Polish		1		1	1.9%

Source: (Besana 2021, p. 22).

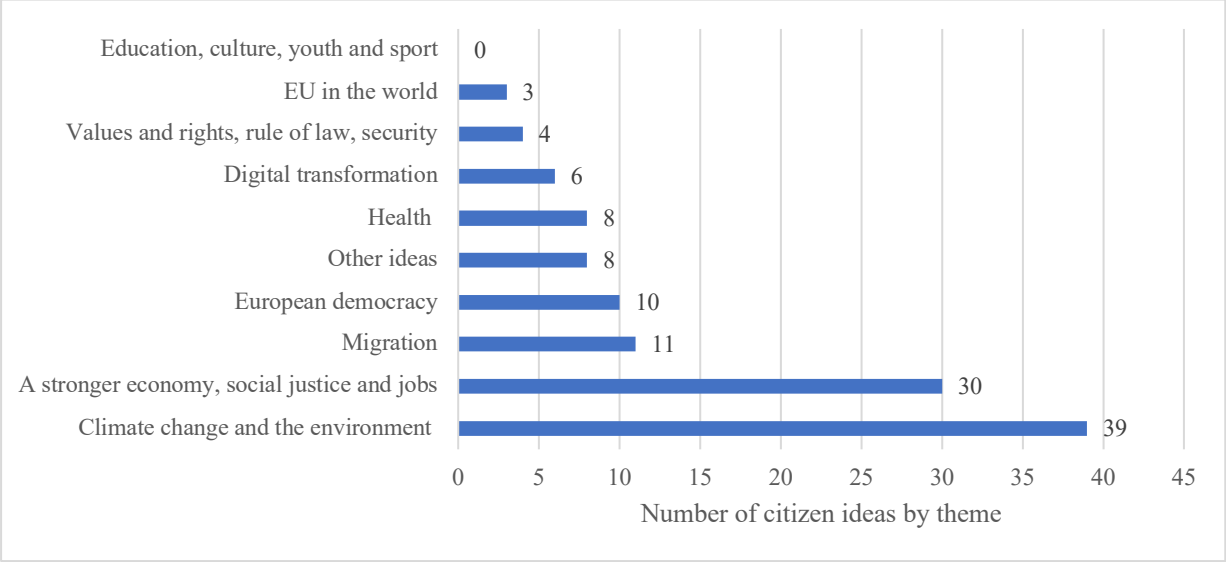
According to the analysis (and previously published in the article), the most diffuse language in the debate on the future of shrinking areas is English (Besana 2021). It is probably used to reach a larger audience, but does not reveal any information when we try to identify specific local debates around shrinkage. The remaining distribution of the original language of shrinkage related ideas reveals more from French speakers (24 ideas), followed by German (14 ideas) and Spanish (12 ideas) speakers. Italian speakers also contributed, though to a more limited extent (6 ideas). The contribution of Slovakian speakers (6 ideas) to the debate is large considering the size of Slovakian population. Remaining ideas return more limited contributions from Portuguese and Hungarian (3 ideas), Finnish and Latvian (2 ideas) and Romanian, Dutch, Swedish and Polish speakers, with one idea each (Besana 2021).

It is more telling to relate the number of shrinkage related ideas to the total number of ideas per language in the whole Conference during the period under investigation (4,576 in total). The last column of the table displays these results and reveals that, limited to the information

available and within the perimeter of the Conference on the Future of Europe, Latvian and Slovakian debates show the highest engagement in the future of shrinking areas compared to other topics. Spanish, Portuguese, and Hungarian speakers also showed significant engagement. The remaining languages have comparatively low engagement, while languages not in the table did not display any shrinkage related idea (Besana 2021). As mentioned earlier in the section, English is a widespread language for communication in the Conference. To add substance to these national patterns, we would need additional data on the geo-location of ideas, which unfortunately is not available on the platform and does not seem to be collected.

The section continues by presenting the thematic concentration of shrinkage related ideas across the pre-defined policy topics (European Commission 2020a). This analysis is intended to investigate which policy challenges are associated with the future of shrinking areas. It researches themes that citizens perceive more closely related to demographic decline, and what policy spheres are mobilised when they think about ideas for revitalisation. Graph 5 displays the frequency of shrinkage related ideas (supporting ideas) across the ten policy topics.

Graph 5: Concentration of shrinkage related ideas across themes of the Conference on the Future of Europe.



Source: (Besana 2021, p. 23).

The thematic concentration shows associations made by citizens when relating shrinkage to the policy fields available. In particular, proposals under environmental and social justice represent roughly 60% of the total. As discussed in the previous paper, whilst for economic, employment and social justice there may be a natural association, considering the socio-economic distress

described in shrinkage literature, it is interesting to detect that climate change and the environment are even more often referred to when thinking positively about the future of shrinking areas. On a first reading, the path to a greener future for the EU could go hand in hand with better future perspectives for shrinking areas (Besana 2021).

Climate change and the environment is the most common theme associated with ideas and proposals on the future of shrinking areas. As such, European citizens contributing to the shrinkage debate, saw the revitalisation of declining urban and rural settings as a positive rebalancing of land and resource exploitation at the expense of metropolitan areas. In general, citizens consider climate mitigation compatible with a reversal of shrinkage, especially in rural contexts, revealing possible synergies with sustainable development scenarios (Besana 2021).

A stronger economy, social justice and jobs is the second theme for shrinkage related ideas. Economic stagnation or decline, social inequality and reduced job opportunities are the main features of shrinkage definitions in existing literature (Bontje and Musterd 2012; Hollander et al. 2009; Rink et al. 2009). The link of shrinkage with these policy challenges lies at the origins of the phenomenon and its definition. As discussed in the previous publication, citizen proposals touch on territorial disparities suggesting greater investment in skills and innovation, as well as a facilitated path to create or access job opportunities, reviving local economies (Besana 2021).

Migration, and emigration patterns at different levels are typically associated with shrinkage in both specialised and general literature (Haase et al. 2016; The Economist 2017; Wolff et al. 2017). As discussed in previous chapters, outmigration, both within countries and between EU countries is often cited among the most important driver of shrinkage. In the Conference on the Future of Europe, this argument is strengthened, and often related to global migration schemes. Beyond intra-EU job driven relocation, immigration from non-EU countries is also argued by some as a potential way to revitalise shrinking areas in the EU (Besana 2021).

The remaining ideas concerning shrinkage, cover a wide spectrum of shrinkage-related problems that can also be seen in existing literature on shrinking areas and territorial disparities (Besana 2021). *Health* and *Values and Rights, Rule of Law and Security* discuss the shrinkage issues with access to basic services, especially in rural and remote areas (Copus et al. 2020; ESPON 2017; Lucatelli 2014; Verma and Taegen 2019). *European Democracy* revamps the

argument of forgotten and left behind places (Davoudi 2019; Rodríguez-Pose 2018) and the need for them to have greater consideration in the future of Europe. *Digital Transformation* ideas highlight the gap in digital infrastructure that hampers development in shrinking areas (Barca et al. 2014; Copus et al. 2020; Haase 2012), especially where remote working schemes could be a major opportunity for revitalisation (Besana 2021). Some citizen ideas corroborate findings in chapter 4 of this dissertation.

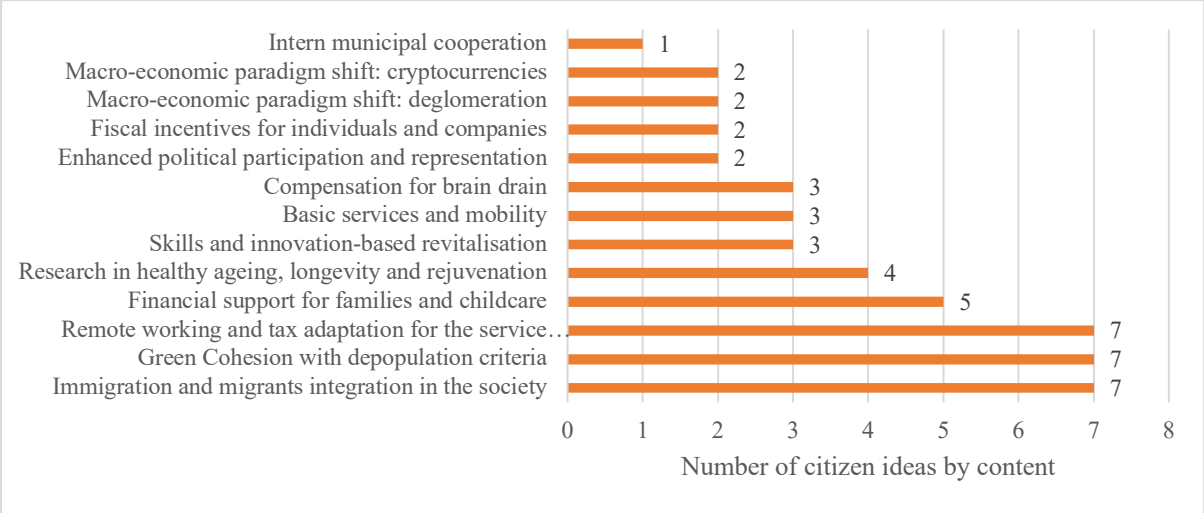
The next section groups the most recurring citizen ideas and proposals to address shrinkage in the EU.

6.4 Content of shrinkage related proposals from citizens

As discussed in my previous publication (on which this chapter is based), results of the policy content analysis highlight relatively limited relevance for shrinkage, and shrinkage related issues in this first initiative for broader citizen engagement in policy debates at European level. The thematic concentration of ideas suggests traditional (service accessibility and industrial revitalisation), but also new associations (remote working and environmental preservation) proposed by citizens on future development trajectories for shrinkage (Besana 2021).

Despite the relatively low number of shrinkage related ideas compared to all other policy themes, the 48 ideas (plus the additional 71 shrinkage related ideas) provide good material to examine citizens' perspective of the issue, at least its positioning in the policy arena and its interplay with other European policy themes. An additional round of coding on a subset of ideas traced common topics in citizen perceptions of shrinkage and their proposals to address structural territorial decline. Therefore, the subset of ideas from the last coding iteration selects ideas that directly target shrinkage, depopulation or structural disparities between regions, and actively propose ideas for revitalisation (not just to raise awareness and call for action). Following these criteria, 51 ideas have been selected for their active contribution to the shrinkage and depopulation debate within the Conference (Besana 2021). The recurrence of similar proposals and topics enabled grouping them into categories as a basis for a synthetic presentation of results. Graph 6 displays the frequency of citizen proposals grouped by category.

Graph 6: Citizen proposals to mitigate shrinkage and depopulation



Source: (Besana 2021, p. 24).

The frequency of ideas across categories reveals that European citizens, when thinking about the future of shrinking areas, propose opportunities to revitalise the declining socio-economic situation. The primary topic is *Immigration and migrant integration* (7 ideas) as the main driver to revitalise shrinking areas. Intra and extra EU immigration are equally proposed. Often there is also a call for an orchestrated process, based on the labour and skills needed in each territory (Besana 2021). This approach seems to welcome a place-based management of migration flows at European level.

With the same frequency (7 ideas), citizens suggest *a Green Cohesion Policy with depopulation criteria*. These ideas propose specific employment incentives, subsidies and support to promote innovation and industrial revitalisation in shrinking areas, under the common denominator of social and environmental sustainability. Among these ideas is a proposal for a 'location-based quota' of funds with facilitated procedures that helps entrepreneurs and innovators to settle in shrinking areas. On a similar note, there are also ideas proposing compensation for rural and depopulating areas for their eco-system services, and incentives for polluting companies to invest compensation in such areas (Besana 2021).

The analysis shows that citizens find most common ground on *Remote working and tax adaptation for the service economy* (7 ideas). The Covid-19 crisis has opened up the possibility to move online and delocalise many tasks and jobs in the service economy, thanks to remote working schemes. European citizens have identified this as an important opportunity to

revitalise shrinking areas, advocating for the relocation of workers towards less crowded, more natural, cheaper territories, reversing past migration paths from bigger cities to their places of origin. These ideas converge on the call for ad-hoc regulation from the EU to encourage the possibility from a tax and social security perspective (Besana 2021).

Financial support for families and childcare is the next most common theme proposed by citizens to address shrinkage and local demographic challenges (5 ideas). These ideas tackle the decline of birth rates and advocate for greater financial (but also services) support for families to be able to raise more children. According to previous analysis, these ideas propose help beyond direct assistance to families, including wider and more capillary access to childcare and incentive systems based on the number of children (like a progressive scheme to anticipate retirement in proportion to the number of children). For childcare, ideas suggest an active role for retired and older people, proposing intergenerational education hosting children and retired people together (Besana 2021). As discussed in the article already, the relevance attributed by citizens to older people in the shrinkage debate is confirmed by another category of ideas: *research into healthy ageing, longevity, and rejuvenation* (4 ideas). However, and unlike the previous category, a decline in birth rates is assumed to be irreversible, and the proposals suggest older people as the main characters for revitalising shrinking areas. In this direction, some ideas call for more investments in research for healthier ageing, longevity and rejuvenation therapies. A very elaborate proposal also suggests the foundation of a 'European Institute for Healthy Longevity Research' (Besana 2021).

As we follow the presentation of concrete proposals to tackle shrinkage, some citizens underline the necessity for greater public investment to fuel *skill and innovation-based revitalisation* (3 ideas) of shrinking areas. The proposals include re-skilling programmes, both practical and intellectual, for areas where traditional industries will, or have been phased out but also direct subsidies and incentives to catalyse innovation. In a similar way, citizens call for *compensation schemes for brain drain* (3 ideas), targeting so-called 'comeback' programmes for émigré workers, and proposing subsidies and direct investments in shrinking areas to attract new workers with incentive schemes to accompany their relocation. More ideas in this class call for improvement in the *access to basic services and local mobility* (3 ideas) stressing this as the main critical issue in rural and remote shrinking areas. On this matter of services and accessibility, *inter-municipal cooperation* (1 idea) is argued as a possible solution, calling for national or European support to promote such cooperation (Besana 2021).

As discussed in the previous article, the remaining proposals to mitigate depopulation include greater *Political commitment and representation (2 ideas)* for these territories, through regional political responsibilities and tighter links between national decisions and local representation, *Fiscal incentives for individuals and companies (2 ideas)* to locate or relocate in shrinking (or declining) areas, a shift in the *macro-economic paradigm* to revert agglomeration economies and privilege local and small-scale production and consumption chains *(2 ideas)*. On a similar note, *Cryptocurrencies* (*2 ideas)* are proposed to be a powerful instrument against money concentration, able to redistribute and equalise development opportunities across territories (Besana 2021).

6.5 Conclusions

This chapter includes a qualitative content analysis of citizen contributions in this debate (Flick 2014; Prior 2014). Following automated data collection, citizen proposals have been assessed through a coding protocol, with an open coding approach in multiple iterations (Gibbs 2014; Schreier 2014). The chapter has discussed results of the previous publication, which highlights a limited relevance of shrinkage and depopulation in citizen proposals for the future of Europe. Among the 4,576 contributions, only 48 directly address the demographic issue and another 71 show affinity or indirectly support issues closely related to shrinkage (Besana 2021). The relevance appears low when considering the extent of shrinkage, in roughly 28.2% of EU territories and concerning 20% of the EU population, as noted in previous chapters of the dissertation.

Moreover, and similar to the existing policy debate on population decline (chapter 2) shrinkage is most strongly perceived and associated with rural and peripheral areas, more than urban and other territorial contexts (as seen above through the results in section 6.2). Reflections from the published article suggest that whilst the engagement of citizens in this debate is hard to interpret, possible reasons for low participation in these issues can be citizens' resignation and inability (Hospers 2013), their feeling forgotten by institutions (Rodríguez-Pose 2018, 2020b), or other explanations such as a lack of previous engagement and a lack of familiarity with direct dialogue (even if virtual) between European policy makers and citizens (Besana 2021).

Previous chapters have discussed the institutional challenge of government quality. The policy content analysis reveals that the institutional challenge is relevant for shrinking areas also for citizen engagement. Whilst more inputs are needed to confirm or describe the perception that citizen have on shrinkage, there is relatively low engagement in advocating for mitigation and revitalisation compared to other policy themes in the Conference on the Future of Europe. Nonetheless, and in spite of the comparatively limited relevance overall, the analysis finds enough shrinkage and depopulation ideas to reflect on citizens' perception of the problem, and their proposals for the future development of shrinking areas. The results of the analysis (as seen in section 6.2) suggest that the future of shrinkage is most often associated with: a) climate change, environment, and sustainable resources exploitation; b) economy, social justice and employment; c) Migration patterns, both as cause and possible solution (Besana 2021).

According to the published article and the results summarised in graph 6, European citizens see the greatest opportunities for shrinkage revitalisation in immigration and migrant integration in local realities, fiscal adaptation and institutionalisation of remote working, financial support, incentives and childcare for families to raise more children, re-skilling programmes driven by an innovation spirit that is both practical and knowledge-based, compensation schemes and comeback programmes to address the brain drain as well as incentives for individuals and companies to relocate to shrinking areas, as well as research into healthier ageing and longevity. In addition, citizens ideas suggest institutions adopt a new Green Cohesion spirit that includes location-based quotas with depopulation criteria, improve access to basic services, local mobility also through inter-municipal cooperation schemes, review their macro-economic paradigm in favour of deglomeration objectives and the adoption of cryptocurrencies (Besana 2021).

To conclude, it is now possible to formulate a concise answer to the research question: *what is the potential impact of direct citizen engagement on the European policy debate around shrinkage?* The analysis reveals that the impact is particularly low in *quantitative* terms as shrinkage topics featured in only 2% of 4,576 ideas analysed, even though more than 20% of Europeans live in shrinkage conditions. However, from a *qualitative* perspective, the analysis reveals that the impact of engaging citizens in the future of shrinking areas has notable positive potential. In fact, the 119 shrinkage related ideas include innovative proposals and show that citizens have a vision for addressing shrinkage.

7 Cross analysis of results between present and future

The title of the dissertation indicates that the analysis involves intertemporal research on European shrinkage. This research produces material with two distinctive traits: I) it is *EU wide* and concerns shrinking areas treating them as a 'territorial object of interest' for policy making. II) *Foresight*, recalling the driving questions of this dissertation, the research has used a mix of statistical tools and scientific methods for ex-ante assessment or anticipation to investigate outlooks for shrinkage from past to future and its interplay with the pandemic, as well as environmental and institutional challenges. The dissertation has investigated how shrinkage has developed and how it is likely to develop in the coming years.

This chapter brings together all the results from the different analyses, discusses them, and puts them in relation with the most relevant debates. Comparing the results of this research with existing knowledge is expected to advance the research on shrinkage, providing ideas on how researchers and policy makers can deal with shrinkage in the future.

The dissertation has taken the demographic challenge in its territorial conception, described it and projected it into the medium to long-term future. Shrinkage is a complex process that is growing and expanding. It will increasingly concern policy makers in the coming years. The analysis shows that it has been hiding there, ignored or untreated already for the past twenty years at least. Shrinkage is the main character and its interplay with other characters will determine its future development. Another character, European policies, can play a decisive role if it engages in this interplay of challenges.

This chapter cross-analyses the results of the dissertation to trace relationships between shrinkage, macro challenges, exogenous shocks and policies and ties the results to existing knowledge on shrinkage in both academic and policy arenas. This discussion of results unfolds in two phases, the present and the future of shrinkage, which together build the conclusive storyline of the thesis.

7.1 Shrinking areas today

Results from the statistical demography modelling (discussed in chapter 3) have highlighted that shrinkage has concerned one out of four European municipalities in the past 30 years, making it a relevant phenomenon for European territorial development. Through the analysis of demographic trajectories from 1991-2018, the dissertation refreshes existing data on European shrinkage and reaffirms the extent that previous research had already anticipated with a similar analysis covering 1991-2010 (Wiechmann and Wolff 2013; Wolff and Wiechmann 2018). Whilst this data refreshment substantially confirms the extent, some difference with to previous research is in the characterisation of shrinkage though the size and trajectories of decline.

Chapter 3 also highlighted that shrinkage affects first and foremost smaller municipalities. In particular, municipalities below 100,000 inhabitants constitute the vast majority of areas affected by shrinkage, with almost 98% of the total European sample. This partially contradicts previous research focuses and case studies that saw a prevalence of towns and cities in the shrinkage panorama of the EU. This update and the quantitative findings refocus shrinkage on smaller settlements for the EU, as it had previously been theoretically conceptualised (Krzysztofik et al. 2015). As it is so widely diffused across Europe, data shows there are still many (over 100) shrinking municipalities above 100,000 inhabitants. Such cases cannot be disregarded and deserve a differentiated focus to the majority of cases. Altogether, today almost 25% of European citizens live in a shrinking municipality.

Picking up on the theoretical prescriptions (Alves et al. 2016; Stryjakiewicz and Jaroszewska 2016; Turok and Mykhnenko 2007) studying population loss as a dynamic process, the data processing enabled different types of shrinkage to be characterised based on intensity, lengths and sequences of demographic trajectories (detailed in section 3.1). The intensity of population loss reveals that over 70% of cases have lost at least 8% of their population in less than 30 years. In 25% of these, the population drop is over 20%, a 1% loss per year on average. Given the time horizon of this research, this highlights that shrinkage is a rooted phenomenon, which has not been reversed in (at least) the past 30 years.

Similarly to the only study at European scale (Wiechmann and Wolff 2013) chapter 3 has investigated population trajectories. Analysis has shown that an overwhelming majority (64.6%) are subject to persistent population decline which started in 1991 (or before) and has continued steadily until the present. In other cases (14.7%) the population decline started only

from 2001 but continued at a sustained pace to reach the minimum threshold (4.05%) in less time. Only the remaining cases (20%) reveal a discontinuous path alternating decline and small windows of regrowth. Overall, results from the statistical profiling of shrinking municipalities (see section 3.1 for more detail) reveal that shrinkage has consolidated over a longer time period, while previous research observed a majority of temporary episodes in continuous paths of decline (Wiechmann and Wolff 2013). These statistical results gain more significance when considering that the total EU population has grown steadily until the present, mainly sustained by migration.

The number of municipalities affected by shrinkage on a national scale varies greatly as we move across Europe (as seen above in section 3.1). The eastern part of the European Union is significantly more affected, with Member States having over 70% of municipal units affected by shrinkage. The incidence is lower in the western part of the Union, and in its founding members, though they still suffer rates of 20% to 30%. With respect to the previous European picture (Wiechmann and Wolff 2013; Wolff and Wiechmann 2018) this dissertation reveals a small increase everywhere and significant accelerations of shrinkage in Poland, Sweden, Portugal, Spain and Italy. These geographical patterns suggest that shrinkage is consolidating in the eastern part of the Union, and is increasingly expanding west, reaching southern and northern corners of Europe.

The updated European picture on shrinkage reveals that local population loss has moderately but steadily gained intensity, continuity and geographical presence across Member States. This outcome is not surprising in light of the recent negative natural population in the EU since 2015, alongside the underlying macro trend of agglomeration and urbanisation (European Parliament. Directorate General for Parliamentary Research Services. 2019; JRC 2021). All in all, shrinkage today is confirmed as a challenge for European territorial development that has steadily evolved and expanded over the past 30 years.

The theoretical framework of this dissertation (reviewed in chapter 2) suggests that throughout this time, little has been moved the European policy debate on territorial development towards recognition of shrinkage in policy measures and regulations. However, in the past decade there has been a growing debate in policy related research on the rural (Copus et al. 2020; ESPON 2017) and peripheral dimension (Gløersen et al. 2019; Noguera et al. 2017; Pérez-Soba et al. 2013) of local population drains and its territorial implications. The results of this dissertation

partially accommodate the narrower focus on rural and remote territories in the existing debate on shrinkage, due to the predominance of small villages in the sample[42]. The widely diffused perception of shrinkage as mainly a rural and remote phenomenon is confirmed by citizens' voices. The qualitative content analysis of their ideas in the Conference on the Future of Europe (as detailed in chapter 6) has revealed that citizen proposals to deal with shrinkage and depopulation are systematically linked to the advantages of rural, remote and peripheral territories. Urban dimensions of shrinkage are not recognised in this citizen-led policy debate.

Whilst shrinkage has been associated with rural, peripheral or remote domains, such exclusivity does not depict the complete character of European shrinkage today. The statistical results of this dissertation (as detailed in chapter 3) demonstrate that, especially for some countries, shrinkage is a general trend, regardless of the physical and geographical specificities of the place. The multi-territorial, and particularly the urban perspective of shrinkage is strengthened by a wide body of comparative and case-study based research over the past two decades (Alves et al. 2016; Stryjakiewicz and Jaroszewska 2016; Wiechmann and Pallagst 2012; Wolff et al. 2017; Wolff and Wiechmann 2018). Possible reasons why the multi-territorial focus has been neglected so far have been investigated (Bernt et al. 2014; Großmann et al. 2013), but their call to widen analytical lenses on shrinkage has not yet led to concrete results in the European policy debate.

Existing theories have conceptualised shrinkage as the local outcome of a complex interplay between external trends from global to regional, intrinsic social, economic, environmental and geographic characteristics of the local context and their governance, as well as policies and strategic decisions (Haase et al. 2014). The interdependencies and mutual influences among these factors lead to different types of shrinkage and their ability to face shocks and development trajectories (Haase et al. 2016). In particular, seemingly similar macro trends, and external shocks affect different areas, with their diverse contextual characteristics, in different ways (Böhme and Lüer 2016; Churski et al. 2021; ESPON 2014a). This dissertation has investigated a global shock, the pandemic, and an endogenous trend, the environmental transition, to reflect on their interplay with shrinkage.

[42] This consideration is based solely on the observation of shrinking municipality size and not on an accurate spatial analysis of the location of these municipalities across territorial typologies.

The potential impacts of Covid-19 across EU regions suggest that new territorial patterns might emerge in the aftermath of the crisis. Traditionally recurring patterns (such as cohesion, urban/rural) do not seem to apply in the Covid-19 crisis (Böhme et al. 2020a; Böhme and Besana 2020; European Committee of the Regions 2020; OECD 2020b). Instead, some dynamics seem to be reversed. Metropolitan areas as well as densely populated and visited destinations temporarily (at least) lose their appeal. Distance and online working, but also new tourism and alternative (to inter-continental) industrial value chains revamp the attraction of places and cities that seemed 'forgotten'. All in all, Covid-19 could generate a partial reshuffle in the debate on territorial disparities, where shrinking areas may benefit.

This dissertation has specifically investigated shrinking areas through a TIA. The results (as presented in chapter 4) paint an unusual scenario where shrinking areas are not particularly vulnerable to the negative effects of Covid-19 since their sensitivity to restrictive measures is around the European average (or below) for most socio-economic indicators identified as drivers in this crisis. Exceptions of vulnerability for shrinking areas are found in economic productivity (GDP), poverty (people at risk of poverty or social exclusion) and, with great statistical consistency, governmental quality. In addition to the strategic relevance of these aspects (governance especially), shrinking areas should mostly be spared from the worst effects of the pandemic. Shrinking areas today have not been overburdened by the pandemic with respect to other areas in Europe, leaving the door open for first steps towards a rebalancing of these territorial disparities.

Shrinking areas today also face the environmental challenge which entails a profound transition affecting traditional socio-economic schemes, with a reshuffle of structurally established territorial inequalities. Unlike the sudden pandemic shock, the environmental challenge has allowed a structured approach from the European Union which results in place-specific policy instruments like the Just Transition Fund (European Parliamentary Research Service 2020a). In light of this, the dissertation could analyse the policy response, not as a reaction, but as an action towards the challenge. There is territorial thinking behind the funding instrument and it offers interesting elements to reflect upon. More than 18% of all shrinking areas today are exposed to the policy, so these can count on significant resources to transform the existing socio-economic fabric, overly reliant on carbon. The structural process welcomed by the Just Transition Fund is particularly suited for shrinking areas as it provides re-skilling programmes, supports innovation with a clear target of promoting sustainable environmental and social

transformation. In this reading, the Just Transition Fund may offer a significant contribution to boost shrinking areas from behind (lagging), to one step ahead in the green transition. Even though the outcome of such a process depends on many other local factors that will be discussed later, the energy transition and the Just Transition Fund unlock opportunities for many shrinking areas today.

Shrinkage and depopulation have been an important challenge for territorial development in Europe (Gløersen et al. 2016; Hospers 2013; Wolff et al. 2017). Despite growing attention which has expanded the volume of research over the last two decades and the emergence of kindred concepts in the policy arena, shrinkage has struggled to climb the priority list of policy makers at supra-local level (Bernt et al. 2014). The main recent policy instruments (CAP, EARDF, ERDF) and strategic documents (Territorial Agenda 2030, the New Leipzig Charter, Long-term vision for rural areas) have not fully recognised shrinkage being a challenge for territorial development. Nonetheless, the latest developments in Cohesion Policy suggest that demographic decline has finally gained some attention in European territorial debates. Whilst several doubts have immediately been cast on the inbuilt resistance to recognise the structural decline of shrinking areas, and the lack of structured intervention (Pazos-Vidal 2021), recital 48 and article 10 of the regulation[43] are important developments for shrinkage today. These provisions offer a little more room for manoeuvre to national and regional governments in addressing shrinkage, and may also represent a first step for shrinkage to climb higher in the agenda of European policy makers.

Shrinking areas are a bulky issue for European territorial development, that has been left to sleep by policy makers despite the growing body of knowledge and awareness on its expansion and reinforcement over time. This sleeping territorial challenge may have been implicitly fuelled as the counterpart of an intense process of urbanisation, and the unintended effects of boosting economic concentration to benefit from scalar productivity. However, demographic figures demonstrate that it is also the natural result of general ageing and population decline which generate imbalances resulting in winners and losers at the local scale. These territorial disparities can be pictured as the side effects of agglomeration and natural decline and the

[43] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021on the European Regional Development Fund and on the Cohesion Fund. L 231/60, Official Journal of the European Union. 30.6.2021

consequences can be observed in shrinking areas today. Whilst overlooking such side effects in territorial policy debates may have complicated socio-economic conditions in shrinking areas, it has accelerated a process that was already affecting underlying European macro trends in demography, industry and economy. European policies for territorial cohesion have, so far, not succeeded in reversing the growing territorial disparities linked to shrinkage.

However, policies designed to narrow territorial disparities are only a small part of the shrinkage issue. All policies (and strategies) can generate opportunities and provide resources to stimulate territorial development and reduce structural gaps. More importantly, macro trends and exogenous shocks highly influence the fates of shrinking areas. Chapter 4 has shown that the majority of shrinking areas are not particularly vulnerable to Covid-19 restrictive measures, but these could still exacerbate existing territorial inequalities. The environmental challenge has led to the Just Transition Fund as a policy response, and we have seen how this is relevant for many shrinking areas. The policy design is place-specific to tackle the structural gaps of declining industries. The multidisciplinary nature of such interventions may benefit shrinking areas. Those analysed in this dissertation are only examples of some of the most pressing challenges the EU is facing nowadays, but previous research shows that all policies have an impact on cohesion to varying degrees, and cohesion should be seen as a value permeating policy making at European level (Böhme et al. 2021b).

Following up on the policy debates together with the quantitative relevance of the phenomenon (as detailed in chapter 3), shrinking areas today can be described as a lethargic giant within the European debate on territorial development. Shrinkage has been consolidating over the past three decades, yet it has been left alone by policy makers. This TIA has shown that shrinking areas have been spared by the worst consequences of the pandemic, at least in the short term. Whilst slumbering in past decades, shrinkage has been intensifying and slowly expanding across the European Union, especially in smaller urban settlements. In spite of the lack of a proactive approach to shrinkage by policy makers, cross-sector policies like the Just Transition Fund seem well suited from a policy design perspective, and may be tangentially beneficial to address shrinkage. All in all, shrinking areas today show a mixed picture where the lack of policy recognition has consolidated territorial disparities, but recent global trends (pandemic), and policy challenges (environmental transition) leave room for reducing such disparities. Still, there are question marks on the medium to long term horizon of European shrinkage, and on the resilience capacity and territorial capital of shrinking areas towards the challenges analysed

in this thesis. The next section explores the future of European shrinking areas, by interpreting the results of the research.

7.2 Shrinking areas tomorrow

The discussion on current shrinkage ends with mixed feelings but definitely leaves the future open. As anticipated, some uncertainties lie around the future of shrinking areas, stemming from vulnerabilities which will be discussed in this section. The methodology in this dissertation is designed to investigate potential futures for shrinkage given upcoming challenges and shocks. This section cross analyses the inputs from projections, ex ante quantitative assessments and qualitative content analysis to unveil a perspective on the future of shrinking areas. It will be reviewed whether the lethargy around shrinkage can be shaken.

The demographic projections for currently shrinking municipalities immediately concern territorial disparity debates. The vast majority of shrinking areas will continue shrinking at equal or increasing intensities from now until 2050. Less than 3% of these shrinking areas are projected to grow in the future. In addition, more than half of areas with a negative demographic outlook[44], though not yet defined as shrinking, will become shrinking areas too. What is striking from the quantitative analysis on the future of shrinkage is the detection of blind areas where shrinkage is currently unknown but will become a challenge soon (regions and provinces in the Netherlands and Germany are among the most affected). These areas are labelled blind spots in the dissertation as none of these municipalities have experienced population decline in recent decades. Projections show that these areas will start with significant population decline from now until 2050, thereby facing shrinkage for the first time.

The element of greatest concern from the statistical analysis on demographic trajectories is the numerical relevance of blind spots (as detailed in chapter 3). More than 11% of all territorial units (NUTS 3) will face shrinkage for the first time from now until 2050. These will mean that up to one fourth of territories are already shrinking (which will continue) or the smaller, but still significant number that only recently started population decline. The geography of future shrinkage confirms the expansion already detected in this present dissertation. In fact, shrinkage will become more capillary in the European Union and will further consolidate in

[44] These are municipalities that started a population decline only in 2011-2018 and therefore do not yet qualify as shrinking according to the definition in this dissertation.

countries already affected (Romania, Croatia, Slovenia and Poland). It will strengthen in countries moderately affected (Germany, France, Spain, Greece) and will spread in countries where now it is only marginal (Netherlands, Austria, Denmark). The label 'blind spots of future shrinkage' reflects a situation where a territory is not being observed, studied, and treated as shrinking today, but the projection model suggests it will soon reinforce the importance of European shrinkage. Their identification can be highly relevant in the policy debate around shrinkage as they are 'asymptomatic' cases of future population decline.

The look into the future of shrinkage confirms some of the warning signals revealed by the updated assessment of the past three decades. Results (as detailed in chapter 3) reveal that for the past few years and onwards shrinkage may no longer be an episodic event as was rightly interpreted or theorised earlier (Stryjakiewicz and Jaroszewska 2016; Turok and Mykhnenko 2007; Wiechmann and Wolff 2013). Shrinkage will continue growing in continuity and intensity and will expand an already wide geographical spread of the phenomenon. Results reveal that shrinkage will have less and less territorial patterns as it grows uniformly on a European scale, becoming a cross-country issue for regional and local development. Excluding Luxembourg and Cyprus, no country will be exempted from dealing with shrinking areas in part (25% - 90%) of their territory. The demographic projections acknowledge its relevance and set the boundaries of discussion on the future of shrinkage. The results of the spatial analysis in this dissertation are also reinforced by the conclusions on demographic change of the 8th cohesion report, which anticipate that by 2050 almost 50% of European citizens will be living in a shrinking region (Dijkstra et al. 2022). The interplay of demographic trajectories with anticipated outlooks from external shocks and concurring policy challenges will now paint a shaper scenario on the future of shrinking areas.

When we cross analyse the sensitivity of shrinking areas with their future demographic profiles (chapter 4 and 5), the scenario is mixed. Shrinking areas on regrowth and stable trends towards 2050, are significantly more vulnerable to Covid-19 impacts. Instead, shrinking areas with predicted negative trends, and especially those with persistent shrinkage in the past, generally have lower or average vulnerability to Covid-19 impacts. The results can be interpreted in two ways. I) On the bright side, it can be argued that shrinking areas with the worst future outlooks are exempt from the worst consequences of the pandemic and can pool an unprecedented amount of resources (recovery and resilience facilities) to narrow existing structural gaps with more prosperous territories, using the crisis to start a catch up process and become more

resilient. For the limited group of shrinking areas with positive future outlooks the pandemic will hit harder, but the policy resources and their intrinsic attraction can make up the deficit and keep them on their positive track. II) On the dark side, the same results leave room for an opposite interpretation where the pandemic hits shrinking areas with the best hopes for revitalisation harder and spares the already hopeless ones with 30 years of steady decline. In this reading, the socio-economic fabric of the negative outlook shrinking areas would be less vulnerable due to their structural lags, such as low attraction and productivity, low integration in international trade and little employment in industrial sectors hardest hit by the pandemic.

The dualism of these interpretations can be disentangled through two additional factors that emerge from the ex-ante assessment of territorial impacts of the pandemic on shrinkage. The first factor derives from a closer look at the results of shrinking areas sensitivity to negative effects of the pandemic, as detailed in chapter 4. Even though shrinking areas proved less vulnerable than the European average for most socio-economic indicators, economic productivity, poverty and social exclusion and quality of governance are exceptions where shrinking areas score consistently below the European average. The first two are intrinsically linked to structural lags affecting shrinking areas, and are part of the problem describing shrinkage in most (not all) contexts. More often than not, shrinking areas, especially in more rooted and intense cases have to deal with social exclusion and a lower economic productivity more than growing areas (Bontje and Musterd 2012; ESPON 2017; Pallagst et al. 2009; Wolff and Wiechmann 2018). Blind spots of future shrinkage reveal a slightly more optimistic picture. Whilst they are little affected by the quality of government, they are very vulnerable due to high employment in economic sectors most affected by the pandemic.

Poor governance transcends the structural features of shrinkage cited in the literature, instead good quality of government is mentioned as a key factor to address shrinkage (Haase et al. 2014; Stryjakiewicz and Jaroszewska 2016). Indeed, existing literature insists on the importance of institutions in determining territorial development, and the role of good governance for the wellbeing and future prospect of European territories (Charron et al. 2014; Rodríguez-Pose and Ketterer 2020). Government quality is recognised as essential for territorial cohesion in Europe, it is among the main challenges for lagging areas (Rodriguez-Pose and Garcilazo 2013). Poor quality of governance is a warning for shrinking areas both during the pandemic crisis, and especially in the aftermath. The recovery requires crucial strategic decisions, with very efficient and speedy use of resources. Profound shocks like

Covid-19, hitting the social and economic fabrics of shrinking areas with potential long-term repercussions, require institutional capacity that steers territories towards resilience. Although shrinking areas are less impacted today, due to the characteristics of the pandemic shock and their social and economic fabric, they seem to have a comparative disadvantage in terms of governance when facing the future.

The multicriteria analysis of potential impacts included an assessment of potentially positive effects from the pandemic, driven by existing or accelerated trends during the crisis, specifically the digitalisation of jobs (teleworking) and other public and non-public services. This ex-ante territorial assessment (as detailed in chapter 4) revealed that shrinking areas are systematically worse positioned than the European average not only on digital access, but also on teleworking and public service digital preparedness. Beyond very few exceptions, this negative outlook is worrying for the future of shrinking areas. Although spared from the worst socio-economic consequences, there is a consistent structural gap that is likely to prevent them from grasping opportunities offered by the pandemic. This positions shrinking areas at the bottom for digitalisation, which is another trend shaping European policy agendas.

Discussing the future trajectories of shrinking areas in light of the pandemic reveals some good signs observed in the present, more than the static perspective. The green transition was identified as a potential opportunity for structural change in a significant number of shrinking areas. Cross analysing the demographic projections and the TIA of the Just Transition Fund widens the view on the future of shrinking areas facing environmental challenges. Shrinking areas with growing or stabilising populations in 2050 generally display positive preconditions for the just transition. For most of these areas, the assessment shows values above or close to the average for both components of the multicriteria assessment (structural shrinkage and green territorial capital). The future outlook is inverted for shrinking areas with negative demographic profiles for 2050, which are more than 80% of all shrinking areas eligible for the Just Transition Fund. The multicriteria analysis revealed that most of these areas have structural conditions of socio-economic distress. They also have with poor to modest green territorial capital to stimulate the just transition envisaged by the policy.

The Just Transition Fund targets a profound transformation of the present industrial and economic fabric which is incompatible with European environmental targets. The analysis on the degree of structural shrinkage (detailed in chapter 5) shows that most shrinking areas had

already reached economic deadlock naturally, with consequences for social and demographic aspects. The just transformation is pivoted around the principle of sustainability, which is primarily environmental but has social traits as well. In areas with particularly negative demographic outlooks, a profound, paradigm transformation such as the one facilitated by the Just Transition Fund can be a major opportunity to start social revitalisation, but not necessarily growth. Unfortunately, TIA results reveal that the current socio-demographic fabric might be compromised, and the territorial capital for knowledge, innovation and business dynamism is often insufficient and consistently below the European average. These conditions raise strong uncertainties about successful implementation of a just transition in most shrinking areas.

There are a considerable number of exceptions but these are limited to Nordic countries, the Netherlands and France where sensitivity to the policy is positive both for socio-demographic and green territorial capital. In these countries we also find most shrinking areas have a positive demographic outlook for 2050. Elsewhere in the EU, shrinking areas are expected to face additional challenges with the green transition alongside their intrinsic vulnerability and structural deficits. These results also unveil possible national patterns and territorial disparities of shrinking areas exposed to the Just Transition Fund.

Apart from a few exceptions, the cross-analysis paints a darker future for shrinking areas as the potential paths of hope opened both by the pandemic and the Just Transition Fund narrow due to the interplay of these challenges with shrinkage trajectories and negative preconditions. Among the hindrances unveiled by the assessment, quality of government stands out. The tendency for shrinking areas to have poor government quality is the biggest cloud on future development trajectories because policy challenges entail paradigm transformations and societal transformations which require strategic administrative capacity in institutions. The institutions acknowledge that high-quality government plays a vital role for the well-being of society, is a pre-requisite for long-term, sustainably increases living standards, and strongly influences people's health, their access to basic services, social trust, and political legitimacy (European Commission 2017).

In addition to the sustainable transition process, the mitigation and transition path of the Covid-19 shock, the European Union and governments at all levels have faced issues of trust and legitimacy vis a vis European citizens which has been already linked to territorial matters (Dijkstra et al. 2020; Rodríguez-Pose 2018). Citizen engagement is another side of the coin for

government quality challenges in shrinking areas. Governments are called to rebuild trust though proximity to citizens, engaging them in political and strategic choices. Considering the lethargy of shrinking areas in the present policy debate, the active involvement of citizens may play a decisive role for their future in the policy agenda. The Conference on the Future of Europe (European Commission 2020a) offered an important policy window at the agenda setting phase for citizens to include shrinkage in future policy debates and raise awareness about the territorial disparities of shrinking areas.

Results of the qualitative content analysis (as discussed in chapter 6) reveal relatively few shrinkage and shrinkage related themes in citizens ideas to shape the future policy agenda of the EU. The complexity of shrinkage is not completely overlooked by citizens who address it either directly (48 ideas) or indirectly (81 ideas) but the overall significance (2%) is far from other policy priorities such as climate change, migration and health. This seems low when recalling that almost 25% of the European population lives in a place already shrinking today. The reasons why shrinkage related problems do not gain greater systematic attention from citizens can be various and opposing. Taking the most recent literature into account, there may be a feeling of being left behind, which seems to drive citizens away from a European towards a national future (Rodríguez-Pose 2018, 2020b). In such an interpretation inhabitants of shrinking areas lean more towards nationalist sentiments which are often associated with Euro-scepticism, leading to lower participation in debates on the future of the EU.

A different reading would suggest that the lack of contributions derives from reduced engagement caused by a continuing decline or a lack of engagement structures and habits, which is totally unrelated to political beliefs. In this interpretation citizens feel detached and disillusioned about the future of their territories, or simply lack the initiative or framework to give their contribution (Hospers 2013). Alternatively, citizens may feel at ease with the shrinking situation and are simply not interested in changing the status. Whilst it is hard to find literature pointing in this direction, this option should not be excluded.

Probably, the relatively low engagement of citizens in shrinkage related themes results from a mix of the above-mentioned factors, along with potentially others. Sometimes the recognition of shrinkage is rejected (or hidden) by residents and local policy makers fearing territorial stigmatisation and negative repercussions in terms of attraction and reputation. Moreover, citizens can have a different perception of socio-economic difficulties which focus on their

individual experience and needs, thus overlooking the systemic nature of the problem. This dissertation does not cover citizen perceptions of shrinkage beyond the Conference, as citizen are active locally or through different digital and non-digital frameworks. Considering the stakes, more research is needed to understand the citizen perspective on this problem.

Limited to the thesis scope, results suggest that the neglection of shrinkage in the European policy debate is not likely to be reinverted by the Conference on the Future of Europe. Despite this unprecedented opportunity to directly influence the future policy agenda of the EU, shrinkage has not been ignited in the debate. This relative silence around shrinkage is understandable in such a wide policy arena, and in relation to other policy priorities that this dissertation itself acknowledges are the main challenges of European policy makers. However, the results of this dissertation in terms of population projections as well as medium and longer-term territorial impacts of environmental and pandemic challenges highlight how territorial disparities are expected to widen with more shrinking areas in the future. As a result, maybe shrinkage does not need to be a top policy concern of the EU, but results indicate that it is becoming a major concern for territorial development and cohesion.

This general discussion of results is of course not uniform nor applicable to all European shrinking areas. This cross-analysis has kept a European focus to align with the scope of the thesis and the objective of reviewing results on shrinkage as a territorial challenge for EU policy making. However, keeping this perspective hides a vast degree of nuances, but also exceptions from the final assessment. Some examples that deviate from the general patterns are found both across countries and within them, though national dependency patterns tend to be strong, especially for the environmental challenge. There are positive and negative exceptions in the two TIAs, but it is very hard to trace clustered territorial patterns or typologies at cross-country level. This variability confirms the importance of context and local feature in the theoretical framework underlying shrinkage (Haase et al. 2014, 2016), and reinforces the need to adopt place-based designs in policy structures (Barca et al. 2012, 2014; Beer et al. 2020; Territorial Agenda 2020) and place-sensitive approaches as a cross-cutting value of all non-territorial policies (Sotarauta 2020; Zaucha et al. 2013).

The cross discussion of results has described shrinking areas today, as lethargic giants in the European debate on territorial development. The initial symptoms of its expansion and intensification in the period 1991-2018 have been confirmed and reinforced by future

demographic trajectories for 2050. The identification of blind spots of future shrinkage is particularly striking for its magnitude and geographical extension. These results indicate that shrinkage will become, even more than today, a challenge without borders for the EU. Notwithstanding the inclusion of citizens, the voice of shrinkage in the European policy debate is quiet and there seems to be no natural awakening in sight for the future of shrinking areas.

In the discussion on shrinking areas at present, results highlighted that the pandemic generally spared shrinking areas from the worst hits, leaving the door open for a potential catch up in disparities in the recovery phase. The cross analysis with future shrinkage trajectories upsets that positive scenario. The few areas with positive demographic outlooks are more vulnerable to the crisis, and all shrinking areas have significant structural gaps in digital working preparedness. This is likely to narrow opportunities for revitalisation, or even widen territorial disparities, namely the digital divide. Not only the pandemic, but also the environmental challenge (Just Transition Fund) could be a source of structural revitalisation for shrinking areas. Apart from some exceptions, the cross-analysis clouds future development prospects with an assessment of poor territorial capital in the most negative projection cases, and rich territorial capital mostly concentrated in a few areas with an already positive outlook.

Furthermore, the sensitivity analysis of shrinking areas has indicated governmental quality as their main challenge, and they are more vulnerable than average for European territories. Institutional capacity is an essential ingredient for the transition processes considered in this dissertation (Charron et al. 2014; Rodríguez-Pose and Ketterer 2020). The future looks dark for shrinking areas as long as they are not highlighted in territorial development discussions. The portion of shrinking areas with a positive foresight assessment gets narrower as the analysis investigates upcoming challenges more deeply. Positive signs remain for a small set of shrinking areas, often with an already positive outlook. Elsewhere, societal challenges are likely to further widen territorial disparities for shrinkage.

8 Conclusions

When the Treaty on the Functioning of the European Union was agreed, demographic challenges were identified in specific territories. Since then the demographic challenge has expanded, and shrinkage now concerns all types of territories, in different contexts and across almost every country (Wiechmann and Wolff 2013; Wolff and Wiechmann 2018). This thesis confirms the expansion and intensification of this issue, updating previous quantitative studies. Shrinking areas projections to 2050 are that population decline will continue and will extend to new territories which are labelled blind spots of future shrinkage. All in all, this dissertation strengthens previous studies that shrinkage is not limited to peripheral and territories with specificities.

While demographic challenges have been expanding across Europe, with 90% of areas in some countries experiencing shrinkage today, European debates on territorial cohesion have not followed up on this trend. In past decades shrinkage has failed to be recognised as a cross-territorial challenge in influential strategic documents (Leipzig charters and Territorial Agendas), nor in the policies pursuing territorial cohesion (Cohesion Policy and structural funds). The first signs of recognition are detected in structural funds for the programming period 2021-2027, so the history of shrinking areas in policy debate might be just about to start a new chapter. Whilst this is an important milestone, the substance and scope of the new provisions cool revolutionary hopes. The future of shrinking areas is not yet prominent in the European debate on territorial development, and the first attempts of involving citizens in shaping future policy agendas does not raise expectations.

Acknowledging the lack of appeal for shrinkage in territorial development debates, but also considering the relevance of other trends and policies in generating territorial impacts (Böhme and Lüer 2017), the challenge of shrinkage has been compared with other major challenges for the European Union. This dissertation has investigated the positive and negative influence that these challenges may have on shrinkage. In a metaphoric view of shrinkage as the main character in the story, its interplay with other characters will determine its future development. This thesis constitutes only one chapter of the story, which will continue developing in the coming years. More and different challenges as well as macro trends will interfere with the

main character, but policies will still play a potentially decisive role in steering and shaping the future developments of shrinkage (Haase et al. 2014; Stryjakiewicz and Jaroszewska 2016).

The TIA on Covid-19 revealed that digitalisation will be a key challenge for shrinking areas. It will be a crucial topic in terms of infrastructure and access to broadband where the gap between shrinking areas and the European average is relatively narrowing. The pandemic has created new online necessities and accelerated digitalisation in the working environment along with a sudden shift of public services (from healthcare, to schools and day to day administration) from physical spaces to online. Shrinking areas are less prepared for this and start from a lagging position in the application of these new principles.

The qualitative content analysis on the Conference on the Future of Europe suggests that the environmental transition is tightly interlinked with shrinkage. In fact, citizen perspectives most often associate proposals for shrinking area revitalisation to climate change action. Answering the environmental challenge may fuel positive synergies for shrinkage too. The TIA on the Just Transition Fund partially confirms the positive synergies between environmental goals and shrinkage, though it raises concerns about territorial capital and local enabling factors for shrinking areas with more intense declining population projections.

To unlock potential positive synergies, additional support within policy and regular planning for the green transformation are needed given that territorial capital is often limited or very poor. The process may be accompanied by parallel policy interventions and strategies targeting socio-demographic restructuring, boosting attraction and levelling up services. Unless a capillary, place-based and multidisciplinary strategy is adopted, the transition will be limited to the environmental footprint while the forecast social and economic spiral of shrinkage will continue, or even worsen due to anticipated coal-job dismissals.

Transition is the common denominator for shrinking areas in the immediate future as the digital and environmental aims are closely intertwined with each other, putting pressure on the policy arena. These challenges, together with a complex pandemic recovery, entail societal transformations with risks and opportunities for territorial disparities. The territorial outcomes of this interplay of factors will largely depend on the ability of institutions to steer processes and guide citizens and enterprises along the socio-economic transformation. In particular, regional and local governments will play a decisive role in shaping the local effects of macro

and overarching trends (Haase et al. 2014, 2016). In the end, institutional capacity and governmental quality play a major role in the likelihood of success for the transformations ahead (Charron et al. 2014; Rodríguez-Pose and Ketterer 2020).

However, quality of government emerged as a principal vulnerability in the ex-ante assessment of Covid-19 on shrinkage. The gap between shrinking areas and the European average is a warning signal when facing important societal changes like the environmental and digital transitions. Without adequate governance these processes risk widening existing territorial disparities for shrinking areas. Quality of government is only one face of the institutional challenge. The engagement of citizens in policy debates and strategic decisions is a broader issue for the European Union, and this thesis confirms that the lack of participation applies also to shrinking areas and their issues. This an even greater challenge in places losing population and struggling to remain attractive and functional places for their citizens. In a context where the engagement of citizens is envisaged and promoted, shrinking areas would benefit from raising their needs directly through citizens' voices.

Political discontent is more pronounced in lonely places, rural areas, peripheries and areas with territorial disparities in general. This dissertation shows that these areas deal with very complex structural issues which matter in ways beyond how they (might) vote and depopulation is a common denominator in a net of negative socio-economic trends. Nonetheless, the debate on places that don't matter (Rodríguez-Pose 2018) and geographies of discontent (Dijkstra et al. 2020) are a rallying cry that has been heard louder than shrinkage and which has gained momentum in territorial policy debates. It is possible that such greater resonance stems from the direct link between territorial disparities and political interests.

These concepts can be an opportunity to raise interest in the socio-economic difficulties and lack of future perspectives that these areas face. It is a helpful device, but it needs to be seen as just a cautionary tale. This dissertation has shown how shrinkage is widely diffused. Discontented voting is a reality in some countries but not yet in others, which can see this if such areas feel neglected in policy debates. Moreover, this thesis has unveiled blind spots of future shrinkage, another opportunity for active citizen participation before discontent takes over. In any event, participation in the democratic process is only one aspect to take into consideration in the framework of systemic interventions for shrinkage. It may be seen as a red flag, but should not be the premise for action per se.

Beyond the political interest of bringing citizens closer to institutions, their engagement can be a resource for shrinking areas. In places where the main problem is depopulation due to a lack of personal opportunities, job-related migration, or difficult access to infrastructure and services then citizen needs and proposals acquire greater value. This dissertation has investigated citizen contributions and their perspectives on the future of shrinking areas in the European policy debate through the Conference on the Future of Europe. It has also analysed the content of citizen proposals to revitalise the future of shrinking areas. The dissertation previously underlined the limited relevance of shrinkage related themes in quantitative terms with respect to other policy themes. On the qualitative side, the 119 shrinkage related ideas still offer precious insights from citizen points of view, including ideas on how shrinking areas could be revived, or simply the quality of life improved.

The content of citizen proposals to address shrinkage may constitute a good base to fuel policy debates on shrinking areas and help policy makers get a better feeling of citizens' needs, inspiring their agendas relating to these fragile places. Synthesising some of the recurring proposals into concrete themes of policy relevance, citizens see the greatest opportunities for revitalisation in immigration and societal integration, remote working schemes, incentives for families to raise more children, re-skilling programmes, incentives for individuals and companies to relocate towards shrinking areas and research into healthier ageing and longevity. In addition, citizens' ideas suggest institutions adopt a new Green Cohesion spirit that includes location-based quotas with depopulation criteria, improved access to basic services and local mobility, also through inter-municipal cooperation schemes, to review their macro-economic paradigm in favour of deglomeration objectives and to adopt cryptocurrencies.

Synthesis

This dissertation has investigated the future of shrinking areas as they face pandemic, environmental and institutional challenges resulting in insights and reflections on the interplay of these factors with shrinkage and trajectories of local population decline. The European scope of the analysis and methods for generating foresight information enabled the thesis to link shrinkage to the European debate on territorial cohesion, producing evidence of the need for greater recognition in future policy agendas.

Recalling the research questions, this dissertation investigates demographic outlooks for shrinking areas in 2050 and explores the potential territorial impacts of selected European challenges on their future development trajectories. The cross-analysis of results concludes that shrinking areas will consolidate their demographic decline, and shrinkage will affect many more territories in the EU, increasing the importance of the issue as a major challenge for European territorial development. Shrinking areas are spared from the worst socio-economic consequences of pandemic restrictions in the short term. However, vulnerability caused by lower quality government and lower economic productivity, and the structural digital divide seriously endanger medium and longer-term development prospects. Local government quality is expected to shape territorial impacts of the Just Transition Fund also through the capacity to use territorial capital. All in all, only 4% of European shrinking areas have a favourable assessment for the energy and industrial transition. Finally, the impact of citizen engagement on the policy debate around shrinkage is quantitatively low at present. Nevertheless, qualitative results show that citizens can positively influence the future of shrinking areas. All in all, the dissertation concludes that territorial disparities and structural gaps are predicted to widen in the future for shrinking areas, given the pandemic, environmental and institutional challenges.

Overall, the results reveal strong place-specificity of territorial impacts for shrinking areas. The impact assessments show significant variations in vulnerability and territorial capital across countries, but also between regions or even provinces. These differences are shaped by local contextual factors, which are likely to influence future development trajectories.

Based on the results of the dissertation, but also citizen proposals to address shrinkage, section 8.3 recaps the positioning of shrinkage in current policy debate and formulates policy recommendations by distinguishing present and future time frames in the policy cycle. Before looking into policy recommendations there is a methodological reflection. Section 8.1 discusses contributions and limitations of the research design, focusing on the specificities of each method. Then, section 8.2 outlines ideas for further research in the field. To conclude, section 8.4 closes the dissertation with an ex-post perspective on this research.

8.1 Methodological reflection on contributions and limitations of the study

The dissertation has utilised an original methodological toolbox, adapting existing methods and combining them to paint future perspectives of shrinkage. The imperatives behind all

methodological choices have been I) to keep a Europe-wide focus in the analysis; II) to provide ex-ante, explorative and anticipatory knowledge. The outcome is a mixed methodology with a marked exploratory research approach. In short, the dissertation has combined three methodological tools: a) demographic models of local population projections; b) Territorial Impact Assessments; c) qualitative content analysis. These methods are discussed individually, highlighting their contributions and limitations in this thesis. At the end of the section, the methods are discussed together as a toolbox to underline the original element of combining them. But before discussing each method in detail, it is important to reflect on the limitations of the overall research design, the scope of the dissertation and data availability.

Limitations of the overall research design

The European scope enlarges the validity of quantitative results, but also slims the content and limits the possibility to specify impacts at local level in a qualitative way. Overall, results are general and serve as interpretative guidelines for European shrinkage. They cannot be uniformly applied to every shrinking area in the EU though the theoretical framework in the dissertation emphasises the importance of local contextual factors.

From a more technical and spatial perspective, the identification of shrinking municipalities (and consequently areas) on the basis of LAU units is imperfect. LAUs are sometimes too rigid a spatial unit, but are adopted for convenience. The boundaries of these units may vary between countries, and in some cases an LAU ends up describing a neighbourhood rather than a municipality itself. In some cases, functional urban areas would better depict reality and would be more relevant to discuss social and economic implications which are not confined to administrative borders. Nonetheless, these cases are the exception rather than the rule when we adopt a Europe-wide scope of analysis.

LAUs tend to reflect reality well in the majority of shrinking areas which are mostly concentrated in rural or intermediate domains rather than in larger functional and dense areas. Previous studies insist that a major challenge for shrinking areas is the provision of essential services and connectivity (Barca et al. 2014, Copus et al. 2020) and these competences are most often municipal. However, the analysis in this dissertation only considers the total or relative number (per region, or per country) of municipalities as a group, without distinguishing between sizes, location or typology of territory. Whilst this is dictated by the European scale

of analysis, it embeds significant generalisations. Also, the choice (discussed in chapter 2) of taking the number of municipal units, partially shadows the relevance of the phenomenon for European citizens. An indication of the number of people in each subgroup of municipalities would have helped keep administrative and policy aspects more tightly linked with social and demographic aspects. Also, the threshold of 5,000 inhabitants embedded in the definition of shrinking municipality represents a limitation as (in some countries like France for instance) it leaves part of shrinkage out of the analysis.

In addition to the geographical and temporal scope of the dissertation, policy adherence characterises the contribution and field of application. However, this research does not intend to anticipate the future of shrinkage in the European Union with a crystal ball, which would be mystifying for an academic dissertation. The anticipatory nature of the research design requires specifications that substantiate the results and place them in the right context. There are no methodologies currently available, not even the most scientifically elaborate models of forecasting (SASI, RHOMOLO, LUISA etc..), that can describe future development trajectories precisely and with certainty. Nor how these will interact with other trends and shocks, in this case environmental, pandemic and institutional ones. The results of this thesis should be read through the exploratory lenses that characterise the research design, thus interpreting trends and links that are likely to take place between shrinkage and the challenges.

The methods generate knowledge that can ignite reflections in the policy debate, and can guide future strategic decisions or influence present policy implementation and debates. The knowledge should be elaborated towards this goal and adapted to the local context. In short, the discussion on the future of shrinking areas should not be read as universal predictions, or prophecies applicable to all shrinking areas and the results should not be extended too far from their methodological boundaries and limitations, which are detailed below. A qualitative assessment by local and sectorial experts could validate the results for each shrinking area based on place-specificity, and further nuance their distinctive features based on contextual conditions. The regional case studies in chapter 5 are a possible first step in this direction. Still, qualitative expert knowledge is required to scale the validity and enrich these results with locally sourced knowledge and information.

Last but not least, existing data sources that are sufficiently comparable at European scale are still limited. In some cases, data availability has influenced methodological choices or

constrained potential extension or potential wider applicability and validity of the analysis. Unfortunately, the limited granularity and variety of databases with EU27 coverage limits the possibilities to assess place-specific factors that shrinkage would ideally need. Nevertheless, for some indicators NUTS 3 spatial scale is available, and has been ideal to assess the contextual characteristics of shrinkage. NUTS 2 data also offer the possibility to assess territorial disparities and offer good proxies of diverse conditions in shrinking areas. Whilst a mix of NUTS 2 and NUTS 3 level has given a rich body of knowledge to carry out this study at interregional and European scale, more granular data would be needed to dig deeper into intra-regional differences. In particular, within NUTS 2 boundaries there can be very different situations and significant internal variations for each indicator which end up homogenised or 'hidden' in the regional average.

This section has reflected on general limitations of the research design, concerning the spatial and temporal scope, as well as the data constraints embedded in this type of research. These limitations apply as a cross-cutting feature throughout the dissertation, and are strictly linked with the wide scope of research questions which result in the pros and cons described so far. In the next section each method is separately scrutinised to describe its specific limitations, but also to underline the new elements introduced by the dissertation, and their scientific contribution from a methodological viewpoint.

Municipal projection model reflections

One new element in this research design is the creation of a tailored methodology to project population at municipal level across Europe which targets shrinkage trajectories specifically. Previous studies at EU level have offered projections only at regional and sub-regional (NUTS 2 and NUTS 3) level. The model elaborated for this dissertation is based on these projections and uses concepts and tools of prominent statistical demography models (Siegel et al. 2004; Smith et al. 2001). This gives the best estimate of expected trends at municipal level. The research arena is rich with population projections in general terms, at national and regional level but for micro-level population forecasts the debate is unstructured and relies on statistical demography models adapted to the local context. This means it is dependent on local phenomena, reflecting specific events with a limited geographical scope and is non-replicable (Marois and Bélanger 2014; Romain et al. 2016).

The scope of the analysis substantially differs from existing literature and has entailed challenges in replicating or adapting existing municipal projections in two directions: I) data availability is limited at EU level and does not allow for cohort applications (Siegel et al. 2004; Smith et al. 2001) II) the wider scope of the sample imposes an automated, replicable methodology that is applicable across borders, thus not dependent on local specificities like existing examples (Munthree et al. 2016; Romain et al. 2016). These requirements limit the accuracy of the demographic projections as they reduce the variables that can be considered in the forecasting model for the sake of applicability at a wider scale.

To increase accuracy, further modelling efforts improved the original model for this dissertation to address the individual limitations of the share of growth model. Improvements include introducing an additional linear component to the formula and two weighting coefficients that should increase the accuracy of projections, taking into account the time and size relations between projected and parent spatial units.

The balancing act between linear and share of growth models is an innovation in local population projections. The advantage is the tailored synthesis between historical trajectories and sub-regional future projections for each case. However, for some of the smallest municipalities the linear model weighting is stronger, which could create path dependency strongly influencing the final projection figures. However, introduction of the linear model neutralises the potentially stronger bias from the share of growth model when there are discordant past and future trajectories. All in all, the model is a balancing act from a methodological standpoint and, although imperfect, it manages to reduce the total bias for the vast majority of municipalities in the sample. Also, the share of growth model has been used and validated in purely demographic studies despite its limitations, also with narrower scopes than the European one applied here (Munthree et al. 2016).

Therefore, the proposed methodology should be seen as a finding a good balance between two needs of this research: I) a projection method replicable at European scale; II) the highest likelihood of projection outcomes using data and sources available. Moreover, as of today there is no empirical evidence showing that more complex or sophisticated methods consistently produce more accurate forecasts than the trend extrapolation methods used in this original model (Munthree et al. 2016; Siegel et al. 2004). Unless smaller spatial scopes (and additional variables) are considered, the projections offer reassuring reliability.

In the end, the municipal population projections are not meant for a purely demographic study unlike most of the literature considered. This would inevitably raise the bar on the statistical accuracy of figures. The role of projections in this thesis is to enrich the debate on shrinkage with anticipatory quantitative information and to cross-analyse demographic trajectories with other ex-ante assessments. This means not relying on demographic cohort components which would have allowed more nuanced discussions on the nature, cause and specificities of future population trends. The few existing studies of this nature (Japan National Institute of Population and Social Security Research 2018; Marois and Bélanger 2014) fall beyond the objectives and scope of this dissertation. The total estimate seems sufficient and sufficiently accurate to be cross analysed with TIAs. However, these projections should not be extrapolated from their policy context as they cannot allow for a more detailed demographic discussion on their content.

Territorial Impact Assessment reflections

The dissertation implements a TIA on shrinking areas of the EU for the first time as a territorial focus. This is not new from a methodological perspective, but it is for shrinkage research. The method has been applied to limited cases with comparable focus (cross-border areas, rural areas, etc.) and similar European or pan-European geographical scopes. From a policy perspective implementation follows lines traced by existing literature as TIAs have already assessed the impacts of macro trends and shocks, as well as sectorial policies. Shrinking areas have never been the territorial focus of this method, but this dissertation has relied on a solid body of evidence based on similar policies, comparable focuses and equal geographical scopes.

The TIAs in this dissertation are inspired by the latest version of ESPON TIA (Essig and Kaucic 2017), which is the best balance between scientific ambition and manoeuvrability. Other versions have been discarded because their quantitative modelling requirements (Camagni 2006; Capello 2006) or mixed-method sophistication (Medeiros 2014) did not match the objectives of this dissertation. Nevertheless, the TIAs implemented here still offer new elements and experimentation from the ESPON TIA model. Also, the exploratory nature of the research design, and the highly flexible adaptability of the tool have allowed for differences in use between the Covid-19 and the Just Transition Fund analyses. These different uses catered for the different features of the two challenges.

The Covid-19 TIA is more aligned with the ESPON TIA (Essig and Kaucic 2017) in a dual assessment of exposure and sensitivity to the challenge, determining potential impacts. The Just Transition Fund instead has place-based criteria which enabled precise definition of the exposure ex-ante. Fixing the exposure helped further develop the sensitivity component into a multicriteria matrix along two impact drivers (degree of structural shrinkage and green territorial capital). This approach differs from the ESPON TIA tool and has enabled a multidisciplinary assessment. In general, the multicriteria approach to sensitivity, also applied in the Covid-19 example (to a single driver this time) experiments with additions to the ESPON TIA tool, whilst keeping its adaptability and accessibility. However, the multicriteria synthetic approaches do not constitute a novelty per se for TIAs as these were present in its earliest applications (Camagni 2006; Capello 2006). This dissertation has only reinterpreted existing versions of the methodology to find the most suitable adaptation to study characteristics of shrinking areas and features of each policy challenge.

When we talk about impacts of a policy in a specific territory, the reader may expect a quantifiable description of the effects through a pre-defined set of indicators. Such quantified impact falls outside the methodological framework of ex-ante TIA and the aims of this thesis. Quantifiable impacts are obtained mainly through ex-post assessments or policy evaluations. SASI, RHOMOLO and LUISA models are the most prominent tools to quantitatively estimate the territorial effects of a policy. However, ROMOLO remains anchored to structural funds and in particular deals with human capital, transport infrastructure, and R&D and innovation policies, so it is not suitable for the challenges scrutinised here. LUISA has wider applicability and would definitely offer precious insights into territorial impacts, nevertheless, its macroeconomic imprint reduces adaptability and flexibility in the multidisciplinary assessment required for shrinkage.

The definition of impacts in this dissertation enable discussion of territorial implications as a consequence of the exposure and sensitivity of a territory to a specific policy (ESPON 2012, 2018b; Medeiros 2014). Therefore, Territorial Impact describes the likely effect on a specific territory (or set of territories) of a given European policy as a product of exposure and territorial sensitivity. The effects can be researched across a multi-thematic grid simultaneously, accommodating the need for a multidisciplinary approach which best suits shrinkage. All in all, the limitations of ex ante TIA in terms of quantifiable impacts turns out to be an enabling

factor for the discussion. On one side it builds on the latest quantitative information for sensitivity that can be easily compared across different territories and in relation to other variables. This approach allows for a broader *qualitative* discussion of the results, including the interplay between sensitivity variables. Whilst still imperfect, this quantitative to qualitative approach from methods to results, has also enabled the cross-analysis of results and a systemic discussion of the future of shrinkage. In the end the impacts must be defined as potential, as they are the results of an interpretative methodology, which suits the exploratory nature of the research design.

Last but not least, the two versions of TIA applied in the dissertation partially miss the qualitative component of methodological inputs (Essig and Kaucic 2017). In ESPON TIA variables and inputs are usually defined and discussed by a pool of thematic experts, specifically asked to identify the most relevant variables considering the challenge and the territory investigated. In the context of this dissertation, it has been possible to discuss these methodological choices with colleagues at Spatial Foresight, Helmholtz Centre for Environmental Research (in Leipzig) and Adam Mickiewicz University (in Poznań). A wider pool of expert opinions could have enriched the perspective but this is not certain and the pandemic limited wider expert engagement. Personalised expert opinions have been substituted with more thorough literature research. Whilst this is sufficient to substantiate and strengthen the choice of themes and variables in the TIA, an expert workshop on the results would add value to the final discussion, especially on the cross-analysis.

Another cross-cutting pillar of the dissertation partially limits the TIAs, which is intrinsic to all similar (in geographical scope) applications of the same methodology. In fact, the European scope imposes some generalisation and limits discussion of the results. There are nuances within the results, and these are browsable through the database, but they are inevitably left out of the final discussion. Although relevant, this information is not reviewed due to the scope and scale of the study. An attempt to maximise the value of the TIA with such a geographical scope has been made with the regional case studies (chapter 5). Whilst these are a useful output, handy examples for policy debates, they also reveal the need for further research to review the validity of territorial impacts in more detail. This opportunity will be addressed more specifically in the next section.

Policy content analysis reflections

The methodological toolbox of this dissertation is completed by qualitative content analysis. In this case, the methods are applied without any new element which allows for broad flexibility and adaptability thanks to an open-coding approach. New elements are in the content and context to which it has been applied. In fact, the dissertation applies a methodology that is widely used for social media (Howland et al. 2006; Sarainsky 2015; Snelson 2016), to a different media context and in an experimental phase of agenda setting within EU policy cycles. In this way, the conceptual framework merges a traditional approach to policy content analysis (Flick 2014; Prior 2014) with data sources that usually belong to commercial, media and social fields. Beyond the specific research interest on shrinkage and depopulation, new elements relate to the unusual actors, data and format of policy process under investigation.

Nevertheless, there are limitations to the originality and unconventional type of data, and the platform itself. The use of language to describe the relevance of shrinkage within national debates is not optimal as it is impossible to establish the origin of ideas written in English, nor to distinguish between national debates in different countries with the same official language (e.g. French, German, Greek). Whilst the language information is still a useful proxy to get a feeling of how shrinkage is perceived in national debates, it does not enable conclusions. An optimal scenario would have displayed the location of each idea, which would allow analysis below the national level. Such analysis could have significantly enriched the conclusions, and would have made it possible to extend the content analysis to all ideas from shrinking areas and to assess citizen proposals. Unfortunately, this information was not available on the digital platform, therefore the analysis remains limited to getting a feeling for national debates with no further spatial information.

Moreover, the Conference on the Future of Europe was chosen due to its innovative character of direct citizen engagement in European policy agenda debates, thus avoiding political representation filters. As previously noted, the modalities of this citizen engagement exercise are new in policy content analyses, but the validity of the results should remain limited to the context of the Conference. The engagement of European citizens in the future of shrinking areas cannot be assessed only by this means, as citizens may be active locally or through different digital and offline frameworks. Therefore, results are just for the Conference on the Future of Europe and should not be generalised. The relevance of investigating other citizen

contributions for the future of shrinking areas will also be relaunched in the following section on research recommendations.

The methodological reflection has so far discussed new elements, limitations and boundaries for the interpretation of results. All in all, the methodological toolbox solidly builds on existing and widely applied methodologies in the fields of demography, impact assessment and analysis. Each of the methods is then used and adapted to territorially study the effects of environmental, pandemic and institutional challenges on the future of European shrinking areas. Small novelties and limitations directly stem from the adaption requirements, tailored to each challenge, data availability, and more generally to the aims and constraints of the dissertation.

The genuine element of novelty that the author claims is the combination of these methods into a coherent research design that incrementally builds on the previous step of the research. Municipal projections have an additional anticipatory element that complements the results of both TIAs. Policy content analysis is applied to an atypical policy phase (agenda setting) in order to gain additional insights into future policy trends for shrinkage. The cohesion of the research design is the essential ingredient that allows cross-analysis of the results and moulds the discussion into a cohesive storyline. The exploratory research approach and combination of these methods under a foresight perspective allows reflections on the future of shrinkage in a systematic way. This toolbox makes a methodological contribution to the conceptual model of shrinkage (Haase et al. 2014, 2016), and its relatively easy implementation makes it flexible and adaptable to more policies as well as exogenous and endogenous shocks. It is still a rudimentary toolbox which would benefit from more tests and wider expert involvement in some aspects of the methodology. This thesis leaves the task to future research endeavours.

8.2 Recommendations for future research

During the dissertation some limitations have emerged concerning the methods and methodological choices (summarised in the previous chapter), stemming from the scope of the research design, in particular the geographical and temporal scopes. Following these limiting factors, constraints encountered while carrying out the research, as well as unattained objectives and new ideas that emerged during the doctoral path, this section puts forward suggestions and proposals for further research in the field.

The first proposal is the need for a new definition of shrinkage and shrinking areas, enabling a more precise identification for research purposes. The definition used in this thesis is handy and easy to use, but the thresholds of population decline might need to be updated in light of recent developments in Cohesion Policy. The distance between the current 0.15% and 1% annual population decline put forward in Cohesion Policy seems too wide. The latter is too narrow, as it would identify only municipalities that lost 1/3 of their population over the timespan of the study (30 years). This happens only in extreme cases where natural hazards, or unique episodes take place. The former limit partially overlooks natural trends of population decline in European society. Another element that could be improved is size thresholds, which currently are applied at 10,000 or 5,000 inhabitants. This dissertation reveals that shrinkage is a predominantly in small municipalities and the current definitions risks underestimating the number of European shrinking areas.

The literature review underlined the existence of kindred concepts closer to the policy debate. More thorough review is needed to find common ground to describe the territorial challenge of local depopulation. The objective should be to liaise between kindred and partially overlapping concepts that in the end might explain the lack of recognition in policy debates. European policy debates seem to work better with stand-alone, more encompassing concepts. Shrinkage needs to be liaised with similar concepts to find a synthetic definition, formulation and description encompassing lonely places, lagging areas, inner areas, inner peripheries, left behind places and so on. The preliminary review carried out for this dissertation reveals that the common denominator among these kindred concepts is demographic decline. More research is needed to investigate similarities further, aiming at a common concept describing the territorial aspects of demographic decline.

More research is also needed to link a wide body of case study research to the European scale. The conclusions of case-study research are precious material, and they offer more hands-on knowledge on shrinkage than this study. However, their validity and resonance are too often anchored to the local context where they are carried out, failing to bring the topic into the European debate on territorial development. More research efforts should be directed towards finding common traits, pooling best practices and linking shrinkage case study research into a cross-country network. The existing body of literature hides knowledge and results that deserve wider validity, and they describe approaches to cope with shrinkage that may be scaled up, or

simply inspire a structurally orchestrated approach in the European policy context. This study, and previous ones (Wolff and Wiechmann 2018), generate only a small part of the knowledge needed for such structured approaches, namely quantitative guiding principles. Case-study research can complement this with qualitative results that could add to the European debate with more content-rich proposals. More research efforts could pool case-study research, summarising and scaling the results into a pragmatic format, digestible in European policy debates.

This dissertation has approached the role of citizens in defining future policy agendas for shrinkage. Their role and engagement in the future of shrinking areas needs to be further investigated with different methodologies. The limitation of a European scope of analysis necessitated an important limiting factor as it could not describe active forms of local engagement in shrinking areas. However, their contributions to the debate, although limited in volume, reveal that citizens have a vision and ideas on how to address shrinkage. The Conference on the Future of Europe is the first exercise of open consultation at European scale, with the limitations of novelty. Such frameworks for direct dialogue should be monitored by research in the future. In addition, research should focus on the role of citizens in shrinkage through other engagement frameworks favoured by Policy Objective 5 of the new programming period, but also in other formal and informal dialogue formats and engagement initiatives at local level.

To conclude, this dissertation has applied an analytical framework on shrinkage at meta level which does not focus on one specific territory but analyses the challenge of local population decline from a European territorial development and cohesion policy perspective. It has researched possible future trajectories, potential impacts as well as synergies in socio-economic decline characterising shrinkage, with some of the main policy challenges for the EU (environmental, pandemic, institutional, and digital). This approach has produced results on the risk for widening existing territorial inequalities and has defined vulnerabilities and opportunities that shrinking areas will face. However, the research design does not enable discussion of what can be done to revitalise, mitigate or improve shrinking area conditions. Future research should go in this direction to create a pool of innovative approaches to address shrinkage that can guide and inspire policy makers and practitioners across Europe.

8.3 Policy recommendations

Shrinkage is characterised by a mix of negative socio-economic trends highlighted by a persistent loss of population, more acute among the young. In this dissertation it has been described as an important challenge for European territorial development, as it affects almost every EU country and almost 25% of European territories and will expand to more areas in the future. Each shrinking area has its own complex mix of social, economic, and environmental challenges that fuel the demographic decline (Haase et al. 2016; Wolff and Wiechmann 2018).

Demographic decline is part of European policy debate (ESPON 2017, 2020; European Commission 2020c; Gløersen et al. 2016; Pazos-Vidal 2021). Shrinkage is the territorial transposition of a general demographic drain, but shrinkage is the result of a web of structural issues that goes beyond demography and varies case by case (Haase et al. 2014, 2016). This is not acknowledged in European policies, and recent debate within Cohesion Policy demonstrates an inbuilt resistance to formally recognising the vulnerable status of shrinking areas in official policy documents (Pazos-Vidal 2021).

Meanwhile, European policies beyond Cohesion Policy, generate territorial impacts that vary across territories due to their exposure to the policy and the territorial and socio-economic potential available to benefit from policy instruments and funds. This research has shown that shrinking areas have more vulnerability and typically lack either financial and human capital resources or the socio-economic milieu to benefit from even the most generous and place-specific policies. Moreover, structural decline makes shrinking areas more vulnerable to negative and unintended territorial effects from other policies (Wolff et al. 2017). Altogether, shrinking areas could see widening structural gaps if they continue to be neglected in policy provisions and endowments.

The European Union and its Member States pursue the goal of territorial cohesion[45] and envision a future for all places including through Cohesion Policy (Territorial Agenda 2020). If shrinking areas and their vulnerability do not find greater recognition in official documents

[45] Consolidated version of the Treaty on the Functioning of the European Union - PART THREE: UNION POLICIES AND INTERNAL ACTIONS - TITLE XVIII: ECONOMIC, SOCIAL AND TERRITORIAL COHESION - Article 174 (ex Article 158 TEC). Official Journal 115, 09/05/2008 P. 0127 – 0127.

and regulations, the objective of territorial cohesion risks remaining largely unattained, especially in consideration of the extent of shrinkage across the EU, with its expansion and intensification that this research has proven. Apart from Cohesion Policy, other sectorial policies risk being ineffective in territories where shrinkage has already narrowed development opportunities and negatively affected the social and economic fabric. This has reduced the territorial capital that could potentially benefit. In this respect, the results of this dissertation highlight the need to increase governance quality and build synergies between policies to deal with shrinking areas. Literature strengthens the focal role of institutional capacity in determining territorial development (Charron et al. 2014; Rodriguez-Pose and Garcilazo 2013; Rodríguez-Pose and Ketterer 2020), especially when facing important societal changes such as the green and digital transitions and the pandemic recovery.

The European Union supported by its Member States can play a unique role in addressing shrinking area structural decline. The EU has strong visions, strategies and financial means to help local authorities make a difference. Its neutrality allows the European Union to promote long term values beyond short term political interests and can mobilise a wider exchange of practices and agreement on the recognition of shrinkage. This dissertation has discussed shrinkage in relation to kindred concepts that gain more momentum in the policy arena (Dijkstra et al. 2020; Rodríguez-Pose 2018, 2018). These concepts are closer to the policy sphere, but shrinkage involves complexity beyond political expression and participation.

Nonetheless, this political perspective is important and can be a crucial trigger to catalyse policy relevance that so far has been lacking for shrinking areas (Bernt et al. 2014). Shrinkage would benefit greatly from principles of territorial equality and environmental and social sustainability in the design of future strategies and implementation of future policies. In addition, the European Union has an opportunity to pool a wide source of knowledge and data, which enhances its innovative capacity in dealing with macro challenges. Taking the lead on addressing shrinkage across borders may entail only positive effects in terms of geography of discontent, euroscepticism and proximity to citizens.

While European Union institutions may have a leading and promoting role, Member States are equally concerned in the recognition of shrinkage in policy documents. Together they can establish a legal framework and binding provisions in policies following subsidiarity ladders to mobilise more resources for shrinking areas. Regions and local authorities should provide

content, vision and local strategies to fuel and enrich the arguments in favour of shrinkage in national and European policy debates. Their role is also extremely important in the implementation phase as each shrinking area has peculiar issues and its own territorial capital to be stimulated. If place-based and place-sensitive approaches are really pursued, regional and local authorities should be responsible for making the most of the new resources.

Policy recommendations address bodies involved in the governance ladder within the context of EU policies. More specifically, Cohesion Policy and structural funds are targeted on territorial cohesion objectives using their firepower in terms of resources, encouraged by recent positive signs of shrinkage recognition described earlier. Policy recommendations differ between institutions but also between stages of the policy cycle (Fischer and Miller 2017) determines the possibilities for intervention. Such arguments discerning present and future also mirror the structure of the thesis and the discussion of results. The objective of these policy recommendations is to formally recognise shrinkage in EU policy documents and provisions by providing dedicated financial, but most importantly technical assistance and capacity support for regional and local authorities to address structural issues and exploit territorial potential.

Current policies

The dissertation comes between the adoption[46] and implementation of Cohesion Policy 2021-2027, so the following recommendations are targeted to actors that can still play a role in the remaining phases of this policy cycle:

- **Member States:** should set an investment priority on shrinking areas through binding criteria and investment targets in Partnership Agreements. For instance, local action plans for shrinking areas may become a specific objective under Policy Objective 4 (a more social and inclusive Europe) or Policy Objective 5 (Europe closer to citizens by fostering the sustainable and integrated development of all types of territories). A common framework for shrinkage and its official recognition in the documentation would be an important step, which is also welcomed by recital 45 of the Regulation.

[46] REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021on the European Regional Development Fund and on the Cohesion Fund. L 231/60, Official Journal of the European Union. 30.6.2021

- **European Commission:** can support shrinking areas in policy transmission through the following initiatives:

  a) Set up technical and strategical assistance from national experts within the Commission to assist local authorities in shrinking areas to deal with European policy instruments. A cost benefit analysis of this task force is needed, but it would significantly increase policy effectiveness, efficient spending, and benefits for shrinking areas in terms of capacity building and training. This is especially relevant when considering the poor quality of governance that emerged in this thesis, and the inbuilt limits to administrative capacity that many shrinking areas face (especially small municipalities, peripheral and rural areas).

  b) This assistance could have the capacity, contacts and information to promote and facilitate a *shrinking areas network* to exchange best practices and mutual learning. The exchange of strategies, project proposals and resolution of administrative bottlenecks may be extremely valuable and an inspiration for shrinking areas facing similar issues. Moreover, strategies to address shrinkage and the related administrative solutions can be replicated and scaled more easily cross-country in such a European framework. This network, after being promoted and facilitated by the Commission, can find its natural place within the Covenant of Mayors, or a similar ad-hoc framework for soft cooperation.
- **Regions** (or managing authorities): dedicate investment priorities and horizontal objectives to shrinking areas within operational programmes. For instance, operational programmes and project calls can include criteria (bonus points) to privilege applications from municipalities, or municipal groups facing shrinkage. On a different level, regional authorities can liaise for technical assistance between local authorities and higher governance levels, such as the assistance suggested earlier at Commission level. Depending on regional government capacity, a group of functionaries could act as contact points for shrinking municipalities within a region. They would facilitate support and common solutions to administrative requirements or even initiate cooperation flows between neighbouring shrinking municipalities, in fields like service provision, infrastructure improvements, as well as industrial and tourism strategies to increase attractiveness.

Future policies

A different set of recommendations concerns future policies, where the inclusion of shrinkage in recurring European policies, like Cohesion Policy targeted here, can become a realistic objective. Other policy initiatives can be initiated from scratch to address shrinkage. Attaining

these goals needs more efforts to advocate for shrinking areas in the policy arena, and more evidence to strengthen their cause. Within the policy cycle, these recommendations are part of setting the agenda for future policies, and therefore aim at influencing the policy debate towards greater and more informed recognition of shrinkage.

- **European Commission:** set up a shrinkage task force within the Regional and Urban policy directorate that is responsible for ex ante impact assessments of all sectorial European policies in shrinkage contexts during policy design. If this is installed as an ordinary step in policy negotiation, it would provide a body of evidence to fine tune policy towards territorial, social and economic cohesion objectives. It is not realistic that policies are modified for shrinking areas per se, but their vulnerabilities can be interlinked (or overlapped) with other sources of territorial disparities. Furthermore, ex-ante assessments contain precious material for later phases of the policy as well. Based on this knowledge, policy makers can implement the policy with a place-based approach.
- **European Parliament**: can influence the European policy debate in future negotiations for the next programming period, setting the agenda for shrinkage by highlighting the intrinsic vulnerability and giving a louder voice to shrinking areas and their lack of future prospects. The role of representation of the European parliament is particularly important for shrinking areas due to the lack of recognition so far in European policy debates, increasing awareness can influence other policy fields beyond territorial development. Its representative role is also significant as roughly 20% of European citizens live in shrinking areas today, with more to come.
- **Joint Research Centre, ESPON and European Committee of the Regions**: provide research and policy knowledge on the specific needs and challenges of shrinking areas, describing different types of shrinking area across the EU. This knowledge would add concrete arguments with nuances for local and higher level policy makers to strengthen advocacy for shrinking areas. Moreover, it would facilitate a tailored, effective intervention at EU and national levels through existing policy instruments.

In the end, a cross-cutting recommendation is to engage citizens during the policy process. Beyond the political implications anticipated by existing literature, this dissertation has insisted on the value of citizen contributions in different steps of the policy cycle. Their engagement is key to realise truly place-based implementation of policies with a territorial scope (Barca et al. 2012, 2014; Zaucha et al. 2013). Instead, their perspective and voices are needed to strengthen the case for shrinkage in agenda-setting of a wider policy arena. Citizen insights can make a

significant contributions towards more place-sensitivity (Sotarauta 2020) as a transversal principle across sectors and all other policies that do not have a pre-defined territorial scope, nor territorial cohesion objectives. This would reduce the unintended induction of territorial disparities and promote territorial cohesion as a cross-cutting value (Böhme et al. 2021b), leaving room for shrinking areas to mitigate their negative future outlooks, as emerged from this dissertation.

Role of local authorities

This dissertation has a European focus, a decision which lies at the core of the conceptual framework and has also determined the methodological choices in terms of spatial and temporal scopes. The methodology does not cater for investigations at the municipal level, and therefore does not provide realistic and concrete recommendations at the very local scale. Nevertheless, the role of shrinking areas is pivotal in determining the future development trajectories of their territory and they are the main protectors and promoters of shrinking area interests in policy debates. Despite the technical and capacity limitations they face (addressed in other recommendations above) the principle of subsidiarity leaves them room for steering decisions and implementing local strategies according to their needs and territorial capital.

Within the supra-local scope of the dissertation, local authorities in shrinking areas should promote and engage in shrinking area cooperation networks at regional, national or EU level to add their voices to a chorus and enhance place-sensitivity towards shrinkage in policy debates. At the local level, they become protagonists in implementation as they are the best positioned actors to use place-based approaches assessing contextual information, needs and territorial capital in each situation and involving citizens in strategic decisions. Their privileged position on the ground also embeds the responsibility to carry out assessments and steer engagement processes to favour decisions based on knowledge that is only available locally.

All in all, the recommendations above are directed towards higher levels of governance with the aim to provide greater empowerment for local authorities in terms of a (geographically) wider framework for action with shared strategies, a common pool of resources, technical assistance and capacity building programmes. In the place-based logic adopted in this dissertation, local authorities are the ultimate and most important actors to gather information

and employ resources, to realise a sustainable future strategy for citizens in their shrinking territory.

Expected return for institutions

The recommendations in the previous section look for greater recognition of shrinking areas in the European policy debate with renewed attention to their specificity from institutions at all governmental levels. Greater awareness and more knowledge on shrinkage from research and policy domains would help shrinking areas overcome their current neglect. The coming paragraphs reflect on expected positive returns that institutions should receive from the recommendations.

European institutions should take the future of shrinking areas into greater consideration otherwise the objectives of territorial and social cohesion stated in the Treaty, and in Cohesion Policy regulations could easily risk failing. In addition, the effectiveness of general and sectorial policies risks being drastically reduced without a tailored approach for shrinking areas. In fact, structural lags and consolidated spiral of decline reduce the chances of positive impacts for all policy measures. Moreover, the European Union could position itself at the forefront for innovative policy approaches to territorial development. Indeed, the dissertation has unveiled potential synergies between shrinkage and the environmental transition, as well as the engagement of citizens in decision making processes. As a positive side effect, European institutions would gain more trust and awareness from citizens in places where previous studies have shown that citizen discontent and distrust towards EU institutions are important issues.

Similarly, national and regional governments would have a positive cascade of renewed trust from citizens living in shrinking areas. In addition, they would have more concrete instruments to address structurally declining conditions there, especially in terms of knowledge and technical support. The creation of a cross-country policy debate would also enable cooperation to find shared visions and common strategies for places that often lack a future perspective and where in-house approaches have been unsuccessful so far. This does not mean unrealistic revitalisation and regrowth in all European shrinking areas, but rather the shared recognition of a strong decline in distributed territorial development and the quest for a common framework to accompany a process that is cost efficient, but also bearable (or even pleasant) for the inhabitants. Greater engagement for shrinking areas would also be coherent with the objectives

in the Territorial Agenda 2030. If they envision 'a future for *all* places', shrinking areas (25% of all territories) should not remain in the shadow.

The negative demographic forecasts for the European Union in 2050, and results presented in this dissertation (chapter 3) concerning blind spots and negative outlook areas open a window of opportunity. Adopting greater awareness towards shrinkage and facilitating new approaches to the territorial development (or not) of shrinking areas also means getting ready for a trend that will continue growing. In a way, raising the debate about the territorial dimension of demographic decline today embeds learning with more benefits than just putting a band aid on the bleeding. If the demographic projections and shrinkage trends were less negative for the coming years, it would probably be more reasonable (and cost-efficient) to just let shrinking areas go naturally and concentrate resources on more 'rewarding' territories. The likelihood that shrinkage will become evermore prominent makes currently shrinking areas a working field for approaches to be tested, improved, and replicated across similar contexts. In addition, the ex-ante identification of spots of future shrinkage opens an opportunity for these places to adopt a proactive (instead of reactive) approach towards shrinkage.

8.4 Afterwords

This dissertation has investigated the future of shrinking areas as they face the pandemic, environmental and institutional challenges and has produced insights and reflections on the interplay of these factors with shrinkage. Since the onset of this research project the territorial perspective on these challenges, but also the perception of shrinkage, has already changed significantly in both academic and policy debates. The research and the knowledge created for this dissertation have fuelled new thoughts and raised more questions on the future of shrinkage.

While finalising this research project, the 8th report on economic, social and territorial cohesion was published. Its conclusions strengthen the results of this dissertation that shrinkage will be a growing issue for the European Union: 'Projections indicate that the share of people in the EU living in a shrinking region will increase from 34% in 2020 to 45% in 2030 and 51% in 2040' (Dijkstra et al. 2022: 191). Moreover, at the time of submitting the dissertation, each of the challenges and the understanding of shrinkage have evolved and more nuances need to be

added to continue fuelling the research process on European shrinkage through foresight lenses.

The Covid-19 restrictive measures may be slowly coming to an end (or new normal), and whilst their impact will still be felt in the medium to longer term, a healing and recovery phase may be starting with new policy measures, and related territorial impacts to consider. Among these, NextGenerationEU and the recovery and resilience plans constitute unprecedented injections of resources to address structural lags and accompany the recovery phase. Investigating the potential territorial impact of these measures on shrinking areas would be a challenging, but extremely interesting research endeavour.

The environmental challenge is a multifaceted process, and this dissertation has focused on the energy transition, and especially on industrial restructuring in territories still heavily reliant on coal-based jobs. The Just Transition Fund is a policy instrument addressing this specifically and proposes to reverse the traditionally established industrial fabric through innovation, technology and knowledge intensive re-skilling. The analysis in this dissertation examines territorial capital and the preparedness of territories to manage this paradigm shift, which implies economic regrowth. In light of the negative projections discussed in this dissertation including the demographic trends it would be interesting to go one step further for areas with a negative assessment and shift the perspective from regrowth to adaptation and post growth. This would allow research on alternative paths for shrinking areas, which would probably explore other facets of the environmental challenge.

The institutional challenge, notably the role of citizens and their engagement within the institutional and political life of the European Union, has also evolved throughout the three years of this research project (2019-2022). These topics have gained momentum and space in the policy debate (as seen above with PO5 of Cohesion Policy, and the Conference on the Future of Europe). Better governance, and greater proximity to citizens are two topics addressed by the 8th report on economic, social and territorial cohesion, just published in the final days of this dissertation (Dijkstra et al. 2022). As citizens seem to gain attention in future European policy processes, it would be interesting to monitor this process of engagement. This dissertation has provided evidence that citizens may have a vision for the future of shrinking areas, though their involvement in this policy debate is at a very early stage, and limited. In future research it would be extremely interesting to enlarge and enrich this focus of citizen

contributions to territorial development and monitor if and how their role evolves in European policy processes. Such a step would also require widening the scope of research methodologies, and including different frameworks of citizen engagement and influence, both formal and informal from EU to local levels.

Last, but most importantly, a reflection should be paid to the emerging war in Ukraine, the latest frightening and deeply saddening event intruding in our lives, and absorbing the policy debate in Europe and beyond. The role adopted by the European Union alongside the economic and financial and decisions already taken will have consequences in many sectors, certainly beyond energy. In addition, more unpredictable events will also result in severe impacts across all European territories. As we have seen with the analysis of the pandemic crisis, these global shocks can unfold in unprecedented territorial patterns of impact. At a stage where even journalists have a hard time decoding and narrating events and new policy decisions, it is certainly too soon to think analytically about the potential territorial impacts. The structural funds already allocated for the programming period 2021-2027 will certainly be impacted, but it is unclear how.

Nonetheless, one element stands out in close connection with demography and shrinkage dynamics: the refugee crisis. The flow of Ukrainian people finding asylum in the European Union exceeds by a very long way any previous immigration wave Europe faced in the past. The seemingly fast formal integration of so many Ukrainian citizens in the EU may disrupt current demographic trends and future projections. It is too early to establish whether we are dealing with a permanent exodus but, sadly, the conditions of Ukrainian cities and infrastructure after only a few weeks of conflict suggest a medium to long-term effect of this migration. The impact on shrinkage in the EU is likely to be significant, especially for countries like Poland.

This afterword is a quick ex-post reflection on how the topics investigated in this dissertation have evolved since the onset of the Re-City project in 2019. It notes how the research design would change if the same questions were posed today. Reflecting along these lines, and noting the new research angles shows the volatility of territorial development as it intertwines with macro trends of change. Foresight approaches and exploratory research in this field seem extremely valuable to remain continuously aware of emerging drivers and to stimulate scientific and policy debates on their implications.

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10 List of tables

11 List of maps and graphs

12 Annexes

This section recollects additional information concerning data sources and technical notes subdivided by chapter.

12.1 Annex to chapter III

This section complements chapter 3 with additional information on data source and technical notes.

Table 31: Overview of data processing and database compilation for LAU 2 population data by country. For countries with blank cells it means that the Eurostat sources had sufficient data availability and code matching continuity.

European countries	Comments on the data compilation procedure
Austria	*I used the most recent LAU 2 codes from 2019 Eurostat as a reference and built the database with time series based on this data. It was necessary to make a refinement with name search to reach a better coverage. Probably the result of change in codes of some municipalities, but not their name. As in the other cases, the formula has been adjusted for the selected cases.
Belgium	Eurostat census and correspondence tables
Bulgaria	* there exist a distinction between LAU 1 and LAU 2. In Bulgaria municipalities are represented by LAU 1, BBSR uses LAU 1 data as well, but it was not possible to reconstruct the time series for LAU1, as in the census we have only LAU 2 data. Data available only for the years 2001-2017
Croatia	*Similar approach to Poland for recompilation of the LAU codes. I used the last 5 figures of the Census, corresponding to the lau shown in the 2019 Eurostat file. 100% ecaxt match
Cyprus	Eurostat census and correspondence tables
Czech Republic	Eurostat census and correspondence tables
Denmark	* I used BBSR lau codes as a last reference because in the latest updates of Eurostat they only gave updates for the LAU 1. Instead, in the census we had the LAU 2 as in the BBSR.
Estonia	*Estonia is a critical case. There has been a reform in 2017 that has merged 226 LAU2 into 79 LAU2 municipalities. In light of this I have decided to take data until 2017 to allow for the complete time series and comparability with other countries.
Finland	*I used the LAU2 codes from BBSR as reference to rule out the discrepancies between LAU 2011 and 2016, but data is coming from Eurostat
France	*I used the LAU2 codes from BBSR as a reference given that there was no data in Eurostat for 2019 and 2017. The codes can be compared to the LAU in the 2019 file though, for matching with NUTS3.
Germany	* I used only Eurostat codes, 2018 file as a reference.
Greece	*for the time series data is available only at LAU 1 level. I used Eurostat codes from 2018 to have the NUTS 3 reference but data comes BBSR for 2001 and 2011 at LAU 2. No other year seems to be available.
Hungary	Eurostat census and correspondence tables
Ireland	*I used the same methodology as Portugal: However in this case there are some discrepancies to be solved. Most probably there have been significant changes in the LAU extension for some LAUs. LAUs have kept the code, therefore we have a match, but the population figures are too different in 2017, with respect to previous years. In light of this I decided to used the BBSR data, though available only for 2001 and 2017. The confusion with LAU code was too relevant to overcome otherwise, and without investigating through national sources.
Italy	Eurostat census and correspondence tables

Latvia	Eurostat census and correspondence tables
Lithuania	Eurostat census and correspondence tables
Luxembourg	Eurostat census and correspondence tables
Malta	Eurostat census and correspondence tables
Netherlands	Eurostat census and correspondence tables
Poland	*There is an issue with LAU 2 codes between the 2017 (used for the previous assessment) version and 2019. Supposedly there has not been any change in the LAUs per se, but in the Eurostat 2019 and 2018 it is impossible to recompose the original lau codes. I managed to match the population data with their codes by using only the last 5 figures of the LAUs. These are in fact equal in both versions 2017 and 2019, after a randomized check. This was enough to close the missing cases to 97. To reduce it even further i changed the matching formula for these cases to the municipality name instead of LAU codes. This "refinement" has reduced the missing cases to 46. This database is the best representation of 2019 polish population figures, besides being empirical. Using 2017 data would allow for a standard methodology instead. If this option is chosen it will be sufficient to used the previous assessment file.
Portugal	*I used the BBSR data for 2017. For the rest I used the Eurostat census source
Romania	Eurostat census and correspondence tables
Slovakia	Eurostat census and correspondence tables
Slovenia	*I combined Eurostat and BBSR databases. In the census there was data available only for LAU 1, around 50 units. Therefore we have no data for 1991, but only '01, '10, '17.
Spain	Eurostat census and correspondence tables
Sweden	Eurostat census and correspondence tables

Table 32: Overview of the data availability for each year, the merging of data sources and the latest available year following the data compilation procedure outlined in Table 1. The information is displayed per country.

Country	1991	2001	2011	2018	Eurostat Source	BBSR Source	Last year available	Shrinking cases
Austria					X		2018	21
Belgium					X		2018	6
Bulgaria					X	X	2017	219
Croatia					X		2018	114
Cyprus					X		2015	0
Czech Republic					X		2018	132
Denmark					X	X	2017	37
Estonia					X	X	2017	36
Finland					X		2018	108
France					X	X	2017	384
Germany					X		2017	725
Greece					X	X	2011	83
Hungary					X		2018	171
Ireland					X	X	2017	23
Italy					X		2018	386
Latvia					X		2018	69
Lithuania					X		2018	55

Luxembourg					X		2018	0
Malta					X		2018	6
Netherlands					X		2017	26
Poland					X		2018	640
Portugal					X	X	2017	158
Romania					X		2018	366
Slovakia					X		2018	55
Slovenia					X	X	2017	37
Spain					X		2017	213
Sweden					X		2018	90

12.2 Annex to chapter IV

This section complements chapter 4 with additional information on data source and technical notes.

12.2.1 Data sources

Table 33: Data sources of sensitivity analysis to Covid-19 restrictive measures

Dimension	Source	Year	Description of the indicator
Employment in risk sectors	Eurostat, ILO	2017 or latest available	The indicator 'persons employed per sector' has been used to calculate the share of employment in each industry on the total working age population (15-64). The main data source is Eurostat 'regional structural business statistics' (covering 13 of the 16 sectors).[47] This has been complemented with data from Eurostat 'regional labour market statistics' (covering the 3 remaining sectors)[48]. The decision to merge two different, though compatible, sources gives the widest coverage of sectors. The data is available by NUTS 2 regions and NACE Rev. 2 statistical classification of economic activities.
Reliance on tourism	Eurostat	2019 or latest available	Tourism can be considered as atypical from an employment perspective (accommodation and food services in NACE Rev. 2), as it very often relies on seasonal, temporary and family workers

[47] Mining and quarrying; Manufacturing - Electricity, gas, steam and air conditioning supply - Water supply, sewerage, waste management and remediation activities – Construction - Wholesale and retail trade, repair of vehicles and motorcycles -Transportation and storage - Accommodation and food service activities - Information and communication - Real estate activities - Professional, scientific and technical activities - Administrative and support service activities.

[48] Agriculture, forestry and fishing - Public administration, defence, education, human health and social work activities - Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies.

			that are more likely to be underrepresented in employment statistics. Therefore, the indicator 'capacity of collective tourist accommodation' has been used to calculate the comparative reliance of European regions on tourism. The data source is the Eurostat 'regional tourism statistics'. For the indicator 'capacity of collective tourist accommodation' the number of bed-places available in each NUTS 2 region is considered as a proxy.
Reliance on international trade	JRC	2018	To capture the comparative reliance of European regions on international trade and their participation in international value chains the indicator 'Export and Import as share of regional GDP' has been chosen. The data source is the JRC technical report 'European NUTS 2 regions: construction of interregional trade-linked Supply and Use tables with consistent transport flows' (Thissen, Ivanova, Mandras, & Husby, 2019).
Quality of government	University of Gothenburg	2017	The quality of government index is therefore chosen to capture this important factor suspect of generating territorial imbalances. The data source is the 'QoG EU Regional dataset' from the Quality of Government Institute at the University of Gothenburg.
Regional GDP	Eurostat	2019 or latest available	The indicator regional GDP at NUTS 2 level per capita has been chosen.
Employment in micro-enterprises	ESPON database	2014	The indicator for persons employed in micro enterprises reflects this characteristic of regional economic structures. The data source is the ESPON Database behind report 'Small and Medium-Sized Enterprises in European Regions and Cities' (ESPON, 2018).
Self-employed	Eurostat	2019 or latest available	The indicator chosen is ratio of the share of self-employed compared to total employees. The data source is Eurostat regional labour market statistics, at NUTS 2 level.
Youth unemployment	Eurostat	2019 or latest available	To capture youth unemployment the indicator 'regional unemployment by age' for the age class 15-24 has been chosen. The data source is Eurostat 'regional labour market statistics'.
People at risk of poverty	Eurostat & ESPON database	2019 or latest available	To capture the comparative incidence of poverty and social exclusion across EU regions the indicator 'share of people at risk of poverty and social exclusion' has been chosen. The database is the result of merging two sources: I) Eurostat 'regional poverty and social exclusion statistics';

			II) ESPON 2020 database 'at risk of poverty and social exclusion rate by NUTS 2 region'.
Cross-border employment	Eurostat	2019 or latest available	To assess how much each European region is impacted by border closures, we look at the share of people (15-64 years) living in a region but working in a foreign country compared to the total employed in the same age class. The data source is 'Employment and commuting by sex, age and NUTS 2 region' from Eurostat labour market statistics.

12.2.2 Risk assessment of the selected economic sectors

The sectors analysed (NACE rev. 2 classification) and the assessment of their economic risk are shown in the table below.[49] The risk assessment is comparative to the other sectors analysed and is based on ILO sources and sub-sector analyses.

Table 34: Risk assessment of the selected economic sectors

Economic Sectors (NACE)	Category assigned	Assessment
Agriculture, forestry and fishing	**Neutral**	Works restrictions are comparatively less rigid, and demand can be considered stable compared to other goods. *Low risk for ILO.*
Mining and quarrying	**Medium**	Work restrictions are less rigid, but demand can be negatively affected in the short term by value chain disruptions. *Medium risk for ILO.*
Manufacturing	**High**	Work restrictions are averagely rigid, but demand will suffer both in the short and long term by value chain disruptions. *High risk for ILO.*
Electricity, gas, steam and air conditioning supply	**Neutral**	Works restrictions are comparatively less rigid, and demand can be considered stable compared to other goods. *Low risk for ILO.*
Water supply; sewerage, waste management and remediation activities	**Neutral**	Works restrictions are comparatively less rigid, and demand can be considered stable compared to other goods. *Low risk for ILO.*
Construction	**Medium**	Work restrictions are less rigid, but demand can be negatively affected in the longer term. *Medium risk for ILO*
Wholesale and retail trade; repair of motor vehicles and motorcycles	**High**	Very strong disruptions on the demand side caused by shop closures in the short term and social distancing in the long term**.** *High risk for ILO*
Transportation and storage	**Medium**	Very strong negative impact on air, and water transport demand both in short and medium term, but stable or even rising demand for postal and courier services. *Medium-high risk for ILO.*
Accommodation and food service activities	**High**	Very strong disruptions on the demand side caused by travel restrictions and social distancing both in the short and long terms. *High risk for ILO*
Information and communication	**Positive**	Demand has sharply increased in the short term and is suspected to consolidate benefits medium-long term. *Not classified in ILO*
Financial and insurance	**Medium**	Financial sector has suffered strong negative impacts in the short term, while insurance is considered relatively stable. *Medium risk for ILO.*

[49] The risk judgment has been derived from the ILO assessment and adapted to 3 risk levels instead of 5. For some sectors, such as agriculture, the categorisation may vary considerably between countries or regions. The categorisation might also change, as we learn more about the impacts of COVID-19 policy responses.

Real estate	**High**	Strong disruption on demand both in the short, but especially in the medium-long term. *High for ILO.*
Professional, scientific and technical	**Neutral**	Smart working has partly neutralised work disruption. Demand considered stable for now. *Low for ILO*
Administrative and support service	**High**	Sub-sectors rely heavily on providing services for physical gatherings, strong negative effects on demand in the medium term at least. *Not classified in ILO.*
Public administration, defence, education, human health and social work	**Neutral**	Online services and learning have partly neutralised work disruption. Health *Low for ILO*
Arts, entertainment and recreation; other service activities; household and extra-territorial organisations	**High**	Recreation sector will suffer the longest lasting restrictions, with extremely negative consequences on demand in the short to medium term. *Medium for Brussels and Luxembourg due to the high presence of extra territorial organisations. *Medium-high for ILO*

12.2.3 Sensitivity to negative impacts: integrated index composition

BOX: COMPOSITION OF THE INTEGRATED INDEX

The indicators have been aggregated in accordance with the importance of individual indicators

- EMPLOYMENT IN RISK SECTORS has a score of 1 for lower risk, 2 for medium risk and 3 for higher risk. This composite indicator is the most comprehensive measure of the sensitivity of regional economies to COVID-19 policy responses. In light of its decisiveness, the methodology gives it greater relevance.
- TOURISM RELIANCE has a score of 2 for the high reliance category, and 0 for the medium and low, as tourism has been considered the most highly affected aspect in the crisis. The 55 European regions (roughly all those well known for being highly attractive) more reliant on this industry have a higher score to reflect their specific circumstances.
- INTERNATIONAL TRADE has a score of 1.5 for the high reliance category, and 0 for medium and low, as the reliance on international trade and value chains is considered very important for capturing regional sensitivity, only slightly less than tourism. The 64 European regions more reliant on this industry will have a higher score to reflect their specific circumstances.
- PEOPLE AT RISK OF POVERTY AND SOCIAL EXCLUSION have a score of 0.5 for the high incidence category, and 0 for the medium and low, as this explains regional sensitivity less than first three indicators (Risk sectors, Tourism and Trade). It makes a very important contribution to the regional picture, though it captures a more specific aspect. The 57 European regions with the most families at risk of poverty and social inclusion will have a higher score to reflect their specific circumstances.
- YOUTH UNEMPLOYMENT has a score of 0.5 for the high incidence category, and 0 for the medium and low, as this explains regional sensitivity less than the first three indicators. It makes a very important contribution to the regional picture, though it captures a more specific aspect. The 70 European regions with the highest shares of youth unemployment will have a higher score to reflect their specific circumstances.
- REGIONAL GDP has a score of 0.5 for the low GDP category, and 0 for the medium and high, as it explains regional sensitivity less than the first three indicators. Its explanatory power makes a very important contribution to the regional picture, though it captures a more specific aspect. The

86 European regions with the lower GDP will have a higher score to reflect their specific circumstances.

- NATIONAL DEBT has a score of 0.5 for the high national debt, and 0 for the medium and low, as this explains regional sensitivity less than the first three indicators. It makes a very important contribution to the regional picture, though it captures a more specific aspect. The 98 European regions with higher levels of national debt will have a higher score to reflect their specific circumstances.
- QUALITY OF REGIONAL GOVERNMENT has a score of 0.5 for the low quality category, and 0 for the medium and high, as this explains regional sensitivity less than the first three indicators. It makes a very important contribution to the regional picture, though it captures a more specific aspect. The 77 European regions with lower quality of government will have a higher score to reflect their specific circumstances.
- EMPLOYMENT IN MICRO ENTERPRISES has a score of 0.5 to the high incidence category, and 0 to the medium and low, as it is considered to be decisive in explaining regional sensitivity to a lower extent than first three indicators outlined (Risk sectors, Tourism and Trade). Its explanatory power is a very important contribution to the regional picture, though it captures a more specific aspect. The 80 European regions with the higher share of persons employed in micro enterprises will have a higher score to reflect their specific circumstances.
- SELF-EMPLOYED have a score of 0.5 for the high incidence category, and 0 for the medium and low, as it explains regional sensitivity less than the first three indicators. It makes a very important contribution to the regional picture, though it captures a more specific aspect. The 69 European regions with the higher share of self-employed people will have a higher score to reflect their specific circumstances.
- CROSS-BORDER EMPLOYMENT has a score of 0.25 for the high incidence category, and 0 for the medium and low, as cross-border aspects are less decisive than the other sensitivity indicators. The 48 European regions with a higher share of people working outside national borders will have a higher score to reflect their specific circumstances.

12.2.4 Sensitivity to positive impacts: integrated index composition

BOX: INTEGRATED INDEX COMPOSITION

The indicators have been aggregated using a weighing system in line with their individual importance.

- EMPLOYMENT IN INFORMATION AND COMMUNICATION SECTORS has a score of 1 for lower, 2 for medium and 3 for higher incidence. This indicator is the most important measure of regional economic sensitivity to potential opportunities and benefits of COVID-19 policy responses. Given the importance of the information and communication sector, the methodology is designed to give the greater relevance to it, attributing the higher number of points.
- BROADBAND ACCESS has a score of 1 for the higher access category, and 0 for medium and lower. This prioritises regions with a potential competitive advantage in reacting to policy stimulus, due to their structural characteristics. The 85 European regions with higher access to broadband will have a higher score to reflect their specific circumstances.
- SMART WORKING PREPAREDNESS has a score of 1 for higher preparedness, and 0 for the medium and lower. This prioritises regions that may have a competitive advantage in reacting to policy stimulus, due to their structural characteristics. The 48 European regions with higher preparedness to work from home will have a higher score to reflect their specific circumstances.
- ONLINE INTERACTIONS WITH PUBLIC BODIES has a score of 1 for higher interactions, and 0 for medium and low. This prioritises regions that may have a competitive advantage due to their structural characteristics. The 64 European regions with more advanced online interactions between public bodies and citizens will have a higher score.

12.3 Annex to chapter V

This section complements chapter 5 with additional information on data source and technical notes.

Table 35: Data sources of the sensitivity component Pillar I: Shrinkage profile

Shrinkage profile				
Variable	Spatial unit	Year	Source	Notes
Crude rate of net migration	NUTS 3	AVG('09/'18)	Eurostat	
Ageing index	NUTS 3	2018	Eurostat	* tot population > 60 / tot population < 19
GVA per inhabitant	NUTS 3	2018	Eurostat	
Long term unemployment	NUTS 2	2018	Eurostat	*12 months or more
People at risk of poverty and social exclusion	NUTS 2	2018	Eurostat/ESPON	

Table 36: Data sources of the sensitivity component Pillar II: Green territorial capital

Industrial diversification vs reliance on mining				
Variable	Spatial unit	Year	Source	Notes
Ratio of dependency of the industrial fabric on phasing out sector	NUTS 2	2018	Eurostat	Ratio of employment in 1st, 2nd and 3rd industrial activity sector over employment in mining
Skills endowment that can drive the transition				
Variable	Spatial unit	Year	Source	Notes
Persons with tertiary education (ISCED) and/or employed in science and technology	NUTS 2	2018	Eurostat	
Accessibility to universities	NUTS 3	2014	DG regio	Percentage of population in a NUTS-2 region who can access a university main campus within 45' drive
Business environment: dynamicity and innovation				
Variable	Spatial unit	Year	Source	Notes
SMEs innovating in-house	NUTS 2	2019	Regional Innovation Scoreboard	Based on the Eurostat Communication Innovation survey the indicator describes those SMEs with in house innovation activities, have introduced a new product or new process either in-house or in combination with other firms.
R&D total intramural expenditure (% of GDP)	NUTS 2	2019	Eurostat	
Taxonomy of 4.0 innovation regions	NUTS 2	2010-2015	ESPON	I) Low tech regions; II) technology falling behind regions; III) new islands

				of innovation; IV) technology leader regions